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CITIZEN EXPERTISE AND ADVOCACY IN CREATION OF  
NEW JERSEY'S 1987 FRESHWATER WETLANDS PROTECTION ACT

By

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Written under the direction of

Karen M. O'Neill, Ph.D.

And approved by

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**ABSTRACT OF THE DISSERTATION**  
**CITIZEN EXPERTISE AND ADVOCACY IN CREATION OF**  
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In this research I explore the influence of citizen expertise on environmental regulatory policy surrounding New Jersey's freshwater wetlands. I intend to improve understandings of pluralism and accountability in social science models of science advising, which have paid little attention to the ways citizens contribute scientific knowledge to policy making. I look at citizen expertise in the context of an important chapter in U.S. environmental history culminating in New Jersey's Freshwater Wetlands Protection Act (FWPA) on July 1, 1987. This Act made New Jersey the first state to completely assume administration of the portion of the federal Clean Water Act that protects wetlands and gave it the nation's strongest measures to protect these environmentally valuable lands. Inquiry is situated in the joint perspectives of Science and Technology Studies (STS) and Social Movement Studies and incorporates constructivist-interpretivist research techniques. A state-wide environmental advocacy movement called the Freshwater Wetlands Campaign (FWC) responded to what it perceived as inadequate and fragmented state and federal attempts to protect freshwater wetlands by developing the technical and political competence to champion wetlands protection. The FWC worked at a time when standards of knowledge production for freshwater wetlands science had yet to be established and when no methodological approach was privileged. The concept of co-production is used to explain how

the FWC helped to define what would constitute scientific competence in three scientifically and technically complex disputes: the definition of a freshwater wetland such that it would be protected; the delineation of a protective freshwater wetland buffer; and the creation of artificial freshwater wetlands as sufficient action to permit destruction of natural freshwater wetlands. Closure around these disputes is conceived as resulting in creation of three new regulatory “artifacts” in New Jersey: freshwater wetlands, freshwater wetland buffers, and mitigated freshwater wetlands. I show that without the FWC’s role in developing science and these artifacts, New Jersey’s FWPA would either not exist or would have followed a different path. From this I suggest that we can improve the co-production framework with a new theory for STS that includes a “bottom up” model of social movements.

## DEDICATION

For Maya: you are the home for which I sigh when tiring of the swamp and her secrets.

And for Denise Broadhurst, in whose office hung a frame with a small note taped to the glass

“Dissertation Goes Here,” but who left us before she could celebrate the achievement of her degree.

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Thanks are also due to New Jersey's many environmental advocates, legislators, state officials, representatives from the building and development community, and others that welcomed me into their homes and offices, gave freely of their time, and shared their memories as we worked together to shape this story of how New Jersey's Freshwater Wetlands Protection Act came into existence.

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## CHAPTER ONE: CITIZEN EXPERTISE AND CITIZEN ACTION IN ENVIRONMENTAL POLICY

Contemporary societies face many challenges as they work to understand and balance anthropogenic environmental change. The scientific and technical complexities and the uncertainties associated with regulating the many environmental concerns directly affected by human action, issues including land and water use, power generation, waste disposal, genetic engineering and nanotechnology, to name just a few, are vast and increasingly intricate. As environmental questions have become more complex so too have the processes of decision-making (Gottweis, 2007: 238). Decision makers must determine how to obtain appropriate, useful information to input into their deliberations, and likewise must determine how to apply the received information to effective decision making. They do this at a time of increased interest in the use of science in planning, decision making, and conflict resolution by those working to integrate science with environmental management (Olson & Rejeski, 2005). They also do this as citizens in many countries, dissatisfied with governmental responses to environmental degradation, have organized as social movements or non-governmental organizations (NGOs). This global increase in movements organizing around environmental issues raises questions about the status of legitimate knowledge (Brian, 1989; Irwin, 1995; Corburn, 2005), prompting some to suggest a need for fresh articulations of both contexts for policy making and engagements between experts and publics in environmental conflicts (Hempel, 1996; Corburn, 2009; Brown, 2009). Do these shifts suggest a need for new foundations for environmental thinking and policy-making? Should we limit representative democracy's capacity to identify expert inputs for environmental decision making and substitute instead more collaborative, participatory approaches, or are there ways of incorporating new knowledges into current institutional structures and policy processes?

My study considers these questions by taking the case of New Jersey's Freshwater Wetlands Protection Act (FWPA) and examining the role of citizen knowledge and advocacy in shaping the FWPA legislation. It looks specifically at the convergence of citizen advocacy and expertise in three disputes central to passage of the FWPA: the definition of a freshwater wetland such that it would be protected (the "definitions" dispute); the delineation of a protective freshwater wetland buffer (the "buffers"

dispute); and the creation of artificial freshwater wetlands as sufficient action to permit the destruction of natural freshwater wetlands (the “mitigation” dispute). Closure of these disputes with passage of the FWPA on July 1, 1987 resulted in the creation of three new regulatory technological artifacts for New Jersey: freshwater wetlands, freshwater wetlands buffers and mitigated freshwater wetlands. Closure also resulted in formation of the new Freshwater Wetlands Mitigation Council, an institution designed to guide collaborative decision making and use of a new instrument for freshwater wetlands ecosystem restoration in the state, the Freshwater Wetlands Mitigation Bank. With passage of the Act New Jersey became the first state in the nation to completely assume administration of the portion of the federal Clean Water Act (CWA) (1972) that protects wetlands. It also became the first (and remains the only) state to incorporate the regulation of freshwater wetlands “buffers,” or “transition areas,” into assumption processes.

A study of passage of New Jersey’s FWPA illustrates aspects of the institutionalization of the CWA, and we can better understand the influence of this Act on other federal and state actions to protect freshwater wetlands. For example, there is evidence that New Jersey’s requests for regulatory guidance as part of shaping the FWPA prompted federal agencies to come to agreement on definition and mitigation determinations that had stymied these agencies for years. And just a month after he signed the FWPA into law, New Jersey’s Republican Governor Thomas Kean was chosen by President George H.W. Bush to head up the National Wetlands Policy Forum. Borrowing from New Jersey’s experience with the FWPA, Kean and the National Wetlands Policy Forum outlined the federal “no net loss” policy goal regarding wetlands preservation, a goal that was ultimately incorporated as part of the February 1990 Memorandum of Agreement Between the U.S. Army Corps of Engineers (Army Corps) and the United States Environmental Protection Agency (EPA). Dozens of states have looked to New Jersey’s FWPA as a model to close regulatory gaps in freshwater wetlands protection, and have considered New Jersey’s extensive mitigation requirements as a model in developing Mitigation Banks and wetland permit and mitigation tracking systems. More than twenty-five years after passage of the FWPA New Jersey remains a leader in national freshwater wetlands protection. Observing a growing interest in ecosystem resiliency programs that accompanies concerns over the effects of climate

change we can imagine that New Jersey's collaborative exercise with the Freshwater Wetlands Mitigation Council and the associated Freshwater Wetlands Mitigation Bank will be looked to for insight as states prepare plans for climate adaptation and resilience.

In passing the FWPA and in creating the new state-specific regulatory artifacts of freshwater wetlands, wetland transition areas, and mitigated freshwater wetlands, New Jersey established the country's strongest measures to safeguard these environmentally valuable lands. These protections were achieved in a context of inadequate and fragmented state and federal attempts to protect freshwater wetlands. They were achieved at the naissance of freshwater wetlands science when traditions of knowledge production for the discipline had yet to be established and no methodological approach was privileged. Critical to this story of New Jersey's achievement were the contributions of citizens who organized as the statewide environmental advocacy movement called the Freshwater Wetlands Campaign (FWC). Working in the absence of an authoritative science the FWC first enacted, and then leveraged, a substantive citizen science to bring recognition to freshwater wetlands as an environment worthy of protection and an environmental issue worthy of pursuit; and second, synthesized substantive knowledge about wetlands with effective political action to preserve them.

In this study I will explain what two models of science advising, the rational model and the "participatory turn" (Jasanoff, 2003), would have predicted as scientific inputs into decision making around New Jersey's 1987 freshwater wetlands legislation. The rational model would project that an authoritative body of scientific evidence specific to freshwater wetlands could be identified and interpreted by scientific and technical experts for the benefit of legislators. These legislators would then incorporate the information into the FWPA legislation. The participatory turn modifies this perspective. Understood as a reaction to the "perceived scientization of politics" (Bäckstrand, 2003: 24) implied by the rational model, and as a reaction to concerns with the lack of transparency and accountability in the policy process, the participatory turn takes the view that citizens, NGOs and businesses have an inherent interest in the science-politics interface. This model would predict that in the FWPA case the government would solicit policy preferences from a diversity of stakeholders in a process whereby "[s]cattered and private knowledge" was "amalgamated, perhaps even disciplined,

into a dependable civic epistemology” (Jasanoff, 2003: 240) for consideration in policy decisions. But neither the rational nor the participatory turn model accounts for the development and insertion of citizen science into decision making observed in the case of New Jersey’s freshwater wetlands. I therefore suggest a third “bootstrap” model of science advising to explain the dynamic of advocacy, citizen science and decision making that led to New Jersey’s FWPA. I suggest a new catchphrase “bootstrap science” to account for the unique convergence of citizen expertise and activism that developed in response to the absence of an authoritative freshwater wetlands science.

In this empirical case study research I conduct critical policy analysis, situating inquiry in the joint perspectives of science and technology studies (STS) and social movement studies (SMS) and incorporating interpretivist research techniques to examine citizen expertise in the context of this important chapter in U.S. environmental policy. The account of freshwater wetlands protection as part of the passage of New Jersey’s FWPA is an account of the co-production of freshwater wetlands science, new federal and state regulatory structures and institutions, new communities of practice around freshwater wetlands science, and evolving roles for citizen advocate-scientists. Part one of my study begins with exploratory ethnographic inquiry. Working from interpretive approaches, in Chapter Three I use “thick” description (Geertz, 1973) to shape a context for the case and to describe the emergence of freshwater wetlands as a significant environmental concern in New Jersey. Building on this description I borrow techniques from SMS and use models of social movement emergence to gain insight into how a small group of citizens formed a statewide environmental advocacy movement called the Freshwater Wetlands Campaign (FWC), and to better understand how they used emerging scientific knowledge about freshwater wetlands in movement organizing. The Movement Action Plan (MAP) model of social movement emergence (Moyer, McAllister, Finley, & Soifer, 2001) helps us understand how the FWC developed technical and political competence to champion freshwater wetlands protection and how this expertise helped to define what would constitute, lacking an authoritative freshwater wetlands science, the scientific competence brought to bear on decision making around freshwater wetlands protection.

In the second part of my inquiry I move to examine the competing policy prescriptions that emerge around the definitions, buffers and mitigation disputes, and the influence of citizen expertise on the closure of debate about these technically and scientifically complex subjects. The nature of what constituted freshwater wetlands science is part of the overall context and action that needs to be explained. This will be discussed in Chapters Four, Five and Six. In these chapters I look at how New Jersey settled on creation of the new regulatory objects of freshwater wetlands, freshwater wetlands buffers and mitigated freshwater wetlands. Creation of regulatory environmental artifacts is an important, but often un-theorized, aspect of many environmental policies. Differences in the designations of New Jersey's freshwater wetland artifacts were socially meaningful, and the debates exposed central tensions around regulatory environmental protection measures: the competing societal goals of economic development and environmental protection. I develop separate case studies for each dispute, first providing context for the genesis of regulatory, scientific and technical concerns surrounding it. I treat these disputes as "sub-movements" because they were distinct political fights, and because each of them involved different levels of engagement with nascent wetlands science. My methods therefore differ across these cases. For example, New Jersey's citizen scientists were especially active in defining what became termed "transition areas" because these were contested in the scientific literature at the time. For this reason I give special attention to examining scientific publications about transition areas at the time of this political debate. Through these case studies we see that in the absence of freshwater wetlands regulations some aspects of science did not have to be pinned down or clarified, presenting a motivation for those who sought greater scientific certainty to directly engage science.

I examine each dispute from two critical policy analytic perspectives: interpretive and constructivist. The interpretive perspective gives me insight into how these issues were "framed" by social movement actors as "sub movements" of the push for freshwater wetlands protections in New Jersey and allows me to probe the meanings and understandings in the emerging scientific arguments that inform the debates around them. Understanding these disputes as sub-movements of the push for freshwater wetlands protection legislation we see that the FWC acted strategically in attempting to

take the lead to establish the scientific parameters of these issues. Tracing the emergence of the sub-movements we can conceive of them as processes of object-making. The constructivist perspective allows me to conceptualize the disputes, and the tactical choices about the use of science that brought about their resolution, as giving form to the new regulatory technological “artifacts”. Conceiving of freshwater wetlands, freshwater wetlands buffers and mitigated freshwater wetlands as artifacts allows me to examine them as the endpoints of a long process of meaning construction, persuasion and conflict over technically and scientifically complex subjects and allows me to begin to consider the “co-productive” processes (Jasanoff, 2004) of science and society that bring them into being.

This is not a legislative history, or a study of policy outcomes or implementation.<sup>1</sup> It is not a study of how science evolved, nor is it an explanation of mobilization around an environmental issue. However this research affects all these things. This is an examination of who enacts co-production and how that affects how policy gets made. It looks at how the FWC started a movement and set criteria through a melding of basic and regulatory science and naturalist’s observations. The purpose of this dissertation is not to provide a full cultural analysis or to characterize the nature of the FWC’s science, although I will comment on it as it includes the FWC’s observations as naturalists, its creation of basic science, and its ability to identify criteria from basic science that could become criteria for regulations. Rather, this is a study of how social movement actors make and use science strategically to constitute policy, and how the use of science changes the freshwater wetland artifact over time. Neither STS nor SMS can account for advocates as people producing science in a political setting. And although the co-production literature allows us to see the role of social movements in ways in which neither STS nor SMS have made clear, co-production typically focuses on elites producing science. However, in this and in other cases that have not been fully identified, we see co-production very strongly driven by activism. In this study we see science in action and the development of science for a purpose.

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<sup>1</sup> A full explanation of the relative importance of flooding vs. science as a motivating force behind passage of the FWPA would be a task for making that sort of causal argument, but that is not my burden. Flooding motivated some people, science motivated others, with these motivations varying in importance over time.

This investigation into the role of citizen expertise and advocacy on environmental regulatory policy surrounding New Jersey's freshwater wetlands demonstrates citizen science in co-production. We see New Jersey's citizen scientists enacting science outside of traditional research domains, serving as transitional figures between naturalists and scientists, and eventually seeing themselves evolve through this process as policy actors. In this the project also aims to improve understandings of pluralism and accountability in our models of science advising. It examines the convergence of citizen science and advocacy in shaping public policy with the goal of broadening our perspective regarding potential agents of change within our power structures. It does this, in part, by bringing attention to contexts for knowledge, e.g. social movement organizations, that are pluralist.<sup>2</sup> It also does this by focusing on the role of meaning in the construction of knowledge claims by social actors and by considering mobilization as an important part of studying science. In this we can see that science is not something apart from society, and can consider science as any other subject of social inquiry. This will both inform understandings of societal shifts toward collaborative engagement and move us closer to understanding the normative standards at play in structuring our (environmental) politics and policy processes.

## Research questions

Although I do not set as my task to fully explore how New Jersey's social movement actors managed to demonstrate the legitimacy and utility of science, an examination of the role of local, contextualized knowledge in the policy process has the potential to inform broad and enduring concerns in studies of planning, politics, political science and government, specifically concerns related to knowledge and power. These include critical questions about whose knowledge counts as legitimate in a specific time and place, e.g. how do "experts" get their status and how are they shaped by "publics" (Arnstein, 1969; Irwin, 1995). These include questions about the role of science in policy

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<sup>2</sup> Social movement organizations are commonly understood to represent weaker parts of society, to criticize questionable governmental practices and imbalances in power structures, and to mobilize collective actions (Jordan & Van Tuijl, 2000).



deliberations, e.g. how is science used in decision making (Flyvbjerg, 1998), and how are conflicts over science resolved (Jasanoff & Wynne, 1998). On the path toward informing these broader concerns this research aims to inform more specific strategic and practical issues in SMS and STS by addressing “epistemological” questions (Nowotny, Scott, & Gibbons, 2003: 179; Jasanoff, 2004) regarding the generation of new knowledge and new technologies in the case of New Jersey’s freshwater wetlands. A successful study will give insight into how citizen knowledge shaped channels for information sharing and how citizens translated scientific knowledge for effective policy action and decision making, e.g. how did citizen science enter the policy stream. It will give insight into a strategic concern in SMS regarding how knowledge and science are used in movement organizing, e.g. how was knowledge used to advance movement development around freshwater wetlands protection. It will likewise inform trending practical concerns in STS regarding problems in identifying and linking scientific and technical knowledge to decision-making and the use of science in the policy process, e.g. how was science used by the FWC to inform tactical choices and decision making in policy processes.

I address one central question in the first part of my inquiry:

- How did citizen science enter the policy stream?

I work to answer this question by addressing two sub-questions:

- How did citizen science contribute to social movement development around freshwater wetlands protection?
- How was citizen science used in movement organizing around New Jersey’s freshwater wetlands?

I address one central question in the second part of my inquiry:

- How was citizen science used by the Freshwater Wetlands Campaign to inform tactical choices and decision making in policy processes?

I work to answer this question by addressing two sub-questions:

- How did citizen scientists translate scientific knowledge for effective decision making?
- How are questions over science resolved?

### **The importance of the case of New Jersey's freshwater wetlands**

The case of New Jersey's FWPA allows us to explore the foundations of some of our most important environmental protection measures. In the sub-movements I examine decision making about how to define freshwater wetlands, how to determine their buffers, and the extent to which the creation of mitigated wetlands are acceptable replacements for the destruction of natural wetlands. These sub-movements provide opportunities to test ideas of serviceable truths in political and scientific arenas and to understand the mechanisms that help structure these truths. The FWPA case matters to studies of the use of science in environmental regulation because it documents a departure from prior practices in environmental management. It matters to studies of public reason and collective sense making of environmental problems and solutions in that it provides an example of citizen-driven context-sensitive negotiation and compromise. It also matters to studies of citizen involvement in that it provides an example of how science can be used to bring about shifts in movement dynamics and to intensify movement organizing around environmental issues.

This case provides a summary of New Jersey's role in the rise of US environmentalism with respect to the growing recognition of wetlands' function in filtration, floodwater retention and biodiversity and through the story of the state's mitigation negotiations. In doing so it offers insight into the shaping of two enduring aspects of federal wetland policy that emerged soon after passage of the FWPA: the national goal of "no net loss" of wetlands, and the Memorandum of Agreement (MOA) between the Environmental Protection Agency and the Department of the Army concerning the determination of mitigation. These state and federal freshwater wetlands and mitigation policies are

important for several reasons. Freshwater wetlands policies are important because they are among the few means by which the government's regulatory jurisdiction extends to ecosystems on private land. These regulations give the government the power to abridge property rights for the benefit of environmental protections by putting wetlands under state or federal control. This can have a significant impact on land use patterns, and affects many millions of land holders: in 2009 the Fish and Wildlife Service (USFWS) estimated there were 110.1 million acres of wetlands in the United States, with approximately 95% of these freshwater (US Fish and Wildlife Service, 2013). Some calculations suggest that as many as three quarters of the nation's freshwater wetlands are privately owned (Kusler, 1992: 92). Not surprisingly the regulations that affect the use of these lands are subject to scrutiny by affected parties. So too are the paths by which these policies are constructed.

New Jersey's FWPA provides several opportunities to test ideas of serviceable knowledge in environmental policy making. First, freshwater wetlands are complex ecosystems that, at the time of passage of the FWPA, were poorly understood. Even today there are competing definitions over freshwater wetlands, conflicting standards for their measurement, and a dearth of analytic approaches to guide the management of freshwater wetlands ecosystems. Second, in that freshwater wetlands are difficult to distinguish they are subject to dispute. As was the case in New Jersey in 1987, the present day conflicts are framed differently by the regulated community and by the environmental community. The regulated community forwards property rights arguments, and advances concerns over the financial impacts of land use restrictions. The environmental community brings attention to issues of uncertainty and to the financial and social impacts of continued environmental degradation. The competing knowledge claims that buoy these disagreements reveal different core ontologies. The conservationist arguments of the regulated community reflect a technical pragmatism with respect to knowledge acquisition: the development of checklists of freshwater wetlands characteristics is a mechanical and practical response to their "wise use" goals. This stands in contrast to the natural science, rule-seeking, descriptive approach to understanding freshwater wetland ecosystems forwarded by the environmentalists. In this we see an epistemic concern with scientific ideals. Different courses of action are suggested by each approach. Finally, because freshwater wetlands do not (yet) hold

significant economic value, the scientific projects undertaken to define them and their values are unlikely to be countered by scientific projects of great sophistication.

This case also gives insights into several shifts. It documents a shift in societal perceptions of freshwater wetlands as valueless to valuable (Chapter Three). It documents a shift in New Jersey in citizen involvement in policy processes, tracing a transformation from political advocacy to a distinctive form of participatory engagement characterized by citizen inputs in decision making (Chapters Four and Five). It maps several changes in the location of expertise in the policy process, most significantly by providing an example of a new, formalized relationship between activism and government work (Chapter Six). Throughout the sub-movement chapters it traces changes in both social movement organizing and in the use of science in environmental decision making. For example with the insertion of science in movement organizing we see a shift from concern with localized issues of freshwater wetlands degradation to a broader regionalized interest in freshwater wetlands preservation (and witness a subsequent expansion of movement organizing). We witness the emergence of new mechanisms, namely citizen science, by which science advice is constructed for input into New Jersey's regulatory and management settings. Citizens were at once establishing the legitimacy of using science as a value system and an evaluation tool, making policy, and bringing in criteria such as fairness and consistency with law. We see them bringing in a new logic to environmental decision making in the state while simultaneously justifying the basis of this logic. But we also see citizens involved in the development of a new form of collaborative deliberation based not just on technical goals or epistemic ideals, but on context-dependent sense making on the path toward prudent action. Pulling the threads of these transformations together we can begin to understand the importance of the story of New Jersey's FWPA as a modification to ideas of representative decision making (Chapter Seven). The case broadens our notions of top-down decision making about scientific and technically complex subjects by providing an example of the development and insertion of citizen science in political processes, and by charting collaborative paths for decision making.

## Background

In 1998, as a master's level graduate student in Urban Planning and Policy Analysis at Rutgers - The State University of New Jersey, I received a Graduate Assistantship under Professor David H. Guston in the Department of Public Policy. It was working under Professor Guston's guidance that I first became interested in the topic of pluralism in environmental decision making, and in the subject of New Jersey's freshwater wetlands. The subject of New Jersey's freshwater wetlands protection originally came to light as an example of the synthesis of politics and science through papers written on it by two graduate students in Professor Guston's classes, Carrie Ann Calvo and Alan Schreck. Professor Guston included it as one of four case studies looking at the relationship of expert knowledge and political decision making sponsored by the Societal Dimensions of Engineering, Science, and Technology Program of the National Science Foundation (SBR-9810390). His research proposed to examine a problem at the nexus of science and politics: achieving the "public interest" in policy making when there is a lack of consensus among scientists about the facts, and among politicians about the proper path to pursue. His research was designed to provide empirical examples of "serviceable truths," a concept proposed by Sheila Jasanoff (Jasanoff, 1990) in response to this problem of reaching closure.<sup>3</sup>

Working under this NSF grant I helped Professor Guston identify how scientific and technical knowledge was made available to state policymakers, considered by them, and "used" in determining the extent of a regulatory "buffer zone" around New Jersey's freshwater wetlands. This "buffer zone decision" was part of general deliberating over passage of the state's freshwater wetlands protection, an event that had occurred almost a dozen years earlier in 1987. Although New Jersey's freshwater wetlands had been regulated under Section 404 of the Federal CWA since 1972, multi-layered and conflicting regulatory approaches led to mounting wetlands losses in the state. Citizen scientists linked certain externalities to the wetlands losses, most significantly increased flooding and well water contamination. They rallied evidence that suggested the failure of the federal government to adequately govern freshwater wetlands, and proposed state-based freshwater wetlands legislation.

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<sup>3</sup> Jasanoff's serviceable truth is a solution in policy making that does not seek a "perfect, objectively verifiable truth," but rather a balance of scientific acceptability with public interest (Jasanoff, 1990: 151).

Alarmed by the prospect of additional land use restrictions but supportive of the notion of streamlined state-based regulations, New Jersey's building/development community forwarded alternative legislation in response to the environmentalist's proposals. Competing positions prompted years of state-level wetlands protection debates, revealing the contours of the contradictory social goals of increased economic growth vs. effective environmental protection. Both parties ultimately agreed on the value of "assuming" regulation of the federal 404 Program. This opportunity emerged as part of the Reagan-era push for decentralization and promised a less bureaucratized regulatory environment by putting freshwater wetlands protection under state control. Coming to consensus on the scope of protections, especially with respect to the extent of a buffer zone around freshwater wetlands from which to exclude further development, would not be so easy. Environmentalists sought maximum protection. The regulated community felt no wetland buffer was required. The "buffer zone decision" centered on narrow, technical judgments and required expert input on the scientific and technical complexities of wetlands functions and buffer roles. Differences in buffer area determinations were socially meaningful, putting the (Jersey) devil in the details of the state's freshwater wetlands protection decision making.

Professor Guston and I worked to examine how New Jersey decision makers obtained the information necessary to input into their buffer area determinations, and likewise how they applied the received information to effective decision making. Document review and elite interviews revealed an angle on the relationship between knowledge and expertise in policy making in New Jersey at odds with what we expected given the model of science advising that informed the research design. Although moderated by the more recent "participatory turn" in which citizens are solicited for input on specific issues (Jasanoff, 2003; Bäckstrand, 2003), traditional models of science advising in legislative politics focus on professional scientists who stand ready as the "Fifth Branch" of government - science advisors vetted by attachment to academic institutions, think tanks and the like - to navigate the issues for regulators and policy makers (Jasanoff, 1990). This view is mutually reinforced by a rational model of policy analysis that assumes well-coordinated, effective decision-making based on ostensibly "reliable" and "legitimate" knowledge from "authoritative" sources (Fischer, 2007; Marsh & Stoker,

2002; Sabatier, 2007). Given this, the research participants we interviewed for the NSF study - legislators and policy makers from the New Jersey Department of Environmental Protection - might have described how they sought advice and information through established channels and from well known academic experts and how they worked to incorporate this advice into their decision making. Instead, the legislators reported that they relied on the grassroots FWC, a locally-organized group of citizen scientist-advocates, to help them understand buffers functions, and explained that they took their cues from the FWC with respect to the scientific and technical aspects of the debate. They also described a decision-making process in which the FWC largely dictated the extent to which compromise on the issue would or would not be acceptable. I realized then that neither our current models of science advising nor the dominant rational model of public policy analysis could capture the anomalous case of New Jersey's "citizen-scientists-as-science-advisors."

As I moved to design my own dissertation project I reflected on this earlier realization. It influenced this research in three key ways. First, the lack of attention given to citizen science in our models of science advising suggested an opportunity for further research into the interaction between pluralism and these models and framed my dissertation topic. Second, I gained an appreciation for the real-world implications of the powers and limitations of the explanatory analytical models designed to help understand the processes of social change. I realized that rational models of policy analysis could not give attribution to the distinct form of citizen science-based scientific advising observed in the buffers case. These models do not consider agency and context, losing significant explanatory potential. To paraphrase Bent Flyvbjerg (Flyvbjerg, 1998), in focusing on "what should be done" by sovereign powers in rational decision making, we miss the opportunity to describe "what is actually done" in the strategic and tactical application of power in a specific context. While I appreciated the normative intent of rational policy analysis I determined that for subsequent research into the topic I would seek alternative productive research approaches that could accommodate agency and context. This put me on a path toward "an abductive logic of inquiry" in my research, and I began to work from an interpretive methodological perspective (Schwartz-Shea & Yanow, 2012: 28). Finally, that ordinary citizens brought science to bear in legislative decision making in the case of New Jersey's freshwater

wetlands left me asking “how?” It piqued my interest in examining the relationships between knowledge, power, authority and “what counts” as legitimate knowledge in our modern democracy, and moved me to articulate research questions that addressed the structural relations of knowledge and power in regulatory decision making.<sup>4</sup>

### **Situating inquiry in research communities**

This policy-focused inquiry describes previously unexplored aspects of social change, namely the contributions of citizen expertise to policy processes and decision making in the absence of an authoritative science. More specifically it describes the construction of knowledge claims around freshwater wetlands. It works to articulate the processes of interpretation that led to the regulation of freshwater wetlands, freshwater wetland buffers and mitigated freshwater wetlands in New Jersey and that manifested shifts in policy processes in the state. To shape these descriptions I draw on theoretical and methodological insights from two epistemic communities, Science and Technology Studies (STS) and Social Movement Studies (SMS). STS is useful in that it allows us to understand the constructed nature of scientific knowledge and authority. SMS holds value in that it reminds us of the constant (re)appropriations of economic, social, cultural and economic-political power relations and power in a political economy of competing knowledge claims. SMS also helps to articulate these relations in terms of strength, tactics and strategies. This section provides a brief summary of these research communities and describes their philosophical approaches and theoretical concerns as they relate to my study.

***Science and Technology Studies.*** STS is an umbrella field and intellectual gathering place for researchers of many disciplines who share an interest in better understanding the inputs and production of scientific knowledge. Its emergence in the UK in the late 1960s was motivated by a

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<sup>4</sup> I should note that I view power as established primarily through material means, and understand (scientific) information as a source of power and as a material factor in social change and political outcomes, recognizing all the while, as Flyvbjerg does, that knowledge means power, and yet, power also determines “what counts as knowledge, what kind of interpretation attains authority as the dominant interpretation” within a political process (Flyvbjerg, 1998: 226).



diverse set of impulses including interest in science as a social system, concern with the roles of science education in society, and questions about the political aims of science and technology (Edge, 1995). The early growth of STS in the US is often understood as propelled by the more political concerns and is explained as a reaction to the authority claims of a view of (natural and social) science as neutral, objective, and driven by empirical research. In its early years in the US STS was an outlet for two distinct interest groups: those on the right critical of the new social “sciences” used to defend Great Society policies, and those on the left concerned with technological determinism. The conservative group is described as using STS to identify “unique, necessary, and invariant qualities that set science apart from other cultural practices and products, and that explain its singular achievements” (Gieryn, 1995: 393). Those concerned with the social and political implications of technological dominance and an emerging scientism are said to have built on findings from context to argue that scientific knowledge “is made rather than found” (Bijker & Bal, 2009: 28). Often referred to as Bloor’s (1973) “strong programme” which considers all knowledge claims as “socially constructed,” this informs a perspective that allows us to view knowledge production as “work,” and to “fruitfully treat scientific fact making and theorizing as forms of work” (Brandwein, 2006: 233). We can then examine scientific work as a practice of persuasion regarding the adequacy or “fit” of knowledge claims, and can move to consider the political dimensions of this practice.

From this second constructivist perspective was cobbled a middle path toward a view of the scientific method and social context as mutually integral to the production of scientific knowledge. An example of this approach is the idiom of “co-production” (Nowotny, Scott, & Gibbons, 2001; Gibbons et al., 1994; Jasanoff, 2004), which seeks to divorce itself from both scientific and social determinism (Nowotny et al., 2001).<sup>5</sup> Jasanoff’s recent STS work in the co-productionist mode, in which she identifies instruments of co-production “at the nexus of natural and social order” including (among others) identities, institutions, discourses and representations, helps us describe and unpack science in society and society in science, and to work to understand these relationships in epistemological terms (Jasanoff, 2004: 39). The idiom of co-production helps us explain that science and technology do not

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<sup>5</sup> This is not to be confused with the notion of co-production advanced as a technique of interpretive research and discussed in Chapter Two (methodology) of this project.

“when all is said and done, ‘drive theory’” (Jasanoff, 2004: 31). And it provides normative guidance “or at least facilitate[s] our critical interpretations of the diverse ways in which societies constitute, or reconstitute, themselves around changes in their apprehension of the natural world” (Jasanoff, 2004: 33). By making apparent “deep cultural regularities” and by working to explain “the contingency or durability of particular socio-technical formations” (Jasanoff, 2004: 80) co-production also moves us toward prediction, expanding not only “what we know about the world” (Jasanoff, 2004: 27) but also our sense of how we can act in it. It is this middle “co-productionist” path that I travel as I explore the intermingling of citizen advocacy with the knowledge claims emerging from the grassroots and as I work to probe the combined effect of advocacy and citizen expertise on the outcomes of environmental policy.<sup>6</sup>

Understanding the potential for grassroots organizations to be both politically savvy and hold substantive scientific knowledge is important because traditional views in STS usually depict expertise and advocacy as conflicting rather than cooperating endeavors (Allen, 2003; Moore, 2008). In recent years STS has traced areas of overlap in these spheres, for example describing professional scientists with an activist streak (Frickel, 2004; Ottinger & Cohen, 2011), cases of citizen involvement in “participatory science” and research organized by government or academia (Moore, 2006; Martin, 2006), and efforts to incorporate local knowledge in studies of local controversies (Brown, 2007).<sup>7</sup> Although this scholarship expands our notion of advocacy and helps to refine definitions of pluralism it focuses on the convergence of advocacy and expertise as facilitated from the perches of academia or government, a perspective that limits conceptions of the agency of social movement actors and leaves little room for examinations of direct interactions between local actors and decision-making or for notions of an authoritative science emerging from the grassroots. There are also calls within STS for the “democratization of science” (Guston, 2000), and proposals to contextualize science on the path

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<sup>6</sup> Following (Castells, 1997), I understand politics of locality as the defining feature of grassroots organizing.

<sup>7</sup> Literally hundreds of public engagement models have emerged from planning, public management and other fields, reflecting improved public participation in decision making and guiding decision makers in their outreach efforts (Rowe & Frewer, 2005: 256). Consistently absent from these concerns however is a serious consideration of citizen *science* as a component of public participation in policy deliberations.

toward more contextualized and democratic decision making (Gibbons et al., 1994; Nowotny et al., 2001; Nowotny et al., 2003). With this latter view is advanced the important argument that the co-production and contextualization of science (the outcome of the shift of what these authors refer to as “Mode-2 Science”) “have made it necessary not only to re-conceptualize the reliability of knowledge but also to question its epistemological foundations” (Nowotny et al., 2001: 179). Somewhat surprisingly these authors do not insert a consideration of grassroots or social movements into their revised “more nuanced, and sociologically sensitive account of epistemology” (Nowotny et al., 2001: 179). In the suggestions for a co-produced, contextualized and democratized science we are provided with top-down models of university- and government-based knowledge production. While these models suggest intensifying communication with society, the goal in their “reach beyond interdisciplinarity to transdisciplinarity” (Nowotny et al., 2001: 89) is more to affect than to be affected. Nevertheless, they hint at a consideration of knowledge production more centered on ordinary citizens, a heretofore atypical perspective of society in STS research.<sup>8</sup>

That STS should be missing a discussion of the potential for citizen knowledge to be authoritative is surprising for two reasons. First, STS has broadened our understanding of and appreciation for a diversity of knowledge holders by tearing down the “deficit of knowledge” argument (the premise that the public lacks the competence to participate in regulatory policy).<sup>9</sup> Second, at least in theory, STS encourages the view that all knowledges are on a common epistemological footing (Cozzens & Woodhouse, 1995: 545-546). If we wish to begin to attend to this oversight, however, we

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<sup>8</sup> They also (re) introduce the “agora” as a metaphor for a newly emerging kind of public space, a “knowledge space” like New Jersey’s freshwater wetlands in which old modernist distinctions between social institutions are seen to be breaking down.

<sup>9</sup> Furthermore the topic of public participation in science policy is a particular focus of Science and Technology Studies. For example, Jasanoff (Jasanoff, 2003) and Wynne (Wynne, 2003; Wynne, 2006) suggest participation as a tool to address the need for improved accountability in decision making. They forward arguments for the legitimacy of public participation in science and technology in decision making, and consider greater public engagement with science as a means to address crises in public confidence related to issues like mad cow disease and climate change. Joss and Durant (Joss & Durant, 1995) seek to improve public engagement in science as part of European consensus conferences, and Hagendijk (Hagendijk, 2004) makes a case for pluralism in scientific issues like sustainability. Although these arguments suggest that STS is beginning to acknowledge power at the margins, giving us room to turn our attention away from academia and the central state politicians to other knowledge-makers such as social movements (Frickel & Moore, 2006), current models of such participatory relationships are still mediated by academic and governmental power holders and do not leave room for citizen knowledge holders to be authoritative.

find that STS lacks strategic models and methods that might allow it to extend its commitment to examining the influences of social, political and cultural contexts of scientific development to the knowledge contributions of social movement actors organizing from the grassroots.<sup>10</sup> We need a set of instruments or approaches that facilitate an understanding of the contexts of discovery that exist outside of the traditional conception of the scientific workshop, laboratory or governmental council, and that treat non-academic or non-governmental knowledge makers seriously.<sup>11</sup>

***Social movement theory.*** Like STS, social movement studies (SMS) is home to interdisciplinary research from many communities, with significant representation from sociology and political science. Studies of historical and contemporary social movements conducted under the SMS umbrella consider movement origins, development, organization, values, context, dynamics, impacts and outcomes. These studies are motivated by a diversity of perspectives and are conducted from a great range of theoretical interests. The development of specific social movement theories is often linked to attempts to understand specific actions, e.g. theorizing on contemporary movements around trade union organizing is tied to rational choice theory, civil rights and labor movements to the political process approach, and identity politics to New Social Movements (NSMs) (Jasper, 2004). Until the late 20<sup>th</sup> century the disparate origins of these theories resulted in the compartmentalization of concerns with little interest on the parts of theorists to develop unified theoretical models of social movements (McAdam, Tarrow, & Tilly, 2001). In more recent years theorists working from the political process and NSM perspectives, and others working within a theoretical framework called resource mobilization theory (Tilly, 1978), have sought to identify areas of convergence. From these efforts emerged the

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<sup>10</sup> Notable research from environmental policy moves us closer to understanding interactions between citizen knowledge and policy outcomes by, for example, comparing data on the effectiveness of citizen group vs. Fish and Wildlife Service (FWS) identification of at-risk species for listing under the Endangered Species Act (ESA) (Brosi & Biber, 2012). The ESA includes provisions for citizen involvement in selecting species for listing through formalized petition and litigation processes. Formal channels exist for citizens to contribute their knowledge and expertise, but in that these channels are mediated by power holders we do not have an opportunity to examine the full range of potential knowledge inputs from citizen science. While such an approach reveals certain benefits of more pluralistic models of information exchange it stands in contrast to the FWPA case presented here because in the New Jersey case the social movement actors actually helped make the sanctioned pathways for inputs.

<sup>11</sup> While a growing body of research explores roles for social movements in producing salient, credible and legitimate knowledge that can be used in decision making (Frickel & Moore, 2006; Moore, 2006) it does not examine the interaction of social movements and policy making at the micro level.

now-dominant “political process” paradigm. This model identifies three central components in social movement emergence: political opportunities, resource mobilization structures, and framing processes (McAdam, McCarthy, & Zald, 1996).<sup>12</sup>

Recent critiques of the dominant paradigm center on two significant oversights: 1) inattention to movement effectiveness, including a lack of concern with movement dynamics and outcomes (McAdam et al., 2001; Moyer et al., 2001); and 2) insufficient attention to the agency and strategic action of movement actors (Jasper, 1997; Jasper, 2004). This first oversight is significant because in failing “to explore the full spectrum of a movement’s activity” we are missing a conception of a movement’s impact over time (Moyer et al., 2001: 108). From a theoretical perspective this compromises fully formed conceptions of social movement impacts in political processes (McAdam et al., 2001), and the lack of “full spectrum” models limits longitudinal examinations into the effects of movement organizing after the movement has ceased direct action.<sup>13</sup> For example, few models, if any, can advance understandings of relationships between movement organizing around environmental concerns in the late 20<sup>th</sup> century and recent trends toward participatory democracy in environmental decision making. The second critique is rooted in the classical debate over the primacy of agency vs. structure in motivating social change (Giddens, 1979; Giddens, 1984). It emerges from the arguments between those who prioritize macro processes in explaining political action and those who believe we are missing significant explanatory potential in failing to consider the role of meaning and strategic action outside of the structural constraints of the dominant paradigm (Jasper, 2004). Theorists from this second “strategic” perspective suggest that the traditional structural models of SMS (especially

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<sup>12</sup> Theorists concerned with political opportunities examine movement emergence and are primarily concerned with structural conditions that affect movement activity (Tarrow, 1998). Research into resource mobilization focuses on how people are recruited into movement activities, and how resources are “mobilized” in movement development. It often focuses on the role of pre-existing networks in rallying resources (McCarthy & Zald, 2002). Theorists who examine framing processes work toward understanding how movements “...frame or assign meaning to and interpret relevant events and conditions in ways that are intended to mobilize potential adherents and constituents, to garner bystander support, and to demobilize antagonists” (Snow & Benford, 1988: 338).

<sup>13</sup> From an activist perspective this can have the effect of limiting the development of strategy beyond the immediate goals around which the movement emerges. Social movement actors cannot conceive of the transformative potential of social movement action on the path to a more participatory democratic engagement process and lose morale when policy change does not occur under their watch (Moyer et al., 2001).

resource mobilization and political opportunity structures, but also framing processes) cannot adequately accommodate considerations of the lived experiences of activists and of the everyday strategic concerns of movement groups (Sturgeon, 1995). They tell us that if we are to grapple with these concerns en route to improved understandings of how movements work we need to turn our attention “to the microfoundations of political action” (Jasper, 2004).<sup>14</sup>

A relatively new policy process model from SMS called the Movement Action Plan (MAP) model of movement emergence (Moyer et al., 2001) addresses both concerns in unique fashion, and holds promise as an explanatory framework. First, the actor-centered eight-stage Movement Action Plan model of social movement evolution is a “full spectrum” model of movement organizing and is inherently open to longitudinal studies by movement theorists interested in relationships between movement action and changes in policy processes over time. Second, the MAP model is more receptive than the dominant paradigm to integration with considerations of agency, especially agency emerging from grassroots social movement organizing. Whereas the traditional political process models reify the power elite “leaving the vote as the primary, if not the only, means by which the general population is expected to participate” the MAP model holds that “power ultimately resides in the mass populace” and that “it is in the powers of the people to create change” (Moyer et al., 2001: 13-14).<sup>15</sup> Based on

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<sup>14</sup> I am sympathetic to the view that the structural constraints of the dominant paradigm limit understandings of both the role of values in movement emergence and of the social construction of meaning as part of movement development. I see value in the potential for considerations of agency to advance understandings of public reason and collective sense making of problems and solutions in a way that the dominant paradigm does not afford. In this study a move toward agency might help us understand how knowledge claims about freshwater wetlands are constructed by giving insight into how social movement actors negotiated the meanings of science in the policy process as they moved to adopt science in policy. Examining agency might help us understand the choices of tactics and strategies used by the FWC in decision making around the wetlands disputes, and could help to improve our understanding of how these grassroots advocates contributed to the synthesis of the scientific and political in the resolution of a complex environmental issue. Notwithstanding these issues it is my view that we are dealing with structural forces that organize power in certain ways in a system of procedurally-bound politics. Theories of agency may indicate whether social movement actors played within or broke the rules, but they cannot address the rules directly, or give insight into the impacts of these (strategic) actions on policy processes. In attempting to explain this aspect of social change I suggest that the “strategic” arguments that seek to supplant the dominant “political process” paradigm through analysis at the micro level still fall short: they simply cannot address the critique that the structural-dominant paradigm limits the development of fully-formed conceptions of movement impacts on policy processes.

<sup>15</sup> Giddens (Giddens, 1979; Giddens, 1984) also makes a significant contribution toward a balance between structure and agency. His “structuration theory” proposes a framework for examining how

this notion of a grassroots “people power” model of social change, the MAP suggests an approach that combines structure and agency, looking “at both movement organizations and their activities and at movement-oriented activities taking place within regular, institutionalized political channels” (Moyer et al., 2001: 108). In that MAP is designed to help reveal specific movement outcomes, including “movement strategy,” “the results of the movement’s activities,” and “the impact of the movement on society” (Moyer et al., 2001: 4) I rely on it to help me work toward improved understandings of the relationships between power, knowledge emergence, movement organizing, environmental decision making and shifts in planning and policy processes.

If we hope to improve understandings of pluralism and accountability in our models of science advising then we need conceptions of the knowledge of the grassroots, and we need to understand certain things about the citizens involved and the nature of their relationship(s) to knowledge and power. We need to gain perspective on the economic, social, cultural, and economic-political forces that lead to “knowledge claims” (Knorr-Cetina, 1988) from the grassroots. We need to begin to ask questions of meaning and understanding (Jasanoff, 2012) as citizen scientists shift to action, e.g. how do people make use of information in formulating problems and the positions they take on problems (Fischer, 2000). From this we can work to provide descriptions of how citizen knowledge claims emerge, how they enter the policy stream, and how they inform decision making in policy processes. Having developed such an understanding we can reflect on “who benefits” from the insertion of citizen knowledge claims into policy processes (Lasswell, 1956). But first we need to identify theories of policy analysis that can accommodate explorations into the foundations of public inquiry and into the “careers” of the knowledge claims (Brandwein, 2006) generated by citizen scientists. In the next section I work to identify theories of policy analysis that are amenable to an examination of knowledge claims in legislative decision making and policy processes.

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underlying structures influence group members’ interactions, and in turn how these interactions influence the evolution of structures (Poole, Seibold, & McPhee, 1996). Although a valuable construction this theory focuses primarily on issues of communication and deliberation and not policy processes and as such is not directly applicable to this study.

## Theories of policy analysis

To identify a framework for policy analysis appropriate for this research I start by considering a recent topography of policy theories used in environmental policy analysis (Arts, 2012). Arts' analysis culls the literature and identifies five central frameworks for understanding policy making: rational policy analysis, the institutional approach, policy network analysis, the Advocacy Coalition Framework, and critical policy analysis.

**The rational policy analytic approach.** My study is motivated in part by empirically-based dissatisfaction with the explanatory power of the dominant rational policy analytic approach to accommodate notions of citizen science as authoritative in legislative politics. The rational model theorizes decision making as proceeding through rational argument (Sabatier, 2007) coordinated by "experts." It leaves no clear opening for theories of social movements and cannot address the broad scope of knowledge emerging from the grassroots. This paradigm cannot help me chart alternative paths for citizen knowledge claims in the policy process other than as mediated by academic and governmental power holders.<sup>16</sup>

**The institutional approach.** There is some overlap between the rational policy analytic approach and the institutional approaches to policy-making that emerged as part of the Great Society ideas of the 1960s and that focus on institutions as the products of societal struggle (Hall & Taylor, 1996; Skocpol & Pierson, 2002). Like the rational models, institutional approaches view decision making as a top-down and linear process. Although neo-institutional approaches are increasingly incorporating studies of social movements (Schneiberg & Bartley, 2001; Schneiberg, 2007), the analysis is still rule-focused and prioritizes structure over agency.

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<sup>16</sup> I recognize that a growing body of research makes room for a turn in attention away from academia and the central state politicians to other knowledge-makers such as social movements (Frickel & Moore, 2006). I also recognize the significant contributions of research that explores the problem of linking more accountable models of expertise to decision making processes (Gibbons et al., 1994; Guston, 2000; Nowotny et al., 2003) and that argues for the legitimacy of public participation in science and technology in decision making (Wynne, 2003; Wynne, 2006; Jasanoff, 2003). However, these participatory relationships are still mediated by academic and governmental power holders and focused on effecting change within the Fifth Branch of influence and between politics and such institutions.



**Policy Network Analysis.** Structural models like policy network analysis consider how policy is structured by social relations (Marsh & Rhodes, 1992). They are more open to critical questions about whose knowledge counts as legitimate at a specific time and place, and to practical questions about the role of science in policy deliberations (Cunningham, 1992). They also aim to reveal the power dimensions of policy development and implementation (Marsh & Rhodes, 1992: 251). For these reasons they hold appeal for a study into pluralism and accountability in decision making. However, structural approaches cannot advance my interest in understanding context and agency and gives no guidance for understanding why environmental advocates, officials and developers might chose to use particular elements of science in particular ways at particular moments.

**Advocacy Coalition Framework (ACF).** More plural models like the Advocacy Coalition Framework (Sabatier, 1988) explain the development of policy through social interactions based on “shared belief systems.” The ACF holds some appeal as a lens through which to examine the FWPA case in that it gives special attention to beliefs and the unfolding of meaning within institutionalized political channels. It also offers a useful theoretical construct specific to the role of knowledge in policy processes with the “enlightenment function” of policy research and considers processes of policy change longitudinally (Sabatier, 1988). However, the ACF does not allow me to theorize movement dynamics, and like the rational and institutional models it is exclusively a top-down approach and cannot accommodate concerns regarding authority or democratic legitimacy.

**Critical policy analysis.** Critical policy analysis, a broad family of theories and perspectives, prioritizes understandings of context in policy processes and represents a “sensibility in which the social and political construction of policy problems and the expert or situated knowledges used to ‘solve’ them are viewed as dynamic interactions that are shaped by power relations” (Orsini & Smith, 2007: 14). The roots of critical theory can be traced to the post-WWI thinking of the Frankfurt School (including Horkheimer, Marcuse and Fromm) that sought an emancipatory, reflective, problem-focused and transformative approach to social change as opposed to the prevailing descriptive and explanatory approaches tethered to ideology (Wagner, 2007: 36). In this project I work under the critical policy analysis umbrella, viewing critical policy theory as open to the notion that politics poses a role for

knowledge and expertise in decision making and to examining grassroots entities as directly engaged with knowledge production and decision making.

According to Arts (2010) critical policy theories are “as diverse as neo-Marxism, social constructivism and discourse theory” but have in common a certain distance from the positivist and post-positivist rational, institutional, policy network and ACF theories (Arts, 2012: 10). Critical theories emerged as a dialectical concern with the social construction of experience and as a critique of mainstream philosophies of science. These include the realist, naturalist and objectivist positions that forward the notion that through a scientific “method” we can arrive at “facts” and an objective reality of the world independent of our prior knowledge base (Arts, 2012: 10). Arts does not provide a robust theoretical classification of critical approaches as part of the topography. Here I conceive of the critical approach as including three broad inter-related categories that embrace the concepts and methodological conventions of the interpretive theory, social constructivism, and political economy perspectives. I describe these categories in some detail here, highlighting specific aspects that directly inform this research. I then explain how I link these theories and approaches as I move toward analysis.

***Interpretive theory.*** The interpretive approach to policy analysis is rooted in the critical theory of literary studies that centers on arriving at knowledge through interpretation by focusing on meaning. In response to the question “what is interpretive policy analysis” Wagenaar suggests that Bevir and Rhodes’s definition encapsulates all relevant elements: “Interpretive approaches to political studies focus on meanings that shape actions and institutions, and the ways in which they do so” (Bevir & Rhodes, 2003: 103). Wagenaar says:

[t]his comes close to being a standard definition of interpretive policy analysis in that it contains all the necessary elements: political actions, institutions, meaning, and the reality-shaping power of meaning. Meanings are not just representations of people’s beliefs and sentiments about political phenomena; they fashion these phenomena” (Wagenaar, 2011: 3).<sup>17</sup>

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<sup>17</sup> This concept informs a distinctive methodological approach to policy analysis as well. Viewing method and context as mutually integral to the production of knowledge, interpretive researchers take a reflexive approach to incorporate considerations of the processes that contribute to the production of certain perspectives into their own research designs, analyses and reporting.

In part a critique of the positivist/post-positivist position, the “interpretive approach” (re)considers the core normative and methodological aspects of policy analytic studies, confronts notions of objectivity and neutrality as an ultimate aim, and questions the validity of empirical research designs that claim the same (Yanow & Schwartz-Shea, 2006). It combines a theoretical exploration of socio-environmental relationships with analysis of decision-making processes, focusing on individual agency and how meaning is contextually bound, socially constructed, and culturally and discursively mediated. Wagenaar describes these explorations as three “faces” of meaning in interpretive policy: hermeneutic, discursive and dialogical (Wagenaar, 2011). The hermeneutic approach includes “frames” and frame analysis which is especially useful for studying processes in movement organizing and the construction of knowledge claims (Brandwein, 2006). The discursive approach centers on “discourse theory” which focuses attention on the power of language (Fischer, 2003). Dialogic considerations center on theories like narrative analysis which examines the content of narratives for meaning (Ginger, 2007), and bring a fresh view to consideration of frames and framing with the concept of “dialogic frame analysis” (Wagenaar, 2011).<sup>18</sup>

***Social constructivism.*** Whereas interpretive theory centers attention on how meanings inform action, shape institutions and define policy problems, social constructivism looks more at the outcomes of policy processes, viewing policy as a political artifact, and giving insight into the social construction of scientific and technological facts and artifacts (Pinch & Bijker, 1987). Like interpretivism, the social constructivist approach emerged as a critique of the empirical thrust of the positivist/post-positivist paradigm, with most constructivists emphasizing “the role of agency,” seeking “to develop causal theories about the role of ideas” (Haas, 2004: 585). Social constructivism is more outcome-focused than interpretivism. It brings a heightened attention to the role of institutions in social change and inserts an ideational factor into policy processes to give insight into the role of structures. Conceptualizing knowledge claims as “institutional artifacts” using constructivist techniques allows us to move toward understanding the “institutional reception of knowledge claims” (Brandwein, 2006: 233). Social constructivism also gives us insight into the “interpretive communities” that serve as the

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<sup>18</sup> Interpretive approaches are often criticized for being overly socialized, for prioritizing subjectivity over structure, for ignoring the asymmetries of power and for failing to rise above context.

“institutional sponsors” of the varying interpretive frameworks and social constructs (Brandwein, 2006: 233-234). The social constructivist approach is at the heart of science studies’ investigations into successful scientific theories.<sup>19</sup>

***Political economy perspectives.*** The political economy perspective is most closely tied to the original emancipatory view of critical theory that emerged from the Frankfurt School after the First World War. This view centers attention on power relations within the state, structural relations of inequality, and how these relations and structures may influence social change in a way that serves the interests of powerful social actors. It also inserts a normative ideological component in theories of social change. Borrowing perspectives from planning theory (Fainstein, 2000), from Canadian approaches to policy studies (Orsini & Smith, 2007), and others (Jessop, 1990) a case can be made for the continued relevance of this view for modern policy analysis, particularly with the insertion of agency and concepts of space into the perspective. A refreshed version can be described as still attentive to power relations within the state, but as working toward a “textured analysis” of policy change and extending interest to policy making forums and how “social forces act through the state” (Graefe, 2007: 19). It can also be described as accommodating new perspectives on the scale and spatiality of conflicts (Fainstein, 2000; Fainstein, 1994). Revised thusly we can appreciate the potential theoretical value in “political economy’s concern with the interaction of economic, cultural, and economic-political factors, its interest in the distribution of social power between actors, and its close attention to the question of ‘who benefits.’” (Graefe, 2007: 19).<sup>20</sup>

**A methodologically plural approach to policy analysis.** In my analysis I work under the critical policy umbrella. I start with a view of society as structured by social and power relations and use the political economy perspective to keep me tethered to the broad questions relating to the structural relations of power and to embed policy within a context. I link questions regarding legitimate knowledge and reconceived contexts for policy making and engagement to the micro level concerns of interpretive theory. I look specifically at the formation of identities/collective actors to study the

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<sup>19</sup> Social constructivism is often criticized for being weak on method and the selectivity of data, and for reducing knowledge to the conditions of its production and the interests of its producers.

<sup>20</sup> Political economy approaches are often positioned in opposition to plural understandings of power as diffused (Graefe, 2007: 35).

construction of knowledge claims and to consider policy formation at the level of actor interactions. I do this using the concept of frame and the application of frame theory. I then take another step and link these questions to the meso level concerns of social constructivism specific to institutions and the shaping of artifacts and policy processes. I follow Brandwein (2006) in linking frames to the study of institutions, and trace the development of successful knowledge claims as institutional, or regulatory, artifacts. This methodological pluralism moves me along the continuum from descriptive to more critical-theoretical understandings: the account of social action is connected to an understanding of structured social relations as I move to the nexus of science and politics to examine how citizen knowledge claims contribute to the development of the three technological artifacts in this case, and how these knowledge claims come to bear in environmental decision-making and institutional processes.

#### **New Jersey's Freshwater Wetlands Protection Act (FWPA)**

The term “wetland” was first used in official government documents, a U.S. Fish and Wildlife Report, in 1956. Before the 1960s no federal or state laws specifically addressed the protection of freshwater wetlands. To the contrary, longstanding federal land management policy encouraged the draining of these swampy wastelands, transforming them into more economically productive land. By the mid 1980's, 118 million of the nation's estimated original 221 million acres of wetlands, approximately 53%, had been converted to a different use or otherwise destroyed (Dahl & Johnson, 1991). Between the 1950's and 1970's, the first period for which wetlands losses were systematically mapped and analyzed, the pace of loss increased with an estimated disappearance of 11 million wetlands during that time period alone. Federal policies like the Watershed Protection and Flood Prevention Act (1954), ostensibly passed for the purposes of land conservation, resulted in dramatically *increased* drainage of wetlands near flood-control projects. Additional federally subsidized programs and policies, among them water management efforts, transportation facilities and natural resource developments, also justified wide-scale drainage and fill of freshwater wetlands. Federal policies

encouraging agricultural conversions were particularly problematic. For example, the Agriculture Conservation Program, supportive of tile and open-ditch drainage for agricultural purposes, prompted annual wetlands losses averaging 550,000 from the mid-1950's to the mid 1970's (Dahl & Johnson, 1991). It was not until the 1972 passage of the Federal CWA, the primary federal law governing water pollution, that wetlands were given any kind of real protection. Section 404 of the CWA mandated permitting for activities that involved the discharge of pollutants or the placement of dredged or fill materials in "the waters of the United States," including "wetlands adjacent to waters." But immediately the issue of their definition became a concern, with regulating agencies proffering varying definitions and methods for delineation. This led to confusion at the state and local levels as entities worked to interpret policy. It also led to frequent conflicts with federal agencies over inconsistent and contradictory rulings and oversight. Meanwhile, wetlands degradation increased rapidly, with estimates of losses in New Jersey ranging from 20% (Tiner, 1985) to 39% (Dahl, 1991).

In New Jersey a small group of concerned citizens played a crucial role in bringing attention to wetlands losses in the state. Eventually organizing as the "Freshwater Wetlands Campaign" these grassroots environmental actors established baseline conditions for the state's freshwater wetlands and gathered evidence that linked flooding and water quality issues to their disappearance. They tied the disappearance of freshwater wetlands to unchecked development and permit violations under the Federal 404 Program, placing blame for the state's problems on the federal government's failure to adequately regulate. They proposed instead the adoption of state-based freshwater wetlands legislation, an idea that met with bipartisan support. This idea was viewed by the regulated community as a boon because of the promised reduction in bureaucratic oversight, and environmentalists found it appealing because of their concern with the prior failures of the federal government to provide adequate protection. Although both parties supported a state-based freshwater wetlands protection bill, they forwarded divergent proposals that revealed core tensions around regulatory environmental protection measures: environmentalists sought expansive protection parameters while the regulated community wanted to minimize regulatory constraints.

Debate centered on the “definitions,” “buffers,” and “mitigation” disputes. Passage of the state’s Freshwater Wetlands Protection Act hinged on resolution of these debates, but resolution of these issues rested on scientific and technical determinations that required knowledge of things like the plant species characteristically found in wetland habitats and the number of days that soil must remain saturated to constitute a wetland. In this case legislators found that there was no traditional authoritative body of freshwater wetlands science for them to draw on as they worked to understand freshwater wetlands functions and to shape the regulatory parameters for their protection. There was, however, a significant body of citizen science recently catalogued at the municipal level by the state’s newly established environmental commissions, at the watershed level by a growing number of watershed associations, and by issues-specific groups like the Passaic River Coalition (PRC) that organized in opposition to an Army Corps proposed tunnel project to address flooding in New Jersey’s Passaic River Basin.

These environmental groups, comprised of citizen scientist advocates, often used natural or environmental resource inventories as an organizing tool to conduct surveys of the land use and natural resource conditions in their communities and watersheds, and to bring attention to issues of wetlands degradation at the local or watershed levels. They documented degradation of aquifer recharge areas and watersheds, the number of species seen in certain tracts over time, the location of flooding, and the number of permits approved in areas supposedly off limits to dredging and filling. Over the years of their involvement with the issue they proved their mettle as skilled data collectors and researchers, and established a substantive expertise on many of the technical aspects of wetlands degradation, preservation and mitigation. In 1982 environmental commission members, watershed associations and other non-profit environmental groups gathered at the first state conference on wetlands protection. There they shared their knowledge and identified elements that they would like to see in a freshwater wetlands protection bill to be sponsored as legislation by State Assemblywoman Maureen Ogden. Synthesizing expertise with activism these environmental groups eventually forged the FWC to serve as an umbrella organization under which they agreed to operate together in support of the freshwater wetlands protection bill. Recognizing the environmental advocates as key players in bringing attention

to the issue of wetlands degradation in New Jersey legislators looked to them for advice. Legislators asked citizen scientists to provide testimony at legislative hearings, trusted them to shape multiple versions of the wetlands protection legislation, and relied on them to inform the scientific and technical aspects of the definitions, buffers and mitigation disputes.

**The definitions dispute.** The definition of a freshwater wetland is frequently referred to as “tractable” (Kent, 2000). Multiple and conflicting definitions of wetlands have been at the root of disagreements among federal agencies for decades with the process of arriving at a definition of a wetland typically characterized by a high degree of political and scientific uncertainty: scientific in terms of lacking proof (of impacts, potential impacts, best approaches to protect and/or remediate), and political in terms of geographic reach (how much land will be put off limits to development). In working toward a definition of a freshwater wetland, New Jersey citizen scientists conducted empirical research to shape a scientifically-grounded state-specific definition more expansive in scope than those definitions forwarded by the primary federal oversight agencies: the Army Corps and the EPA. The building and development group hewed to the Army Corps regulatory definition inscribed in the federal CWA, a position the FWC felt was untenable because of the history of wetlands losses under that definition. The environmentalists forwarded a more scientifically-specific definition drawn from the one used in the field by the USFWS. State-level quibbles over the regulatory vs. scientific definitions of freshwater wetlands stalled the legislation for almost five years. In April 1987 the Army Corps, EPA, USFWS and the U.S. Department of Agriculture’s Soil Conservation Service finally agreed on a federal regulatory definition of freshwater wetlands. Recognizing the legitimacy in the process that led to consensus at the federal level, New Jersey’s environmental and building/development communities agreed to incorporate this definition into the FWPA legislation. With a definition in hand they could move to settling the buffers and mitigation disputes.

**The buffers dispute.** In settling the definitions dispute all relevant actors agreed that development should not occur within the boundaries of wetlands as defined. However, environmentalists argued that the decision of developers to build right up to the edge of wetlands could be just as fatal to wetlands as no protection at all. Environmentalists lobbied for a buffer zone



to extend 300 feet from the wetland. Developers lobbied for no buffer. Without agreement on the distance no wetlands protection was possible. Scientific uncertainty and the strength of the interests conspired to prevent compromise until the legislature decided to split the difference between the two major proposals for the extent of the buffer zone, settling on 150 feet for most cases and moving the legislation closer to passage.

**The mitigation dispute.** Mitigation is the creation of a wetland somewhere else in exchange for destruction of a regulated wetland. For the FWC, the question was not whether to allow mitigation, but how to approach it. Believing mitigation was a political necessity but an environmental abomination, environmentalists sought to walk a fine line in their arguments between opposing the concept and risking alienating political partners, or supporting a concept they were opposed to but taking some control over the definition of parameters. They chose to take control, and in exchange for their willingness to approve mitigation as a component of the bill they required creation of a new politically appointed participatory governing body, the Freshwater Wetlands Mitigation Council, to oversee mitigation banking. They also required that significant scientific decisions about mitigation be pushed off for decision-making by this body.

### **The value of the case of New Jersey's FWPA to a study of legislative decision making**

New Jersey's FWPA case reflects an instant of convergence of citizen knowledge and environmental policy at the micro level just as movement organizing around protection of the environment reached a zenith and at a time when popular movements critical of authoritarian technocratic approaches stepped up demands for democratic debate and accountability in decision making processes. It unfolds at the naissance of freshwater wetlands science and in the absence of an authoritative science but at a time of increasing pressure on (sub)urban lands, pitting environmentalists and the regulated community (primarily builders and developers) against one another. It unfolds in a state with one of the largest economies in the nation. Freshwater wetlands was an emerging natural science specialty with the potential to provoke outcry in that it proposed

limiting what some people do: build on freshwater wetlands. With the opportunity for New Jersey to assume federal control over Section 404 of the CWA and bipartisan support for the concept, the politics were ultimately organized around notions of compromise. Politics around the protection of freshwater wetlands emerged as competition to impose a dominant scientific perspective regarding freshwater wetlands functions, the extent of freshwater wetlands degradation, and the means by which to secure adequate protections.

Viewing the evolution of freshwater wetlands protection through the experiences of social movement actors provides insight into unique configurations of governance generated by the conflation of knowledge and political power at the grassroots. Probing the socio-political context of freshwater wetlands degradation in New Jersey allows us to consider the state's citizen scientists as authoritative, legitimate "science advisors," and to work toward improved insight regarding the balance of knowledge and power that contributes to environmental policy and policy processes. It allows us to examine the role of science in the dynamics through which a social movement compelled significant policy reform. This research presents an overarching case and three sub cases. This triumvirate of controversies and decisions related to wetlands definition, buffer delineation and appropriateness of mitigation serve as individual units for analysis regarding citizen science contributions to scientific decisions in environmental decision making and tactical choices about the use of science. Taken together they move us closer to understandings of the relationships between better informed citizens and engagement in policy processes.

### **The "interpretive" approach to inquiry**

In this section I describe the "interpretive" approach to inquiry, and work to explain how this methodological approach connects logically to the focus of my research and influences my research design. I then give a brief overview of the data I engage and the methods and analytical tools I use to access, generate and analyze them.

**Interpretive Methods.** My work is grounded in the “interpretive” methodological perspectives that began to gain attention in the late 20<sup>th</sup> century. These approaches emerged in tandem with the impulses that drove interest in STS and that sparked a renewed interest in the post-WWI critical theory of the Frankfurt School. This perspective brought a fresh critique of the dominant positivist paradigm. This critique directly addresses objectivity in the quantitative and qualitative research conducted in this vein, and proposed a third “interpretive” methodology. This interpretive approach builds on a constructivist viewpoint that links method and context as mutually integral to the production of knowledge but focuses most specifically hermeneutic concerns with problems of meaning:

The sine qua non of interpretive research - the sensibility that is its hallmark and which makes it distinctive in comparison with other research approaches - is its focus on meaning-making: it seeks knowledge about how human beings, scholars included, make individual and collective sense of their particular worlds (Schwartz-Shea & Yanow, 2012: 46).

Like other critical approaches, interpretive research diverges from positivist variables-based research presuppositions. In that it theorizes academic-analytic and policy-analytic actions it provides researchers with different and specific “procedural enactments of assumptions about the reality status and the knowability of their subjects of inquiry” (Yanow & Schwartz-Shea, 2006: xv). In this way interpretive methodology is more than just a critique of the positivist approaches, but comes close to being a “fully formed” theory (arguably more so than other critical theories), offering a set of well developed concepts and processes for conducting research.

In addition to prioritizing meaning-focused processes hallmarks of interpretive methodology include a profound concern with contextuality which extends to a “bottom up” approach to concept development. A “bottom-up” approach requires that concepts either emerge from the field through an intersubjective research process called “co-production,” a concept distinct from that in the STS literature. Co-production in the interpretive vein understood as the testing and evaluating of research by the group under study, or as concepts identified through field work as part of the existing local knowledge of this group. In this way researchers: “consciously expose themselves to reactions from their surroundings - both positive and negative - and may derive benefit from the learning effect, which is built into this strategy” (Flyvbjerg, 2001: 132). This means, however, that interpretive

approaches address “sense making” iteratively, in a manner which cannot “be fully specified a priori because of its unfolding, processual character” (Schwartz-Shea & Yanow, 2012: 53). The interpretive perspective also forwards a logic of inquiry shaped not by hypotheses or reasoning on a linear path toward general laws (characteristics of the more standard quantitative and qualitative research approaches), but by an “abductive,” inferential approach to explanation. This abductive approach is increasingly recognized as the central logic of interpretive research design (Schwartz-Shea & Yanow, 2012).<sup>21</sup> Others see that an abductive logic “employs a situated perspective of the problem at hand rather than an abstract one” (Moore, 2007: 112) and in this way differs from the inductive and deductive reasoning that characterize traditional quantitative and qualitative research.<sup>22</sup>

I was put on the interpretive path by way of my critical ontological and constructivist epistemological leanings, but also by virtue of how my research topic and questions emerged. Citing Friedrichs & Kratochwil (2009), Schwartz-Shea & Yanow tell us that we engage in abductive inquiry “when we become interested in a class of phenomena for which we lack applicable theories” (Friedrichs and Kratochwil 2009: 714 as cited in Schwartz-Shea & Yanow, 2012). As I explained in the back story to this study, my inquiry began with a puzzle: I became interested in how the knowledge contributions of citizen scientists fit into science advising when I recognized that our models of science advising did not accommodate notions of an authoritative science emerging from the local level. My

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<sup>21</sup> The abductive approach has also been linked to grounded theory methodology in the variant of Strauss & Corbin (Reichert, 2010).

<sup>22</sup> Moore provides a concrete example of this, and demonstrates the centrality of context to an interpretive methodology focused on meaning. Here he considers abductive reasoning as applied to decision making in the planning culture in Curitiba, Brazil:

When confronted with the need to extend city infrastructure (water and sewer services) into informally settled areas, or *favelas*, planners were aware that if they also extended paved streets, which is the normal engineering practice, land prices would rapidly escalate and drive residents to another sector of the city without such services. In other words, engineering best practices (derived from inductive reasoning) would have consequences that were contrary to the social goals of providing infrastructure in the first place, which was to improve public health and thus decrease municipal health care costs. Alternatively, the use of deductive reasoning to solve this problem would suggest that planners could, for example, act on the basis of the trickle-down theory that would accept the dislocation of residents on the assumption that wealth and good health work their way down the social order. What planners actually did, however, was to develop an unorthodox technological solution to an agreed-on social goal - they extended sewer and water lines along existing foot paths but did not construct vehicular streets. The consequence was that the *favelas* remained socially stable and became more healthful places to live (Moore, 2007: 112).

research questions emerged as I determined to make this theory-event anomaly “less anomalous” (Schwartz-Shea & Yanow, 2012: 29). Interpretive methods connect logically to my research in four key ways. First, interpretive constructs are well suited to my examination of the role of citizen science in policy processes for several other reasons. Interpretive constructs require a “bottom up” approach to concept development and reflection on this process. In this way they both maintain consistency with the theoretical concerns of constructivism specific to the emergence of knowledge, and reflect the “people power” understanding of social movement emergence. Second, in that interpretive constructs focus attention on the role of meaning in the development of concepts they afford insight into the use of science and the convergence of advocacy and expertise around the definitions, buffers and mitigation issues. Third, interpretive constructs are flexible and allow for analysis from multiple levels. Finally, interpretive constructs provide a recognizable “structure” required by formal dissertation research and allow for (if not require!) regular revisions of research design.

***An interpretive approach to generating data.*** In that this study developed out of experience with a setting that I did not initially imagine would serve as the location for future research, my choices of setting, actors, events, archives and materials developed “reiteratively with the elaboration of the research question” (Schwartz-Shea & Yanow, 2012: 57). In generating data I employed abductive thinking to uncover possibilities. Three primary sources of data serve as the backbone for this research: semi-structured interviews, review of primary sources and documentary materials (including newspaper clippings, transcripts of public hearings and government and social movement files), and participatory observation (in action settings including government offices and freshwater wetlands). My approach to accessing this data shifted over time as I became more familiar with the case and with the concepts used in the field, and as I worked to refine my research questions. My approach shifted as I worked to “map” the research setting to “gain exposure to multiple perspectives on the research focus” (Schwartz-Shea & Yanow, 2012: 51). It also shifted as I developed skills as a researcher and learned to probe the data as it was generated, essentially checking *my* sense-making in the field (for example with follow-up questions to confirm my understanding of what was being said).

***Generating data: talking.*** I transcribed interviews with twenty-three individuals involved with passage of the FWPA (Appendix A - Research Participants). These included legislators, government officials from state and federal levels, movement actors, lawyers and other representatives from the building and development community. My approach to interviewing evolved over time as I developed as a researcher and recognized a need for an interview approach characterized by relationship building. I began with semi-structured formal interview protocol (Appendix B - Interview Protocol) and gradually switched to a more conversational open-ended retrospective interview style. This “evolution” in my approach turned some interviews into half day affairs (with invitations to come back for further conversations!) and yielded troves of additional materials for review. I also spoke at length with two individuals involved with maintaining the state’s archives specific to freshwater wetlands. One of these individuals worked at the state library in Trenton and another worked at the New Jersey Department of Environmental Protection. I also conducted informal, non-transcribed interviews with eighteen other individuals involved with passage and implementation of New Jersey’s FWPA.

***Generating data: reading and watching.*** I read more than one hundred newspaper articles written about New Jersey’s freshwater wetlands between 1980 and 1987. I reviewed the transcripts of five public hearings (Appendix C - Public Hearings on Freshwater Wetlands Protection), and examined each version of freshwater wetlands legislation submitted in the Assembly and the Senate (as well as multiple drafts of these bills). I reviewed approximately four feet of files marked “freshwater wetlands” from the New Jersey Department of Environmental Protection (NJDEP), and another four feet of “wetlands protection” files from the Freshwater Wetland Campaign (FWC) and the Association of New Jersey Environmental Commissions (ANJEC). I reviewed the newsletters distributed by the New Jersey Builder’s Association (NJBA) to their membership for the years from 1983-1987, screening these documents for articles related to freshwater wetlands. I also reviewed personal correspondence from the files of one of the NJBA lawyers. I watched two 45-60 minute videos developed by the New Jersey Builder’s Association specific to the issue of freshwater wetlands protection in the state. These videos

were distributed to the NJBA membership with the goal of explaining the impacts of certain decisions on the regulatory climate in the state.

***Generating data: participant observation and “doing”.*** I attended ten “Freshwater Wetlands Mitigation Council” meetings between the years 1999 and 2004. I also enrolled in a two-day field course on freshwater wetlands methodology and delineation with the goal of observing approaches to freshwater wetlands delineation and then took my new found knowledge into the field.

### **A multi-methodological approach to analyzing data**

Data interpretation unfolded in two primary stages. The first stage focused on developing an understanding of the cultural and institutional context around freshwater wetlands protection in the years leading up to passage of New Jersey’s FWPA. This involved working to understand why and how citizens developed scientific expertise about freshwater wetlands. To shape this context I developed a “thick” description of the environment around freshwater wetlands concerns in the mid-20<sup>th</sup> century (Geertz, 1973). I then employed a framework of movement emergence from the SMS literature called the Movement Action Plan (MAP), applying it to New Jersey’s Freshwater Wetlands Campaign (FWC) and joined it to a narrative of legislative politics throughout the FWPA process. This analysis revealed the definitions, buffers and mitigation disputes as central to passage of the Freshwater Wetlands Protection Act. In the second part of my inquiry I shape case studies around these disputes on the path to examining the influence of citizen expertise in environmental policy making in the case of New Jersey’s FWPA. I look at these disputes to understand how citizens balanced alternatives in advocacy and policy as they worked to bring their knowledge(s) to bear in decision making. More specifically I examine them to gain insight into the choices of tactics and strategic action around the use of science in creation of New Jersey’s regulatory objects of freshwater wetlands, freshwater wetlands buffers and mitigated freshwater wetlands. To do this I again build up from context, first shaping “thick” description of the genesis of regulatory scientific and technical concerns surrounding each of the disputes. Then, working under the critical theory umbrella and engaging in a bit of methodological

pluralism, I move to examine the path to resolution for these disputes. In this I study the disputes using two frameworks from the perspectives of interpretive theory and social constructivism, frame analysis and the social construction of technology (SCOT).

**Techniques from the interpretive perspective: frame analysis.** Frame analysis is central to both the interpretive perspective (Yanow & Schwartz-Shea, 2006) and to social movement theory (Snow & Benford, 1988).<sup>23</sup> In interpretation frames help us understand meaning: “Frame analysis builds on the fundamental interpretive insight that ‘meaning’ is not self-evident but, instead, a complex interaction of sensory stimuli and meaning making by human actors” (Yanow & Schwartz-Shea, 2006: 205). In SMS frame analysis gives insight into meaning, but is more focused on understanding action: “Frames help to render events and occurrences meaningful and thereby function to organize experience and guide action” (Benford & Snow, 2000: 614). Like Brandwein (2006: 232), I appreciate frames as “both models of prior thought and models for subsequent action.” In this research I use the frame analytic approach to give insight into the negotiation and reconstruction of social change by social and political actors. I examine the contexts of discovery that lead to citizen knowledge claims about freshwater wetlands and consider these contexts in an examination of sense-making and meaning as the grassroots FWC moves to strategic action. My approach builds directly on the Movement Action Plan (MAP) model of social movement emergence. MAP reveals three “sub-movements” that emerged around freshwater wetlands protection in New Jersey: an attempt to establish a state-specific definition of a freshwater wetland (definitions), an effort to expand wetlands protection to include wetlands buffers (buffers), and a concerted effort to preclude wetland mitigation as part of any wetlands protection legislation (mitigation). Viewing these disputes as “sub-movements” opens the door to addressing interpretive concerns with how frames developed around definitions, buffers and mitigation as the central disputes of the FWPA legislation.

**Techniques from the constructivist perspective: Social Construction of Technology (SCOT).** Combining these social movement perspectives with science studies serves as a building block as I move

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<sup>23</sup> The concept of “frame” is also valuable in psychology, sociology and political science.



to study the institutional reception of knowledge claims.<sup>24</sup> Working from the constructivist perspective allows me to conceptualize these disputes, and the tactical choices about the use of science that brought about their resolution, as giving form to three new regulatory technological artifacts in New Jersey: freshwater wetlands, freshwater wetland buffers, and mitigated freshwater wetlands. Conceiving of these disputes as “artifacts” allows me to examine their outcomes as the endpoints of a long process of meaning construction, persuasion and conflict over technically and scientifically complex subjects. To examine the outcomes in this way I use a methodological modeling technique from STS called the Social Construction of Technology (SCOT) (Pinch & Bijker, 1987). SCOT outlines steps by which to analyze the successes or failures of technology. These steps include reflection on social, cultural, political and economic influences in addition to the technical inputs traditionally examined in more technologically deterministic considerations of technological development. A central component of SCOT is its consideration of closure in determining the “success” of a particular technological construct. SCOT forwards two notions of closure, “rhetorical closure” and “redefinition of the problem.” I do not conduct a full SCOT history, but the explanatory potential for both these concepts is considered for each of the definitions, buffers and mitigation disputes.

### **Research aims and audience**

This research examines how citizens in New Jersey enacted a science of freshwater wetlands and how they engaged the public about freshwater wetlands to secure regulatory protections. It examines the processes by which citizen scientists fostered linkages between their knowledge of freshwater wetlands and the needs of decision makers. It also considers the extent to which this knowledge influenced decision-making and policy outcomes. I identify questions designed to lead to insights about how political goals frame scientific questions and how they might shape science itself. This study

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<sup>24</sup> In this research I draw primarily from two bodies of literature on STS, the sociology of science (SSK), and innovation studies. The first approach directly addresses the content of scientific ideas, theories, and experiments as the subject of analysis. The second approach gives us concepts related to the social construction of technological or institutional “artifacts” and the dictate that “the success of an artifact is precisely what needs to be explained” (Pinch & Bijker, 1987: 24).

works broadly toward these goals by addressing specific issues in STS and SMS and by opening the door to new relations between the disciplines. This work sets a precedent for the use of “bottom up” models of social movement theory in STS. It also sets a precedent for the application of science studies to better understand aspects of social movement dynamics and outcomes.

**Theoretical and trending practical concerns in STS.** In studying the science enacted, identified and used by the FWC this research addresses certain theoretical concerns in STS, specifically gaps in theories of pluralism, by extending understandings of contexts of discovery to previously excluded groups. It characterizes knowledge emerging from citizen science and popular movements in new ways for STS, viewing expertise and advocacy as cooperating rather than rivalrous endeavors and strengthening STS by treating non-academic and non-governmental contexts of discovery seriously. This research also speaks to trending practical concerns in STS. These concerns include issues of supply and demand in situations when “expert” inputs and an authoritative science is hard to come by (Sarewitz & Pielke, 2007), and the use of science in policy decision making. It directly addresses issues of the supply and demand of adequate information in policy decision making with a discussion of the role of citizen knowledge claims in decision making in the absence of an authoritative science. Emerging work documents the processes by which decision makers seek improved access to “useful” scientific information (Clark & Dickson, 2003; Frickel, 2006; McNie, 2007) and explores the mechanisms of supply and demand for such information (Sarewitz & Pielke, 2007). Several researchers have identified a mismatch in the supply of adequate scientific information about environmental issues with the demand for it (Cash et al., 2003; Bocking, 2004; van Kerkoff, 2005; Lebel, Contreras, Pasong, & Garden, 2004; McNie, 2007).<sup>25</sup> To date these efforts have not included specific considerations of the contributions of citizen science.

This research takes a historical approach to investigate tactical choices about the use of science and in doing so provides new perspectives on empirical studies that assert how “science is used.” Growing interest in the use of science is practically tied to, among other concerns, integration with environmental management. For example, federal agencies, including the United States Geological

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<sup>25</sup> Another body of STS scholarship specifically addresses linking scientific knowledge with action in environmental resource management (Jacobs et al., 2008).

Survey (USGS) and the U.S. Bureau of Reclamation are beginning to prioritize research into the use of science in decision making and conflict resolution. This interest extends to the use of “citizen science” and increasingly addresses the role of participation in resource management.<sup>26</sup> One goal in these efforts is to assist natural resource professionals in the Department of the Interior as they work to connect management problems with appropriate scientific inputs (Burkhardt, 2012).

This research also explores the boundaries between science and social change in new ways for STS. It considers how, over time, the boundaries between expert and non-expert change, how the location of expertise shifts among government and outside actors, and how needs for expertise change. It considers how a scientific field has been shaped by environmental activism, describing certain relationships between movements and scientific knowledge and between activism and government work. It also addresses issues of definition in emerging fields of science and technology that could inform more current (e.g. nano and synthetic biology) fields.

**Critical and strategic concerns in SMS.** Although I do not make any broad claims for the possibility of activists to enact and use science the way the FWC did, I do suggest that in some circumstances advocates may make and deploy science in ways that help them define and achieve their policy ends. Part of this process is for activists to view themselves as agents. In bringing attention to this role this work will be of interest to social movement scholars and to grassroots struggles for several reasons. First, it goes beyond a focus on movement emergence to examine a social movement as it navigates the institutionalized political channels of legislative policy making. It then uses historical research and analysis to examine the courses of action through which New Jersey’s social movement activists used science to achieve their objectives. It tracks action eight stages of the process of social movement success outlined in Moyer’s Movement Action Plan (MAP) model for organizing social movements (2001). In doing so it addresses issues of knowledge production as an element of movement formation, provides an example of a “bottom up” methodological approach to understanding movement emergence, suggests the emergence of a citizen science removed from moderation by government or academic

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<sup>26</sup> This is also the case in the United Kingdom where English Nature and the UK Biodiversity Group at the Natural History Museum in London, as part of the UK Biodiversity Action Plan, considers “what should be conserved, who should be involved in the conservation process, and how maximum participation could be achieved” (Ellis & Waterton, 2004: 97).

intermediaries, forwards theories of democratic decision and social problem solving making, and makes suggestions to improve the effectiveness of action. Finally, this research works to improve definitions of grassroots inquiry and influence and considers citizen science as a force in intellectual change in a particular scientific field.

## Chapter Overviews

In this chapter I have described the focus of my policy analysis of New Jersey's Freshwater Wetlands Protection Act (FWPA) as an exploration into an aspect of problem solving in environmental policy making. I articulated my primary concern as with how the knowledge contributions of mobilized citizen scientists might create a more robustly democratic decision making and detail the ultimate goal of my study: to contribute to the democratic content of socio-environmental construction by identifying strategies through which a more equitable distribution of social power and a more inclusive mode of environmental production might be achieved. I described the critical approach to policy analysis I employ, an orientation "inspired by the Lasswellian tradition and by a desire to speak truth to power" (Orsini & Smith, 2007: 1), and provide an epistemic context in two specific fields of theory and practice: Science and Technology Studies (STS) and social movement studies (SMS). In this I described STS as a field that, at its core, reflects an interest in examining relations between science and policy (Jasanoff, 2004). I reference thinking that demonstrates the conceptual openness of STS to both a manifold knowledge (Cozzens & Woodhouse, 1995) and to a diversity of approaches to democratic governance, including those that would enjoin public knowledge to scientific decision making (Irwin, 1995). SMS is viewed as a path to understanding pluralism by other means, and as a field replete with procedures to articulate context and issues of authority, accountability, legitimacy and challenges to the status quo. I justified a study of the convergence of citizen knowledge and advocacy in environmental policy making for STS and SMS, articulating research objectives specific to theoretical and practical concerns in both research fields. I then discussed my interpretive approach

to generating and accessing data and the multi-methodological approach to analyzing these data and conclude by outlining the implications of my research.

**Chapter Two: Methods.** Having provided the conceptual grounding for my research approach in Chapter One, in Chapter Two I work to link my underlying philosophical presuppositions to hermeneutics and then to specific methodological devices. I begin by describing how hermeneutics informs the interpretive approach to inquiry. Although I do not use formal coding, this research is, in effect, quantitative in that I am looking at prevalence. I describe how I generate and access data and provide more detail regarding my data. The hermeneutic concern with expression of meaning in the creation of cultural artifacts puts the focus of study on object-making and requires attention to context. Understanding context is important if we wish to better comprehend how knowledge is produced and used in environmental decision making. I work to identify conceptual openings to contextual studies of citizen empowerment and citizen science in STS. This is followed by a discussion of how I use interpretive approaches to shape a “thick” description of context. I explain the particular value of SMS and the Movement Action Plan (MAP) model of social movement emergence for context-building and describe how insights from SMS and the application of MAP help us understand how knowledge claims emerge, how they gain legitimacy, and how they enter the policy stream. I then work to describe the analytic devices, frame and SCOT, that I use to look at how the competing knowledge claims that emerge in the FWPA case inform decision making in the definitions, buffers and mitigation disputes. Both devices allow me to link social movement emergence with created freshwater wetlands, freshwater wetland buffers and mitigated freshwater wetlands. I describe frame analysis as a means by which to ask questions of values, meaning and understanding and as a way to separate the emerging freshwater wetland science from the early fuzzy thinking about freshwater wetlands. Applying frame allows me to describe in Chapters Four, Five and Six how, as an element of social movement building, citizen science rose to the level that it had to be taken seriously by institutions. The SCOT model is a technique that illustrates how human action shapes technology. Here I describe how I use the SCOT concept of closure to identify strategic choices that led to creation of the three technological regulatory artifacts.

**Chapter Three: Historical Context.** In order to explain the sub-movements, and to make clear why I think STS needs to incorporate citizen science to explain at least some aspects of environmental policy analysis, I have to first describe who became active and why. In Chapter Three I provide the “thick” description of context, loosely applying the MAP model as a modified policy process heuristic to describe movement organizing around freshwater wetlands protection. Although I am not testing this theory per se, I am trying to affirm it. In this chapter I am setting up the broad circumstances for all three sub-movements and describing broad cultural regularities. I introduce the people who would become citizen scientists in part to make clear that they were not professionals when they started, and that they did not expect to become involved in doing science. I describe the circumstances of the case as they relate to the use of science and the idiom of co-production. I address the central question of the first part of my inquiry: “how did citizen science enter the policy stream” most explicitly in this chapter.

I begin Chapter Three by describing the specific efforts of four activists, all women, to pursue science in building an argument for freshwater wetlands protections. Although my focus here is on the efforts of individual activists, these individuals are not the center of my exploration, but in describing their efforts I start on the path toward understanding how ordinary citizens brought science to bear in legislative decision making and how knowledge is used by social movement actors in movement organizing and advocacy. In this chapter I relate two intertwined paths. The first follows the emergence of wetlands protection as a significant environmental concern in New Jersey. In this instance citizen-experts helped create and organize the knowledge base that demonstrated the value of wetlands beyond that of wasteland. The second path follows the activity of the coherent, statewide environmental advocacy movement that emerged from citizen action. In this instance, citizen advocates engaged in a sophisticated grassroots lobbying effort that made freshwater wetlands protection a force to be reckoned with. In this we see the development of a community of practice. These paths are observed in the sense of bringing freshwater wetlands into focus as an issue of concern in New Jersey, bringing attention to how and why freshwater wetlands are valued, and identifying the role of scientific and technical understanding of wetlands functions vs. political choices in shaping

protection measures. Applying the MAP model of movement emergence (Moyer et al., 2001) we can see how actor networks of grassroots environmentalists gained control of the intellectual attention space surrounding freshwater wetlands and their protection and the initial anomalous phenomena of citizens-scientists-as-science-advisors is made less anomalous.

**Chapters Four, Five, and Six: The Definitions, Buffers and Mitigation Sub-Movements.** The middle chapters Four, Five and Six are devoted to examining the central disputes in passage of New Jersey's Freshwater Wetlands Protection Act, which I refer to as the three "sub-movements". In these chapters I work to answer the central question of the second part of my inquiry: "how was citizen science used to inform tactical choices and decision making in policy processes". Chapter Four focuses on the definitions sub-movement, Chapter Five examines the buffers sub-movement, and Chapter Six centers on wetlands mitigation. These chapters unfold along a similar trajectory. I begin each chapter by describing both the general state of freshwater wetlands science at the time, and the degree of activist engagement. I provide an historical overview of the issues in preparation for a consideration of how definitions, buffers and mitigation science varied at the times these debates were engaged in New Jersey and whether differences in the state of the science mattered. In the case of definitions, I trace perceptions of freshwater wetlands and the evolution of definitions of "wetland" in Europe and America over time including the emergence of scientific and regulatory definitions of wetlands in the United States leading up to the environmental movements of the 1970s. For the buffers and mitigation chapters I consider shifts in policy and the co-production of the emerging science. I then describe each sub-movement in the context of the path of the FWPA legislation from its introduction in 1983 to passage in 1987, joining to a narrative of legislative politics a conscientious take at its interaction with emerging scientific and technical inputs. This includes consideration of ways in which co-production is at work. In this I look at stages of knowledge production (e.g. creating, conducting, and adapting knowledge by movement actors) and how science was made to matter. I provide an overview of the evolving nature of movement actor engagement in each dispute and consider the extent to which using science was an overt strategy on the path to creating the new regulatory artifacts. Although I am not making a causal argument, I work to characterize how activists used science in each sub-movement by

outlining the events that inclined these activists to use science in a specific way. To conclude each chapter I analyze the disputes using the frame analytic and SCOT techniques and consider how citizens directly contributed to the synthesis of the scientific and the political in resolution of these complex environmental decisions.

**Chapter Seven: Conclusion.** The sub-movements make clear that credit should be given to New Jersey's citizen scientists for defining the problems facing freshwater wetlands, mobilizing action for their protection, and contributing substantive scientific expertise to the policy debates that shaped the New Jersey Freshwater Wetlands Protection Act. They provide examples of how scientific knowledge about freshwater wetlands was used strategically by movement actors to prove the failure of official institutions to protect freshwater wetlands, put problems of freshwater wetlands degradation on the social agenda, and put protection of freshwater wetlands on the political agenda. The sub-movements provide accounts of the co-production of new identities, artifacts, regulatory processes and institutions, and validate the use of citizen science in co-production explanations. What is less clear is the degree to which science and scientific understanding about freshwater wetlands influenced the development of the three technological artifacts in these debates, and whether the insertion of citizen science in the debates over freshwater wetlands and their protection directly influenced shifts in policy processes. How does the use of science change the artifact over time? To what extent does science matter? I explore these questions in Chapter Seven. In that each of the case study decisions effectively required the synthesis of technical information and political considerations there is an opportunity to compare the resolution of these disputes and open doors to an improved understanding of the role of science in regulatory decision making. Joining the interpretive and constructivist considerations to a study of policy processes in the FWPA I suggest that science does matter, but that it has limits. We see for each case that political action is not possible without the strategic use of science. But I also look at how it is used differently in each case to variously define a policy area (definitions), define standards for policy (buffers), and to (re)define standards for decision making (mitigation).



In this final chapter I also consider the influence of the institutional structure on the form of science advising that emerged as New Jersey worked to establish protections for its freshwater wetlands. The definitions, buffers and mitigation case sub-movements begin by building an historical context to understand potential avenues for scientific inputs into environmental decision making. They then examine the convergence of politics and science at the point of decision making activities. Understanding the context for decision making in this way provides detail of how decision making pathways may or may not have been conditioned by the institutional setting. In this chapter I develop a new model of science advising I call the “bootstrap” model to explain what was observed in the FWPA case. I also develop a new catchphrase, “bootstrap science,” for the unique convergence of citizen expertise and activism I observed. I draw from democratic theory and constructivist and interpretivist policy studies to suggest that the emergence of bootstrap science as an input to legislative decision making speaks to a normative democratic core of policy making upheld by the existing institutional structures.

### **Understanding who enacts science in co-production**

This research provides, in part, a political history of how New Jersey’s freshwater wetlands were accorded a legal identity and special status in the state. Creating the FWPA can be viewed as part of the process of the institutionalization of the CWA. We often talk of business owners seeking regulatory certainty under the CWA, but that is a post-1970s worldview that developed after the CWA was institutionalized. This research provides an investigation into how people built that edifice. Historically-inclined people are concerned with starting conditions. This is a story of starting conditions and their lasting effects, one that focuses on how who used science, and how they used it, affected how policy processes unfolded. In this study of the emergence and stabilization of the regulatory artifacts of New Jersey’s FWPA the role of citizen expert-advocates in policy and decision making processes, and their use of science in these processes, emerges as a distinct research concern. The study combines a critical evaluation of the relationship between knowledge and power in social

change within a study of the context in which the change plays out, prioritizing an examination of the use of science in social movement activism and practice. It describes the emergence of freshwater wetlands as a significant environmental concern in New Jersey. It describes the emergence of a new freshwater wetland science, and relates how citizen scientists enacted, identified and used this science to define problems of wetlands degradation and to build a statewide environmental advocacy movement with the political competence to champion freshwater wetlands protection. It then explores how the FWC leveraged certain types of scientific knowledge and technical expertise to influence policy processes and decision making to stabilize the new regulatory artifacts. It looks specifically at closure of debate about technically and scientifically complex aspects of these emerging artifacts. Moyer et al.'s Movement Action Plan model offers a lens to view context, process and action around issues of freshwater wetlands protection. Techniques from critical policy analysis including frame and social constructivism help to trace the relationship between emerging knowledge(s) about freshwater wetlands to the actions and practices of social movement actors and give insight into how citizens negotiate the meanings of science in the policy process.

This account of the protection of New Jersey's freshwater wetlands under the FWPA is an account of the co-production of new discourses of freshwater wetlands, the artifacts protected under the FWPA legislation, the organizations that would organize to protect them, and the institutions that would regulate them. Initiating a dialogue between STS and SMS around New Jersey's freshwater wetlands requires us to expand explanations of who enacts co-production to include conceptions of citizen science. It allows for an examination of the strategic use of science by movement actors throughout the policy process and for a consideration of how these actors cultivate scientific knowledge and then bring this knowledge to bear on an examination of alternatives in both advocacy and policy. From this joint perspective we begin to build scaffolding for new characterizations of knowledge emerging from the grassroots, and for fresh views of the adoption of science in policy.

## Chapter One: Reference List

Allen, B. (2003). *Uneasy Alchemy: Citizens and Experts in Louisiana's Chemical Corridor Disputes*. Cambridge, MA: MIT Press.

Arnstein, S. (1969). A Ladder of Citizen Participation. *Journal of the American Planning Association*, 35, 216-224.

Arts, B. (2012). Forests policy and theory use: Overview and trends. *Forest Policy and Economics*, 16, 7-13.

Bäckstrand, K. (2003). Civic Science for Sustainability: Reframing the Role of Experts, Policy-Makers and Citizens in Environmental Governance. *Global Environmental Politics*, 3, 24-41.

Benford, R. D. & Snow, D. A. (2000). "Framing Processes and Social Movements: An Overview and Assessment. *Annual Review of Sociology*, 26, 611-639.

Bevir, M. & Rhodes, R. A. W. (2003). Interpretive Theory. In *Interpreting British Government* (pp. 131). London: Routledge.

Bijker, W. E. & Bal, R. (2009). *The paradox of scientific authority: the role of scientific advice in democracies*. Cambridge: MIT Press.

Bocking, S. (2004). *Nature's Experts: Science, Politics and the Environment*. New Brunswick, NJ: Rutgers University Press.

Brandwein, P. (2006). Studying the Careers of Knowledge Claims: Applying Science Studies to Legal Studies. In D. Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 228-243). Armonk, New York: M.E. Sharpe.

Brian, W. (1989). Sheepfarming after Chernobyl: a case study in communicating scientific information. *Environment*, 31.

Brosi, B. J. & Biber, E. G. N. (2012). Citizen Involvement in the U.S. Endangered Species Act. *Science*, 17, 865.

Brown, L. (2009). *Plan B 4.0: Mobilizing to Save Civilization*. Washington, DC: W.W. Norton & Co.

Brown, M. (2007). Can Technologies Represent Their Publics? *Technology and Society*, 29, 327-338.

Burkhardt, N. (2012). *Use of Science in Decision Making and Conflict Resolution* US Geological Survey.

Cash, D. W., Clark, W. C., Alcock, F., Dickson, N. M., Eckley, N., Guston, D. H. et al. (2003). Knowledge systems for sustainable development. *Proceedings of the National Academy of Sciences*, 100, 8086-8089.

Castells, M. (1997). *The Power of Identity, The Information Age: Economy, Society and Culture Vol. II*. Malden, MA: Blackwell.

Clark, W. C. & Dickson, N. M. (2003). Sustainability science focuses on the dynamic interactions between nature and society. *Proceedings of the National Academy of Sciences*, 100, -8059.

Corburn, J. (2005). *Street Science: Community Knowledge & Environmental Health Justice*. Boston: The MIT Press.

Corburn, J. (2009). *Toward the Healthy City: People, Places, and the Politics of Urban Planning*. Boston: The MIT Press.

Cozzens, S. & Woodhouse, E. (1995). Science, Government and the Politics of Knowledge. In S. Jasanoff, G. E. Markle, J. C. Petersen, & T. Pinch (Eds.), *Handbook of science and technology studies* (pp. 533-553). Thousand Oaks: Sage.

Cunningham, C. (1992). Sea defences: a professionalized network? In D.Marsh & R. A. W. Rhodes (Eds.), *Policy Networks in British Government* ( Oxford: Oxford University Press.

Dahl, T. E. (1991). *Status and Trends of Wetlands in the Conterminous United States, mid-1970s to mid-1980s* U.S. Department of the Interior Fish and Wildlife Service.

Dahl, T. E. & Johnson, C. E. (1991). *Status and Trends of Wetlands in the Conterminous United States, mid-1970's to mid-1980's* U.S. Department of the Interior, Fish and Wildlife Service.

Edge, D. (1995). Reinventing the World. In S.Jasanoff, G. E. Markle, J. Peterson, & T. Pinch (Eds.), *Handbook of Science and Technology Studies* ( Thousand Oaks, CA: Sage.

Ellis, R. & Waterton, C. (2004). Environmental citizenship in the making: The participation of volunteer naturalists in UK biological recording and biodiversity policy. *Science and Public Policy*, 31, 95-105.

Fainstein, S. (1994). *The city builders: Property, politics, and planning in London and New York*. Oxford: Blackwell.

Fainstein, S. (2000). New directions in planning theory. *Urban Affairs Review*, 4, 478.

Fischer, F. (2000). *Citizens, Experts, and the Environment: The Politics of Local Knowledge*. Durham, NC: Duke University Press.

Fischer, F. (2003). *Reframing Public Policy: Discursive Politics and Deliberative Practices*. Oxford: Oxford University Press.

Fischer, F. (2007). Deliberative Policy Analysis as Practical Reason: Integrating Empirical and Normative Arguments. In F.Fischer, G. J. Miller, & M. S. Sidney (Eds.), *Handbook of Public Policy Analysis: Theory, Politics, and Methods* (pp. 223-236). Boca Raton: CRC Press - Taylor & Francis Group.

Flyvbjerg, B. (1998). *Rationality and Power: Democracy in Practice*. Chicago: University of Chicago Press.

Flyvbjerg, B. (2001). *Making Social Science Matter: Why social inquiry fails and how it can succeed again*. Cambridge: Cambridge University Press.

Frickel, S. (2004). *Chemical Consequences: Environmental Mutagens, Scientist Activism, and the Rise of Genetic Toxicology*. New Brunswick: Rutgers University Press.

Frickel, S. (2006). When Convention Becomes Contentious: Organizing Scientist Activism in Genetic Toxicology. In S.Frickel & K. Moore (Eds.), *The New Political Sociology of Science:*

*Institutions, Networks, and Power* (pp. 185-214). Madison, WI: University of Wisconsin Press.

Frickel, S. & Moore, K. (2006). *The New Political Sociology of Science: Institutions, Networks, and Power*. Madison, WI: University of Wisconsin Press.

Geertz, C. (1973). *The interpretation of cultures: Selected essays*. New York: Basic Books.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The New Production of Knowledge: The dynamics of society and research in contemporary societies*. (First ed.) London, England: Sage Publications.

Giddens, A. (1979). *Central Problems in Social Theory*. Berkeley and Los Angeles: University of California Press.

Giddens, A. (1984). *The Constitution of Society: Outline of the Theory of Structuration*. Oxford: Polity Press.

Gieryn, T. (1995). Boundaries of Science. In S.Jasanoff, G. E. Markle, J. Peterson, & T. Pinch (Eds.), *Handbook of Science and Technology Studies* (pp. 393-443). London: Sage.

Ginger, C. (2007). Interpretive Content Analysis: Stories and Arguments in Analytic Documents. In D.Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 331-348). Armonk, NY: M.E. Sharpe.

Gottweis, H. (2007). Rhetoric in Policy Making: Between Logos, Ethos, and Pathos. In F. Fischer, C. A. Miller, & M. S. Sidney (Eds.), *Handbook of Public Policy Analysis: Theory, Politics, and Methods* (pp. 237-250). Boca Raton, FL: CRC Press.

Graefe, P. (2007). Political Economy and Canadian Public Policy. In M. Orsini & M. Smith (Eds.), *Critical Policy Studies:*

*Contemporary Canadian Approaches* (pp. 9-40). Vancouver: UBC Press.

Guston, D. H. (2000). *Between Politics and Science: Assuring the Integrity and Productivity of Research*. Cambridge: Cambridge University Press.

Haas, P. M. (2004). When does power listen to truth? A constructivist approach to the policy process. *Journal of European Public Policy*, 11, 569-592.

Hagendijk, R. (2004). The Public Understanding of Science and Public Participation in Regulated Worlds. *Minerva*, 42, 41-59.

Hall, P. & Taylor, R. (1996). Political science and the three new institutionalisms. *Political Studies*, -952.

Hempel, L. C. (1996). *Environmental Governance: The Global Challenge*. Washington, DC: Island Press.

Irwin, A. (1995). *Citizen Science: A Study of People, Expertise and Sustainable Development*. London: Routledge.

Jacobs, K., Lebel, L., Buizer, J., Addams, L., Matson, P., McCullough, E. et al. (2008). Linking knowledge with action in the pursuit of sustainable water-resources management. In W. C. Clark (Ed.).

Jasanoff, S. (1990). *The fifth branch; advisors as policy makers*. Boston: Harvard University Press.

- Jasanoff, S. (2003). Technologies of Humility: Citizen Participation in Governing Science. *Minerva*, 41, 223-244.
- Jasanoff, S. (2004). *States of Knowledge: The co-production of science and social order*. London: Routledge.
- Jasanoff, S. (2012). *Science and Public Reason*. Oxford: Routledge, Taylor & Francis Group.
- Jasanoff, S. & Wynne, B. (1998). Science and decision making. In S. Raynor & E. Malone (Eds.), *Human choice and climate change. Volume one. The societal framework* (pp. 1-87). Columbus, OH: Batelle Institute.
- Jasper, J. M. (1997). *The Art of Moral Protest*. Chicago: University of Chicago Press.
- Jasper, J. M. (2004). A Strategic Approach to Collective Action: Looking for Agency in Social-Movement Choices. *Mobilization: An International Journal*, 9, 1-16.
- Jessop, B. (1990). *State Theory. Putting the Capitalist State in its Place*. University Park, PA: Penn State University Press.
- Jordan, L. & Van Tuijl, P. (2000). Political Responsibility in Transnational NGO Advocacy. *World Development*, 28, 2051-2065.
- Joss, S. & Durant, J. (1995). *Public Participation in Science: the Role of Consensus Conferences in Europe*. London: Science Museum.
- Kent, D. M. (2000). *Applied Wetlands Science and Technology*. (2nd ed.) CRC Press.
- Knorr-Cetina, K. (1988). The Internal Environment of Knowledge Claims: One Aspect of the Knowledge-Society Connection. *Argumentation*, 2, 369-389.
- Kusler, J. A. (1992). Wetlands Delineation: An Issue of Science or Politics. *Environment*, 33.



Lasswell, H. D. (1956). *The Decision Process: Seven Categories of Functional Analysis*. College Park: University of Maryland Press.

Lebel, L., Contreras, A., Pasong, S., & Garden, P. (2004). Nobody knows best: alternative perspectives on forest management and governance in southeast Asia. *International Environmental Agreements: Politics, Law and Economics*, 4, 111-127.

Marsh, D. & Rhodes, R. A. W. (1992). *Policy Networks in British Government*. Oxford: Clarendon Press.

Marsh, D. & Stoker, G. (2002). *Theory and methods in political science*. New York: Palgrave Macmillan.

Martin, B. (2006). Strategies for Alternative Science. In S. Frickel & K. Moore (Eds.), *The New Political Sociology of Science: Institutions, Networks, and Power* (pp. 272-298). Madison, WI: University of Wisconsin Press.

McAdam, D., McCarthy, J., & Zald, M. (1996). *Comparative Perspectives on Social Movements: Political Opportunities, Mobilizing Structures, and Cultural Framings*. New York: Cambridge University Press.

McAdam, D., Tarrow, S., & Tilly, C. (2001). *The Dynamics of Contention*. Cambridge: Cambridge University Press.

McCarthy, J. & Zald, M. (2002). The Enduring Vitality of the Resource Mobilization Theory of Social Movements. In *Kluwer Academic/Plenum Publisher* (pp. 533-565). New York: J.H. Turner.

McNie, E. C. (2007). Reconciling the supply of scientific information with user demands: an analysis of the problem and review of the literature. *Environmental Science & Policy*, 10, 17-38.

Moore, K. (2006). Powered By the People: Scientific Authority in Participatory Science. In S.Frickel & K. Moore (Eds.), *The New Political Sociology of Science: Institutions, Networks, and Power* (pp. 299-323). Madison, WI: University of Wisconsin Press.

Moore, K. (2008). *Disrupting Science: Social Movements, American Scientists, and the Politics of the Military, 1945-1975*. Princeton: Princeton University Press.

Moore, S. A. (2007). *Alternative Routes to a Sustainable City*. Lanham: Lexington Books.

Moyer, B., McAllister, J., Finley, M. L., & Soifer, S. (2001). *Doing Democracy: The MAP Model for Organizing Social Movements*. Gabriola Island, BC, Canada: New Society Publishers.

Nowotny, H., Scott, P., & Gibbons, M. (2003). Introduction: Mode 2 Revisited: The New Production of Knowledge. *Minerva*, 41, 179-194.

Nowotny, H., Scott, P., & Gibbons, M. (2001). *Rethinking science: knowledge in an age of uncertainty*. Cambridge: Polity.

Olson, R. & Rejeski, D. (2005). *Environmentalism & The Technologies of Tomorrow*. Washington, DC: Island Press.

Orsini, M. & Smith, M. (2007). Critical Policy Studies. In M.Orsini & M. Smith (Eds.), *Critical Policy Studies* (pp. 1-14). Vancouver: UBC Press.

Ottinger, G. & Cohen, B. R. (2011). *Technoscience and Environmental Justice: Expert Cultures in a Grassroots Movement*. Cambridge, MA: MIT Press.

Pinch, T. & Bijker, W. E. (1987). The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other. In W.E.Bijker, T. P. Hughes, & T. Pinch (Eds.), ( Cambridge, MA: MIT Press.

Poole, M. S., Seibold, D. R., & McPhee, R. D. (1996). The structuration of group decisions. In R.Y.Hirokawa & M. S. Poole (Eds.), *Communication and group decision making* (pp. 114-146). Thousand Oaks, CA: Sage.

Reichertz, J. (2010). Abduction: The logic of Discovery of Grounded Theory. In A.Bryant & K. Charmaz (Eds.), *The SAGE Handbook of Grounded Theory* ( London: Sage.

Rowe, G. & Frewer, L. J. (2005). A Typology of Public Engagement Mechanisms. *Science, Technology and Human Values*, 30, 251.

Sabatier, P. A. (1988). An Advocacy Coalition Framework of Policy Change and the Role of Policy-Oriented Learning Therein. *Policy Sciences*, 21, 129-168.

Sabatier, P. A. (2007). *Theories of the Policy Process*. Boulder, CO: Westview Press.

Sarewitz, D. & Pielke, R. A. (2007). The neglected heart of science policy: reconciling supply of and demand for science. *Environmental Science & Policy*, 10, 5-16.

Schneiberg, M. (2007). What's on the path? Path dependence, organizational diversity and the problem of institutional change in the US economy, 1900-1950. *Socioeconomic Review*, 5, 47-80.

Schneiberg, M. & Bartley, T. (2001). Regulating American industries: Markets, politics, and the institutional determinants of fire insurance regulation. *American Journal of Sociology*, 101-146.

Schwartz-Shea, P. & Yanow, D. (2012). *Interpretive Research Design: Concepts and Processes*. New York: Routledge.

Skocpol, T. & Pierson, P. (2002). Historical Institutionalism in Contemporary Political Science. In I.Katznelson & H. V. Milner (Eds.), *Political Science: The State of the Discipline* (pp. 693-721). New York: W.W.Norton.

Snow, D. A. & Benford, R. D. (1988). Ideology, frame resonance, and participant mobilization. In B.Klandermans (Ed.), *International Social Movement Research V.1* ( Greenwich, CT: JAI Press.

Sturgeon, N. (1995). Theorizing movements: direct action and direct theory. In N.Darnovsky, B. Epstein, & R. Flacks (Eds.), *Cultural Politics and Social Movements*

, pp. 35-51 (pp. 35-51). Philadelphia: Temple University Press.

Tarrow, S. (1998). *Power in Movement*. Cambridge: Cambridge University Press.

Tilly, C. (1978). *From Mobilization to Revolution*. Reading, MA: Addison-Wesley.

Tiner, R. W. (1985). *Wetlands of New Jersey*. Newton Corner, Mass.: U.S. Fish and Wildlife Service.

US Fish and Wildlife Service. (2013). Questions and Answers About Status and Trends of Wetlands in the Conterminous US 2004 to 2009. 5-31-2013.

Ref Type: Online Source

van Kerkoff, L. (2005). Integrated research: concepts of connection in environmental science and policy. *Environmental Science & Policy*, 8, 439-463.

Wagenaar, H. (2011). *Meaning in Action: Interpretation and Dialogue in Policy Analysis*. M.E. Sharpe, Inc.

Wagner, P. (2007). Public Policy, Social Science, and the State: An Historical Perspective. In F.Fischer, C. A. Miller, & M. S. Sidney (Eds.), *Handbook of Public Policy Analysis* (pp. 29-42). Boca Raton, FL: CRC Press - Taylor & Francis Group.

Wynne, B. (2003). Risks as globalizing 'democratic' discourse? Framing subjects and citizens. In M.Leach, I. Scoones, & B. Wynne (Eds.), *Science and Citizens, Globalization and the Challenge of Engagement* ( London: Zed Books.

Wynne, B. (2006). Public engagement as a means of restoring public trust in science -- hitting the notes, but missing the music? *Community Genetics*, 211-220.

Yanow, D. & Schwartz-Shea, P. (2006). *Interpretation and Method: Empirical Research Methods and the Interpretive Turn*. Armonk, NY: M.E. Sharpe.

## CHAPTER TWO: CONCEPTS AND PROCESSES IN A STUDY OF SOCIAL PHENOMENA

In the varied topography of professional [planning and policy] practice, there is the high, hard ground where practitioners can make effective use of research based theory and technique, and there is a swampy lowland where situations are confusing “messes” incapable of technical solution. The difficulty is that the problems of the high ground, however great their technical interest, are often relatively unimportant to clients or to the larger society, while in the swamp are the problems of greatest concern (Schön, 1983: 42).

In Chapter One I presented an overview of the need for policy analyses that consider the convergence of citizen knowledge and grassroots advocacy in what Schön might refer to as the messy, “swampy lowlands” of policy making.<sup>27</sup> In this chapter I describe the “interpretive” methodological approach to policy analysis I use to structure my research design and then describe how I use two analytical constructs borrowed from critical theory, frame and “social construction of technology” (SCOT), as frameworks to guide my analysis in considering the convergence of citizen expertise and advocacy in the policy process as it contributed to passage of New Jersey’s Freshwater Wetlands Protection Act (FWPA).

The methodology of interpretivism helps structure my study of the political world of New Jersey’s freshwater wetlands regulations. Wagenaar explains that in interpretive research “methods cannot be seen apart from finding a good subject, becoming aware of your specific interest in the topic, formulating an interesting question about it, becoming aware of the presuppositions with which you approach the subject, collecting data on your subject, and formulating ideas and concepts that respond to the question. Articulation of one of these elements informs and suggests articulations of the others” (Wagenaar, 2011: 241). That said the interpretive approach to researching the policy

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<sup>27</sup> I explained the importance of such research to practical and strategic concerns in Science and Technology Studies (STS) and social movement studies (SMS), and to theoretical debates regarding the foundations for environmental thinking and policy making specific to participant engagement. I worked to explain how such considerations might advance our understandings on several fronts: giving insight into issues of accountability in our models of science advising; improving our understandings of the use of science in environmental decision making and conflict resolution; improving access to citizen science as a knowledge supply for input into environmental decision making; enhancing the effectiveness of advocacy; and bringing attention to certain relationships between a better informed citizenry and demands for popular sovereignty.

process is commonly described as including three primary interwoven constituent parts: interpretive research, contextualization and conceptualization.<sup>28</sup>

**Interpretive research.** Interpretive research includes the gathering and accessing of data in ways that “reveal hidden assumptions and thereby open up the taken-for-granted manner in which the world appears to us” (Wagenaar, 2011: 275). This necessitates an effort to access rich, diverse data and a willingness to be surprised. It also demands improvisational flexibility in interviews and field research through the use of, for example, structured but open-ended interview questions and the posing of follow up questions that seek concrete observations and personal stories. Interpretive research requires thorough consideration of all data, even that which at first may not appear relevant, so as to avoid affirming assumptions. Interpretive research is designed to get “the dialogue between theory and data started” (Wagenaar, 2011: 248).

**Contextualization.** Contextualization involves the organizing of data in a way that reflects the contextualized, situated perspective of the research participants, researcher, or both (Yanow, 2012). In the case of New Jersey’s FWPA this helps us understand the political context that led to the state’s freshwater wetlands legislation: the failure of state and federal authorities to adequately regulate freshwater wetlands. We then see the grassroots Freshwater Wetlands Campaign (FWC) provide scientific accounts of freshwater wetlands that led to a shift in worldview for many in the state. Contextualization helps us understand that the wetlands science that was used to pass this legislation was not initially intended to contribute to some universalized body of science. Rather, the scientific accounts of freshwater wetlands provided by the FWC and other “bootstrap scientists” were contextually-bound socio-cultural explanations advanced by a specific community of inquirers situated in a particular place at a particular time and deployed as part of a strategy to achieve specific policy goals. Contextualization also helps reveal points at which political actors, in this case the FWC,

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<sup>28</sup> “Interpretive analysis,” understood as the processes of interpreting the meanings that are associated with the research process is woven into the interpretive research, contextualization and conceptualization processes with the understanding that “data collection should proceed hand in hand with data analysis and theory development, the one shaping the other in a dialectical manner” (Wagenaar, 2011). It is, however, to be understood as clearly delineated from the critical theoretical constructs used to analyze the knowledge claims surrounding the definitions, buffers and mitigation issues.

experienced tensions between science and politics in New Jersey's freshwater wetlands debates and aids in drawing a boundary between these realms. To work toward a contextualized appreciation for how this came about I ask two central questions that emerged through the processes of iterative and interpretive research:

- How was science enacted and used to advance social movement development around freshwater wetlands protection?
- How did grassroots knowledge about freshwater wetlands enter the policy stream?

**Conceptualization.** Conceptualization involves identifying the central concepts for analysis as they “emerge from the field” (Schwartz-Shea & Yanow, 2012). In this research I use a modified policy process heuristic from social movement studies (SMS) called the Movement Action Plan (MAP) model of social movement emergence to identify three concepts around which movement actors develop “sub-movements” as they struggle to advance environmental values against competing economic goals in the FWPA debates. These concepts include: the definition of a freshwater wetland such that it would be protected (“definitions”); the delineation of a protective freshwater wetland buffer (“buffers”); and the creation of artificial freshwater wetlands as sufficient action to permit the destruction of natural freshwater wetlands (“mitigation”). Conceptualization also involves developing the questions that guide analysis. In this research these questions include:

- How was science / knowledge used to inform tactical choices and decision making in policy processes?
- How were conflicts over scientifically and technically complex subjects resolved in the definitions, buffers and mitigation disputes?

Having engaged the research process using interpretive methodologies I then draw from critical analytic perspectives to study the competing knowledge claims that emerge around the definitions, buffers and mitigation disputes and to examine the path of “successful” knowledge claims as they are



incorporated into the FWPA. Working from *interpretive theory* I apply the frame analytic approach to bring insight to the micro foundations of political action, looking at the role of group strategic action in advancing knowledge claims about freshwater wetlands. Examining framing processes illuminates issues of meaning and processes of interpretation in the construction of knowledge claims (Schön & Rein, 1994). *Social constructivism* yields the Social Construction of Technology (SCOT) model, which allows me to understand successful knowledge claims as “artifacts” of the process, and serves as a tool “to study the institutional reception of knowledge claims” (Brandwein, 2006: 232). *Political economy* perspectives prompt me to consider “who benefits” from the regulatory outcomes of these processes.

Following the requirements of interpretive research with respect to transparency of knowledge generation and trustworthiness I tend to three tasks before describing the interpretive process and my analytic frameworks and techniques. First, I grapple with philosophical questions that make my choice of the interpretive research approach matter to my specific research concerns. These include considerations of democratic engagement and public discourse in policy making and the topography of policy practice. Second, I consider the relevance of “researcher identity” in conducting this study. In this case I position myself as a researcher in what Schön would call the “swampy lowland” of normative concerns, conducting research at the boundary between knowledge (research) and action (Schön, 1983). I describe my interest in theoretical considerations of the balance between democracy and “good governance” (Fischer, 2010), and give some background to my “activist’s” commitment to recognizing bottom-up models of social engagement. Finally, I describe how I prepared to conduct interpretive research, working to contextualize my methods and make the tacit knowledge of my research practices as explicit as possible.

### **Choosing an approach to inquiry**

The notion that citizen advocacy and expertise can influence policy raises specific theoretical questions about relationships between governance and democracy e.g. is it appropriate to place demands of time and expertise on our citizenry? What does the public have to know? These are enduring questions. E.E. Schattschneider, writing at midcentury, argued for a conception of

democracy that delineates between the knowledge of experts, amateurs, specialists and generalists and suggested that in working toward more accountable, plural models of expertise we think seriously about the contingency of the social and political structure of life: “The problem is not how 180 million Aristotles can run a democracy, but how we can organize a political community of 180 million ordinary people so that it remains sensitive to their needs” (Schattschneider, 1975: 135).

In recent years this “problem” has been further complicated by certain contemporary trends. These include the documented rise in non-governmental environmental justice and social movements (Hawken, 2007).<sup>29</sup> They include organizational changes in non- governmental organizations (NGOs), from grassroots environmental movements to increasingly bureaucratized, professionally run “protest businesses” (Jordan & Maloney, 1997), raising questions about the extent of democratic citizen engagement (Bosso, 2005). They also include increases in collaborative knowledge production between NGOs and traditional research organizations (Edwards, 2004). These trends have led to suggestions that as a society we are shifting from a representative form of government in which elected officials make decisions with little interference from others in society, to a collaborative form of government (Leighninger, 2006). They have also resulted in a new set of concerns related to the often opaque functions of NGOs and public/private partnerships, specifically critiques regarding their lack of transparency and accountability and questions regarding the legitimacy of these organizations (Kock, 2006).

If we are to understand the extent of democratic citizen engagement in scientific and technical decision making in general, and in the FWPA case in particular, we need to study the social character of problem solving about scientifically and technically complex subjects. We also need to examine the social processes that help produce and communicate scientific findings. To do this we need a methodological approach open to research into contexts of discovery at the micro level and accommodating of policy-making models that recognize more plural forms of governance. To identify

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<sup>29</sup> Some theorists suggest the increase of NGOs reflects a distrust of representative forms of government and argue that citizens active in more directly democratic forms of government view political engagement as the price that must be paid to keep watch on the questionable decision-making of elected representatives (Bowler, Todd, & Karp, 2007). Others view the shift as a response to citizen empowerment, and their demands for self-management and autonomy (Weir & Ganz, 1997).

such an approach I begin by considering alternatives to the dominant positivist top-down methods (e.g. cost-benefit analysis and economic evaluation criteria) typically used in policy analysis. These more standard approaches emphasize “rigorous quantitative analysis, the objective separation of facts and values, and the search for generalizable findings whose validity would be independent of the particular social context from which they were drawn” (Fischer, 2007: 223). Seminal research by Lindblom and Cohen (Lindblom & Cohen, 1979) provides a useful starting point to consider the importance of a contextualized knowledge with the concept of “local knowledge.”<sup>30</sup> They posit local knowledge as an alternative to technocratic methods, describing it as inherently “usable,” in spite of the fact that “...it does not owe its origin, testing, degree of verification, truth, status, or currency to distinctive...professional techniques, but rather to common sense, casual empiricism, or thoughtful speculation and analysis” (Lindblom & Cohen, 1979: 12). Lindblom builds on this to move us toward a broader conception of the public’s role in inquiry through a process he calls “lay probing” (Lindblom, 1990: 190), and suggests that we have overlooked the influence of lay probing in the shaping of society: “Any claim that social problem solving is now largely a task for social scientists or other scientists obscures the ordinary citizen’s role...in producing and disseminating knowledge” (Lindblom, 1990: 9-10). However, Lindblom’s (Lindblom, 1990) notion of probing as a research approach, in eschewing “professional techniques,” gives little guidance to policy analysis with respect to data generation, data access and research design. How, then, are we to examine the citizen’s role in “producing and disseminating knowledge”?

Tracing Lindblom and Cohen’s notion of “usable knowledge” forward through the constructivist policy analysis literature led me to Fischer’s consideration of philosophical and social science inquiry, and put me on the “interpretivist” methodological path to analyzing policy processes (Lindblom &

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<sup>30</sup> Others detail the competency of “lay citizens” (Sclove, 1995), or the value of “local contextual knowledge” that can result in meaningful collective judgments on issues based on the integration of expert and stakeholder knowledge (Fischer, 2000). Corburn describes a form of knowledge called “street science,” defining street science as a “contextual intelligence that is uniquely held by geographic or identity groups” (Corburn, 2005: 4). What Lindblom and these authors share is an understanding of context as an important organizational dimension for individual/citizen knowledge: “*local* knowledge” (Lindblom and Cohen), “*local contextual* knowledge” (Fischer), and “*contextual* intelligence” (Corburn). They also share a common struggle in bringing the stories and findings of these more local concerns into a framework that allows one to make sense of their impact on larger policy decisions.

Cohen, 1979; Fischer, 1995; Fischer, 1998). Interpretivists, like constructivists, challenge notions of objectivity and neutrality as an ultimate aim in research efforts and question the validity of empirical research designs that claim the same. Both groups concern themselves with the sociological practices through which policy outcomes are constructed. However, central to interpretivist researchers' concerns is the theorization of the sociological practices that define the processes of policy analysis itself and attention to the ways in which the researcher's presence might affect what is learned in the course of research (Yanow, 2007: 408). This perspective gives theorists like Fischer (Fischer, 2010), Yanow (Yanow, 2000), Yanow & Schwartz-Shea (Yanow & Schwartz-Shea, 2006), Bevir & Kedar (Bevir & Kedar, 2008), and Schwartz-Shea & Yanow (Schwartz-Shea & Yanow, 2012) a position from which to suggest an alternative research protocol and a new set of methodological techniques. The interpretive approach is distinct from strictly quantitative and qualitative analyses in several important ways. First, interpretive research is designed to focus on the *meanings* of policy (as opposed, for example, its costs or impacts) and the role of meanings in the creation of policy (Yanow, 2000). Second, interpretive research is not hypothesis-driven. It is guided instead by hermeneutics. Understandings and the very existence of concepts are "abducted" from, or "emerge" from the field (Schwartz-Shea & Yanow, 2012: 18). Third, interpretive research views method and context as mutually integral to the production of knowledge in the research process, requiring a "reasoning in context," that defines interpretive research's inherently iterative-recursive character. I travel the interpretive path in conducting research in this project.

### **Situating the self**

In interpretive research practices the researcher is considered the primary research instrument (Lincoln & Guba, 1985) thus requiring attention to the "presentation of self" (Goffman, 1959) as a potential influence on the ability to develop research relationships and to access and generate data through these relationships (Maher & Tetreault, 1994). Considering the presentation of self in research processes involves researcher reflection on "positionality." In this project I reflected on my positionality at the time of the research project, focusing on two contexts of my life, the first educational, the second geographic, as they related to the research effort. This led me to actively

express aspects of my educational and geographic positions in the course of the interviews. I also worked to recognize epistemic influences on the research project, particularly my professional life as a practicing planner and my experiences as a social movement activist.

**Positionality.** Maher & Tetreault (Maher & Tetreault, 1994: 168) use the term “positionality” to describe researchers “not in terms of fixed identities, but by their location within shifting networks of relationships which can be analyzed and changed.” Louis & Barton (Louis & Barton, 2002) suggest that researchers actively “position” themselves to “set the stage” for productive participant reflection.<sup>31</sup> As I engaged with research participants in the interviews I consciously referred to two different aspects of my identity with the aim of 1) establishing specific interview dynamics with respect to power, control and authority (Ng, 1996) engaging interviewees as “co-generators,” or “co-creators” of the data (Yanow, 2007: 409). First, I identified myself as a graduate student at Rutgers - The State University of New Jersey. New Jersey residents tend to have a fondness for the state school. In positioning myself as a student I seemed to vest those interviewed in my research process as “educators” working on behalf of an institution they respected. Second, I identified myself (a Midwestern transplant) as new to New Jersey and as interested in finding my way around the landscape of the state’s environmental politics. Positioning myself as an outsider resulted in an “orientation” process of sorts as research participants guided me through New Jersey’s political landscape. Acknowledging the special authority of the interviewees on the topic of New Jersey’s freshwater wetlands, and vesting trust in the participants as (my) educators, fostered a comfortable, non-interrogatory dynamic, giving significant control to the interviewee. I also suspect that it resulted in a greater degree of detail in the recollection of how events unfolded, particularly with respect to describing the major players and institutions involved.

**Epistemic influences.** I am a city and regional planner by training and profession. I am also a social movement activist with a long history of engagement in social movement organizing. In college I engaged in pressure group activities around issues of environmental degradation (deforestation in

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<sup>31</sup> Lincoln & Guba (Lincoln & Guba, 1985) also suggest that statements of positionality be included as a standard for judging quality in interpretive inquiry by revealing researcher bias, motivation and/or interest.

Brazil) and democracy (electoral reform in El Salvador). In 1994 I was involved with coordinating election monitoring activities for the Committee in Solidarity with the People of El Salvador (CISPES). During graduate school I was a regional organizer for The Loka Institute, working to develop a popular movement for community-driven policies in research, science and technology. I am currently involved with movement organizing in my community around the issues of food security and Environmental Justice (EJ). These experiences both inspire and provide unique insights into this examination of citizen and social movement influence on policy and policy processes. In particular they inform my interest in normative concerns related to the transformative potential of group action: I am interested in contributing not only to the social movement studies (SMS) community and to the planning literature on participatory engagement, but I also seek to inform transformative learning amongst social movement activists.

### **Preparing for interpretive inquiry**

Both the interpretivist methodological approach and the interdisciplinarity of my research questions require specificity regarding theoretical, analytical and practical choices in the conduct of research. This includes acknowledging assumptions that influence the direction of research and explaining how I work toward “trustworthiness” in research design and throughout the processes of inquiry.

**Acknowledging assumptions.** Some of my choices are guided by assumptions that may seem atypical from the perspective of one research community engaged in policy analysis, but par for the course in another. For this reason here I identify six key assumptions that guide my approach to inquiry and the reporting of findings. First, I am most concerned with the process of developing policy, not the outcome of policy, and go about conducting analysis *of* policy, not analysis *for* policy. Second, building on this first assumption, I focus on the *meaning* of policy to the stakeholders. Third, I work toward “co-generation” of data in interviews by incorporating paraphrasing and “testing” interpretations on the spot (Schaffer, 2006: 160) and by further validating my understandings of the data through presentations and publications. In the end, however, I am responsible for interpretation.

Fourth, this research incorporates aspects of both field work and empirical research. Fifth, my primary intent with this case study research is to explore and describe, rather than to test existing theory or to develop theory for the purpose of making predictions (Yin, 2003). Finally, I do not begin my research with a hypothesis, but use “abductive” logic to identify research questions.

**Designing for trustworthiness in the research process.** In qualitative and quantitative positivist research three criteria are typically used to evaluate research: validity, reliability and replication (Yin, 1994). Validity is associated with achieving certainty, and reliability is associated with the replicability of the research (the extent to which the research results can be reproduced). In interpretive research these issues are addressed differently as certainty and replicability of results are not the goal. Instead, interpretive researchers, in working to develop defensible knowledge claims, seek to develop the “trustworthiness” of their projects (Lincoln & Guba, 1985).<sup>32</sup> In this research I adopt several strategies on the path toward trustworthiness, including the use of “thick description” (Geertz, 1973), “reflexivity” (Lincoln & Guba, 1985); and “intertextuality” (Schwartz-Shea & Yanow, 2012).

**“Thick” description.** “Thick description” (Geertz, 1973) is generally understood as the description of a phenomenon in such detail so as to consider the transferability of conclusions to other like contexts (Lincoln & Guba, 1985). In reporting on my research I work toward a “thick description” of the social, economic and political culture of New Jersey in the years leading up to passage of the FWPA. This type of description includes plenty of details and identifies conceptual structures and meanings associated with freshwater wetlands at the time.<sup>33</sup>

**Reflexivity.** If I am to work to understand how others “make use of information in formulating problems and the positions they take on problems” (Lindblom, 1990: 3) then I need to examine how I use information in formulating problems and the positions I take on problems. In interpretive research

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<sup>32</sup> Lincoln & Guba (Lincoln & Guba, 1985) identify four categories of evaluative criteria for establishing trustworthiness. These included credibility, transferability, dependability and confirmability.

<sup>33</sup> In this research “thick description” serves an additional, non- evaluative purpose specific to developing context so as to illuminate why New Jersey’s social movement actors developed certain understandings about their concerns and how they cultivated knowledge(s) to bring to bear on an examination of alternatives in both advocacy and policy.

this is referred to as “reflexivity” (Lincoln & Guba, 1985) and has been described as “the turning of science back upon itself” (Oren, 2006: 221). I incorporate several techniques for reflection in my research, including the related concepts of co-generation of data via the interview process, “checks” on sense making in data gathering, and “member checking” of the research I present and publish.<sup>34</sup>

**Co-generation of data in interviews.** Interpretivist researchers view knowledge generation as a co-creative process that requires reflexive discussion on the meanings of words and statements in the course of the interviews (Yanow, 2007). Seeking shared meaning in this sense led me to work toward a “mutually negotiated communication” (Soss, 2006: 132) in the interviews. I must acknowledge that I did not use this technique out of the gate as a rookie researcher. Rather, as I honed my interviewing skills I gradually incorporated paraphrasing into the conversations, “reflecting” participant’s words back to “test” my interpretations on the spot (Schaffer, 2006: 160, note #4). This served both as a strategy of engagement and as a technique of “verification in the field.”

#### **Checks on sense making in data gathering**

**The “commonplace book.”** For more than twenty five years I have kept notebooks in the tradition of the 17<sup>th</sup> century practice of “commonplacing.” These notebooks are scrapbooks that include observations, quotations and commentary in the form of notes, essays, drawings and diagrams. What I record is dated, and I include details about where I am when I record my observations. I borrowed from my experience with commonplace journaling for this project, keeping two separate notebooks that I referred to as my “wetlands commonplace books.” These notebooks reflected two approaches to data gathering: notemaking and notetaking. In *notemaking* I documented observations and descriptions of things observed in the field. In *notetaking* I took a more analytical approach and recorded my thoughts and hunches based on both field observations and engagement with various

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<sup>34</sup> The concept of reflexivity also influenced my choice of analytical frameworks, particularly the Movement Action Plan model of social movement emergence (Moyer, McAllister, Finley, & Soifer, 2001) used to shape context. The MAP model is highly reflexive. Use of the model to explain a social movement’s path to success helps illustrate points of reflection and debate over desired ends, values and purposes and regular examination of means to the end. For example, in the case of New Jersey’s FWPA, in reflecting on what was needed to advance their cause the Freshwater Wetlands Campaign recognized the value of education campaigns and established a push for expertise on the issue as a cornerstone of their approach.



texts. In this way I: 1) separated analysis from description; 2) developed an “archive of data” (Sumara, 2002) that I could refer to as I worked to contextualize, conceptualize and analyze my findings; and 3) opened the door to self-reflection through the review of my sense-making and interpretation over time.

**Narratives.** I began each interview by asking research participants (Appendix A - Research Participants) to situate their initial awareness of freshwater wetlands as an issue of concern and to describe how this awareness led to their involvement in passage of the FWPA (Appendix B - Interview Protocol). In this way I worked “to encounter participants’ understandings in their own terms” (Soss, 2006: 133) and to consider how “each knower comes to his subject with prior knowledge that has grown out of past experience, education, training, family-community-regional-national (and so on) background and character” (Yanow, 2006b: 12-13). After transcribing the interviews I then developed narratives of the “personal stories” of interview participants based on their sense-making of the issues. My intent with this was to twofold: 1) to document the various conceptual worlds of the participants; and 2) to reflexively force a re-examination of my initial impressions as recorded in the commonplace books.<sup>35</sup>

**Member checking in reporting.** I worked to validate my understandings of the data gathered through a process called “member checking,” described as “the practice of sending or bringing written material involving the people studied back to them” (Schwartz-Shea & Yanow, 2012: 106). In five cases I conducted “member checking” with situational members, asking that interviewees review their transcribed responses for validity. I presented at three local conferences as I worked toward conceptualization. I also distributed the “context” chapter “Citizen Expertise and Citizen Action in the Creation of the Freshwater Wetlands Protection Act” to project participants and published the chapter in a collection of essays called *New Jersey’s Environments* (Fenyk & Guston, 2006).

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<sup>35</sup> Reviewing the transcripts in this way also helped me to remain aware of the various ways that the interview context and the interaction between me and the interview subjects could affect the content and the information provided by the interviewee, specifically the potential of reactivity (Hammersly & Atkins, 1993) or the “performative character of interview talk” (Hammersly & Gomm, 2008).

**Mapping for Exposure and Intertextuality.** A third way I worked toward trustworthiness in my research practices was by casting a wide net for resources and data inputs so as to maximize “exposure” to multiple views and to incorporate “intertextual readings” into my sense making (Schwartz-Shea & Yanow, 2012: 87). Yanow describes intertextual research as an attempt to make “links across data sources in ways that contribute to the interpretation of those data....Intertextual readings of this sort look for the dimensionality, ambiguity, and possible contradictions that might arise from broad examination of evidence, the researcher remaining open to the possibility of consensus and agreement without presuming or privileging it” (Yanow, 2006a: 86). Although I struggled at times with what seemed an unwieldy collection of files and records (from the Freshwater Wetlands Campaign, New Jersey Department of Environmental Protection, Association of New Jersey Environmental Commissions and the New Jersey Builders Association, in addition to the hearings and interview transcripts and multiple versions of the freshwater wetlands bill), when I documented interaction on certain topics and concepts through my “intertextual reading” of these materials I gained confidence in the credibility of my findings.

### **Processes of inquiry**

In this section I describe the data and my processes of inquiry, including methods of generating data using iterative research techniques, and organizing the data through contextualization and conceptualization.

**Interpretive research: generating and accessing data.** In this research I draw on three methods to generate and access data: reading, interviewing, and observing (Yanow, 2007).

***Reading/Watching: Primary source review.*** I began my research efforts by identifying primary sources of data that documented the development of NJ’s FWPA. I collected and reviewed newspaper clippings on the topic of freshwater wetlands from New Jersey’s regional newspapers, and reviewed transcripts of public hearings on freshwater wetlands protection legislation held before two Assembly Committees: the Assembly Agriculture and Environment Committee and the Assembly Energy and Natural Resources Committee.

*Newspaper articles.* From the 1950's to 1989 reference librarians at the New Jersey State Library clipped articles on issues deemed "of significance" to the state and filed the articles in the Library's archives by year and under subject headings like "New Jersey's environment - wetlands" (New Jersey State Reference Librarian, 2012). I accessed all the clippings in the "New Jersey's environment - wetlands" folders at the New Jersey State Library for the years 1980-1989. There were approximately 150 articles in these files, all of them addressing local or regional issues. The clippings included general reporting, feature articles, letters to the editor, columns, and editorials. These pieces were clipped from nine state and/or regional newspapers including *The Bergen Record*, *The Star-Ledger*, *The Trenton Times*, *The New York Times*, *The Asbury Park Press*, *The Press (Of Atlantic City)*, *The North Jersey Herald News*, *The Newark Evening News*, and *The Princeton Packet*.<sup>36</sup>

I made handwritten lists of the principal topics addressed in the articles and organized this information by year. I also kept a list of the names and affiliations of the actors interviewed or mentioned in the clippings and the specific topics and problems addressed by these individuals.<sup>37</sup> As I worked through these clippings I observed reporting that referred to "environmentalists" vs. "builders" in the developing debates. This framing led me to consider how some actors (environmentalists) defined the conditions of freshwater wetlands as violating widely held values and how others (the building and development community) disagreed, suggesting instead that development projects in freshwater wetlands were improvements on the land.

*Transcripts from public hearings.* I read transcripts from five public hearings held on issues related to wetlands protection and passage of New Jersey's Freshwater Wetlands Protection Act, two

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<sup>36</sup> For these materials I created a database summarizing the nature of the publication in which each article was found and identifying for each paper the publisher and their political interests/leanings. I documented the frequency of publication on the issue of freshwater wetlands protection for each paper each year, and the nature of the principal topic(s) addressed. For the clippings themselves I identified the paper in which they were found, whether they were in keeping with the paper's political/ideological leanings (for or against freshwater wetlands protection), and when possible made note of the section and page number from which the piece was clipped with the idea to gauge possible changes in magnitude of the issue and/or topic. For the actors interviewed or mentioned in the clippings I made note of any refinement or change in their arguments over time.

<sup>37</sup> These topics included: property rights, freshwater wetlands values, impacts on freshwater wetlands, status of freshwater wetlands, science of freshwater wetlands, uncertainty and freshwater wetlands protection, legal issues and freshwater wetlands, state assumption of the Federal 404 program, and freshwater wetlands definitions, buffer delineation, and mitigation.

in 1984 and three in 1986 (Appendix C - Public Hearings on Freshwater Wetlands Protection). As with the newspaper clippings, from these transcripts I made handwritten lists of the principal topics addressed.<sup>38</sup> I also identified the names and affiliations of actors presenting at the hearings and noted the specific topics they addressed.<sup>39</sup>

Having identified the “buffers” dispute and its resolution as an issue for exploration as part of the NSF study, and having gained an appreciation for buffers as a contentious issue in the course of the FWPA debates through review of the newspapers and public hearings transcripts, Professor Guston and I began to shape an interview protocol (Appendix B - Interview Protocol) to take out into the field to guide conversation with actors identified through the primary source review. This interview protocol was originally designed to yield information about the buffers debate and how the various parties came to closure on the issue.

*DEP documents.* Prior to passage of New Jersey’s Freedom of Information Act (FOIA) I was given unfettered access to over eight feet of unorganized “freshwater wetlands” files from New Jersey’s Department of Environmental Protection (DEP) for the years 1981 to 1991. This material included letters between the DEP and federal and state agencies, inter and intra division memos, drafts of many versions of the Senate and Assembly bills and division comments on these draft bills, internal reports on aspects of freshwater wetlands research and science, voting records of Senators and Assemblymen, handwritten notes, newspaper clippings, and many other items. I began the review of these materials during a series of visits to the DEP. First working with Professor David Guston and then visiting the archives alone I created handwritten lists of items in the files, identifying an author and

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<sup>38</sup> In 1984 these included wetlands values, “the fundamental elements of a freshwater water wetlands bill,” the definition of freshwater wetlands, mapping / delineation of freshwater wetlands, and buffers. In 1986 these included Assumption of the Federal 404 process, wetlands definitions, buffers delineation, and mitigation.

<sup>39</sup> As with the newspaper clippings, as I reviewed the hearing transcripts I kept a list of the names and affiliations of the actors interviewed or mentioned, identified their position on the issues of freshwater wetlands degradation and protection, and the topics they addressed. I made note of shifts in or the refinement of arguments in the sequence of three hearings in the summer of 1986. I also established a database of quotations specific to the emerging primary concerns of wetlands definitions, buffers, mitigation, and general issues of knowledge or expertise.

date when possible. I then organized the data on these lists chronologically, sifting through each year's material to identify core themes.

*Freshwater Wetlands Campaign and ANJEC files.* During the course of the interviews ANJEC “gifted” me with many hundreds of documents - indeed, what I was told was the entirety of the Freshwater Wetlands Campaign (FWC) files - pertaining to FWC's organizing efforts around passage of the FWPA. This material included letters, memos, handwritten notes, drafts of many versions of the bills, voting records, and newspaper clippings. Additional materials included meeting minutes, fundraising letters, budget materials, promotional material, educational material, photographs, and maps. I began to organize this material chronologically, but also based on the organizing activities and strategies adopted by the FWC.

*New Jersey Builder's Association (NJBA) Videos.* The NJBA provided me with access to their resource library. While there I reviewed the newsletters they distributed to their membership for the years from 1983-1987, screening these documents for articles related to freshwater wetlands. One NBFA lawyer provided me with copies of personal correspondence from his files. I also watched two 45-60 minute VHS videos developed by the NJBA as “interpretation” of the FWPA for NJBA membership. These videos documented round table conversations between individuals from the NJBA and National Association of Office Parks (NAIOP) involved with the FWPA negotiations and their counterparts from the NJDEP.

*Review of the multiple versions of the bills.* The DEP, FWC, ANJEC and NJBA files contained several versions of freshwater wetlands protection bills, some developed by the “environmentalists” and others by “the builders”. From these I followed the metamorphosis of a bill designed as a tool to guide local land use decisions to a bill designed to allow New Jersey to assume Section 404 of the Federal CWA as it related to freshwater wetlands and that would serve to help coordinate regional land use planning decisions. I developed a database of the central issues addressed in each version of the bill and began to identify how certain issues were framed in certain ways by the various champions of the bills.

**Talking: Interviews.** Initially working from the list of actors identified in the course of primary source review I identified potential research participants to interview. I conducted interviews in the participants' offices or homes, settings that afforded insight into the participant's "world" (Schwartz-Shea & Yanow, 2012). I explained to participants that the general aim of the research was to gain insight into making political decisions about technically complex subjects, and I relayed to them my belief in their expertise on the subject. The semi-structured interview protocol guided conversation through mostly open ended, retrospective and reflective questions about freshwater wetlands protection and decision making. This approach allowed for issues of importance to the interview subjects to emerge from their stories. (However, it should be noted that the retrospective approach presented challenges with respect to gauging actor perceptions of the *relative* importance of organizational strategies adopted some twenty to thirty years prior). Understanding the participants as "co-producers" of the data (Yanow, 2007) I incorporated paraphrasing into these conversations, essentially testing my interpretations on the spot (Schaffer, 2006: 119). As a general topic the passage of New Jersey's Freshwater Wetlands Protection Act generated considerable enthusiasm and many anecdotes. More than 43 individuals were interviewed with over one hundred hours of interviews were transcribed.

**Participant observation.** I engaged in two forms of participant-observation. I attended open meetings of New Jersey's Freshwater Wetlands Mitigation Council as a member of the public. In this I was not an active participant but engaged in "research-observation" (Gans, 1979). I also enrolled in a two day course on freshwater wetlands delineation. In this role I interacted with other students and directly observed the difficult task of freshwater wetlands delineation.

## Contextualization

To determine a process by which to study the context for social movement activities I first examined how others in political science and policy studies have envisioned this context. I looked in particular to the political process models that first developed in the mid 1970's (May & Wildavsky, 1978; Palumbo, 1988; Van de Graaf & Hoppe, 1989). Building on Lasswell's (Lasswell, 1956) "stages

heuristic” model these represent the context for engagement as a set of pre-existing processes, or steps, in policy-making that each new group of contenders enters. Such heuristic devices are useful starting points from which to organize thinking about policy making and changes in public policy. They emphasize the importance of the political system in providing opportunities for organizing resistance or positive social change. They view social movements as constituting long-term collective efforts to challenge the status quo, and movement organizing as an essential part of the wider democratic process of society. Their particular value in a study of pluralism is that they open doors to political theorizing with views of social movements as autonomous-but-integral parts of the political process, affording demonstrations of how movements make use of elements of the establishment to realize success. However, these models are limited in at least two significant ways. First, we cannot use them to examine the cultural and institutional contexts that may make decision-makers more or less willing to make new policies on a specific issue (Melucci, 1996; McAdam, Tarrow, & Tilly, 2001; Jasper, 2004). Second, their technocratic conception of policy making leaves little room to advance more democratic forms of policy evaluation.

Understanding that political context can change the way policy is made, I sought a policy process model flexible enough to accommodate conceptions of contextual knowledge while still depicting specific junctures where political actors were likely to be experiencing tensions between science and politics. Familiarity with certain theoretical constructs in social movement studies (SMS), specifically social movement evaluation, led me to social movement models built on the political process model (McAdam, 1999).<sup>40</sup> In particular I looked to Moyer et al.’s Movement Action Plan (MAP) (Moyer et al., 2001) of social movement emergence. MAP grew out of citizen action in participatory democracy and summarizes social movement organizing from an activist perspective, seeking to “contribute to the effectiveness of social activism” (Moyer et al., 2001: 1). MAP conceives of social

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<sup>40</sup> The political process models of social movements first developed in the mid-1980’s. These models emphasize the importance of the political system in providing opportunities for organizing resistance or positive social change. They view social movements as constituting long-term collective efforts to challenge the status quo, and movement organizing as an essential part of the wider democratic process of society. Their particular value in a study of pluralism is that they open doors to political theorizing that embraces a perspective of social movements as autonomous-but-integral parts of the political process, affording demonstrations of how movements make use of elements of the establishment to realize success.

movements as part of the broader political system and is designed to help reveal specific movement outcomes including “movement strategy,” “the results of the movement’s activities,” and “the impact of the movement on society” (Moyer et al., 2001: 4). It has been demonstrated to be a valuable framework for understanding movement evolution (Moser, 2007), and movement dynamics (Balkwill, 2003). Viewed as an ideal (i.e. how social movement activist-theorists think policy should be made), MAP can also be used to understand policy making as “a process rather than a fixed set of analytic techniques” (Haas, 2004: 575) and as a tool to pinpoint the emerging knowledge claims around New Jersey’s freshwater wetlands. MAP allows us to “examine movement outcomes not at the end of the direct action phase...but at a later point in the process, as the issues make their way through legislative bodies or other decision-making bodies of the powerholders” (Moyer et al., 2001: 112). Finally, MAP accommodates accounts of agency in descriptions and explorations of social lives, bringing attention to the micro-foundations of political action.<sup>41</sup>

Like traditional policy process models the MAP follows a procedural logic, tracing social movement organizing through eight defined stages (Figure 1) and detailing for each stage the roles of the various actors (opposition, powerholders and the public), the goals of the opposition, the “pitfalls” the opposition might face, and the “crisis” that marks the transition from one stage to another. Whereas traditional “rational” policy process heuristics presuppose a strictly analytical approach to social problem solving and decision making that centers on government officials, the MAP construct “places a focus on the agency of the activists” (Moyer et al., 2001: 112). This allows for explorations of the micro-foundations of political action and for the probing of questions about meaning making and the use of scientific information in the FWC’s operations and strategizing as it worked to ensure protection of the state’s freshwater wetlands.

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<sup>41</sup> In this way MAP is a response to what many SMS scholars have claimed is the failure of overly mechanical political process models, models integral to classical SMT, to take culture and institutional contexts seriously (Melucci, 1996; Benford, 1997; McAdam et al., 2001).



**FIGURE 1: The Movement Action Plan (MAP) 8-Stage Model**

*Normal times.* In the first stage a critical social problem exists that violates widely held values, but the problem is not a public issue. In fact, the public is unaware of the problem, supporting powerholders whose operating policies are at odds with the official policies that speak to publicly held values.

*Prove the failure of official institutions.* In the second stage new opposition groups begin to use the courts, government offices, commissions and hearings to demonstrate the failure of official institutions.

*Ripening conditions.* There is a greater recognition of the problem in the third stage, with the public hearing from those affected by it. Tapping into pre-existing institutions and networks more local groups organize on the issue, with 20-30% of the public opposing powerholder policies.

*Take off.* Activity in the fourth stage is galvanized by a trigger event, prompting dramatic actions and campaigns that demonstrate how conditions and policies violate widely held public values. The problem is put on the social agenda and the movement takes off with 40% of the public now opposing current policies.

*Perception of failure.* The fifth stage is a period of demoralization, prompted by a failure to achieve goals and influence powerholders. The social movement appears to have ended.

*Majority public opinion.* With the sixth stage comes a majority opposition to present conditions and powerholder policies, with actors demonstrating how the problem and policies affect all sectors of society. Mainstream citizens and institutions are engaged to address the problem and to put it on the political agenda. Alternatives are promoted, and powerholder strategies, including their promotion of public's fear of alternatives and activism, are directly addressed. Alternatives go beyond the suggestion of reforms to include a paradigm shift in approach. Re-trigger events happen, re-enacting Stage Four for a period.

*Success.* Stage seven sees a large majority opposing current policies and no longer fearing alternatives. Many powerholders change their positions, with those who don't often voted out of office. New laws and policies are shaped, with powerholders working toward minimal reforms and movement actors demanding greater change.

*Continuing the struggle.* Stage eight extends successes, works to oppose attempts at backlash, and promotes the paradigm shift. Movement actors recognize their success and renew their focus on other sub-issues.

SMS offers additional analytical devices that reflect the pluralist concerns of the larger political community and include tools rooted in democratic approaches to policy evaluation and democratic exchange. Although primarily concerned with why and how social movements take place, SMS also seeks to understand the social, political and cultural impacts of social movement organizing. SMS has been described as “a way to study how social movements and movement organizations play a role in creating new issues and generating new policies” (Hjelmar, 1996: 170). Certain social movement concepts including “repertoires of contention” (Tilly, 1986: 2), “framing” (Snow & Benford, 1988), and “counter-framing” (Benford, 1997) offer potential insights into the strategies and tactics used to identify and advance alternative policies in the FWPA case. Repertoires of contention are the tactics and techniques that social movement organizations can advocate and employ in a certain time and place, and the availability of tactical repertoires can impact the viability of solutions proposed (Koopmans & Duyvendak, 1995; Polletta & Ho, 2006). The concept of “frame” is imported by social movement scholars (Snow, Rochford, Worden, & Benford, 1986) citing Goffman’s (1974) study of the organization of social experiences. As discussed in the Snow et al. piece, for Goffman, frames function as the “schemata of interpretation” for the individual (Snow et al., 1986: 464). Benford and Snow (Benford & Snow, 2000) extend this concept to social movement organizations and collective action in their discussion of framing as an interactive social process of meaning construction around “some problematic condition or situation...define[d] as in need of change” (Benford & Snow, 2000: 615). “Counter-framing” includes opposing framing activity that attempts “to rebut, undermine, or neutralize a person’s or group’s myths, versions of reality, or interpretive framework” (Benford & Snow, 2000: 626). Counter-framing can prompt a defensive stance and a refinement of frames on both sides of an issue in what Ryan (Ryan, 1991) refers to as a “framing contest.” These concepts combined with the MAP model make SMS a valuable complement to constructivist studies that focus on how society, politics and culture influence the production and dissemination of scientific knowledge.

In this research contextualization involved employing the MAP model to articulate processes. It also involved arranging the data to: 1) describe the identification of freshwater wetlands as an issue of concern; 2) trace the emergence of a grassroots movement around freshwater wetlands protection; 3)

identify how science / knowledge was used to advance movement development around freshwater wetlands protection; and 4) identify points at which grassroots knowledge about freshwater wetlands entered the policy stream. Contextualizing the data using the SMS techniques identified above helped me understand the environment in which environmental advocates, organizing as the Freshwater Wetlands Campaign (FWC). It also contributed firsthand knowledge about the nature of freshwater wetlands degradation, clarified the environmental issues, and gave form to the arena of conflict between science and politics. This process provided two important insights for my research. First we see how science as a worldview became associated with the policy deliberations over scientific and technical parameters of freshwater wetlands protection in New Jersey from 1983-1987. Second in observing the incorporation of citizen science into the FWC's "repertoire of contention" (Tilly, 1986), and in observing the framing and counter-framing that contributed to the "framing contest" between environmental and regulated community concerns, we see that without the science from the grassroots the FWPA most likely would not have been written, or at least would have followed a very different path.

### **Conceptualization**

The Movement Action Plan (MAP) model gives structure to my understandings of context, lending insight into how the FWC developed technical and political competence to champion freshwater wetlands protection along the way. MAP helps me understand how this expertise defined what would constitute, in the absence of an authoritative freshwater wetlands science, the scientific competence brought to bear on decision making around freshwater wetlands protection. MAP also helps me acquire "local" concepts and to identify those concepts around which competing knowledge claims "emerge" from the swamp of New Jersey's freshwater wetlands deliberations as strategic "sub-movements" or "sub-goals" of concern around the major goal.<sup>42</sup> Applying the MAP model to New Jersey's freshwater wetlands we see that the major goal of passage of the state's Freshwater Wetlands Protection Act evolved to include three central sub goals, or sub movements: establishing a state-

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<sup>42</sup> These "sub-movements" progress through the eight-stage MAP model at their own pace and of their own accord (Moyer et al., 2001).

specific definition of freshwater wetlands (“definitions”), establishing protections for freshwater wetlands buffers (“buffers”), and prohibiting, or limiting the extent of, wetlands mitigation (“mitigation”).

The MAP model’s recognition of sub-goals within the major goal is particularly helpful in showing that pursuing each sub-goal produced specific puzzles over the use of science, and that, similarly, emerging uses of science affected the pursuit of these sub-goals. The MAP framework reveals that this emerging scientific knowledge about freshwater wetlands was used strategically in movement organizing to: 1) prove the failure of official institutions to protect freshwater wetlands; 2) put problems of freshwater wetlands degradation on the social agenda; and 3) put protection of freshwater wetlands on the political agenda (Moyer et al., 2001). In this study I examine each sub goal as its own case, asking how the FWC leveraged certain types of scientific knowledge and technical expertise to influence policy processes and decision making in the closure of debate about freshwater wetlands definitions, buffers and mitigation.<sup>43</sup>

### Processes of Analysis

Having identified freshwater wetlands definitions, buffers and mitigation as the principle points of contention around which competing knowledge claims are forwarded in the FWPA negotiations, I move to examine how movement actors work to insert these knowledge claims into the policy process. In this I look specifically at how science is used to inform tactical choices and decision making to bring about closure in these disputes. In my analysis I borrow from the interpretive and constructivist perspectives of critical policy analysis. These analytic techniques include the interpretive concept of frames, and an approach to understanding the social construction of artifacts called the “social construction of technology” (SCOT). In my analysis of the definitions, buffers and mitigation disputes I

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<sup>43</sup> Initial research into the organizing around these sub-goals involved an examination of the disciplinary emergence of freshwater wetlands science in general. It also involved investigating the emergence of buffers science and mitigation science as subset research disciplines. I explored the disciplinary history of the developing freshwater wetlands science community to gain a better understanding of the relationship between the knowledge gains of backyard scientists and the FWC and the developing expertise of the academy and environmental management community. I looked first to the popular literature for references to these concepts, inferring meaning from these uses.

build on the structured and historical context established through interpretive research, and draw on this methodological pluralism to do three things. First, I identify strategies used by social movement actors in their efforts to translate scientific knowledge for effective policy action and decision making. Second, I examine the opposing influences of agency and structure as social movement actors work to insert certain knowledge claims into the policy process. Finally, I reflect on socio-historical context to consider the social and political implications of the success or failure of these knowledge claims to affect policy and policy processes.

**Frames.** In the social movement literature the concept of “frame” is used to describe how social movement actors translate and communicate their goals and beliefs about issues of concern into collective action (Snow et al., 1986; Snow & Benford, 1988; Snow & Benford, 1992). Social movement scholars take the view that through frames symbolic constructs are made real, and that movement actors use these constructs not just to make sense of reality but also to shape it in a particular way (Snow & Benford, 1988). Movement actors are described as “signifying agents actively engaged in the production and maintenance of meaning for constituents, antagonists, and bystanders or observers” (Benford & Snow, 2000: 613). Movement frames are understood as “constructed in part as movement adherents negotiate a shared understanding of some problematic condition or situation they define as in need of change, make attributions regarding who or what is to blame, articulate an alternative set of arrangements, and urge others to act in concert to affect change” (Benford & Snow, 2000: 615).

Benford & Snow (2000) divide frame construction into three core framing tasks: diagnostic framing, prognostic framing and motivational framing. Diagnostic framing involves problem identification and attribution.<sup>44</sup> Prognostic framing involves “the articulation of a proposed solution to the problem, or at least a plan of attack, and the strategies for carrying out the plan,” and addresses “what is to be done, as well as the problems of consensus and action mobilization” (Benford & Snow, 2000: 617). Motivational framing provides the “rationale for engaging in ameliorative collective action” (Benford & Snow, 2000: 617). Frame analysis is most often used to examine how social

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<sup>44</sup> More specifically, diagnostic framing associates baseline categories of thought and world views with particular interpretive communities or relevant social groups. The processes of diagnostic framing in passage of New Jersey’s Freshwater Wetlands Protection Act are the subject of Chapter Three.

movements use diagnostic and motivational frames to mobilize people (Snow & Benford, 1988; Snow & Benford, 1992; Snow et al., 1986; Tarrow, 1992). However, in recent years frame theory has also been applied to political science (Schön & Rein, 1994) and studies of the processes of environmental policy-making (Triandafyllidou, A., & Fotiou, 1998). This emerging body of research suggests that the concept of frame both offers a cultural perspective for the study of social actor participation in the processes of policy formation and serves as a method for analysis of frameworks that require problems to be solved through negotiation. Similarly, recent research from social movement theory inserts prognostic frames in “contentious politics,” a concept understood as the merging of contention, collective action and politics (Tilly & Tarrow, 2006: 3). I build on these alternative applications of frame analysis as I study the use of prognostic frames to advance knowledge claims in the definitions, buffers and mitigation disputes.

For each sub-movement I focus on the prognostic frames forwarded by social movement actors. To do this I draw on the concept of “frame resonance,” a concept “relevant to the issue of the effectiveness or mobilizing potency of proffered framings” (Benford & Snow, 2000: 619). To understand the degree of resonance of any particular frame, Benford & Snow (2000) suggest that we consider its “credibility.” In this study I look at the use of science and citizen expertise in shaping prognostic frames and consider the extent to which science was used strategically to influence frame credibility. I evaluate the credibility of the scientific framing of the knowledge claims around definitions, buffers and mitigation using three analytic concepts proposed by Benford & Snow: frame consistency, empirical credibility, and the “credibility of the frame articulators or claimsmakers” (Benford & Snow, 2000: 619). The notion of frame consistency relates the frame to the social movement’s stated “beliefs, claims, and actions” (Benford & Snow, 2000: 620) e.g. do contradictions exist between the prognostic framings and tactical actions. The empirical credibility of a prognostic frame reflects the “apparent fit between the framings and events in the world” (Benford & Snow, 2000: 620) e.g. is the proposed solution understood as feasible. Finally, the perceived credibility of the frame articulators relates to “variables such as status and knowledge about the issue” (Benford &

Snow, 2000: 621) e.g. does the perceived expertise of the frame articulators influence the persuasiveness of the prognostic frame.

In that frames help us understand social movements as “framing agents actively engaged in the production of meaning and ideas” (Benford & Snow, 2000: 151) they allow us to work toward understandings of how meaning is inscribed in science. Understanding the metaphorical “frame” as a device through which social movements weave bits of information together in a meaningful fashion, and understanding collective action frames as “both models of prior thought and models for subsequent action” (Brandwein, 2006), once we identify the frames used by movement actors to advance solutions to the definitions, buffers and mitigation disputes we can begin to comprehend how the combination of citizen advocacy and expertise informed the policy processes and outcomes of the FWPA.

**SCOT (STS/constructivist).** Following MacKenzie and Wajcman’s work on the social shaping of technology (MacKenzie & Wajcman, 1985), Bijker et al. (Bijker, Hughes, & Pinch, 1987) introduced the theory of the Social Construction of Technology (SCOT). In this they identified mechanisms by which the social and the technical interact in the development and design of technology, and suggest that technologies fail or succeed based on the capacity of social groups to disseminate the meanings and interpretations they associate with that technology to other relevant social groups (Bijker et al., 1987). Webster (1991: 26-27) explains this as a process of intergroup negotiation: “Successful technologies are ‘constructed’ through a process of strategic negotiation between different groups, each pursuing its own specific interests” (Webster, 1991: 26-27). At the heart of the SCOT theory is the notion that successful technologies are rendered as technological “artifacts” through this process of negotiation, and that theorists can work to understand the developmental process of a particular technological artifact by examining four central components: 1) “interpretive flexibility”; 2) the relevant social groups involved; 3) processes of “closure and stabilization”; and 4) the wider context (Pinch & Bijker, 1987).

***Interpretive flexibility.*** The notion of interpretive flexibility “suggests that technology design is an open process that can produce different outcomes depending on the social circumstances of development” (Klein & Kleinman, 2002: 29).

**Relevant social groups.** Relevant social groups are all the members of a certain social group that “share the same set of meanings attached to a specific artifact” (Pinch & Bijker, 1987: 30), the agents “whose actions manifest the meanings they impart to artifacts” (Klein & Kleinman, 2002: 29).

**Closure.** Closure, marked by the emergence of consensus, is described as the “social mechanisms that limit interpretive flexibility and thus allow scientific controversies to be terminated” (Pinch & Bijker, 1987: 27). Pinch & Bijker propose two mechanisms by which closure is accomplished, “rhetorical closure” and “closure by redefinition of the problem,” although other closure mechanisms may exist. Different closure mechanisms can play a part in the “stabilization” of an artifact, understood as establishing the “essential ingredients” of an artifact.<sup>45</sup>

**The wider context.** The wider context is understood as “the wider sociocultural and political milieu in which artifact development takes place” (Klein & Kleinman, 2002: 30) and to which the closure mechanisms are to be related (Pinch & Bijker, 1987: 27).

Other theorists extend these social constructivist theories to policy and policy processes. For example, Hughes (2012) suggests that SCOT is relevant to a study of legislative artifacts including regulatory laws (Hughes, 2012: 51). And Brandwein (2006) applies the constructivist examination of artifacts to constitutional law, conducting socio-historical analysis of knowledge claims related to the Fourteenth Amendment and conceptualizing successful knowledge claims in this case as “institutional artifacts” (Brandwein, 2006: 233). It is this element of theorizing that I draw from in my analysis as I apply a SCOT analysis to the definitions, buffers and mitigation cases, focusing on the notion of closure, or consensus, around these technological constructs.

### Heels in the Mud

On a chilly Saturday morning in October of 1999, twelve years after passage of the Freshwater Wetlands Protection Act, I pulled on my rain boots and headed south on the Garden State Parkway to New Jersey’s Pinelands National Reserve. New to on-the-ground environmental management I was

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<sup>45</sup> Stabilization can be achieved, for example, through “reification,” understood as the existence of the artifact in the consciousness of a certain social group, or through “economic stabilization,” understood as “the economic existence of a market – its having a market” (Pinch & Bijker, 1987: 50 note #33).



looking forward to getting my feet wet during a field course on freshwater wetlands methodology and delineation. The course, geared to regulators and environmental managers (of which I am neither), was marketed to those seeking wetlands delineation certification to put them in the field:

Learn the methods of the experts! This two-day course will introduce you to delineating wetlands using the Federal Interagency Wetland Delineation Manual, which is required for use in New Jersey. Techniques taught will also be applicable to individuals interested in using the 1987 Corps of Engineers Wetland Delineation Manual as well.

Recognize the key indicators of wetlands (hydrophytic vegetation, hydric soils and wetland hydrology) while expert instructors Ralph Tiner and Peter Veneman show you how to use them in following proper delineation methods. Immediately apply criteria learned in the classroom by performing wetland determinations during team field exercises (Rutgers New Jersey Agricultural Experiment Station, 1999).

The first day was a marathon of lectures by Ralph Tiner, author of several industry standard field guides including *Wetland Indicators: A Guide to Wetland Identification, Delineation, Classification and Mapping* (1999), and wetland soils expert Peter Veneman, co-author with Mr. Tiner of *Hydric Soils of New England* (1995). Our instructors first summarized the regulations as drafted by the legislators who shaped New Jersey's Freshwater Wetlands Protection Act, and then led us in discussion about the various soil and plant manuals. The next day participants were divided into groups and provided with supplies: barrel samplers (open-ended steel tubes used to collect soil samples) and a roll of fluorescent pink flag tape. Tools in hand we were sent out into the Pinelands with our soils and plants guides and instructions to mark off fifty feet of wetlands from uplands. Accompanying me during the delineation portion of the course was my research advisor, Prof. David H. Guston. Working with our group to discern wetlands plants from uplands plants and hydric soils from non-hydric soils we ended up wrapping our pink flag tape around mature trees situated halfway up a hillside. Our instructors found this hilarious. Our newly acquired understanding of hydric soils and wetland plants led us to establish a wetlands boundary in uplands - included in our wetland was part of a forest and trees!

A representative from the New Jersey Association of Realtors recalled a similar session with Tiner and Veneman that took place in the mid 1980s. In the 1980s assumption of the Federal 404 process of the Clean Water Act became a goal shared by both Democrats and Republicans as they

worked toward passage of the state's freshwater wetlands protection legislation. As legislators moved closer to compromise all parties tried to get a handle on what was at stake and sought an understanding of exactly how the freshwater wetlands boundaries would be determined. Several "fieldtrips with the experts" were scheduled to buoy understanding of the issues, although they did not necessarily provide assurance of the certainty of the science:

I remember thinking here I am, a lobbyist, I wasn't dressed for this. I mean, I had heels on. And I had to walk out into the woods and the dirt and I was sinking and I was like "yuck"....We understood the political scenario but what constituted wetlands was a little beyond us...when they started debating the edges of the wet, like how far out did the wet go, we were looking for assurances that there were going to be some realistic measurements applied to this instead of just coming down and saying "stamp" this is it... I remember we walked around and they were digging around - the two directors were actually debating about wetlands and we're like "oh, good, *you* can't tell?" (New Jersey Association of Realtors Representative #1, 1999)

The difficulty of freshwater wetlands delineation in the field serves as a metaphor of the larger sloppiness of the process of creating a statewide policy for freshwater wetlands delineation. It also works as a metaphor for my approach to social inquiry in this research which, like delineating wetlands, may seem unpredictable and messy. However, that at times wetlands delineation and interpretive inquiry appear to be little more than a muddling through does not mean that the tasks cannot be done, or done well.

## Chapter Two: Reference List

Balkwill, M. (2003). *Building Hope Together: Strategies for Creating Housing in Uncertain Times* Ontario, CN: Halton Social Planning Council.

Benford, R. D. (1997). An Insider's Critique of the Social Movement Framing Perspective. *Sociological Inquiry*, 67, 409-430.

Benford, R. D. & Snow, D. A. (2000). "Framing Processes and Social Movements: An Overview and Assessment. *Annual Review of Sociology*, 26, 611-639.

Bevir, M. & Kedar, A. (2008). Concept formation in political science: An anti-naturalist critique of qualitative methodology. *Perspectives on Politics*, 6, 503-517.

Bijker, W. E., Hughes, T. P., & Pinch, T. (1987). *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. Cambridge, MA: MIT Press.

Bosso, C. J. (2005). *Environment Inc.: From Grassroots to Beltway*. Lawrence, KS: University Press of Kansas.

Bowler, S., Todd, D., & Karp, J. A. (2007). "Enraged or Engaged? Preferences for Direct Citizen Participation in Affluent Democracies". *Political Research Quarterly*, 60, 351-362.

Brandwein, P. (2006). Studying the Careers of Knowledge Claims: Applying Science Studies to Legal Studies. In D. Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 228-243). Armonk, New York: M.E. Sharpe.

Corburn, J. (2005). *Street Science: Community Knowledge & Environmental Health Justice*. Boston: The MIT Press.

Edwards, M. (2004). *Future Positive: International Cooperation in the 21st Century*. London: Earthscan.

Fenyk, H. & Guston, D. H. (2006). Citizen Expertise and Advocacy in Creation of New Jersey's 1987 Freshwater Wetlands Protection Act. In N.Maher (Ed.), *New Jersey's Environments* ( New Brunswick, NJ: Rutgers University Press.

Fischer, F. (1995). *Evaluating Public Policy*. Belmont, CA: Wadsworth/Nelson-Hall.

Fischer, F. (1998). Beyond Empiricism: Policy Inquiry in Postpositivist Perspectives. *Policy Studies Journal*, 26, 129-146.

Fischer, F. (2000). *Citizens, Experts, and the Environment: The Politics of Local Knowledge*. Durham, NC: Duke University Press.

Fischer, F. (2007). Deliberative Policy Analysis as Practical Reason: Integrating Empirical and Normative Arguments. In F.Fischer, G. J. Miller, & M. S. Sidney (Eds.), *Handbook of Public Policy Analysis: Theory, Politics, and Methods* (pp. 223-236). Boca Raton: CRC Press - Taylor & Francis Group.

Fischer, F. (2010). *Participatory Governance* (Rep. No. Working Paper 24). Jerusalem: The Hebrew University.

Gans, H. (1979). *Deciding what's news: A study of CBS Evening News, NBC Nightly News, Newsweek and Time*. New York: Vintage.

Geertz, C. (1973). *The interpretation of cultures: Selected essays*. New York: Basic Books.

Goffman, I. (1959). *The Presentation of Self in Everyday Life*. Carden City, NY: Doubleday Anchor Books.

Haas, P. M. (2004). When does power listen to truth? A constructivist approach to the policy process. *Journal of European Public Policy*, 11, 569-592.

- Hammersly, M. & Atkins, P. (1993). *Ethnography: Principles in practice*. London: Routledge.
- Hammersly, M. & Gomm, R. (2008). Assessing the radical critique of interviews. In M.Hammersly (Ed.), *Questioning qualitative inquiry: Critical essays* (pp. 89-100). Los Angeles: Sage.
- Hawken, P. (2007). *Blessed Unrest: How the Largest Movement in the World Came Into Being and Why No One Saw It Coming*. New York: Viking Press.
- Hjelmar, U. (1996). *The political practice of environmental organisations*. Avebury: Ashgate Publishing.
- Hughes, T. P. (2012). The Evolution of Large Technological Systems. In W.E.Bijker, T. P. Hughes, & T. Pinch (Eds.), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Anniversary Edition ed., Cambridge, MA: The MIT Press.
- Jasper, J. M. (2004). A Strategic Approach to Collective Action: Looking for Agency in Social-Movement Choices. *Mobilization: An International Journal*, 9, 1-16.
- Jordan, G. & Maloney, W. (1997). *The Protest Business? Mobilizing Campaign Groups*. Manchester: Manchester University Press.
- Klein, H. K. & Kleinman, D. L. (2002). The Social Construction of Technology: Structural Considerations. *Science, Technology, & Human Values*, 27, 28-52.
- Kock, B. E. (2006). Engaging Non-Governmental Organizations with International Environmental Negotiations: Institutional Approaches to Reforming State-NGO Interactions. Clearinghouse Program on Negotiation at Harvard Law School [On-line]. Available: <http://www.pon.org/downloads/len15.4.Kock.pdf>
- Koopmans, R. & Duyvendak, J. W. (1995). The Political Construction of the Nuclear-Energy Issue and its Impact on the Mobilization of Antinuclear Movements in Western Europe. *Social Problems*, 42, 235-251.

Lasswell, H. D. (1956). *The Decision Process: Seven Categories of Functional Analysis*. College Park: University of Maryland Press.

Leighninger, M. (2006). *The Next Form of Democracy: How Expert Rule Is Giving Way to Shared Governance...and Why Politics Will Never Be the Same*. (1st ed.) Nashville: Vanderbilt University Press.

Lincoln, Y. S. & Guba, E. G. (1985). *Naturalistic Inquiry*. Beverly Hills, CA: Sage Publications, Inc.

Lindblom, C. E. (1990). *Inquiry and Change: The Troubled Attempt to Understand and Shape Society*. New Haven: Yale University Press.

Lindblom, C. E. & Cohen, D. K. (1979). *Usable Knowledge: Social Science and Social Problem Solving*. New Haven: Yale University Press.

Louis, K. S. & Barton, A. C. (2002). Tales from the science education crypt: A critical reflection of positionality, subjectivity, and reflexivity in research. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, 3.

MacKenzie, D. & Wajcman, J. (1985). *The Social Shaping of Technology*. Buckingham: Open University Press.

Maher, F. & Tetreault, M. K. (1994). *The Feminist Classroom*. New York: Basic Books.

May, J. V. & Wildavsky, A. B. (1978). Volume editor's introduction. In *The policy cycle* (pp. 10-14). Beverly Hills, CA: Sage.

McAdam, D. (1999). *Political Process and the Development of Black Insurgency, 1930-1970*. (2nd ed.) Chicago: University of Chicago Press.

McAdam, D., Tarrow, S., & Tilly, C. (2001). *The Dynamics of Contention*. Cambridge: Cambridge University Press.

Melucci, A. (1996). *Challenging codes: Collective action in the information age*. Cambridge, MA: Cambridge University Press.

Moser, S. C. (2007). In the Long Shadows of Inaction: The Quiet Building of a Climate Protection Movement in the United States. *Global Environmental Politics*, 7, 124-144.

Moyer, B., McAllister, J., Finley, M. L., & Soifer, S. (2001). *Doing Democracy: The MAP Model for Organizing Social Movements*. Gabriola Island, BC, Canada: New Society Publishers.

New Jersey Association of Realtors Representative #1. (1999). Interview with New Jersey Association of Realtors Representative #1 - conducted by David H. Guston.

Ref Type: Personal Communication

New Jersey State Reference Librarian. (4-19-2012). Interview with New Jersey State Reference Librarian -- conducted by phone by Heather Fenyk.

Ref Type: Personal Communication

Ng, S. H. (1996). Power: An Essay in Honour of Henri Tajfel. In P.W.Robingson (Ed.), *Social Groups and Identities* (pp. 191-214). Oxford: Butterworth-Heinemann.

Oren, I. (2006). Political Science as History: A Reflexive Approach. In D.Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 215-227). Armonk, NY: M.E.Sharpe.

Palumbo, D. J. (1988). *Public policy in America: Government in action*. San Diego, CA: Harcourt Brace Jovanovich.

Pinch, T. & Bijker, W. E. (1987). The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other. In W.E.Bijker, T. P. Hughes, & T. Pinch (Eds.), ( Cambridge, MA: MIT Press.

Polletta, F. & Ho, M. K. (2006). Frames and Their Consequences. In R.E.Goodin & C. Tilly (Eds.), *The Oxford Handbook of Contextual Political Studies* ( Oxford: Oxford University Press.

Rutgers New Jersey Agricultural Experiment Station. (1999). Wetlands Delineation Certificat Series.

Ref Type: Pamphlet

Ryan, C. (1991). *Prime Time Activism: Media Strategies for Grassroots Organization*. Boston: South End Press.

Schaffer, F. C. (2006). Ordinary Language Interviewing. In D.Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 150-160). Armonk, New York: M.E. Sharpe.

Schattschneider, E. E. (1975). *The Semisovereign People: A Realist's View of Democracy in America*. Fort Worth: Harcourt Brace Jovanovich College Publishers.

Schön, D. A. (1983). *The Reflective Practitioner: How Professionals Think in Action*. London: Temple Smith.

Schön, D. A. & Rein, M. (1994). *Frame Reflection: Toward the Resolution of Intractable Policy Controversies*. New York: Basic Books.

Schwartz-Shea, P. & Yanow, D. (2012). *Interpretive Research Design: Concepts and Processes*. New York: Routledge.

Sclove, R. E. (1995). *Democracy and Technology*. New York: The Guilford Press.

Snow, D. A. & Benford, R. D. (1988). Ideology, frame resonance, and participant mobilization. In B.Klandermans (Ed.), *International Social Movement Research V.1* ( Greenwich, CT: JAI Press.

Snow, D. A., Rochford, E. B., Worden, S. K., & Benford, R. D. (1986). Frame Alignment Processes, Micromobilization and Movement Participation. *American Sociological Review*, 51, 464-481.



Snow, D. A. & Benford, R. D. (1992). Master Frames and Cycles of Protest. In A.D.Morris & C. M. Mueller (Eds.), *Frontiers in Social Movement Theory* (pp. 133-155). New Haven: Yale University Press.

Soss, J. (2006). Talking Our Way to Meaningful Explanations: A Practice-Centered View of Interviewing for Interpretive Research. In D.Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 127-149). Armonk, NY: M.E.Sharpe.

Sumara, D. J. (2002). Creating commonplaces for interpretation: Literary anthropology and literacy education research. *Journal of Literacy Research*, 34, 237-260.

Tarrow, S. (1992). Mentalities, Political Cultures, and Collective Action Frames. In A.D.Morris & C. M. Mueller (Eds.), *Frontiers in Social Movement Theory* (pp. 174-202). New Haven: Yale University Press.

Tilly, C. (1986). *The Contentious French: Four Centuries of Popular Struggle*. Cambridge, MA: Belknap Press.

Tilly, C. & Tarrow, S. (2006). *Contentious Politics*. Boulder, CO: Paradigm Press.

Triandafyllidou, A., & Fotiou, A. (1998). Sustainability and modernity in the European frame: a frame theory approach to policy making. *Sociological Research online*, 3.

Van de Graaf, H. & Hoppe, R. (1989). *Policy and Politics (Beleid en politiek)*. Muiderberg, The Netherlands: Coutinho.

Wagenaar, H. (2011). *Meaning in Action: Interpretation and Dialogue in Policy Analysis*. M.E. Sharpe, Inc.

Webster, A. (1991). *Science, Technology and Society: New Directions*. New Brunswick, NJ: Rutgers University Press.

Weir, M. & Ganz, M. (1997). Reconnecting people and politics. In S.B.Greenberg & T. Skocpol (Eds.), *The New Majority: Toward a popular progressive politics* (pp. 149-171). New Haven, CT: Yale University Press.

Yanow, D. (2000). *Conducting Interpretive Policy Analysis*. Newbury Park, CA: Sage.

Yanow, D. (2006a). Neither Rigorous Nor Objective? Interrogating Criteria for Knowledge Claims in Interpretive Science. In D.Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 67-88). Armonk, NY: M.E.Sharpe.

Yanow, D. (2006b). Thinking Interpretively: Philosophical Presuppositions and the Human Sciences. In *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 5-26). Armonk, NY: M.E.Sharpe.

Yanow, D. (2007). Qualitative-Interpretive Methods in Policy Research. In F.Frank, C. A. Miller, & M. S. Sidney (Eds.), *Handbook of Public Policy Analysis: Theory, Politics, and Methods* (pp. 405-416). Boca Raton: CRC Press - Taylor & Francis Group.

Yanow, D. (2012). Interpretive Analysis and Comparative Research. In I.Engeli & C. Rothmayr (Eds.), *Comparative policy studies: conceptual and methodological challenges* ( Palgrave.

Yanow, D. & Schwartz-Shea, P. (2006). *Interpretation and Method: Empirical Research Methods and the Interpretive Turn*. Armonk, NY: M.E. Sharpe.

Yin, R. K. (1994). Applications of case study research. *Applied Social Research Series*, 34.

Yin, R. K. (2003). *Case Study Research: Design and Methods*. (3rd ed.) Thousand Oaks, CA: Sage.

### CHAPTER THREE: THE BIRTH OF A MOVEMENT

The 401 State Street, Trenton address of the New Jersey Department of Environmental Protection shelters a small plaza with park benches and flowers. The plaza's floor is paved in part with carved marble slabs depicting natural scenes in relief. Some of the slabs depict wildlife. Some of the slabs are labeled with environmental concerns: water quality, water resources, natural lands, and lakes management. There is no slab for wetlands.

The story of how the state's freshwater wetlands merited attention, and protection, is one of the most interesting and important chapters in New Jersey's environmental history. It culminated with passage of the state's Freshwater Wetlands Protection Act, which, on July 1, 1987, made New Jersey the first state in the nation to completely assume administration of the portion of the federal Clean Water Act that protects wetlands, giving New Jersey the nation's strongest measures to protect these ecologically and environmentally valuable lands. Critical to this story of New Jersey's achievement is the recognition of wetlands as an environment worthy of protection and an environmental issue worthy of pursuit, and the agency of a small group of citizens who enacted the new science of freshwater wetlands in instrumental terms, and who cultivated the ability to synthesize substantive knowledge about freshwater wetlands with effective political action to preserve them.

In order to explain the sub-movements that developed around the definition of freshwater wetlands, freshwater wetlands buffers and mitigated freshwater wetlands, and to make clear why I think Science and Technology Studies (STS) needs to incorporate considerations of bottom up citizen science to explain at least some areas of environmental policy analysis, I need first to describe who became active in the campaign to save New Jersey's freshwater wetlands and why. In doing this I loosely follow Moyer et al.'s (Moyer, McAllister, Finley, & Soifer, 2001) Movement Action Plan Model (MAP) of social movement emergence, without testing or attempting to affirm it. Tracing movement organizing through MAP's "eight stages of the process of social movement success" allows me to set up the broad circumstances for all three sub-movements. It also allows me to introduce the people who

would become citizen scientists and to make clear that they were not professionals when they started and that they did not expect to become involved in “doing” science.

Development of this context is important to my interpretive approach and is consistent with the idiom of co-production. It emerged from an interpretive line of questioning that included questions that allowed me to engage with what the actors said they perceived, e.g. could you tell me when and how you first became aware of freshwater wetlands as an issue? And then what became your involvement? In this chapter I take the stories that emerged and use them to draw a picture of New Jersey’s citizen scientists.

This research relates two intertwined paths. The first follows the emergence of wetlands protection as a critical environmental concern in the state. In this instance, four citizen-experts - all women - helped create and organize the knowledge base that demonstrated the value of wetlands beyond that of wastelands. The second path follows the activity of the coherent, statewide environmental advocacy movement that emerged from citizen action. In this instance, citizen-advocates engaged in a sophisticated grassroots lobbying effort that made freshwater wetlands protection a force to be reckoned with. Both paths are set in the context of inadequate and fragmented state and federal attempts to protect wetlands. This context is described in detail here to provide insight into the institutionalization of freshwater wetlands, freshwater wetlands buffers and mitigated freshwater wetlands as artifacts in New Jersey. It captures an unusual moment in New Jersey’s environmental history and contributes to an understanding of how “in a state with such a fabled affinity for local control, about 40% of New Jersey’s land area came under the management of regional and state agencies in the 1970’s and 1980s” (Salmore & Salmore, 1998: 83). It also opens a window on a moment in U.S. environmental history, giving insight into the initial conditions and the institutionalization of the federal CWA.

In the last several decades, planners and policy makers throughout the United States have faced the challenges of understanding and balancing the biologic and economic impacts of anthropogenic environmental change. Within accounts of the interaction of the environmental and the social, examples of how citizen expertise interacts with environmental governance are in short supply.

Through documenting the convergence of these paths in FWPA, I trace the emergence in New Jersey of an environmental movement as both a well-informed and popular enterprise. This portrait of both the technical and political competence of the environmental movement is important because traditional views usually depict expertise and advocacy as conflicting rather than cooperating endeavors, and because the synthesis of substantive knowledge with political power at the grassroots level is usually identified as a contemporary rather than historical phenomenon, when it is identified at all.

### **Making Wetlands Protection a Critical Concern**

Beginning in the 1950s, freshwater wetlands near urban centers in the United States were increasingly identified as lucrative sites for development (Barnard, Ansell, Harn, & Kevin, 1985). As suitable upland was exhausted, pressure intensified to develop wetlands for housing, manufacturing, office complexes, and similar uses. Developers throughout the United States found bargains in inland “wastelands” - swamps that were often the last large parcels of open space in a community. Before the 1960s and the shift in public consciousness prompted by Rachel Carson’s *Silent Spring*, no federal or state laws specifically addressed the protection of freshwater wetlands. To the contrary, longstanding federal land management policy encouraged the draining of such swampy wastelands, transforming them into more commercially productive land. In New Jersey, as in many other states, laws written primarily for engineering purposes were the proxy used for a wide range of environmental protection measures. For example, New Jersey’s Waterfront Development Law passed in 1914 was designed to “limit problems that new development could cause for existing navigation channels, marinas, moorings, other existing uses, and the environment” (1914).

While residents of many New Jersey communities looked from their windows and witnessed tracts of open space disappearing rapidly, they also experienced more tangible troubles with rivers and streams that flooded main streets and basements. Feeling that something was drastically wrong, some citizens began tentatively to connect these phenomena, even while recognizing that they lacked a

scientifically supported knowledge base to draw from in fashioning a coherent and powerful argument to preserve the wetlands.

The regulatory system in which these citizen activists developed as advocates was not one we would recognize today. The New Jersey environmental regulatory system mid to late century lacked accepted and clear practices. For example, citizen scientists collecting data for the Passaic River Coalition discovered that a municipality in northern New Jersey actively discouraged developers from securing state wetland stream encroachment permits because the town had “entered into negotiations, secret negotiations, with the state to have what they call ‘fill credits,’ which would allow the town to almost in essence take over the state floodplain and wetlands program” (ANJEC Representative #1, 2011). What follows examines how ordinary citizens marshaled science as a means to push back against this kind of arbitrary decision making.

A quartet of women was indispensable in making wetlands protection the critical concern of New Jersey’s emerging environmental movement. All of these women started as backyard environmentalists and then expanded and organized their expertise through advocacy groups and political positions. For each of them, involvement in the campaign to protect New Jersey’s freshwater wetlands was a defining element in their career. Concern for the protection of freshwater wetlands gained steam through their efforts to gather substantive knowledge about wetlands and give it relevance and force in environmental advocacy groups.

The first of the four women, Helen Fenske, launched a successful career in public service by synthesizing the pursuit of substantive knowledge with advocacy for wetlands protection. Her activism had developed largely in response to the 1959 proposal by the New York Port Authority (later, the Port Authority of New York and New Jersey) to bulldoze New Jersey’s largest wetland, the Great Swamp, and develop it into the world’s largest international jetport complete with four 10,000-foot runways. Not only opposed to having an airport materialize in her backyard but also eager to demonstrate the ecological value of the area to justify halting development, Fenske and other community members enlisted the expertise of biologists and natural resource specialists at various New Jersey colleges (Fenske, 1999).

Having used the Great Swamp as a living laboratory for years, these academic experts were eager to provide baseline data documenting the diversity of the habitat and wildlife in the Great Swamp and other New Jersey wetlands. In addition, at Fenske's behest, academic researchers documented the changes to the environment that community members were intuitively aware of, correlating these changes with the destruction of open space through urban growth and, in particular, the filling of wetlands. Buoyed in the courts by the contributions of these academic experts, the community won a nine-year battle that not only saved the Great Swamp from being paved over into an airport, but also established it in 1968 as the first wilderness area in the National Wildlife Refuge System.

Fenske recognized the value to communities documenting local environmental change, and was a force behind the creation of a way to institutionalize the emergent environmental knowledge and interests in New Jersey's municipalities, although she calls her role an "absolute fluke." She describes receiving a request from a female legislator in the state Assembly for an idea for legislation that "wouldn't threaten the men." The legislator was casting about for ideas because her male colleagues had offered her a bill in thanks for her gracious behavior at the lack of women's toilet facilities in the legislature. Fenske offered up the creation of municipal environmental commissions, which she had been studying in their original implementation in Massachusetts. The legislator "took it down, had it adjusted, introduced it, and it passed in the blink of an eyelash - non-controversial, harmless, motherhood. It was nothing" (Fenske, 1999).

Although their creation seems frivolous, the municipal-level commissions that the legislature authorized in 1968 were anything but. Not only did the law give the environmental commissions a new advisory-body status regarding natural resource planning and protection, but it also allowed municipalities to give the environmental commissions a legal status as official arms of local government. By the N.J.S.A. Environmental Commissions Enabling Legislation environmental commissions could acquire property, develop and maintain environmental resource inventories, and "study and make recommendations concerning open space preservation, water resources management, air pollution control, solid waste management, noise control, soil and landscape protection,

environmental appearance, marine resources and protection of flora and fauna” (1968). The environmental commissions quickly established themselves as legitimate public actors that embodied both significant substantive expertise about the environment and the perspectives of environmental advocates.

Candace Ashmun was a second active citizen-expert involved with the campaign to save the Great Swamp and, ultimately, the passage of the Freshwater Wetlands Protection Act. Ashmun gained unique insight into the need to preserve New Jersey’s freshwater wetlands, and into the information necessary to shape a process of wetlands protection, right out of college. Following her graduation in the 1950s, she moved to New Jersey and worked two jobs, one as a stringer for a newspaper and another at the Upper Raritan Watershed Association (URWA). Ashmun’s newspaper job required that she attend meetings of the planning board and board of adjustment, and that she learn to read municipal law. She recalls: “I began to start putting these things together. It was obvious that I was going to see the problems with the wetlands. You couldn’t avoid it as you [conducted] water quality testing. It certainly was an education in the relationship of land use to water quality and therefore the relationship of wetlands to water quality and flooding and everything else” (Ashmun, 1999).

With URWA, a non-profit formed in 1959 to protect the natural resources of the Upper Raritan River in northern and central New Jersey, she helped develop New Jersey’s first environmental resource inventory by mapping the watershed by hand on fifteen twelve foot by three foot maps (Ashmun, 1999). These maps evaluated 23 environmental factors such as geology, soils, aquifer yields, water quality, and open space. An example of Ashmun’s role at the vanguard of the young science of freshwater wetlands, these maps formed the basis for many of the planning and zoning decisions made over subsequent years throughout the Upper Raritan’s 23 watershed communities (Raritan Headwaters Association, 2013).

Ashmun later became the human link between the watershed community and the environmental commissions when she served as the director of the Association of New Jersey Environmental Commissions (ANJEC) from 1975 to 1982. Her intimate understanding of the connection between land use and the degradation of freshwater wetlands shaped her commitment to educating



the environmental commissions about wetlands science. It also contributed to her ability as an organizer in March 1983 to the growing number of environmental community partners to the first state conference on wetlands protection held at the Chauncey Center in Princeton.

A third environmental activist to recognize the benefit of long range planning and substantive environmental knowledge was Millburn Township resident Maureen Ogden. Concerned that the development encroaching the Cora Hartshorn Arboretum and Bird Sanctuary in Millburn would compromise 16.5 square miles of this environmentally sensitive kettle moraines, hilly slopes, and a natural amphitheatre created by glaciers, Ogden began to collect environmental information. Ogden worked with members of the Millburn Environmental Commission to document and map the local aquifers, watersheds, and traffic patterns for her community, presenting a natural resources inventory to her township that informed a subsequent environmental impact statement (EIS) for the development. Although the natural resources inventory she developed was meticulously documented, the Township committee and the planning board refused to enact the EIS. Ogden recalls: “And so that’s when I decided that I really had not spent a year of my life having our dining room table covered with maps and done all this work to see that nothing is going to come of it. So I decided I have to do one of two things, either get into politics, or else become a professional planner” (Ogden, 1999).

With reservations about the latter option because “you can have the best plans in the world, but if you don’t have people in political power who are going to support you, it’s going to be an incredibly frustrating experience,” Ogden entered into the local political arena. She served three years as deputy mayor and another three as mayor. Finishing her second term in 1981 and not interested in a third, Ogden opted to run for the legislature (Ogden, 1999). She took her Assembly seat in 1982, as a Republican, and she soon started working on a state-wide law to preserve freshwater wetlands. With her friend Candace Ashmun, who had left ANJEC to become assistant state planning commissioner, Ogden helped shape the 1983 Chauncey Center conference to jumpstart the development of an “Inland Wetlands Bill.”

The fourth activist who followed this pattern of synthesizing activism with expertise was Abigail Fair who, bringing an interest in the landscape that dated back to childhood moved to an area

near the Great Swamp in 1972 and gained an appointment to the local planning board. Frustrated with the lack of progress in protecting freshwater wetlands despite the passage of the federal Clean Water Act in 1977, Fair founded the Great Swamp Watershed Association (GSWA) in 1981. The GSWA gained expertise and developed credibility through its community based water quality monitoring programs. Seeking additional allies and expertise regarding land use issues in her community Fair reached out to the New Jersey Water Resource Coalition (WRC). Fair soon engaged as an active participant in the coalition's organizing efforts and as an agent of change in shifting its agenda to a more dedicated effort on behalf of wetlands legislation. By 1985, with many other environmental organizations joining the GSWA and the WRC in agreeing to make freshwater wetlands a priority and to support Ogden's bill, the Freshwater Wetlands Campaign (FWC) was formed with Abigail Fair at its helm (Fair, 1999).

The documentation of changes in the Great Swamp environment, conducted principally by university-based researchers but instigated and coordinated by Fenske's Great Swamp Committee, was not unlike Maureen Ogden's efforts to develop a natural resources inventory in her Short Hills community, Candace Ashmun's painstaking mapping of the Upper Raritan Watershed, or Abigail Fair's efforts on behalf of the Great Swamp Watershed Association. Although each of these actors started out as naturalists their process of discovery did not hew solely to a naturalist's ken, yet they did not begin the process thinking they would become scientists. Through their organizing efforts these women came to understand the importance of developing a scientifically supported knowledge base as a first step in fashioning a coherent and powerful political argument to preserve the wetlands. The science they enacted was not hypothesized in a laboratory but rather developed in response to needs as they went along. They brought a homegrown science to a difficult task, a rearguard action of convincing people of the value of freshwater wetlands at a time when ecology was in its infancy and the concept of biodiversity was still some 10 years away. In the process of developing a freshwater wetlands science for New Jersey Ogden, Fenske, Ashmun, and Fair helped create an agenda of policy relevance for a new scientific field.

## **New Jersey learns to love wetlands**

The enactment and organizing of knowledge for advocacy engaged in by Candace Ashmun, Helen Fenske, Maureen Ogden, and Abigail Fair was enabled by popular support for expanded environmental protection measures in the state and a federal system of wetlands management that continued, despite ongoing efforts, to leave a great deal of freshwater wetlands in New Jersey at risk. The gaps in federal law provided the conditions for advocates in New Jersey, led by Ashmun, Fenske, Ogden, and Fair, to enact and engage the new science of freshwater wetlands to constitute policy and to pursue legislation to assume the authority of the federal law and establish the first broad-based protection for freshwater wetlands in any state.

Although New Jersey is a coastal state with a strong set of regulations that protect coastal wetlands as part of the Coastal Wetlands Act (1970), the coastal wetlands measures did not extend to the inland wetlands of the environmental heart of New Jersey, a region of more than one million acres of forests, farms, and scenic towns now known as the Pinelands. Covering nearly one-fifth of the state's land area - at the center of America's most populous region - the Pinelands are the largest tract of forested open space between Richmond, VA and Boston (New Jersey Pinelands Commission, 2013). Early settlers called the land the Pine Barrens because the acidity of the soil and water made it difficult to grow the usual agricultural crops, and for generations the region was considered not only barren, but haunted as well. The "Jersey Devil" - frequently described as a winged, cloven-hoofed beast that terrorized the local towns - was born there in 1735, the thirteenth child of one Mrs. Leeds. The Jersey Devil tormented the area until 1740, when an exorcism banished it for one hundred years (Weird New Jersey, 2013). When the timber, glass, and iron industries began to die out in the first half of the 20<sup>th</sup> century, the Devil reappeared, and locals blamed it for their departure. Sightings were frequent up until the 1950s, at which point development began to encroach on the area.

Through the 1950s, New Jersey had two alternative perspectives on wetlands like the Pinelands. If they were not economically productive, they were barren and even haunted and cursed. That dichotomy began to change as the efforts of the environmental activists brought attention to

ecological processes and to the functional values of freshwater wetlands, and as a series of state laws developed that recognized the productive, ecological, and aesthetic value of undeveloped wetlands.

The awareness of wetlands degradation and gaps in New Jersey's environmental protection measures generated by the campaign to save the Great Swamp soon led to a number of *ad hoc* approaches to wetlands protection in the state (Appendix D - New Jersey Wetlands Protection Chronology). In 1968, the Hackensack Meadowlands Reclamation and Development Act established a commission to oversee thirty-two square miles of environmentally sensitive land in northeastern New Jersey, the last large tract of open land near New York City, and to "protect the balance of nature in the Hackensack Meadowlands; provide for orderly development of district property; and provide facilities for the disposal of solid waste." The Wetlands Act of 1970, passed to protect New Jersey's coastal wetlands south of the Raritan River, soon followed.

A set of other laws, including the Coastal Areas Facilities Review Act (CAFRA) of 1973, the engineering-focused Flood Hazard Control Act of 1972 and its Stream Encroachment Program, the Sewer Extension Program, and the Construction Grants Program, expanded the jurisdiction of the New Jersey Department of Environmental Protection over the state's wetlands. Increasingly appreciative of the ecological value of wetlands, the scientists participating in these programs advocated for broader regulations that would include New Jersey's hardwood and wetland forests (NJDEP Staff Member #1, 1999).

Meanwhile, the New York Port Authority - unable to complete its international jetport plan in the Great Swamp because of the efforts of activists like Helen Fenske - shifted its sights south to the Pinelands. The Pinelands forest - of stunted pitch ("pygmy") pines mixed with oak and watered by tea-colored streams and rivers - is rich with flora and fauna. An area with considerable freshwater wetlands itself, it provides habitat to nearly 100 threatened or endangered species. Faced with the demands of postwar urban sprawl, developers saw great potential for the Pine Barrens. In addition to the failed jetport, other proposed uses included recreating an extensive timber industry and constructing an oil pipeline from offshore wells.

In 1977, New Jersey Congressman James Florio (Democrat, 1st district) sponsored legislation to establish a federal reserve in the Pinelands. In 1978, the US Congress, concerned with burgeoning development pressures on this environmentally fragile area, established the Pinelands National Reserve and called upon New Jersey to create a planning agency to preserve and protect the area's natural resources. Governor Brendan Byrne subsequently created the Pinelands Commission, issuing a moratorium on state permits for development in the Pinelands area and effectively halting all development there until a Comprehensive Management Plan was prepared.

In June 1979, the legislature approved the Comprehensive Management Plan and passed the Pinelands Protection Act, which ultimately dispelled the connotation of freshwater wetlands as wastelands. In doing so the Act chased away another apparition - that of the Jersey Devil. With one notable exception, a 1993 episode of television's "The X-Files" in which the Jersey Devil was blamed for upsetting tourism in nearby Atlantic City, the monster has not surfaced to wreak havoc since the Pinelands Protection Act of 1979 brought with it the recognition of the region as an environmental asset.

Beyond this change in perspective, the protection of the Pinelands also introduced a number of concepts that became precedents for the treatment of other freshwater wetlands in the state. Early drafts of the FWPA borrowed from the Pinelands criteria for establishing freshwater wetlands delineation standards. Although these standards were passed over because they were deemed too complicated and confusing for state-wide implementation other aspects of the Pinelands Act were borrowed for the FWPA. These included: the issuing of a moratorium on development by a Governor; the idea of mitigation requirements (an improvement upon wetlands that is made as exchange for damage done to wetlands elsewhere); and the creation of wetland buffer areas to provide transitional zones between developed and preserved land.

### **Federal law and the context for local knowledge**

When Maureen Ogden and Helen Fenske met in the late 1970s, Fenske was coming off the heels of a stint in environmental consulting for the Ford Foundation. Her job had been identifying environmental projects for funding. Particularly interested in projects that could develop environmental case law she worked closely with the nascent Environmental Defense Fund and the Natural Resources Defense Council, charging them with developing a comprehensive method for managing the natural resources in the United States (Fenske, 1999).

One of the environmental groups' first initiatives was the shaping of Section 404 of the Federal Water Pollution Control Act of 1977, otherwise known as the Clean Water Act (CWA), which provided the nation with its first wetlands protection measures and created a framework within which states could then work for their own more comprehensive activities (Fenske, 1999). The CWA established standards, technical tools, and financial assistance to address many of the causes of pollution and poor water quality in the United States, including municipal and industrial wastewater discharges, polluted runoff from urban and rural areas, and habitat destruction. Ambiguity in the language of the law, however, led to considerable confusion over the responsibility for shaping standards and tools and for oversight. While the law ostensibly charged the Environmental Protection Agency with responsibility for the program, the US Army Corps of Engineers administered the permitting program, which granted permission under the law to develop wetlands. In addition, the act stipulated that the Army Corps receive environmental guidance regarding permits from the National Fisheries Service and the Fish and Wildlife Service. To further complicate matters, while the act provided that the federal government set the agenda and standards for pollution abatement, and that it regulate the nation's waters in broad terms, it delegated many of the chores of street-level implementation and enforcement to the states, including decisions about wetlands smaller than 10 acres.

Not only did it take time to work out the logistics of what the CWA meant by federalism, but it was also clear that a lack of knowledge about wetlands pervaded both federal and state agencies. For

example, the CWA specifically addressed wetlands in tidal and brackish waters, but the language in the act was unclear regarding its application to inland freshwater wetlands. Staff of the federal agencies involved in implementing the CWA had established bureaucratic competencies seemingly at odds with the roles the act expected of them. Particularly problematic - given their new role in the permitting process - was the Army Corps of Engineers, which historically engaged in building dams and maintaining navigable waters, activities which often destroyed wetlands. The Corps' only previous experience with permitting had been with the Rivers and Harbors Act, from which the Corps has authority to permit structures in or over navigable waters, and so the development of an ecological perspective necessary to implement the intent of the Clean Water legislation was slow.

This steep learning curve was not unique to the Army Corps. An EPA staff member described a laborious and mistake-filled process of hiring qualified people in all of the agencies: "The agencies would hire somebody who was a microbiologist and think they were an ecologist. They would hire people that had a couple of biology courses and expect them to identify wetlands. Some of these people knew a lot about fish, some people knew a lot about certain aspects of science, but they really had to learn about what to regulate" (Federal Official #1, 2000).

A limited federal mandate, no comprehensive state regulation, a lack of implementing expertise, and a history of public sentiment that considered wetlands as wastelands that could only be improved through development conspired to create a situation in which many hundreds of acres of New Jersey's freshwater wetlands were filled even after the passage of the CWA. A host of inadequacies in the program precluded comprehensive wetland protection, including inconsistent jurisdictional determinations and the failure of the Army Corps to completely regulate ditching, draining, and clearing of wetlands by regularly approving permits to alter and by performing limited review of the proposed and likely relevant alterations. Meanwhile, insurance claims following floods mounted, and a large portion of northern part the state was in the middle of its second severe water shortage in five years. The first water shortage in 1980-81 led to an Emergency Declaration by then-Governor Byrne and subsequent development of the state's first Water Supply Management Act N.J.S.A. 58:1A-1 in 1981. With the second water shortage in 1985 environmental groups including the PRC seized public

attention, linking a compromised groundwater supply to drought, contamination, overdrawing from reservoirs in the Passaic River Basin and wetlands degradation.

With awareness heightened by the CWA combined with the new context for action by the emerging activist groups and their science, the New Jersey press began to probe more deeply into the impact of development on flood problems in the state in the state. According to *The Record's* July 11, 1983 article about the Passaic River's Wetlands, "[d]evelopment made flooding from this spring's heavy rains worse than usual in many basin communities....[F]lood experts warn further development of the wetlands would increase the severity of flooding even in a year of normal rainfall." Just a few months later, another *Record* article (September 25, 1984) explained that "wetlands in the Passaic River Basin have been filled in for development at a rate of two to five times faster than the rest of the country....[E]ach year the basin area suffers \$50 million in flood damage to public and private property and has been declared a federal disaster area six times since the 1970's." While Section 404 of the CWA focused national attention on the linkages between choices about land use and flooding, the degradation of public water supplies, habitat loss, and other consequences of the loss of wetlands, it did not prove the solution to the continued filling of freshwater wetlands in New Jersey.

### **Emergence of a coherent environmental community**

The post-WWII spread of suburban settlement in the state, facilitated by construction of the New Jersey Turnpike, had the curious effect of strengthening localism, already strong in this Home Rule state (Salmore & Salmore, 1998). This converged with an increase in place-based conservation movements like watershed organizations that worked to protect source areas, and with renewed interest in the concepts of Jeffersonian democracy by President Reagan. In New Jersey, concepts of localism and decision-making at the local level held appeal for both the left and the right, and party alignments at this time were particularly hard to discern. New Jersey's Republican Governor Thomas Kean, for example, was considered more liberal than many on the left.



The Great Swamp brought freshwater wetlands to the forefront of environmental protection discussions in the state. The early organizing around its preservation then reoriented to protect New Jersey's Pinelands from development. Experiences with both regions built a general understanding throughout the state of the need for environmental protection by highlighting problems of freshwater wetlands degradation. Critical to the development of an environmental movement in New Jersey was the energy and commitment of volunteers to place-based environmental efforts, like the nascent watershed associations built during the 1960s and the role of municipal environmental commissions in generating local expertise and allying in ANJEC.

Watershed associations' ability to advocate for improved environmental planning at the local level was crucial, as was their ability to perform some technical tasks. Many, like Candace Ashmun's Upper Raritan Watershed Association, were busy conducting water quality inventories and documenting sources of surface and ground water pollution. By the time Congress passed the Clean Water Act, these groups were ready and organized to fulfill the Act's promises by actively participating in the new planning opportunities created by federal law. When Ashmun took the executive directorship of ANJEC in 1976, she received access to site plan reviews and environmental databases through the Association's oversight of the environmental commissions. The pattern of environmental degradation she saw was undeniable. Ashmun recalls: "It was obvious that the wetlands were a really serious part of the problem, and that the existing system which was controlling land use - all land use at the municipal level - was not working" (Ashmun, 1999).

With the research conducted by New Jersey's watershed associations and municipal environmental commissions, evidence mounted by the early 1980s that the Clean Water Act was failing. A 1984 review by the State College Field Office of 40 post-Clean Water Act wetland fill cases further documented approximately 800 acres of wetlands impacts resulting from illegal filling and permitting activities (State College Field Office, 1984). And although regional regulation under the Pinelands Act, CAFRA, and the Hackensack Meadowlands Act minimized wetland losses in their respective jurisdictions, they still did not provide for comprehensive, statewide wetland protection. Indeed, the

host of contradictory programs and standards compromised the ability of the New Jersey Department of Environmental Protection to regulate freshwater wetlands effectively.

This context, combined with the status of freshwater wetlands science as a “new” field, gave the environmental community the freedom to shape and adopt regulations they felt were appropriate for the state. New Jersey came to love its freshwater wetlands, and could enter the wetlands regulations without interference of competing agencies. As will be documented in the sub-movement chapters, we see the environmental activists using science to make an opening for new regulations based on an emerging science. For example, Helen Fenske describes the variety of activity around the environmental commissions as a growing groundswell, with in-roads made into New Jersey’s local government on the parts of those concerned about the environment. She believes that it was with many environmental commissions in place, and a growing coalition of people who understood what she was trying to do, that Assemblywoman Ogden decided the time was right to craft a freshwater wetlands law (Fenske, 1999; Ogden, 1999).

Freshwater wetlands protection became not just a critical environmental issue in New Jersey, but the primary focus of a wide array of environmental groups and of an advocacy coalition with enough knowledge and grassroots strength to move legislation. The first orchestrating event was the 1983 Chauncey Center Conference, which brought interested parties together and led to draft legislation. Ashmun had recently hosted, under the auspices of the Great Swamp Watershed Association, a two-day wetlands conference at Drew University that gathered wetlands experts and advocates from across the country. On the heels of this event she worked with Assemblywoman Ogden to bring together a group of New Jersey politicians, experts, and advocates (NJDEP Official #2, 1999).

Ogden and Ashmun designed the conference to bring everyone involved in the previous legislative campaigns together with everyone currently involved with the related statutes to discuss the potential for comprehensive freshwater wetlands protection (Ashmun, 1999). They intended the Chauncey Center Conference to be a brainstorming session and an opportunity to develop both tactics and strategy for a campaign. Ashmun explains, “We had one big huge round table and we all just dove into discussion. There was no question in anybody’s mind that a) something had to happen and b)

something would happen. The question really was ‘what?’ and ‘how do you handle it in New Jersey in particular?’” (Ashmun, 1999)

The Chauncey conference yielded both the immediate impetus for legislation and began to foster a coordinated effort among the environmental community that would advocate for it. Participants recall that the conference shifted the focus from beating up the “incompetent people failing to enforce the law” to getting a new freshwater wetlands law (Ashmun, 1999). Following the conference Assemblywoman Ogden asked the Office of Legislative Services to draft a bill.

After Maureen Ogden introduced the first Freshwater Wetlands Protection Act bill in 1983, two distinct groups emerged around the proposed legislation. These groups were often perceived and referred to as diametric opposites: “the builders” and “the environmentalists.” The builders comprised primarily the community of interests that would be regulated by such an act. Lumped with the environmentalists were not only individuals and organizations interested in protecting the natural environment, but also individuals adversely affected by flooding and other consequences of wetlands degradation.

A former state official described the two groups: “The environmentalists obviously felt that the wetlands should be preserved and that they were an important environmental resource. The building community felt that it was too much of a burden on them to worry about what they considered to be patches of wetlands in the areas that they wanted to develop. They felt that areas that got wet once a year and were otherwise dry shouldn’t be considered wetlands unless it was standing water or marsh, and they felt the hardwood swamps shouldn’t be eligible for preservation at all” (NJDEP Official #2, 1999).

Although this research focuses on the environmentalists, to understand what they did we also have to understand their sparring partners, the state-based New Jersey Builder’s Association (NJBA) and the National Association of Office and Industrial Parks (NAIOP). Development of the New Jersey Turnpike in the early 1950s turned the state into the east coast’s “Main Street,” leading to a new “rurban” citybelt-cybernetic frontier (Salmore & Salmore, 1998) and serving as a thoroughfare for

seemingly endless opportunities for growth. In spite of the organizing activity around the concept of wetlands protection for the Hackensack Meadowlands Reclamation and Development Act and the Pinelands Protection Act, builder and developer groups in the state seemed blinded to freshwater wetlands as an issue to be treated through state-wide protection measures. Taking a view that freshwater wetlands were still something to be engineered they were caught unawares and were unprepared to respond to the more ecological epistemic to freshwater wetlands advanced by the environmental community. Furthermore, having not seen or perceived a need to respond to the environmentalist's concerns regarding freshwater wetlands degradation in the state the NJBA was not well organized or prepared to quickly counter the environmentalist's proposals. That said, the development community was well bankrolled, and had friends in high places.

Coming off the heels of the passage of the Coastal Wetlands Act which deemed hundreds of thousands of acres of saltwater and brackish marshlands inaccessible to development developers saw stricter regulations on freshwater wetlands as an additional impediment to their livelihood. Although most agreed that the state's coastal wetlands were worthy of preservation, there was little consensus over the inland freshwater wetlands. A state official recalls: "There really wasn't an understanding even on the part of people who might be supportive of their importance or their need for preservation. And the builders thought they could engineer around anything. They couldn't understand why we were going to put their developments on hold" (NJDEP Official #2, 1999).

With local level support for Ogden's legislation growing as communities developed an understanding of freshwater wetlands functions, the building and developer's groups went on the offensive and in 1984 proposed a limited set of freshwater wetlands protection measures in competing legislation. In 1985, responding to a request from Environmental Commissioner Hughey, and recognizing an opportunity to streamline permitting processes through state "Assumption" of the Federal 404 Program, the development community agreed to work towards compromise legislation with the environmentalists. This compromise effort proved to be short-lived however when the Assembly Speaker, a legislator with ties to the building and development community, refused to post the compromise bill to a vote.

Although discouraged by the political action on the part of the Assembly Speaker Maureen Ogden and Candace Ashmun again organized a conference to bring environmental groups to the table. At this conference, held at Drew University in 1985, they drafted a new version of the legislation and re-grouped, forming the Freshwater Wetlands Campaign (FWC) through which environmental groups pledged acted in concert to work toward a bill. With Abigail Fair, founder of the Great Swamp Watershed Association at the helm, the FWC attracted 140 environmental and civic organizations to its ranks within two years. The campaign had a two-pronged approach. It focused on constructing as bipartisan and broad-based a coalition as possible - inclusive of groups as diverse as hunters, environmentalists, garden clubs, and educators. It also focused on using this large and diverse coalition to provide substantive information to educate legislators and their constituents about wetlands (Fair, 1999). The FWC soon became savvy, active participants in the policy-making process.

It was this political muscle that gave environmental knowledge and emerging freshwater wetlands science power. Abigail Fair recalls that traditional lobbying played a valuable role, especially the capacity for rapid response through networking. When Ogden's legislation ran into roadblocks, Fair would call campaign members across the state to say: "hey - your legislator is misbehaving - you need to have 40 calls go into him telling him to straighten up." She feels that it was not just the fact that the campaign existed, but that it could call on people to write letters, and they wrote thousands of them (Fair, 1999).

The campaign's sophisticated organizing efforts drew on the knowledge generated earlier by the environmental community to develop and distribute fact sheets that defined wetlands, traced their losses, and described the ineffectiveness of the federal wetlands protection program. The campaign also prompted new exercises in freshwater wetlands scientific inquiry as the advocates identified new problems for policy. For example, the FWC helped frame the Passaic River Campaign's research into the flood protective benefits of freshwater wetland buffers. They also drew on the PRC's new relationship with the state DEP, a connection formalized in the PRC's new Flood Plain Watch Program that enlisted community volunteers to track wetlands mitigation permitting in their communities and to evaluate the efficacy of freshwater wetlands mitigation projects in the state against the state's

standards (Passaic River Coalition Representative #1, 2006). The FWC built on the data generated from these efforts and developed an editorial board committee to meet with the editors of local newspapers and to establish a platform for their knowledge and findings. They continued to tap into the power of their advocacy, too. Testifying at hearings, campaign representatives would begin by reading off their membership list, which eventually grew to 200 groups representing at least 100,000 people in the state (Fair, 1999). Legislators became increasingly aware of the votes tied to wetlands protection.

The Freshwater Wetlands Campaign worked closely with organizations like the New Jersey Conservation Foundation (NJCF) to raise awareness of the impact of wetlands degradation and losses in New Jersey. They developed programs to enhance the public understanding of the need for wetlands preservation, including bus tours showing examples of where the Army Corps of Engineers had issued permits to develop wetlands, and visits to homes and office complexes that routinely flooded because of adjacent development. They created slide shows for legislators, and campaign member groups hosted legislative breakfasts in Trenton to convince legislators of the environmental importance of wetlands (Ogden, 1999).

Involvement in the FWC represented several years' sacrifice of staff time, volunteer time, and financial and other resources for many of the member organizations. The sophistication and savvy of environmental advocacy that had developed with the Great Swamp and Pinelands legislation, however, helped foster the willingness to engage in such an effort. It was the leveraging of the new science of freshwater wetlands combined with the efforts of a diverse cross-section of the public committed to the preservation of wetlands that ultimately affected the politicians' view of wetlands protection. And for the diverse members of the campaign it was the belief that consensus on the issues, and particularly consensus on the definition of a wetland, was necessary for passage of the bill.

The FWC was now well positioned to play a significant role in articulating the thresholds at which the legislation was or was not going to be an acceptable option for wetlands preservation. Most legislators, unqualified to discuss the environmental issues in technical terms, had no way of judging rationally what was required for adequate protection. In their decision-making, they relied not just on the support of their constituents to indicate policy preferences but also on such groups for substantive

knowledge. The FWC had shaped a general consensus for both preferences and knowledge about wetlands. One person involved in the shaping of the freshwater wetlands legislation described the typical decision-making process as follows: “Legislators don’t make decisions on a technical basis. They’ve got a handful of letters from developers on one side of their desk, and 100 letters from the environmentalists on the other side and they weigh what the impact of their decision might be on their next campaign” (NJDEP Official #2, 1999).

One of the primary targets of the campaign was Assemblyman Jack Penn (Republican, 16<sup>th</sup> District), who had introduced a wetlands bill more favorable to the builders’ interests in opposition to Ogden’s bill. Among the campaign’s tactics were mass gatherings outside Penn’s office to read the list of New Jersey residents who supported Ogden’s bill. Ogden herself prepared a slide presentation and delivered it to the Somerset Hills Garden Club, in Assemblyman Penn’s home county. So enthusiastic about her presentation, club members organized to staff a booth at the county fair to gather signatures and visited Penn’s office to push for Ogden’s version of the bill. Ogden does not “think that Jack Penn ever realized what he was getting into. He didn’t realize he had the tiger by the tail....Not only did the vast...majority of the people who [attended field hearings on wetlands] support my legislation..., but we had the support of the Somerset Hills Garden Club” (Ogden, 1999).

Such mobilization was critical because, as Ogden recalls, the builders were relatively well bankrolled compared to the environmentalists, and the ability to get good legislation was “not based on...the value of the wetlands, or the importance of them. It’s a question of votes and money” (Daggett, 1987). With the mobilization of potential votes by the Freshwater Wetlands Campaign, and increasing pressure from fellow legislators who saw the writing on the wall as well, Penn was ready to compromise.

One element of the compromise included emphasis on the assumption of the Federal 404 Program by New Jersey. Developers were frustrated with an Army Corps program that, prior to 1984, did not publish maps outlining its jurisdiction - thus making it difficult to determine which areas of wetlands were exempt from regulation through the nationwide permit provision. And even though permitting by the state was expected to be more strict than permitting by the Army Corps, the

developers soon recognized that under the proposed rules wetlands for New Jersey, by filling out only one permit, they might move through the process more smoothly (Building and Development Community Counsel Subject #1, 1999).

A second element was the concept of buffers for the wetlands - a concept familiar from the Pinelands legislation and the New Jersey Coastal Management Program, both of which required 300-foot buffers to preserve the protected wetlands. The significance of citizen knowledge regarding the emerging science of freshwater wetlands was particularly salient in the treatment of this issue. Using research documented by backyard environmentalist / activists around the state, proponents set forth their own statement of the ecological values and functions of wetlands and argued that because development adjacent to wetlands can adversely affect wetlands through increased runoff, sedimentation, the introduction of pollutants, and changes in species composition, the provision of adequate buffers around wetlands is critical to preserving their ecological integrity.

Not surprisingly, the builders were not interested in expanding the area off-limits to development by 300-foot buffers and were determined to fight the additional restrictions tooth and nail. John Sheridan, then president of the New Jersey Builders Association, argued: "Rather than arbitrary buffers, we need to understand the contributions each type of wetlands makes. All wetlands are not of equal value, and the state should regulate wetlands consistent with the benefits they provide" (1986).

At the heart of the compromise on the buffer provision was an agreement to classify the wetlands for the purposes of assessing buffer widths. The environmental community originally resisted a classification system, fearing that it would create a second class of wetlands (Freshwater Wetlands Campaign Organizer #1, 1999). At an impasse with the developers and desperate to move the legislation, the environmental community conceded that certain wetlands warrant larger buffers and certain wetlands warrant smaller ones (Freshwater Wetlands Campaign Organizer #1, 1999). Three categories of wetlands emerged from the compromise: ordinary wetlands with no surface water connection, isolated from a larger system; intermediate wetlands somehow connected to the overall system; and exceptional wetlands on very pristine waters and adjacent to wetlands that provided



habitat to threatened and endangered species. The policy issue of wetlands classification was, as a DEP regulator describes it: “contentious, but it ended up in a compromise that all could live with. The environmentalists argued that classification of wetlands was a slippery slope, and that anything considered ‘low quality’ wetlands would not be protected in the end. The developers argued that all wetlands are not created equal, that they have a variable habitat, water quality benefit, and flood storage, and that these components have to be taken into consideration. The result was a compromise in that a classification scheme couldn’t call them buffer zones anymore they had to call them transition areas” (Federal Official #1, 2000). But the builders ended up with classifications, and the environmentalists ended up with *de facto* buffers.

A third element was the definition of wetlands itself. Unlike other disputes over broad policy questions, the wetlands issue centered on narrow, technical judgments such as the plant species characteristically found in wetland habitats and the number of days that soil must remain saturated to constitute a wetland. Federal officials and legislators recalled that the environmental advocates demonstrated remarkable scientific expertise. This expertise both brought these issues to light and helped shape a definition of wetlands. But disputes at the federal level over freshwater wetlands definitions accentuated the rift between New Jersey’s environmentalists and builders over the definition.

The parties eventually resolved this fundamental dispute by agreeing to rely on the April 1, 1987 *Wetland Identification and Delineation Manual* developed by EPA. A regulator involved in the policy-making process describes working with the federal definition of freshwater wetlands as “the one positive aspect of having to incorporate the federal stuff into the process” (Federal Official #1, 2000). While the developers were still not happy with the federal definition, they accepted it as the most credible definition and the one with the most science behind it. All parties involved recognized the lengthy process the federal agencies had gone through in developing the definition: “there were all these agencies that didn’t necessarily agree about how to regulate - the Fish and Wildlife Service didn’t agree with how the Army Corps of Engineers was doing its job, and the EPA was somewhere in

between - but you had all these agencies agreeing on a definition, so that gave it credibility. It was public policy credibility beyond just hours and science invested” (Federal Official #1, 2000).

In hindsight, once everyone was comfortable with the definition of freshwater wetlands, the battle was nearly over. With a definition in hand, Republican Governor Thomas H. Kean could step in, as he did on June 8, 1987, and following Governor Byrne’s precedent in dealing with the Pinelands, issue a moratorium on all construction in wetlands until a protection law was passed. One of only nine Governor’s in the U.S. with the power to issue executive orders, Governor Kean flexed his political muscle with Executive Order #175 to declare a temporary halt to the issuance of all State approvals, including grants, permits, certifications, licenses, and applications for financial assistance for projects involving freshwater wetlands. Kean’s executive order was an affirmation of a legislative mandate incorporated in the Pinelands Preservation Act, against disruptive developmental incursions on the state’s natural reserves. Although challenged on constitutional grounds (involving the separation of powers doctrine), Kean’s decree was eventually upheld by the courts. It put on hold several hundred projects involving more than 5,000 acres of freshwater wetlands that had been filed with DEP.

Governor Kean’s moratorium was instrumental in bringing the builders’ interests to the table. In a video made after passage of the FWPA, Morton Goldfine, Vice President for Law and Public Affairs of the National Association of Industrial and Office Properties (NAIOP), a major lobbying group for the builders, said that NAIOP was brought “kicking and scratching to the table, but once we got to the table we found there was widespread support for freshwater wetlands protection in New Jersey. We labored for a bill that was reflective of what NAIOP could live with. We wanted to find a bill for New Jersey and took the governor at his word that there was going to be a bill and we wanted to see to it that the bill was not more restrictive than there need to be” (National Association of Industrial and Office Parks, 1987).

Despite the settling of issues between Ogden and Penn and the precedent of the Pinelands moratorium, Governor Kean’s action was a courageous one. Ashmun believes it was “gutsy” and that “you need a gutsy governor in New Jersey because the governor has so much power....And if you don’t have that, everything else underneath it kind of falls apart” (Ashmun, 1999). Indeed, final passage in

the Assembly required some maneuvering to protect a few legislators who were only reluctant supporters of the bill, but the necessary last-minute deals were cut. The Freshwater Wetlands Protection Act emerged, and New Jersey assumed authority from the federal government for protection of its freshwater wetlands.

### **A common well of knowledge**

When Helen Fenske began recruiting academic biologists to help her document the ecological value of the Great Swamp in response to the Port Authority's plan to develop it into a jetport, she was mobilizing technical information for an *ad hoc* lobbying effort. When Candace Ashmun was laboring over resource maps, her efforts were dedicated to informing planning and zoning decisions for the Upper Raritan Watershed. When Maureen Ogden completed her natural resource inventory, she was fighting to preserve a local park. When Abigail Fair joined her local planning board, she too was fighting to preserve a local park - the Great Swamp. These women, both activists and environmental experts in their own right, had no foreknowledge that their activities would begin to lay the groundwork for a statewide advocacy campaign to preserve freshwater wetlands.

The policy environment in which they participated was fragmented, like the mosaic courtyard floor outside DEP's Trenton office. There was no tile unique to freshwater wetlands, let alone a comprehensive picture of how to protect them. Their experience with this fragmentation, however, suggested that the organization of knowledge and advocacy could be a successful long-term strategy for environmental protection. So Fenske helped instigate municipal environmental commissions. Ashmun led ANJEC, their local umbrella organization, and helped the commissions gain expertise. Ogden moved to electoral politics and orchestrated public and elite opinion through the Drew and Chauncey conferences. Fair spearheaded the Freshwater Wetlands Campaign, which lobbied for wetlands protection but emphasized the grassroots enactment of freshwater wetlands science and dissemination of environmental knowledge about the value of wetlands.

These activities succeeded not only in establishing wetlands protection as a critical environmental concern in a state with many such concerns. But they also created a coherent, state-wide environmental movement that mobilized knowledge for the purpose of advocating for comprehensive wetlands protection and resulted in the passage of the nation's toughest wetlands law.

Of course, the story is not over, as the Freshwater Wetlands Protection Act has a history of implementation that is at least as curious and controversial as its history of creation. But the influence of this strategy of organizing around knowledge and advocacy continued to pay off even after FWPA passed. One of the law's provisions required DEP to hold workshops and develop a manual describing the law and the importance of wetlands. DEP hired Abigail Fair to write the manual.

## Chapter Three: Reference List

New Jersey Statutes Annotated Title 12 Commerce and Navigation. (1914). Chapter 5  
Waterfront and Harbor Activities, Section 3 Submission to board of plans for waterfront development.

Ref Type: Statute

New Jersey Statutes Annotated Title 40 Environmental Commissions Enabling Legislation.  
(1968). Chapter 56A.

Ref Type: Statute

(1986, June 20). Real Estate Marketplace. *New Jersey Star Ledger*.

ANJEC Representative #1. (4-5-2011). Interview with Association of New Jersey Environmental  
Commission (ANJEC) Representative #1 -- conducted by Heather Fenyk. 4-5-2011.

Ref Type: Personal Communication

Ashmun, C. (9-24-1999). Interview with Candace Ashmun, former Executive Director of New  
Jersey Environmental Commissions (ANJEC) -- conducted by Heather Fenyk and David H. Guston.

Ref Type: Personal Communication

Barnard, William D., Ansell, Christopher K., Harn, Joan G, and Kevin, Daniel (1985, December  
6). Establishing Priorities for Wetland Management. *American Water Resources Association Water  
Resource Bulletin*, 21.

Building and Development Community Counsel Subject #1. (6-18-1999). Interview with Building  
and Development Community Counsel #1 - conducted by Heather Fenyk.

Ref Type: Personal Communication

Daggett, C. J. (3-25-1987). Letter to Maureen Ogden and Jack Penn regarding Assembly Committee Substitute for Assembly Bills No. 2342/2499.

Ref Type: Personal Communication

Fair, A. (9-16-1999). Interview with Abigail Fair, Director of New Jersey's Freshwater Wetlands Campaign (FWC) -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Federal Official #1. (2000). Interview with Federal Official #1 -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Fenske, H. (4-12-1999). Interview with Helen Fenske, Former Assistant Commissioner of the New Jersey Department of Environmental Protection -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Freshwater Wetlands Campaign Organizer #1. (3-30-1999). Interview with New Jersey Freshwater Wetlands Campaign Organizer #1 -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Moyer, B., McAllister, J., Finley, M. L., & Soifer, S. (2001). *Doing Democracy: The MAP Model for Organizing Social Movements*. Gabriola Island, BC, Canada: New Society Publishers.

National Association of Industrial and Office Parks. Post-FWPA De-Brief Video with NJDEP and NAIOP. 1987.

New Jersey Pinelands Commission (2013). Our Country's First National Reserve. New Jersey Pinelands Commission website [On-line]. Available: <http://www.state.nj.us/pinelands/>

NJDEP Official #2. (4-21-1999). Interview with NJDEP Official #2 -- conducted by Heather Fenyk and David H. Guston.

Ref Type: Personal Communication

NJDEP Staff Member #1. (5-5-1999). Interview with NJDEP Staff Member #1 - conducted by Heather Fenyk and David H. Guston.

Ref Type: Personal Communication

Ogden, M. (4-15-1999). Interview with Maureen Ogden, former New Jersey State Assemblywoman -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Passaic River Coalition Representative #1. (3-22-2006). Interview with Passaic River Coalition Representative #1 - conducted by Heather Fenyk.

Ref Type: Personal Communication

Raritan Headwaters Association (2013). History of Raritan Headwaters Association. Raritan Headwaters Association website [On-line]. Available: <http://www.raritanheadwaters.org/about-us/history/>

Salmore, B. & Salmore, S. (1998). Government and Politics in Localities. In *New Jersey Politics and Government: Suburban Politics Comes of Age* (2nd Edition ed., University of Nebraska Press.

State College Field Office (1984). *Clean Water Act Assessment*.

Weird New Jersey (2013). The Jersey Devil. Weird New Jersey [On-line]. Available: <http://weirdnj.com/stories/jersey-devil/>

## CHAPTER FOUR: WETLANDS DEFINITIONS

With the Clean Water Act Amendments of 1977 Congress created a legal mechanism for states to “assume” the federal regulatory responsibilities of Section 404 (regulating the discharge of dredged or fill material into navigable waters) and opened the door to greater state involvement in wetlands management. New Jersey was the second state after Michigan to assume responsibility for administering the federal program with passage of the 1987 New Jersey Freshwater Wetlands Protection Act (FWPA) N.J.S.A. 13:9B. The FWPA, in combination with the administrative rules implementing it, established a regulatory structure equivalent to the federal law. Central to passage of the FWPA and the process of assumption was significant scientific and policy debate regarding, and an ultimate agreement on, a definition of freshwater wetlands. In what follows I consider how the definition of “freshwater wetlands” became a contentious issue in New Jersey and how the debates around the issue were resolved. This is not intended as a legislative history (although it does track the path of the FWPA legislation) but more so a study of the starting conditions and the events that inclined the actors involved to make and use science in specific ways e.g. how was the need for science framed in this case, was this an overt strategy or more happenstance, and how were issues framed “scientifically.” I then consider the use of science in shaping the regulatory technological artifact of “freshwater wetland,” looking into whether the use of science changed the artifact over time and the extent to which science was used to constitute policy. I situate myself in the middle of New Jersey’s policy making around freshwater wetlands. My aim in this is to develop insights into the role of science in policy processes, specifically how who enacts science and how they use science affects how policy processes unfold.

This research begins with an overview of the difficulties in defining freshwater wetlands followed by a brief historical survey of perceptions of freshwater wetlands leading up to the US environmental movements of the 1970’s. It then traces the development of both regulatory and scientific definitions of freshwater wetlands at the federal level, highlighting the values conflict revealed by these two different approaches. Turning to the New Jersey case it follows the evolution of



a regulatory definition of “freshwater wetlands” in the state from the introduction of the first wetlands protection legislation in the Assembly in 1983 to passage of the FWPA in 1987. From the perspective of frame this evolution is observed in the sense of bringing freshwater wetlands into focus as an issue of concern in New Jersey, bringing attention to how and why freshwater wetlands are valued, replacing views of wetlands degradation as problems of local concern with an ecological perspective that required comprehensive state wide protection measures, and identifying the role of scientific and technical understanding of their functions vs. political choices in shaping these protection measures. From the perspective of co-production it is observed as the processes by which new environmental knowledge co-evolves with new identities. We see environmental advocates engage with science to define a policy area and observe them as they are re-defined as both movement actors and environmental experts.

### **The difficulty of defining wetlands**

For endeavors that seek to protect freshwater wetlands as an ecological resource, and in terms of understanding the impact of human disturbance on freshwater wetlands as an ecological system, the question of their definition is basic. But defining freshwater wetlands in the United States has long been complex and highly contentious. This is a factor of a nascent science, and reflects the difficult task faced by wetlands scientists and others in arriving at a scientifically precise definition for “freshwater wetland” and scientifically defensible criteria for their delineation. It also reflects a society conflicted over values: settling on a definition for regulatory purposes determines not only the levels of protection afforded ecological values and functions, but the extent of monetary value removed from the land upon their protection. Regulation of freshwater wetlands is a form of land use restriction. Undeniably, providing maximal protection for freshwater wetlands comes with social, economic, and political costs and a societal evaluation of these costs is necessarily a part of any effort to protect them.

Regulating freshwater wetlands requires specification with respect to both definition and delineation. A definition of a wetland makes a statement regarding what constitutes wet lands. It details the length and frequency an area is wet and the ground surface or soil depth at which wetness occurs, and also often indicates the point at which wetness occurs in the growing season (Tiner, 1985). Delineation of wetlands provides guidance for the purpose of identification in the field and the construction of a boundary line for regulation. Interpretation of a definition through delineation can lead to significant differences in the treatment of comparable wetlands. Inconsistencies in interpretation prompted many federal regulating agencies to standardize delineation practices, with delineation manuals specifying indicators, criteria and characteristic plant and animal species to avoid uncertainty in determinations.

Wetlands textbooks typically begin with a disclaimer regarding the difficulty of defining their subject.<sup>46</sup> Freshwater wetlands extend over vastly different geographic landscapes, habitats and ecotones and exist in a wide variety of hydrologic conditions making definition tricky. Textbooks often catalogue a great variety of intricate and nuanced definitions and criteria for delineation that are difficult to apply unambiguously to any circumstance. Precisely formulated scientific meanings that can easily be used in legal documents to guide land management do not exist, and classification schemes used for policy purposes, even those with the credibility of the Ramsar Classification System for Wetland Type (developed as part of the Ramsar Convention on Wetlands of International Importance in 1971 and generally considered the most coherent and comprehensive of wetlands definitional and classification schemes) are critiqued by scientists concerned with the imprecision of definitions (Semeniuk & Semeniuk, 1997).

In the US the difficulty of defining freshwater wetlands combined with the values conflict over the extent of environmental protection contributed to the development of several different “official” federal definitions of freshwater wetlands with the advent of freshwater wetlands protection activities in the late 1970’s. By 1986 there were multiple official wetlands identification and delineation manuals with the Environmental Protection Agency (EPA), U.S. Army Corps of Engineers, the U.S. Fish

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<sup>46</sup> For examples see textbooks by (Niering, 1985; Tiner, 1999; Batzer & Sharitz, 2006; Mitsch & Gosselink, 2007).

& Wildlife Service of the Department of the Interior (USFWS), and the U.S. Department of Agriculture's Soil Conservation Service (USSCS) (and even different branches within some of these agencies) each crafting a unique approach. It was not until the 1987 Memorandum of Agreement between the Army Corps, the EPA and the USFWS that these agencies determined a common definition, and not until publication of the 1989 Interagency Wetlands Delineation Manual that the agencies agreed on common procedures for delineation. However, as evidenced by the recent definitions question in *Rapanos v. United States*, 126 S. Ct. 2208 (2006) that were not directly addressed by the courts, and by the Bush Administration's Energy and Water Development Appropriations Act of 1992 which prohibited use of the Interagency Manual for the purposes of delineation, at least at the federal level issues of definition and delineation have clearly not been settled.

#### **Culture, science, and shifts in wetlands characterization**

Morass, quagmire, fen, slough and (frequently dismal) swamp: bleak terms for a complex natural ecosystem with proximity to both soil and water. For millennia the human attitude toward wetlands was characterized largely by fear, the lands perceived as dangerous, unworkable, godless, and shrouded in mystery. Some of the earliest literature in the western canon uses wetlands symbolically to distinguish between good and bad, the known from the unknown. In the 800's AD Beowulf fought the murderous swamp monster Grendel and Grendel's mother, doing battle in the "murky swamp" (Chickering, 1977). In the fourteenth century Sir Gawain, seeking the Green Knight, confronts his own mortality in a freezing bog (Armitage, 2008). Wetlands creatures including toads, adders, and a "filet of fenny snake" find their way into the Wyrd Sisters' boiling cauldron as it sinks into the slough (Shakespeare, 1972).

Such perceptions persisted over time and space, and were parlayed to the freshwater swamps of the new American lands during Colonial settlement. There they combined with an attitude of human domination over nature, in part necessitated by survival, but contributed to by no small measure of hubris. Hundreds of thousands of acres of swamps were subjected to "improvements"

better suiting them to immediate and practical human uses. This ethic rooted firmly in the American mindset and has likewise endured over centuries, with virtually every phase in American development - from the early European settlement to western expansion, and including wars, agricultural expansion and changes in technology - exacting a heavy toll on the nation's freshwater wetlands (Howarth, 1999).

American attitudes towards their murky swamps shifted slightly toward the positive in the 1700's. This shift was no doubt influenced by the advent of taxonomy, including detailed species categorization of swamp life in *Systema Naturae* (1734) and *Species Plantarum* (1753) by Swedish botanist Carolus Linnaeus (Howarth, 1999) and the dawn of cultural characterization of the environment in the Everglades of the southern United States by writers like Quaker naturalist William Bartram in his *Travels*, 1791 (Bartram, 1958). This improved understanding of swamps, gained by categorizing and detailing the nature of life within them, prompted a nominal revision to public perception. It was during this time (1743) that the more literal ecological description "wetland" was coined (Harper, 2013).

It would take almost 200 years for the term "wetland" to stick and for scientific research to provide a basis for its definition. In the interim, instead of relying on taxonomic classification as a guide, early attempts to describe wetlands in federal legislation referred to them as "swamps" and lacked virtually any scientific grounding. The Swamp and Overflowed Lands Act of 1849 defined them simply as those areas "wet and unfit for cultivation," a vague definition posing significant challenges to regulation (Knetsch, 2004). Definitional confusion incited almost 200 Supreme Court cases by 1888 (National Resources Council Water Science and Technology Board, 1995) and a remedial act in 1855 (Knetsch, 2004; Wetlands Wiki, 2013). Litigation seeking further definitional precision persisted until *Leonard v. Vicksburg, Shreveport and P.R. Co.*, 198 U.S. 416 (1905) (FindLaw for Legal Professionals, 2013).

The difficulty of agreeing on a definition for wetlands, the creation of a precise statement of their essential nature, and the setting of their boundaries reflect a society struggling to come to terms with how wetlands fit in their hierarchy of values. Emily Dickinson, writing in the late-1800's, uses

wetlands metaphorically as witness to an American psyche conflicted between romantic notions of the environment and solace in modern engineered comforts:

Sweet is the swamp with its secrets,  
Until we meet a snake;  
'Tis then we sigh for houses,  
And our departure take.

--Emily Dickinson, 1896

Dickinson's tip of the balance toward "houses" presaged a century of federal land management policies (including significant amendments to the Swamp and Overflowed Lands Act) that encouraged the draining of the "swampy wastelands," transforming them into more economically productive land. Although the sympathies for wetlands acquired during the taxonomic exercises of the 1700's were parlayed into preservation efforts of organizations like the Audubon Society in the late 1800's, in terms of federal policy the sentiment was squashed by the ascendancy of engineering over wetlands for the purposes of development.

It was not until 1956, in a U.S. Fish and Wildlife Service landmark report about wetlands (financed largely by the sale of federal duck stamps), that the term "wetland" was finally used and defined in official federal documents (National Research Council, 1995). Like the taxonomic exercises of the 1700's, the 1956 report and the improved understanding of wetlands it afforded focused on them as habitat for plant and animal species:

Wetlands are "lowlands covered with shallow and sometimes temporary or intermittent waters. They are referred to by such names as marshes, swamps, bogs, wet meadows, potholes, sloughs, and river-overflow lands. Shallow lakes and ponds, usually with emergent vegetation as a conspicuous feature, are included in the definition, but the permanent waters of streams, reservoirs, and deep lakes are not included. Neither are water areas that are so temporary as to have little or no effect on the development of moist-soil vegetation. Usually these temporary areas are of no appreciable value to the species of wildlife considered in this report." (Shaw & Fredine, 1956)

In spite of this official recognition, and in spite of a growing body of evidence that linked degradation of wetlands to problems like flooding, diminished habitat value, and compromised water quality, the institutional dominance of engineering and technology lasted well into the latter half of the 20<sup>th</sup> century. In fact, wetlands destruction picked up pace with dredging technology advances

made during the 1950's (Tiner, 1984). Even the popular publications of the time celebrated technological improvements that allowed developers to significantly lower the almost prohibitive expense of filling wetlands. Articles like a 1958 *House and Home* piece titled "Need Land: Take a Look at Marshland" heralded the new technology as a boon to development, noting "many good building sites are going unnoticed because developers see them only as swamps, tidal marshes or low land along lakes and rivers." Rising population and economic growth created high demand for real estate in suburban localities, and wetlands near urban centers were particularly vulnerable. For such wetlands, like those in New Jersey, the impact of economic growth in the urban core combined with the advent of new technologies to hasten the development of the state's freshwater wetlands for residential housing, industry and commercial facilities.

### **Federal Wetlands Definitions**

In 1972 wetlands came onto the national radar with passage of the Federal Water Pollution Control Amendments (FWPCA). This legislation regulated the pollution of the "waters of the United States," referring to wetlands under the umbrella of "interstate waters and tributaries" (Public Law 92-500: 86 Stat 816). Although it did not specifically use the term "wetland," the 1972 FWPCA was nevertheless considered the first federal legislation to specifically address wetlands degradation. Lacking specificity in terminology and definition the scope of protection quickly became an issue. How far inland, and to what, exactly, did "interstate waters and tributaries" extend?

Regulatory responsibility for the FWPCA was divided between the Army Corps, EPA and USFWS. The Army Corps held permitting authority, a holdover responsibility from the turn of the century Rivers and Harbors Act of 1899. It was to develop regulation for substantive review of permit applications in accordance with the guidelines set by EPA as part of its authority over effluent discharges via the National Pollutant Discharge Elimination System (NPDES). Meanwhile, the USFWS was vested with the prime Federal responsibility for protection and management of the Nation's fish and wildlife and their habitat and was authorized to review permit applications with an eye toward conserving fish and

wildlife resources. Ideological approaches to resource management varied and divergent views on the issue emerged.

The commodity-focused, pro-conservation Army Corps was in favor of restricting the scope of protection to accommodate economic pressures. It also sought to attempt to limit its role in regulatory oversight as much as possible. The newly formed EPA, imbued with an environmental protection ethic and an activist spirit, focused on matters relating to air and water quality.<sup>47</sup> Although linked to the Army Corps by its joint regulatory mandate under the FWPCA, the EPA favored a broader 404 Program and wetlands definition (Stine, 1983). Meanwhile, the science and research based pro-preservation USFWS viewed a broader 404 program, including freshwater wetlands, as an integral part of its goals of meeting environmental standards and preserving ecological functions for fish trusts and waterfowl.<sup>48</sup> The resulting conflicts amongst the agencies played out on the already polarized landscape of environmental concerns of the late 19<sup>th</sup> century and two primary federal definitions emerged, one scientific (USFWS) developed in 1974, and a regulatory definition (Army Corps/EPA) developed in 1975. Closure around creation of the artifact of a federal freshwater wetland would take more than ten years as these agencies debated issues of value: whether or not freshwater wetlands, as privately held resources, contained public value enough to regulate their use.

**Scientific definitions of freshwater wetlands at the federal level.** In a move to establish a sound basis of ecological information within which to make decisions regarding policy, planning, and management of the country's wetlands resources the USFWS created the National Wetlands Inventory (NWI) in 1974. The stated aim of the NWI is to "generate scientific information on the characteristics and extent of the Nation's wetlands. The purpose of this information is to foster wise use of U.S.

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<sup>47</sup> EPA involvement was largely defined by the spirit of the time and by its first administrator, William D. Ruckelshaus. Ruckelshaus was an activist committed to environmental protection and preservation, appointed to head the nascent agency at the advent of Earth Day. In his view the EPA had "no obligation to promote commerce or agriculture," and he viewed his role as "the governmental advocate of environmental progress, not merely a mediator between industry and the public" (Environmental Protection Agency, 2013).

<sup>48</sup> The USFWS had significant environmental expertise and regulatory savvy, having worked with the Federal Water Quality Administration at the core of the federal government's pollution control apparatus prior to the birth of the EPA. It was comprised of scientists and researchers with experience in enforcement and standard setting.

wetlands and to provide data for making quick and accurate decisions.” (Fish and Wildlife Service, 2002) The NWI was developed by ecologists and other wetlands scientists who took an approach “to describe ecological taxa, arrange them in a system useful to resource managers, furnish units for mapping, and provide uniformity of concepts and terms” (Cowardin, Carter, Golet, & LaRoe, 1979). The USFWS, working with academic partners and federal agencies including the Army Corps, EPA and Soil Conservation Service, spent three years intensively shaping and reviewing a wetlands delineation method. The “Cowardin classification system” published in 1979 was first and foremost a heuristic to guide the NWI and the creation of national wetlands maps, but it set forth a scientifically based and objectively broad definition of wetlands:

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al., 1979).

**A federal regulatory definition of freshwater wetlands.** The USFWS’s Cowardin scientific definition, with its “one-parameter” approach to identifying freshwater wetlands based on the presence of any one of the attributes of hydrophytes, hydric soils, or hydrology stood in contrast to what eventually developed as the more limited “three-parameter” regulatory definition forwarded by the Army Corps and EPA. In early 1975, prompted by a U.S. district court decision invalidating the initial Army Corps regulations which were designed to limit federal involvement in wetland regulation (*Natural Resources Defense Council v. Callaway*; 392 F. Supp. 685, 5 ELR 20285), and by the new rulemaking requirements for the CWA, the Army Corps began the process of shaping a regulatory definition of wetlands.

On May 6, 1975, in cooperation with the EPA and with suggestions from environmental groups, the Army Corps published four alternative regulations for public comment and review. These were submitted simultaneously with a provocative press release widely distributed by the Army Corps. The press release contained what Senator Muskie, a sponsor of the CWA, referred to as “deliberate distortions” of the act suggesting, for example, that a rancher might be required to obtain federal



permits “to enlarge his stock pond” and farmers would have to acquire permits “to deepen an irrigation ditch or plow a field” (US Army Corps of Engineers, 1978). The press release prompted “vast outcries against the proposed regulations,” (Stine, 1983) and although it was publicly condemned by the Assistant Secretary of the Army for Civil Works Victor V. Veysey, the damage had been done. Thousands of letters and telephone calls came in from across the country encouraging the Army Corps to limit the scope of its oversight. The Army Corps used the public outcry to justify regulations submitted on July 25, 1975 which took the narrowest view of required oversight, defining wetlands as:

...those land and water areas subject to regular inundation by tidal, riverine, or lacustrine flowage. Generally included are inland and coastal shallows, marshes, mudflats, estuaries, swamps, and similar areas in coastal and inland navigable waters (40 Federal Register 31328, July 25, 1975).

In spite of a public relations plan coordinated by the Army Corps Public Affairs Office, this revised definition was roundly criticized for its limited scope (Stine, 1983). Two major environmental litigating organizations - the Environmental Defense Fund (EDF) and the National Resource Defense Council (NRDC) - were especially concerned that the definition left a major portion of wetlands unregulated, thus violating the mandate of the FWPCA. The EDF and NRDC led a national effort to encourage the expansion of Army Corps oversight. Following two years of public comment, review, revision and criticisms of foot-dragging, the Army Corps published a final definition in 1977. It defined freshwater wetlands as:

...those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils. Wetlands generally include swamps, marshes, bogs, and similar areas (42 Federal Register 37, 125-26; 37, 128-29, July 19, 1977).

This definition used the concepts of plant community to define jurisdictional wetlands, requiring that hydrophytic vegetation be present or capable of growing to constitute a wetland. To limit confusion over regulatory interpretation, the text of the final definition included discussion of the rationale behind key components of the new definition, for example referencing the hydrologic cycles of water as prohibiting boundary line distinctions between fresh and salt water (National Resources Council Water Science and Technology Board, 1995) and recognizing non-vegetated wetlands and

aquatic beds as “special aquatic sites” to distinguish them from regulated freshwater wetlands (Tiner, 1999). This definition still stands as the federal regulatory definition used by the Army Corps and the EPA.

### **Pre-FWPA definitions of freshwater wetlands in New Jersey**

In New Jersey prior to the 1960s, state laws written primarily for engineering purposes were the proxy used for a wide range of environmental protection measures including those that affected wetlands. For example, New Jersey’s Waterfront Development Law passed in 1914 (N.J.S.A. 12:15-3, 1914) was designed to “limit problems that new development could cause for existing navigation channels, marinas, moorings, other existing uses, and the environment.” The state’s Sewer Extension Program and its Water Quality Management Plan were similarly focused on prioritizing orderly development first and protection of wetlands second. Furthermore, definitions of wetlands were almost always categorical. Typically wetlands were referred to simply as estuarine (marshes and saltwater wetlands), riverine (seasonally flooded areas) or palustrine (swamps and freshwater wetland lowlands).

By the 1970’s environmental actors in New Jersey began to understand the limited efficacy of the state’s engineering-based laws as instruments for the protection of freshwater wetlands. These actors had a new and rapidly growing understanding of the biological, chemical and ecological characteristics of freshwater wetlands and understood the importance of legislating for their protection while keeping these characteristics in mind. For example, the 1972 Flood Hazard Control Act (N.J.S.A. 58:16A) and associated Stream Encroachment Program were referred to by a movement actor as “the single tool we had to try to protect swamps and streams and yet it was an engineering law that in no way addressed the biological components, the ecosystems, so essential to clean water” (Ashmun, 1999).

The advent of special planning area designations in the state fostered a new concern with the technical and scientific aspects of environmental protection to the development of land use policies in

the state. Passage of the Hackensack Meadowlands Reclamation Act (1968) and the New Jersey Pinelands Protection Act (1979) ushered in more robust scientific definitions of coastal wetlands and freshwater wetlands. These definitions included a specific focus on ecological functioning with the goal of facilitating effective, well-balanced and rational land use management. These exercises were conducted by academic experts in the field with a public engagement component of management planning for the areas ensuring that a technical/scientific understanding of wetlands functions filtered down to the regulating agencies and the interested public.

Coastal wetlands in the Hackensack Meadowlands Protection Act were defined precisely and a list of hydrophytic vegetation capable of growing in coastal wetlands shaped to assist in delineation exercises (N.J.S.A. 13:9A-2). Pinelands wetlands, including approximately 200,000 acres of freshwater wetlands, were included as part of the state's Pinelands Protection Act (N.J.S.A. 13:18-1 to 13:29) and were defined using the USFWS one-parameter Cowardin classification system, identifying hydrologic characteristics, soil type and vegetation. It was the first time a definitional distinction was made between coastal wetlands and "inland" wetlands in state regulations:

Wetlands are those lands which are inundated or saturated by water at a magnitude, duration and frequency sufficient to support the growth of hydrophytes. Wetlands include lands with poorly drained or very poorly drained soils as designated by the National Cooperative Soils Survey of the Soil Conservation Service of the United States Department of Agriculture. Wetlands include coastal wetlands and inland wetlands, including submerged lands.

Coastal wetlands are banks, low-lying marshes, meadows, flats, and other lowlands subject to tidal inundation which support or are capable of supporting one or more of the following plants:" (29 plants are listed). "Inland wetlands" are defined as including, but not limited to, Atlantic white cedar swamps (15 plants listed), hardwood swamps (19 plants specified), pitch pine lowlands (10 plants listed), bogs (12 plants identified), inland marshes (6 groups of plants listed), lakes and ponds, and rivers and streams.

As in the Hackensack Meadowlands, the Pinelands regulations focused on hydrophytic vegetation with a robust vegetation list to guide delineation in the field. But it also broke with the Army Corps / EPA definition to incorporate the new USFWS Cowardin classification system, which allowed for freshwater wetlands delineation to be based solely on hydric soils or hydrophytes or hydrology. The development of regulations for both the Pinelands and the Hackensack Meadowlands Acts involved significant community involvement and these experiences, along with the regulations themselves, informed the draft freshwater wetlands legislation that emerged in the coming years. In spite of these regional planning precedents it was still a heavy lift to convince legislators of the need for freshwater wetlands protection measures. A member of the environmental community recalled “When this debate started I’m willing to bet that 99% percent of the people in the legislature didn’t even know what a wetland was, and I know for a fact hardly any of them knew why they were important” (Passaic River Coalition Representative #1, 2006).

### **The path of the FWPA legislation**

In 1981 Assemblywoman Maureen Ogden (R - Essex) won a seat in state legislature, starting the first of what would be seven consecutive two-year terms in office. Ogden was motivated to address gaps in the Federal 404 program that led to development of freshwater wetlands near her home in Millburn, gaps she had helped identify by developing an Environmental Resource Inventory (ERI) for the Millburn Environmental Commission. Ogden was particularly concerned with the Army Corps mandate and growing recognition of its failure to determine freshwater wetlands boundaries based on consistent criteria, and so set to work shaping a general law to protect the state’s freshwater wetlands. This was a joint effort with her friend, Assistant State Planning Commissioner Candace Ashmun, the former director of the New Jersey Association of Environmental Commissions (ANJEC) whose prior involvement in the Great Swamp protection efforts and the Upper Raritan Watershed Association led to the development of the state’s very first ERI which informed scores of planning and zoning decisions in the Raritan River Basin. Ogden and Ashmun began their efforts by orchestrating a conference of

environmental representatives and state officials at the Chauncey Center in Princeton in March 1983. The forum, funded by the New Jersey Conservation Foundation (NJCF), was designed to bring everyone involved with the Pinelands Protection Act and the earlier Great Swamp legislative campaign together with those involved in the Watershed Associations to discuss the potential for comprehensive freshwater wetlands protection for New Jersey. The context was the Army Corps's Proposed Amendments to Section 404, published in 1983 (48 Fed Reg. 21,466; May 12, 1983), that sought to severely limit what would be included as "waters of the United States" under federal regulatory authority (Ashmun, 1999). The Chauncey conference yielded the immediate impetus for the first attempt at freshwater wetlands protection legislation in the state.

**1983: Conflicting definitions of freshwater wetlands forge alliances for their protection.**

Following the Chauncey conference Assemblywoman Ogden asked the Office of Legislative Services (OLS) to draft a bill with the aim of limiting the Army Corp's impact on the state's freshwater wetlands. An OLS staffer recalled that environmentalists identified elements for inclusion in the bill and OLS staff would draft the bill with appropriate language (Office of Legislative Services Research Staff #1, 1999). Ogden's "Inland Wetlands Bill," introduced in July 1983 and co-sponsored by Senator John A. Lynch (D-Middlesex), proposed local regulation generally, with county or state regulation where development crossed political boundaries. It applied the only comprehensive wetlands mapping system available for the state at the time, the 1:80,000 scale high-altitude, black and white aerials used by the US Geological Service (USGS) for topographic mapping and interpreted by the USFWS for wetlands. The bill built on the one-parameter Cowardin system adopted in the state's Pinelands, and relied on the USFWS Data Classification Standard for "Wetlands and Deepwater Habitats in the United States," to define wetlands and related terms (Ashmun, 1999).

As the sponsors expected, the "Inland Wetlands Bill" was quickly passed over in the New Jersey legislature when it was introduced in the summer 1983 session. But it did not escape notice entirely, gaining attention from state DEP Commissioner Robert Hughey, an outspoken critic of the Army Corps and its renewed attempt to scale back oversight and limit the extent of its jurisdiction over freshwater wetlands areas through proposed changes to the 404 Program. Having determined that under the Army

Corps's proposed regulations the 404 program would continue to be inadequate in protecting New Jersey's wetlands Hughey wrote to the Army Corps days after the introduction of Ogden's bill and, citing the bill extensively, announced that New Jersey would soon seek to implement its own laws regulating activities in freshwater wetlands (Hughey, 1983).

At the crux of Hughey's disagreement with the Army Corps was the definition of freshwater wetlands. Like the USFWS approach and as detailed in Ogden's "Inland Wetlands Bill," Commissioner Hughey favored a broad definition of wetlands to maximize their protection in the state. Meanwhile the Army Corps sought to define other terms (e.g. "inundated," "saturated," "prevalence of vegetation," and "typically adapted") more narrowly (48 Federal Register 21466 published May 12, 1983). And while Ogden's bill and NJDEP hewed to the original, more broadly interpreted 1972 CWA definitions of "adjacent wetlands" as "bordering, contiguous, or neighboring," the Army Corps Proposal suggested a drastic definitional shift, limiting adjacent wetlands to only those "bordering, contiguous, or immediately neighboring and having a reasonably perceptible surface or subsurface hydrological connection to a water of the United States." Ideological battles fought at the federal level found a new front in New Jersey.

When introduced, Ogden's "Inland Wetlands Bill" was not perceived as a threat by the state's powerful building and development lobby. It did, however, prompt discussions of the issues of wetlands definitions and regulation at the industry group level (New Jersey Builder's Association Counsel, 2001). New Jersey builders and developers had long struggled with the hodgepodge of wetland definitions, most specifically the confusing and conflicting Coastal Areas Facilities Review Act (CAFRA) legislation. In September of 1983, builder David Midelton filed a suit against the NJDEP in an attempt to force it to redefine the areas of existing wetlands law that were unclear. Having originally been given approval for the development of 350 units on his own property it was reported in *The Atlantic City Press* that Midelton found that as his project "filtered through Trenton's bureaucratic maze, questions arose concerning the amount of wetlands involved. Ultimately the state decided that two-thirds of the tract is wetlands and established a 118-unit limit." His challenge concerned "just what is wetlands and what is not, what are 'dry' wetlands and what are 'wet' wetlands, and whether

the state has the same authority over ‘freshwater wetlands’ as it does over ‘saltwater wetlands’” (Thursday September 15, 1983).

**1984: Defining wetlands, drawing battle lines.** Ogden and her staff worked hard to solicit input from the building and development community after the Inland Wetlands Bill was introduced, coordinating a series of roundtables and engaging in much back and forth to accommodate “the legitimate concerns of the people most affected when the bill becomes law” (Ogden, 1984). The bill was redrafted to reflect many of the concerns of these groups, but reliance on the Cowardin-based definition of “inland wetlands” remained unchanged. The severe April floods served as a springboard for the bill’s reintroduction in the June Assembly Session and it was backed by both New Jersey Environmental Protection Commissioner Robert Hughey and Charles Kulp, the New Jersey and Pennsylvania administrator of the USFWS.

Given the good faith negotiations with builders and developers, recent attention to issues of flooding, and what she believed was a clearly articulated statement of the flood protective benefits of freshwater wetlands, Ogden anticipated increased support from the development community. Unexpectedly, legislators with ties to the New Jersey Builder’s Association (NJBA) responded with their own version of a Freshwater Wetlands Bill sponsored by Assemblyman Dennis Riley (D-4<sup>th</sup> Dist) and 20 co-sponsors. Of paramount concern to NJBA was the inadequacy of existing regulatory definitions of wetlands when put to use in the field. They argued that “the lack of a clear definition has resulted in extensive litigation and costly building delays that are usually footed by the consumer” (Fisher, 1984). In their view Ogden’s bill lacked definitional specificity and failed to provide enough guidance for the applicant, or regulatory agency, to accurately identify freshwater wetlands. Criticism focused on the scale of the federal wetlands maps used, and a written definition of wetlands plant species seen as too open to subjective interpretation. Uncertainty over definitions in Ogden’s bill led to sponsor concern that too much land would be put off limits to development.

The Riley bill borrowed heavily from the July 25 1975 Army Corps definition of wetlands, the narrow draft version attacked by the Environmental Defense Fund and National Resource Defense Council and eventually revised in the 1977 definition. Per the definition of freshwater wetlands in

Riley's Bill No. 2348, an area had to have both predominantly hydrophytic vegetation AND predominantly hydric soil to be considered a freshwater wetland. The Riley bill further narrowed the scope of intended freshwater wetlands protection, stipulating that hydrophytic vegetation be "naturally occurring" and "growing vigorously."<sup>49</sup> It also categorically excluded all freshwater wetlands within the jurisdiction of the Army Corps of Engineers as well as areas supporting upland species, "wetlands artificially created due to manmade or natural obstructions," and areas "drained prior to the effective date of the act" (see Table 1).

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<sup>49</sup> This approach quickly came under attack by the New Jersey Department of Environmental Protection in their "Summary and Technical Review of the Assembly Committee Substitute for Assembly Bills No. 672 and 2348." The NJDEP criticized the lack of a scientific approach, writing:

Freshwater wetlands, for the purposes of this Act, are not defined scientifically. Specifically, the element which suggests that freshwater wetlands must be "naturally occurring and growing vigorously, but shall not include lands supporting upland vegetation" is not acceptable.

It described further in Technical Point 12:

"Naturally occurring" and "vigorously growing" is an unworkable and unacceptable qualifier of scientific definitions of wetlands. Vigorous growth may be influenced by soil contaminants, unusual and extreme climatic conditions, or other factor unrelated to the degree of value of wetlands. Degrees of vigor should not be a factor in evaluating permit issuance.



TABLE 1. 1984 DRAFT FRESHWATER WETLANDS LEGISLATION

Comparison of definitions of “freshwater wetlands” between draft bills

Ogden A-672	Riley A-2348
<p>“Freshwater wetland” is defined as:</p> <p>Any area, natural or man-induced, that is inundated or saturated by fresh surface water or groundwater frequently enough and for long enough duration that at least periodically supports hydrophytic vegetation or other aquatic life, or any area of hydric soils.</p> <p><u>Exclusions</u> -</p> <p>Pinelands, Hackensack Meadowlands, Coastal Wetlands</p>	<p>“Freshwater wetland” is defined as:</p> <p>Land areas defined as riverine, lacustrine or palustrine environments that contain hydric soils and where hydrophytic vegetation is naturally occurring and growing vigorously.</p> <p><u>Exclusions</u> -</p> <p>Pinelands, Hackensack Meadowlands, Coastal Wetlands</p> <p>Lands under Army Corps 404 permit program</p> <p>Lands supporting any plants requiring a portion of their root zone aerated during the growing season</p> <p>Previously drained areas</p> <p>Wetlands created due to manmade or natural obstructions</p> <p>Lands within the uppermost twenty acres of an intermittent stream corridor</p> <p>Wetlands within an isolated depression or discontinuous area of less than 10 acres.</p>

*From definitions to framing understandings of wetlands functions and values.* Riley and his co-sponsors heralded A-2348 as “a reasonable permit program that would balance the economic benefits of development against the public benefits of preservation,” criticizing what they viewed as the primacy of ecological values demonstrated in Ogden’s definition of freshwater wetlands (*The Star-Ledger*, 9/25/84). The sponsors quickly leveraged the lobbying power of the National Association of Industrial Office Parks (NAIOP) and NJBA to bring attention to the dispute. In a Center for Legal Education Video distributed by NAIOP to NJBA members throughout the state Morton Goldfine, Vice President for Law and Public Affairs for the developer Hartz Mountain and NAIOP strongman described the motives of the USFWS in shaping the Cowardin system: “The agency’s function is to maintain and maximize the area of habitat. That is their concern.” Furthermore, the sponsors encouraged attacks on the scientific premise of Ogden’s Bill A-672, questioning the ecological functions of freshwater wetlands identified, specifically freshwater wetlands as flood buffers. David B. Fisher, director of environmental affairs and planning for the New Jersey Builder’s Association (NJBA), criticized Ogden’s use of the floods to underline the need for freshwater wetlands protection. Quoted in a September 25, 1984 *Star Ledger* article he argued “It is misleading to contend that her bill would safeguard the public against future flood damages since many wetlands were along streams and rivers which were already strictly regulated by the DEP as floodplains. Contrary to popular belief, more and more literature and research indicates that wetland areas do not act as natural sponges for flood waters. Thus, the Ogden bill would provide very little, if any, additional protection against major floods.”

For many New Jersey residents, particularly those in the Passaic River Basin, such sentiments rang false. They had witnessed the disappearance of local freshwater wetlands and had cleaned out wet basements. The emerging research correlating flooding with wetlands degradation and disseminated by the Passaic River Coalition (PRC) and its umbrella organization, the Water Resources Coalition (WRC) as part of a campaign against a multi-million dollar flood diversion tunnel project proposed by the Army Corps, made sense. In addition, the USFWS report “Wetlands of the United States: Current Status and Recent Trends,” which drew on work conducted in partnership with the PRC and used Northern New Jersey and the Passaic River watershed as an example of urban impacts on

wetlands, had just been released, bringing national attention to the debates in New Jersey and exposing existing state wetlands policy as problematic (Tiner, 1984). Ten months earlier Charles Roman and Ralph Good published “Wetlands of the New Jersey Pinelands: Values, Functions, and Impacts” for the Division of Pinelands Research, Center for Coastal and Environmental Studies (Roman & Good, 1983). Roman and Good used the freshwater wetlands in New Jersey’s Pinelands to show how natural retention areas, following development, are no longer available to store water and ease the severity of floodwaters. The magnitude of freshwater wetlands filling in Passaic County as well as other counties within the Passaic River Basin was cited as contributing to the accelerated flooding problems within the Basin. PRC membership grew (Filippone, 2006).

When the Governor did not designate a public body to evaluate the flood tunnel proposals the PRC, using member dollars, initiated a cost-benefit analysis of structural vs. non-structural options to the flooding problem to rally opposition to the Army Corps tunnel proposal. Like the Roman & Good study its analysis focused on the environmental quality values of freshwater wetlands. In its report the PRC defined freshwater wetlands in terms of their functions, particularly their floodwater retention functions and reported on data collected over several years that showed how these functions were compromised by development (Filippone, 2006). The PRC distributed its findings widely, and through hundreds of presentations on wetlands throughout the region influenced the general conceptual understanding of wetlands functions as natural flood control and greatly influenced the shift in public sentiment about freshwater wetlands. Former director of the PRC’s Flood Plain Watch David Epstein recalls “Having real data, having real diagrams and information to show the legislators was very helpful in terms of getting them off the middle and to do something....I think the greater amount of public information about wetlands that was out there got all of the greenies revved up and to the table. But that isn’t necessarily the majority of either the population or the legislature. What it took to get that extra mile was to make the connection between the destruction of wetlands and the increase in flooding and the fact that the current laws weren’t working. That was information that we brought to the table in a very demonstrable way” (Passaic River Coalition Representative #1, 2006).

This time the PRC galvanized citizen opposition to more than just the tunnel project and Army Corps actions in freshwater wetlands. Press clippings from the time and testimony at multiple public hearings document public criticism of state and municipal policies that allowed and even encouraged development in the flood plain and, more specifically, to criticism of the Riley bill (Assembly Agriculture and Environment Committee, 1984). Municipal officials, under pressure to act, complained that their hands were tied and that they could not stop property owners from building. Officials like Mayor Nalesinik from flooded Fairfield asked for state intervention: “The state and the federal governments should declare they [wetlands] cannot be built upon” (Leith, 1984). Commissioner Hughey linked the ecological functions of freshwater wetlands to flood abatement, telling the Assembly Agriculture and Environment Committee “it makes no sense to, on one hand, spend hundreds of millions of dollars to resolve flooding problems in areas such as the Passaic River Basin, and on the other hand, aggravate flooding problems through the unnecessary filling of freshwater wetlands” (Hughey, 1984). By September he had called for a marriage of the Ogden and Riley bills. Commissioner Hughey asked that a compromise be “based on definitions that have been prepared by wetlands ecologists and soil scientists, and that are broad enough to include all of the freshwater wetlands, hydrophytes and hydric soils recognized by at least a substantial segment of the scientific community” (Hughey, 1984).

**1985: Tenuous compromise, impasse, and identification of shared goals.** Ogden and Riley appointed representatives to negotiate a compromise bill, drafts of which were discussed at multiple committee meetings. At the negotiating table were Tom Gilmore from the New Jersey Conservation Foundation (NJCF) and Tom Wells from the New Jersey Audubon Society (NJAS), both selected by Ogden. David Fisher from the NJBA and Lloyd Tubman, Counsel for the NAIOP represented building and development interests. None of the negotiators was a credentialled wetlands scientist. Introduced in early 1985, Assembly Committee Substitute for A-672 and A-2348 (now called “The Freshwater Wetlands Act”), jointly sponsored by Assemblywoman Ogden and Assemblyman Riley, represented months of hard work and considerable compromise on the parts of both the environmental and development interests.

The Ogden/Riley bill adopted the USFWS Cowardin approach to defining freshwater wetlands, reflecting DEP's request for scientifically based delineation criteria and a scientific definition. Per the draft legislation, wetlands would be defined by a one-parameter approach: by hydrology OR by a prevalence of hydrophytic vegetation OR by hydric soil conditions where a definitive vegetation determination was not possible. The vegetational definition also allowed for the temporary loss of hydrophytic vegetation during drought periods. Although the compromise bill passed various Assembly Committees the Assembly Speaker Alan J. Karcher (D-Middlesex) repeatedly refused to bring it up for a vote. As the newspapers of the time made clear, Karcher had ties to many in the building and development community who did not feel their interests were adequately represented in the new legislation and who were especially concerned with the broad scope of the proposed definition.<sup>50</sup>

Frustrated by Karcher's actions after months of good faith negotiation, Ogden decided to give the legislation a rest, change tactics, and launch an education campaign. Working again with Candace Ashmun she began to shape a plan to convince legislators and the public of the need for more stringent regulation by pointing out the inadequacies of existing regulation (Ogden, 1999). Crucial to the plan was tapping the energy and momentum of the PRC and its umbrella organization, the Water Resources Coalition (WRC). As was reported in the May 19, 1985 *Star Ledger*, the WRC's membership included 38 environmental groups, and had focused national attention on issues of freshwater wetlands degradation by calling upon Congress to remove the Army Corps from its role in protecting wetlands and invest authority with either the EPA or the USFWS.

With a grant from the Geraldine R. Dodge Foundation, and under the auspices of the Great Swamp Watershed Association, Ogden and Ashmun organized a two-day wetlands conference at Drew University June 7-8 1985, bringing state environmental groups together with wetlands experts and advocates from across the country. Called the "National Wetlands Conference," the organizers intended the event to be a national conversation about the impacts of federal regulations on wetlands degradation, a brainstorming session, and an opportunity to develop both tactics and strategy for a statewide campaign (Great Swamp Watershed Association, 1985). The June 9, 1985 *Star Ledger*

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<sup>50</sup> See, for example, the Atlantic City Press February 26, 1985.

reported that it was at the conference that, building on the resources of the WRC, the movement in the state to protect freshwater wetlands resources was formally established and given a name: the Freshwater Wetlands Campaign (FWC).

The National Wetlands Conference included opening remarks by NJDEP Commissioner Hughey and Governor Thomas H. Kean (R), who had called for passage of the compromise legislation in his state of the state address earlier in the year. Also involved was EPA Regional Administrator Chris Daggett, who was asked by Kean to provide insight into the federal processes of wetlands protection and to help move the discussion regarding a freshwater wetlands program. Daggett agreed to lend EPA staff support to the shaping of legislation if all parties involved agreed to two things: to work together, and to work toward state assumption of the federal 404 Program.

Although many in the building and development community were opposed to a freshwater wetlands protection law, they were increasingly frustrated by the layering on of conflicting wetlands regulations in the state. Added to the existing federal and state laws were two new levels of regulations: 1) stream encroachment permit requirements adopted as part of the Flood Hazard Control Regulations (a response to the 1984 flooding) and 2) NJDEP's now-extensive use of the 401(b) water quality certification program which requires that any applicant for a federal license or permit to conduct activity that "may result in any discharge" into navigable waters must obtain a certification from the state in which the discharge originates (Section 401(b) Water Quality Certification Program). While environmental interests were organizing the National Wetlands Conference, the NJBA petitioned NJDEP to establish a single methodology for delineating wetlands, but with the suggestion of assumption, and the promise of eliminating federal oversight and a layer of regulation, the development community became more interested in coming to the table.

While federal involvement in shaping state legislation would be onerous, adding another set of complicated rule-making to the policy-making process, both parties agreed to EPA involvement. Negotiations resumed with the goal of EPA conformance and with EPA staff helping to navigate the debate. The individual assigned to the task describes his predicament simply: "I was brought into a situation of warring camps!" (Federal Official #1, 2000) Major concessions were made by the sponsors,

and a new compromise bill #S-602 passed in the Senate in December with a modified definition of freshwater wetlands combining elements of the EPA/Army Corps definition with the one-parameter Cowardian standard for delineation. Still swayed by the development lobby Karcher again refused to post it for a vote.

**1986: Seeking a common goal.** Bowing to pressure from the NJBA, Riley withdrew from negotiations. Working with Senator Lynch, Ogden co-sponsored another piece of freshwater wetlands legislation, Bill A-2342/S-2003, introducing it in March 1986. Modeled after S-602, the compromise bill that passed in the Senate in December 1985, the Ogden/Lynch draft retained several of the negotiations worked out with the development interests and included additional notable changes. Most significantly the bill contained a new definition of wetlands aimed at bringing it into conformity with the federal definition. As reported by the *Star Ledger* on April 4, 1986, this definition, modeled almost exactly after the definition used by the Army Corps and EPA in the 404 Program since 1977 and vetted by the EPA staff member assigned to the case, “would mean the state could take over jurisdiction of wetlands from the federal government and eliminate the need for developers to go through two permit processes.”

A state official explained the scientific learning that accompanied the decision making around the issue of the definition in the legislature: “Environmental issues were relatively new. They were becoming more and more technical, and it required the environmental committees, especially the chair, to be much more knowledgeable about the substance of it. It was far less a political decision making process than it was a real attempt to get at the substance of some of the issues” (NJDEP Official #1, 2006). References in the S-602 definition to the Cowardin classification of hydric soil conditions as the determining factor where no definitive determination could be reached regarding the prevalence of hydrophytic vegetation were deleted, along with the exclusion for cultivated or disturbed hydric soils. A research associate at the Office of Legislative Services explains:

As the process wore on there was less and less debate about the data. There was less and less debate about what isn't hydrophytic vegetation or hydric soils...there was a recognition as we went on that there had to be some standard that everybody could agree to....They weren't going to put the executive agency into a discretionary mode where they'd have to make case by case decisions on whether in this case there was a hydric soil but in that case there wasn't!

The idea was to use the federal guidelines. It was the process of identifying mutually agreeable information as a basis that started making the information and the research less important to the political infrastructure that was going to have to make decisions (Office of Legislative Services Research Staff #1, 1999).

For the sake of political consensus and consistency with EPA definitional requirements for delegation of the federal 404 Program, Ogden relinquished her commitment to a rigorously scientific definition of freshwater wetlands. The DEP declared its full support for the major provisions.

Legislative in-fighting resumed when the builder's lobby countered, yet again, with a wetlands bill of its own in May 1986. This time the bill was sponsored by Assemblyman Jack Penn, a Republican from Somerset County (himself a developer) and 55 co-sponsors including Assemblyman Riley. Penn's Bill A-2499 emulated the 404 program structure but with significant weakening in key areas, including the definition of wetlands. While Penn's definition used elements of the EPA/Army Corps federal definition, it narrowed the definition significantly, exempting isolated wetlands of less than 5 acres, cultivated or disturbed wetlands soils not containing wetlands vegetation, and all soils with seasonal high water tables greater than 12" below the ground surface (See Table 2). Furthermore, Penn's bill, pegged to the federal CWA Amendments vetoed by President Reagan in the fall of 1985, could never have gone into effect. The sponsor of the Senate companion was Raymond Zane (D) from Salem County in the southern part of the state. Interestingly, Zane identified the physical divisions between North and South New Jersey as justification for a definition that strayed from federal conformance. Quoted in the December 16, 1986 *Star Ledger* he said "with South Jersey's flat terrain and relatively high water table, the legislation that relies on broad definitions would have a disastrous effect on most of South Jersey."

Responding to Penn's bill the Freshwater Wetlands Campaign launched into full gear, mobilizing more than 200 coalition partners and putting renewed vigor into its education efforts. They distributed fact sheets critiquing the definition of freshwater wetlands in Penn's A-2499 as "narrow and scientifically indefensible." The issue of a strong definition of freshwater wetlands became a refrain. The FWC worked to bring attention to the wetlands definitions both in terms of wetlands functions and in terms of the more rarefied one-parameter vs. three parameter wetlands delineation debates. Its



activism propelled the definitional discussions regarding the freshwater wetlands bill to municipal-level board and council meetings in the state. For example, the December 16, 1986 *Star-Ledger* reported that organizers protesting a development in Edison Twp. “argued with the developers’ definition of wetlands, stating that it incorrectly excludes land that had been farmed, but in its natural state should be wetlands.” A public consensus supporting a broader one-parameter definition of “freshwater wetland” for the state of New Jersey had been established. After several battles in the press and a petition drive in Penn’s district (coordinated by the FWC), Penn agreed to sit down and work toward a compromise. Several all day sessions later a compromise bill sponsored by both Ogden and Penn was shaped, passing in the Assembly in December 1986. But the definition of “freshwater wetland” in the compromise bill was not consistent with federal requirements for State assumption.

TABLE 2. COMPARING DEFINITIONS OF “FRESHWATER WETLANDS” IN DRAFT BILLS 1985-86

Compromise Bill S-602 (1985)	Ogden A-2342 (1986)	Riley A-2348 (1986)
<p>“Freshwater wetland” is defined as:</p> <p>Areas inundated or saturated by fresh surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation. Where no definitive determination can be reached that there is a prevalence of hydrophytic vegetation, the presence or absence of hydric soil conditions shall be the deciding factor.</p>	<p>“Freshwater wetland” is defined as:</p> <p>Any area, natural or man-induced, that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support aquatic life or a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.</p> <p>Activities in freshwater wetlands less than three acres in size and not contiguous to a surface water tributary may be regulated under a general permit, but are not exempt from the act.</p>	<p>“Freshwater wetland” is defined as:</p> <p>Areas inundated or saturated by fresh surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation, and where a hydric soil condition simultaneously exists, and where appropriate hydrologic conditions exist (defined as “lands where the water table is at or within 12 inches of the surface for a significant portion of the growing season” as determined by five foot piezometer readings from November to May), provided further that the area is 1) contiguous to an inland lake, pond, river, or stream, or 2) more than five acres in size, or 3) determined by NJDEP to be an area whose protection is essential to the preservation of the natural resources of the State from pollution, impairment or destruction.</p>

**1987: Federal agreement prompts consensus in New Jersey.** At this point a formal opinion was sought from the EPA regarding the suitability of the legislation for 404 delegation prior to Senate consideration of the bill. The legislation went under review by the Governor's office, DEP, and interest groups, and subsequently by the Senate Committee on Energy and the Environment. The compromise legislation was harshly criticized by Governor Kean, who described the bill as an embarrassment that had prevented him from trying to draw national attention to the wetlands issue. Kean announced, even before the Senate acted on the measure, that if it were adopted in the compromise form he would return it to the Legislature with a conditional veto, demanding a stronger bill. Maureen Ogden reacted to the Governor's demand for a stronger bill by saying that if there were to be one the Governor would have to play a more active role than he had done. Rumors of what was to come next, specifically hints of a moratorium on building in the wetlands, were circulated in editorials: "Mr. Kean ought to be willing to use the full power of the governorship to achieve this important goal" (*Star Ledger Viewpoint*, April 5, 1987).

Dozens of drafts later the parties eventually resolved their fundamental dispute on the definition by agreeing to define freshwater wetlands using the Wetland Identification and Delineation Manual developed in partnership by the EPA, Army Corps and USFWS that had just been published by the EPA on April 1, 1987. The manual emerged out of the USFWS's National Wetlands Inventory and its attempt to establish a set of national identification procedures for freshwater wetlands. This definition followed the Army Corps standard and required that a freshwater wetland be designated using the three-parameter approach (vegetation and soils and hydrology). A regulator involved in the policy-making process describes working with the federal definition of freshwater wetlands as "the one positive aspect of having to incorporate the federal stuff into the process" (Federal Official #1, 2000). While the developers were still not happy with the federal definition, they accepted it as the most credible definition and agreed that it had the most science behind it. And while Ogden and the FWC felt the three-parameter definition was far too limited, they accepted it as a means of moving forward. All parties involved recognized the lengthy process the federal agencies had gone through in developing the definition: "There were all these agencies that didn't necessarily agree about how to

regulate - the Fish and Wild Service didn't agree with how the Army Corps of Engineers was doing its job, and the EPA was somewhere in between - but you had all these agencies agreeing on a definition, so that gave it credibility. It was public policy credibility beyond just hours and science invested" (Federal Official #1, 2000). With agreement on a definition Governor Kean could step in, as he did on June 8, 1987, and, following Governor Byrne's precedent in dealing with the Pinelands, issue a moratorium on all construction in wetlands until a protection law was passed.

### From wasteland to wetland

In June 2006, a divided US Supreme Court handed down a ruling in *Rapanos v. United States* governing protected wetlands and streams. In its ruling the Court provided interpretation and clarification of the scope of the Clean Water Act of 1972, effectively limiting the CWA's potential reach over thousands of small streams and wetlands. The questions before the Court on the February 2006 docket sought clarification of "the waters" and "wetlands" of the United States, specifically the extent to which wetlands are protected under the CWA.<sup>51</sup> The Court resolved the conflict by defining "the waters" of the United States to explain how they were originally referenced in CWA 1362(7), but effectively left the definition of "wetlands" untouched. Eschewing input from scientific and environmental experts they decided to shape a definition using the 2<sup>nd</sup> Edition of Webster's New International Dictionary. It concluded: "The use of the definite article 'the' and the plural number 'waters' show plainly that 1362(7) does not refer to water in general, but more narrowly to water '[a]s found in streams,' 'oceans, rivers, [and] lakes.'"

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<sup>51</sup> The questions before the court were:

Does the Clean Water Act prohibition on unpermitted discharges to "navigable waters" extend to nonnavigable wetlands that do not even abut a navigable water?

Does extension of Clean Water Act jurisdiction to every intrastate wetlands with any sort of hydrological connection to navigable waters, no matter how tenuous or remote the connection, exceed Congress' constitutional power to regulate commerce among the states?

The *New York Times* reported that the Court's decision left a "muddled definition of what constituted a protected waterway (Broder, 2007)." The Army Corps and EPA, the agencies responsible for implementation of the CWA, must now struggle with a host of uncertainties relating to the actual reach of Federal regulation. While lack of clarity and conflicting court decisions contribute to the confusion, conflicts between science and policy are what truly stymie. With respect to democratic debate and accountability, seeking clarification from Webster's is clearly different from seeking advice from environmental experts or those knowledgeable about wetlands, watersheds and ecological systems. It is apparent at least to those on the ground that the science of wetlands and their protection did not weigh in the Court's decision but rather that it focused solely on geographical limits to its regulation. The scientific and political are thus alienated, and regulators can do little but flounder at the boundary between them.

In 1983 in New Jersey defining freshwater wetlands and creating the artifact of a freshwater wetland moved the state a few steps away from the regulatory difficulties faced by the Army Corps and EPA. The New Jersey case is instructive in that it illustrates how the state clarified regulatory reach and streamlined processes through the co-production of science and policy. We see, too, the important role of social movement organizing, and can begin to identify the co-production of freshwater wetlands science and both citizen-scientists and activist-scientist identities. In this we observe the process by which science legitimizes a social movement organization as credible and authoritative, and recognize an opening to more democratic and directly participatory arrangements of science advising.

Tracing the construction of a definition of freshwater wetlands in the state reveals the interdependence of the development of a new scientific field (or at least novel ways of knowing about science) and a new community of practice and advocacy. Attention is given to two aspects of the definitions question. First, the evolution of a definition of freshwater wetlands for regulatory purposes is observed in the sense of bringing wetlands into focus as an issue of concern, and bringing attention to how and why they are valued. Second, we observe the processes by which freshwater wetland

characteristics were identified and defined for the purposes of enacting legislation to protect them. The definition of freshwater wetlands in New Jersey shares its biography in part with this new community of practice and advocacy, the environmental movement that would eventually become the Freshwater Wetlands Campaign. We see this new community of citizen scientist activists evolving as a movement, and observe processes by which environmental actors in New Jersey worked to make a place for, and then establish, their authoritative knowledge about freshwater wetlands by applying the concepts of frames and of the social construction of technology (SCOT).

This case begins by observing how a small group of citizens working to document environmental change over time managed to establish a substantive knowledge base and the political savvy to link the observed changes to regulatory irregularities and to prove the failure of official institutions to adequately regulate freshwater wetlands. Although reluctant scientists - the expertise of New Jersey's backyard citizens initially emerged from their interest as naturalists, not ecologists - these actors recognized an opportunity to leverage their scientific knowledge in opposition to the more mechanical, technological ontology of the primary regulating agency, the Army Corps. The use of science by citizen scientists to identify the failings of the Army Corps to adequately protect freshwater wetlands helped legitimize appeals for improved understandings of freshwater wetlands functions. Science was also used to provide the rationale for, and give legitimacy to, the FWC as an entity that could comprehensively catalogue and disseminate knowledge about freshwater wetlands and the impacts of their degradation. We see science used differently based on the need to identify regulatory failure versus the FWC's shifting purpose of defining the scope of a new regulatory approach.

The push-pull of competing frames was crucial in shifting the geographic reach of Assemblywoman Ogden's proposed legislation and in establishing a general consensus for the need for a state-specific freshwater wetlands protection bill. Ogden originally framed freshwater wetlands degradation as a local environmental impacts issue, seeking municipal control over land use decisions that affected freshwater wetlands based on the environmental knowledge held by municipal Environmental Commissions (ECs) and accumulated in the course of EC-coordinated activities like environmental resource inventories (ERIs) and environmental impact statements (EISs). The building

and development community also perceived freshwater wetlands as a problem, but framed it as a regulatory issue, suggesting the need to streamline the multitude of overlapping and often conflicting laws addressing their protection. Alarmed at the prospect of additional layers of permitting requirements at the local level, the building and development community framed the issue of freshwater wetlands regulation as a problem of definitional clarity and as a state-level responsibility. In this way it presented Ogden and the ECs a rationale for developing a credible and resonant counter-frame with the notion of freshwater wetlands degradation as an ecosystem impacts problem that transcended municipal boundaries that thus required a broad ecologically-sensitive scientific definition of a freshwater wetland - a definition distinct from the one developed by the regulated community that focused on defining the elements common to all freshwater wetlands. The builder's proposal simply served to bring attention to discussions regarding science and the need for comprehensive land management.<sup>52</sup> Furthermore, in the re-framing of the geography of concern from the local to the state, the building/development community brought attention within the environmental community, a formerly disparate collection of locally-based environmental groups forwarding knowledge claims about freshwater wetland impacts (groups including the institutionally-positioned ECs and state watershed associations), to the need for a state-wide environmental movement for freshwater wetlands protection.

Examining the case from a SCOT perspective we observe that two different artifacts existed, or were being formed. The first one, the regulatory artifact forwarded by the Army Corps, was truly not much of an artifact. As originally defined by the Army Corps, freshwater wetlands were viewed simply

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<sup>52</sup> We see intimations of this perspective on the parts of the environmentalists in a position paper developed after Ogden's legislation was first introduced. The New Jersey Audubon society wrote:

While the NJAS does support current legislation, we have reservations about placing wetlands regulation in the hands of local municipalities. The track record shows that land use decisions made by local planning and zoning boards tend to be economically motivated and development oriented. The ecological value of land is given short shrift. Furthermore, biological and ecological technical knowledge that should guide such decisions is often lacking on the local level. Wetlands and waterways, which are linear ecosystems unconfined by municipal and political boundaries, would be better served by regional or state management with strong technical support and scientific objectivity (New Jersey Audubon Society, 1983).

as a function of hydrology and were defined as tangible hydrologic objects. The second scientific artifact forwarded by the environmental community emphasized the functions and values of diverse wetlands resources. Through knowledge production at the grassroots and the deployment of emergent expertise New Jersey's freshwater wetlands soon became much more complicated: they became hydrologic, hydrophytic and hydric ecological artifacts.

Although New Jersey did not ultimately produce a distinctive state-specific definition of freshwater wetlands, incorporating instead the new federal regulatory definition of freshwater wetlands established in April 1987, it did establish a new policy area in the state, successfully incorporating freshwater wetlands into state-level comprehensive resource planning. The idiom of co-production can be usefully deployed to understand this process as well. The original impetus for freshwater wetlands protection legislation emerged as part of a push for local autonomy and control over development, and coincided with Reagan's inducements for devolution of federal regulatory authority over freshwater wetlands to the states. Definitional clarity was sought first through administrative means, and then the need - and the opportunity - to legislate became clear. Working with the concept of devolution New Jersey could entertain the thought of regulating freshwater wetlands without the interference of competing agencies, and it could establish both a new regulatory and scientific authority. The opportunity to assume the federal program also gave the state the freedom to adopt definitions it felt appropriate, and to compromise. It had the freedom to engage in debates over the values of freshwater wetlands and how the various definitions spoke to these values.

Although the final determination of, and closure around, a definition of "freshwater wetland" in New Jersey ultimately relied on involvement of the sovereign, stabilization of a definition at the federal level was not a foregone conclusion prior to New Jersey's efforts to seek assumption of the Federal 404 Program and prior to the state's seeking of guidance in shaping its new regulatory technological artifact. We have reason to believe that the definitional debates at the state level in New Jersey, and the desire on the part of the federal government to devolve regulatory responsibility for Section 404 of the CWA to the state, ultimately prompted the federal deliberations that led to MOA between the Army Corps, the EPA and the USFWS that brought about the common federal definition.



In this case we see that in New Jersey the construction of a freshwater wetland as a technological artifact requiring regulatory oversight to protect it from human impacts brought about a significant shift in the ordering of environmental governance in the state. Federal control over freshwater wetlands was deemed inadequate, and a state institution (the NJ DEP) was vested instead with the authority to regulate. Tracing the history of the FWPA in general, and the emergence and stabilization of a state-specific definition of freshwater wetland in particular, we see an intimate link between the construction of a regulatory definition-as-artifact and the construction and emergence of a social movement organized around its protection. In this we begin to understand that we cannot adequately appreciate these shifts in political order without conceptions of the agency of social movement actors, or without theories of social movement emergence and mobilization. The initial historical summary of perceptions of freshwater wetlands over time, and the development of federal and state definitions, is provided to both give a sense of the significant shift in understandings of wetlands as valueless to valuable in the latter part of the last century, and to illustrate how the tensions over regulatory vs. scientific definitions brought freshwater wetlands into focus as a policy area. We see that the science of freshwater wetlands did not pre-exist the policy in New Jersey, nor did it exist in its current form until social movement activists, organizing as the FWC, brought it to bear through education campaigns and the strategic collective effort of constructing a science of freshwater wetland. We observe these activities as both tactics of movement organizing and tools for micro-mobilization, and we begin to understand how knowledge production and the creation and deployment of a substantive expertise about freshwater wetlands were equally as fundamental to the creation of the FWC as they were to defining “freshwater wetland” in the state.

## Chapter Four: Reference List

Armitage, S. (2008). *Sir Gawain and the Green Knight (A New Verse Translation)*. London: W.W. Norton & Co.

Ashmun, C. (9-24-1999). Interview with Candace Ashmun, former Executive Director of New Jersey Environmental Commissions (ANJEC) -- conducted by Heather Fenyk and David H. Guston.

Ref Type: Personal Communication

Assembly Agriculture and Environment Committee. (8-6-1984). Public Hearing before the Passaic River Restoration Subcommittee: Flood Control Proposals for the Passaic River Basin. Assembly Agriculture and Environment Committee, Passaic River Restoration Subcommittee.

Ref Type: Hearing

Bartram, W. (1958). *The Travels of William Bartram: Naturalist's Edition*. New Haven: Yale University Press.

Batzer, D. P. & Sharitz, R. R. (2006). *Ecology of Freshwater and Estuarine Wetlands*. Berkeley, CA: University of California Press.

Broder, John M. (2007, July 6). After Concerted Lobbying, Rules Governing Protected Wetlands are Narrowed. *The New York Times*.

Chickering, H. D. (1977). *Beowulf: A Dual-Language Edition*. New York: Doubleday Anchor.

Cowardin, L. M., Carter, V., Golet, F. C., & LaRoe, E. T. (1979). *Classification of wetlands and deepwater habitats of the United States* Washington, DC: U.S. Department of the Interior Office of Biological Services.

Environmental Protection Agency. (2013). EPA History: The Birth of EPA. Washington, DC, Environmental Protection Agency. 11-24-2013.

Ref Type: Online Source

Federal Official #1. (2000). Interview with Federal Official #1 -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Filippone, E. (6-22-2006). Interview with Ella Filippone, Executive Director of the Passaic River Coalition -- conducted by Heather Fenyk.

Ref Type: Personal Communication

FindLaw for Legal Professionals. (2013). LEONARD v. VICKSBURG, SHREVEPORT & P R CO, 198 U.S. 416 (1905). 11-24-2013.

Ref Type: Online Source

Fish and Wildlife Service (2002). *National Wetlands Inventory: A Strategy for the 21st Century* Washington, DC: Fish and Wildlife Service.

Fisher, D. B. (1984). New Jersey Builder's Association.

Ref Type: Pamphlet

Great Swamp Watershed Association. (1985). Great Swamp Watershed Association Newsletter. Great Swamp Watershed Association.

Ref Type: Pamphlet

Harper, D. (2013). Online Etymology Dictionary. Lancaster, PA. 9-21-2008.

Ref Type: Online Source

Howarth, W. (1999). Imagined Territory: The Writing of Wetlands. *New Literary History*, 30, 509-539.

Hughey, R. (7-8-1983). Letter from Robert Hughey, Commissioner NJDEP to William R. Gianelli, Assistant Secretary of the Army - Civil Works.

Ref Type: Personal Communication

Hughey, R. (9-24-1984). Statement of Honorable Robert E. Hughey, Commissioner NJDEP. 672 and 2348. Assembly Agriculture and Environment Committee.

Ref Type: Hearing

Knetsch, J. (2004). *A brief history of swamp and overflowed lands*. Professional Surveyor Magazine.

Leith, Rod (1984, April 12). Building in wetlands: tomorrow's disaster. *The Bergen Record*.

Mitsch, W. J. & Gosselink, J. G. (2007). *Wetlands*. (4th ed.) New York: John Wiley & Sons, Inc.

National Research Council (1995). *Wetlands Characteristics and Boundaries* Washington, DC: National Academy Press.

National Resources Council Water Science and Technology Board (1995). *Wetlands: Characteristics and Boundaries* Washington, DC: National Academy of Sciences.

New Jersey Audubon Society. (1983). Position Paper on Inland Wetlands Bill.

Ref Type: Pamphlet

New Jersey Builder's Association Counsel. (7-21-2001). Interview with New Jersey Builder's Association Counsel -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Niering, W. A. (1985). *Wetlands*. New York: A.A. Knopf.

NJDEP Official #1. (6-22-2006). Interview with NJDEP Official #1 - conducted by Heather Fenyk.

Ref Type: Personal Communication

Office of Legislative Services Research Staff #1. (4-28-1999). Interview with Office of Legislative Services Research Staff #1 -- conducted by Heather Fenyk and David H. Guston.

Ref Type: Personal Communication

Ogden, M. (9-24-1984). Statement before the New Jersey Assembly Agriculture and Environmental Committee on Assembly Bills 672 and 2348. 672 and 2348. Agriculture and Environmental Committee.

Ref Type: Hearing

Ogden, M. (4-15-1999). Interview with Maureen Ogden, former New Jersey State Assemblywoman -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Passaic River Coalition Representative #1. (3-22-2006). Interview with Passaic River Coalition Representative #1 - conducted by Heather Fenyk.

Ref Type: Personal Communication

Roman, C. T. & Good, R. (1983). *Wetlands of the New Jersey Pinelands: Values, Functions and Impacts* New Brunswick, NJ: Division of Pinelands Research, Center for Coastal and Environmental Studies.

Semeniuk, V. & Semeniuk, C. (1997). A geomorphic approach to global classification for natural inland wetlands and rationalisation of the system used by the Ramsar Convention - a discussion. *Wetlands Ecology & Management*.

Shakespeare, W. (1972). Macbeth. In S. Barnet (Ed.), *The Complete Signet Classic Shakespeare* (pp. 1227-1136). New York: Harcourt Brace Jovanovich.

Shaw, S. P. & Fredine, G. (1956). *Wetlands of the United States - their extent and their value to waterfowl and other wildlife: Circular 39* U.S. Department of the Interior.

Stine, J. K. (1983). Regulating Wetlands in the 1970s: U.S. Army Corps of Engineers and the Environmental Organizations. *Journal of Forest History*, 27, 60-75.

Tiner, R. (1984). *Wetlands of the United States: current status, recent trends*. Washington, DC.

Tiner, R. W. (1985). *Wetlands of New Jersey*. Newton Corner, Mass.: U.S. Fish and Wildlife Service.

Tiner, R. W. (1999). *Wetland Indicators: A Guide to Wetland Identification, Delineation, Classification, and Mapping*. Boca Raton, FL: Lewis Publishers.

US Army Corps of Engineers (1978). Press Release, Department of Army, Office of Chief of Engineers May 6, 1975. In Environmental Policy Division of the Congressional Research Service of the Library of Congress (Ed.), *4 Legislative History of the Clean Water Act of 1977: a continuation of the legislative history of the Federal Water Pollution Control Act: together with a section-by-section index* ( Washington, DC: US Library of Congress.

## CHAPTER FIVE: WETLANDS BUFFERS

Buffers were the ugly ducklings of the wetlands campaign. Most developers couldn't stand to look at them, environmentalists embraced them as only a mother could, and legislators were torn between the two views but felt that if the buffers could be made smaller and given a classier name, they might become more attractive. So buffers were reduced in size and given a new title. We now have transition areas.

-Tom Gilmore, Former Director of the New Jersey Audubon Society (5-28-1988)

Under the New Jersey Freshwater Wetlands Protection Act (FWPA) certain wetlands in the state may receive different levels of protection with an expanded vegetated perimeter, or “transition area,” off-limits to development.<sup>53</sup> After the definitions debate, described in chapter four, regulatory “buffers” or “transition areas” were the most contentious issue of the FWPA process. In settling the definitions dispute all relevant actors agreed that development should not occur within the boundaries of wetlands as defined. With respect to freshwater wetlands buffers however, environmentalists argued that the decision of developers to build right up to the edge of wetlands could be just as fatal to wetlands as no protection at all. They lobbied for a buffer zone to extend 300 feet from the wetland. Developers lobbied for no buffer. Without agreement on the distance no wetlands protection was possible. An uncertain science, lack of standards, and the strength of the interests conspired to prevent compromise until legislators decided to split the difference between the two major proposals for the extent of the buffer zone, setting New Jersey's maximum regulatory transition zone widths at 150 feet.

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<sup>53</sup> The FWPA rules define a transition area as “an area of land adjacent to a freshwater wetland which minimizes adverse impacts on the wetland or serves as an integral component of the wetlands ecosystem.” The need for additional protection via regulated transition areas is identified by assessing each wetland and assigning to it one of three resource value classifications. Freshwater wetlands with threatened or endangered State or Federally-listed species, and those adjacent to high quality waterways (trout production waters), are called “exceptional value” wetlands and are provided with additional protection through larger (75-150 ft) upland regulated transition areas. “Intermediate resource value” wetlands are protected with smaller (25-50 ft) regulated transition areas. Some wetlands are referred to as “ordinary resource value” wetlands and are provided no regulated upland transition area (N.J.A.C. 7:7A Freshwater Wetlands Protection Act Rules Statutory Authority: N.J.S.A. 13:9B-1 et. seq.).

New Jersey broke new ground in legislating regulation of transition areas as part of the FWPA. While it was not the first state to attempt to control development in uplands adjacent to freshwater wetlands it was the first (and remains the only) state to incorporate the regulation of these areas into state assumption of Section 404 of the federal Clean Water Act Program. At the time the agencies responsible for Federal 404 Program oversight, the Army Corps of Engineers and the Environmental Protection Agency (EPA), did not require protections of upland areas as part of the assumption process and would not for more than a decade.<sup>54</sup> Wetlands buffers science was under the federal radar, and national regulatory standards did not exist. New Jersey legislators entered into the process of setting regulatory transition area widths on their own, and because of political demands for regulatory specificity in the bill, were also ultimately forced to debate the criteria by which New Jersey's freshwater wetlands buffers would be delineated, an activity typically in the realm of regulators. No authoritative science existed to guide the legislators in their decision making, presenting yet another challenge to the legislative process. Legislators relied on constituents, who had demonstrated substantive knowledge of wetland buffers functions through advocacy efforts, to interpret the emerging freshwater wetlands buffers science and translate it for meaningful insertion into the legislation.

This research begins with a review of the scientific literature on freshwater wetlands buffers and transition areas published between 1972 and 1990. This review helps me identify the dominant themes and salient aspects of the academic literature that would have informed New Jersey's deliberations in the 1980s and gives insight into the processes by which freshwater wetlands buffers developed as a sub movement of the push for freshwater wetlands protection in the state. I then draw on a typology developed by Castelle et al. (1992, 1994) to identify and classify regulatory precedents for freshwater wetlands buffers and transition areas in mid-20<sup>th</sup> Century U.S. environmental policy. This exercise gives insight into the different epistemological and ontological bases of the approaches to

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<sup>54</sup> On March 9, 2000 Army Corps issued final notice in 65 Fed. Reg. 12818 et seq. imposing a new "general purpose" Nationwide Permit (NWP) Number 39 requiring vegetated buffers of 25-50 feet around perennial and intermittent streams and other open waters. NWP 39 now stands in lieu of NWP 26, which applied to discharges of dredged or fill material into headwaters and isolated waters of the United States.



buffer area determinations forwarded in the various versions of the proposed legislation, and we can see how the final criteria evolved over time.

My research then directly addresses the New Jersey context, tracing the pre-FWPA understanding and regulation of these upland areas in the state and examining how the “artifact” of a wetlands buffer evolved in the FWPA legislation between 1983 and 1987. As in the definitions case I draw on frame and the social construction of technology (SCOT) as analytic constructs to better understand how science was created and used. I consider how the need for science was framed, how the artifact of the freshwater wetland buffer changed over time, and how New Jersey came to closure in determining the final regulatory buffer width. Through these analyses I show that New Jersey’s freshwater wetlands “transition areas” would likely not exist had the environmental advocates not deployed a homegrown science to underscore claims for their protection and, in doing so, established for themselves a place at the negotiating table. The idiom of co-production takes us a step further, bringing attention to the relationships between these new scientific discourses and new social identities, and the new legislative processes - direct constituent engagement in rule making - that emerged around them. I conclude by suggesting that what appears as a mechanized, political solution to a stubborn debate in “splitting the difference” between interests should not be viewed as strictly socially determined but requires a balanced analysis.

**A note on terms:** The terms “transition area” (also “zones of transition” or “transition zones”) and “buffer zone” (often simply referred to as “buffers”) have long been interchanged. Both terms are used to describe the realm of the “ecotone,” a word formed from the combination of eco(logy) and -tone, from the Greek *tonos*, or tension. The Encyclopedia of Environmental Science defines ecotones as “a boundary area or *buffer zone* between two adjacent ecosystems, such as a tract of savanna between grassland and forest...although the borders can be marked by abrupt changes in ecological character, they are most commonly *zones of transition* in which overlapping and interdigitation lend the ecotone some of the characteristics of both of its contiguous ecosystems” [emphasis added] (Alexander, 1999). The scientific literature provides greater distinction in the use of these terms, most frequently referring to “transition areas” as an aspect of the ecological realm while giving “buffers”

regulatory overtones specific to protection of a wetland resource. For example, (Odum, 1983) describes the areas of habitat where two or more distinctly different ecosystems meet (and are in tension) as the “transition area” between two ecosystems. (Vought, Dahl, Petersen, & Lacoursiere, 1994) defines a “buffer zone” as an area that serves as a barrier limiting impacts on water (or other resource) quality from upland activities. These distinctions have gone largely un-theorized in the scientific and regulatory literature.

Although New Jersey legislated regulation of “transition areas” adjacent to the state’s freshwater wetlands, the research conducted for this study revealed the terms “buffer” or “buffer zone” used almost to the exclusion of “transition areas” in the historical documents (newspaper articles, videos, organizing material, public hearing records and draft legislation). Similarly, with few exceptions, the individuals interviewed for this research use the term “buffers” and not “transition areas” or “transition zones” in their recollections of events.<sup>55</sup> Any inconsistency in the use of the terms “buffer zone” and “transition area” will reflect the actual use of the terms in the context of the research findings. In addition, the terms “regulated” or “regulatory” will precede (or follow) “buffer zone” and “transition area” where necessary when the goal is to distinguish the limited regulated areas from references in the scientific literature, which generally use “buffer zone” and “transition area” to refer specifically to the broader ecological realm of upland adjacent to the wetland.

### **Buffers for wetlands in the scientific literature**

Following the anti-pollution mandate of the CWA, in the United States the most common goals in regulating development and other uses in the uplands adjacent to a freshwater wetland include attempts to intercept pollution, manage environmental concerns around protected water resources, moderate the effects of stormwater runoff, and provide essential habitat for wetland-associated species (Castelle, Johnson, & Connolly, 1994). These benefits are achieved through buffer zone “functions,” the environmental processes including the filtering of suspended solids, nutrients, and

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<sup>55</sup> Cognizant that a preference for “buffer” over “transition area” may in part be a factor of the terms used in the interview protocol, what follows reports on the terms as used in the historical and interview materials and analyzes the context for intent when necessary.

harmful or toxic substances; stabilizing soil to prevent erosion; providing cover for safety, mobility and thermal protection; blocking noise and glare; reducing sedimentation and nutrient input; and providing visual and physical separation from human uses. Documentation of these functions, and minimum effective buffer widths by which to maintain them, began to emerge in scientific literature in the early 1970s.

Although research accumulated rapidly, the benefits of upland area protections for freshwater wetlands remained “intuitive or unverified hypotheses in the eyes of opponents of comprehensive environmental land use planning” (Kudrna, 1979). Post facto assessments of the regulatory buffer width standards and recommendations of the 1980s suggested that these early regulations were shaped “with significant regard for political acceptability but with little consideration of scientific data” (Castelle et al., 1994). Setting regulatory buffer widths is an exercise in risk management, requiring evaluation and trade-offs between environmental, political, and economic risks. Defining or delineating wetland buffers relies on good science “both to achieve good results and to meet any legal challenges to regulation of activities” (McElfish, Kihlslinger, & Nichols, 2008). To better understand the rise of wetlands buffers as an issue of concern, and the state of buffers science available for incorporation in the regulatory buffer definition and delineation exercises of the 1980s, this section provides an account of the emergence of the science of buffers for wetlands. It starts by situating the science of buffers for wetlands in the general wetlands science field then moves to a summary and analysis of the buffers-related literature and conference proceedings published between 1972 and 1990.

**Methodology.** The definitions question described in Chapter Four began as a dispute over environmental values and morphed into a debate over what constitutes a freshwater wetland vs. what constitutes a regulated freshwater wetland. But the buffers question described in this chapter was initially framed as one of greater uncertainty - weren’t freshwater wetlands themselves buffers? And the building community debated environmental actors regarding the primacy of regulatory vs. scientific certainty. Scientific concepts relating to the definition of freshwater wetlands, freshwater wetlands buffers, and freshwater wetlands mitigation varied at the time these debates were engaged in New

Jersey. From my preliminary research I had a sense that New Jersey's environmental community was at the vanguard of freshwater wetlands buffers science and sought to improve my understanding of how New Jersey environmental community's conceptions of buffers science fit into and augmented the emerging academic freshwater wetlands buffers science literature. For this reason I give special consideration to scientific literature generated about freshwater wetlands buffers at the time of these debates, and I found that my earlier sense was justified in that New Jersey's environmental actors and the FWC truly were at the forefront of transition area research at the time.

Four databases of scientific literature (Environmental Sciences and Pollution Management, Aquatic Pollution and Environmental Quality, Water Resources Abstracts, and Aquatic Sciences and Fisheries Abstracts Aquatic Pollution) were queried for the earliest records available (in this case, 1972) through 1990. The advanced search features of CSA Illumina allowed for sorting by pairs of terms: wetland AND buffer, wetland AND buffers, wetland AND transition, buffer AND transition, buffers AND transition. Articles that focused exclusively on coastal or riparian buffers and transition areas were excluded.<sup>56</sup> A total of 48 articles, books, and summaries of conference proceedings met these criteria. These documents are summarized in Table 3.

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<sup>56</sup> Although aspects of the more robust coastal and riparian research continually informed the freshwater buffers science, coastal and riparian upland ecologies are distinct from freshwater wetlands uplands and the goal with this research is to understand the development of a body of scientific research specific to freshwater wetlands uplands.

TABLE 3. WETLANDS BUFFERS AND TRANSITION AREAS LITERATURE SEARCH RESULTS

Retrieved March 7, 2011

	Environmental Sciences and Pollution Management / Aquatic Pollution and Environmental Quality (CSA Illumina)	Water Resources Abstracts (CSA Illumina)	Aquatic Sciences and Fisheries Abstracts Aquatic Pollution
wetland AND buffer	15	16 (+2 duplicate)	2 (+2 duplicate)
wetland AND buffers	11	(8 duplicate)	(2 duplicate)
wetland AND transition	17	(13 duplicate)	4
buffers AND transition	1	1	0
buffer AND transition	6	(1 duplicate)	0

The literature search was conducted on March 7, 2011 using four Rutgers University Libraries Indexes and Databases: Aquatic Pollution and Environmental Quality; Aquatic Sciences and Fisheries Abstracts; Environmental Sciences and Pollution Management; and Water Resources Abstracts. Search parameters were limited to the earliest records available through 1990 and included all sources and all language hits. The search yielded 48 unique articles.

**Summary of literature.** The earliest references to buffers or transition areas identified in my query situated the concepts in the path of an emerging new field of freshwater wetland science. Schools of forestry and marine science, driven largely by conservation principles, spearheaded the nascent wetlands science of the 1950s. Field studies of the 1960s identified links between disturbances in adjacent upland areas and changes in the biological, chemical, and physical properties of riparian streams and coastal wetlands. These studies contributed to a growing body of riparian and coastal area buffers function data. By the 1970s this scientific data was parlayed to economic arguments for using freshwater wetland ecosystems as “buffers” against flooding (Gupta, 1972; Kadlec & Tilton, 1979). Ecologists began to outline a formal statement of research needs specific to the land-water interface, seeking better distinctions between freshwater wetlands and their upland areas, and calling for detailed research regarding the scientific functions of wetlands buffers (Kudrna, 1979). The articles that followed described buffers and buffer ecology, framing them as integral elements of wetlands ecology (Wetzel, 1979; Porter, 1981; Wharton, Kitchens, Pendleton, & Sipe, 1982; Shisler, Waidelich, Russell, & Piel, 1987) and presented techniques for research and monitoring (Zedler, Josselyn, & Onuf, 1982; Turner, McKee, Sikora, Sikora, & Mendelssohn, 1984). Refinement in presentations of ecological functions continued throughout the 1980s (Feierabend, 1989; Carter, 1990; Holland, Whigham, & Gopal, 1990; Szczepanski, 1990; Parikh, Ferren, Jones, & Callaway, 1990). The push for wetlands protection in the late 1970s and early 1980s saw “an increasing need for the accurate delineation of wetlands for planning and conservation purposes” (Sharp & Keddy, 1986) and prompted intensified scrutiny of uplands areas in descriptions of techniques for wetland delineation (Anderson, 1977; Anderson, Lefor, & Lennard, 1978; Johnson, Mayes, & Sharik, 1982; Fletcher, 1983; Roman & Good, 1983; Hart, 1984; Vaughn, Cooper, Brashwell, & Hart, 1984; Sharp & Keddy, 1986; Carter, Garrett, & Gammon, 1988; Demo, Loggy, & West, 1989).

By the mid-1980s, reports on wetlands buffer functions reflected one of two perspectives: engineering or ecology. Engineering interests focused on the capacity of wetlands uplands areas to mitigate agricultural and forest drainage and to “buffer” water bodies and wetlands from nonpoint source pollutants like agricultural runoff. While a few of these articles reflected an ecological

appreciation for the differences between wetlands and their upland areas, and made clear the distinction between the two (Roesner, 1988; Mitsch, Reeder, & Klarer, 1989), the majority of the articles muddled the waters, often equating wetlands with buffers. For example Jorgensen et al. sought to determine “the efficiency of using wetland systems as buffer zones between agriculture and aquatic systems” (Jorgensen, Hoffman, & Mitsch, 1988) and Cheschier et al. reported on their study regarding “the hydrology and pollutant-removing effectiveness of two wetland areas being used to buffer impacts of pumped agricultural drainage” (Cheschier, Skaggs, Gilliam, & Broadhead, 1987). Ecological concerns, on the other hand, made clear the distinction between upland buffer areas and wetlands and were consistent with the sentiment that “adequate buffer zones are essential to the longevity and quality of wetlands and their associated wildlife” (Schreiner, 1989). This body of research reported on the day-to-day functioning of wetlands buffers and transition areas as ecological realms (Wilpiszewska, 1990; Keddy, 1989), considered the long term impacts of engineering exercises on the ecological functions of upland areas (Day & Kemp, 1995), and highlighted the potential for buffers to protect freshwater wetland realms (Stockton & Richardson, 1987; Erwin, 1990; Zedler, Josselyn, & Griswold, 1990).

Chapter Four provides an example of how closure around the artifact of New Jersey’s freshwater wetlands was linked to stabilization of the artifact first at the federal level. Unlike the definitions issue, on buffers and criteria for buffer widths the federal government was silent. As a wetlands research subfield 1970s, wetlands buffers science was fragmented. Multiple research streams and an unclear buffers science terminology likely contributed to the failures of federal agencies to articulate a regulatory approach. The literature on buffers science often conflated coastal, riparian and freshwater ecologies and applied buffer width proposals emerging from the science on one particular ecological realm to another. The terms “buffer,” “buffer zone,” “transition area” and “transition zone” were not clearly defined and were consistently interchanged, and these areas were frequently equated with wetland bodies. Also problematic was a body of field-study research into the

various functions performed by wetlands buffers which yielded nearly as many suggestions for buffer widths as there were field studies.<sup>57</sup>

At the time of New Jersey's buffer discussions no federal buffers policy existed, despite the publication by federal agencies of two major reports on freshwater wetlands between 1980 and 1984. The U.S. Fish and Wildlife Service and the U.S. Department of Interior collaborated on one report: *Strengthening State Wetland Regulations* (Kusler, 1980). A 1984 Office of Technology Assessment report "Wetlands: Their Use and Regulation" (Office of Technology Assessment, 1984) responded to the Senate Committee of Environment and Public Works and its Subcommittee on Environmental Pollution's request to examine the feasibility of devolution of wetlands regulation to the state. This document was a guide for state standard setting for local regulation of riparian uses in cases of direct state regulation over inflow uses. Neither of these documents provided advice regarding, or even mentioned, freshwater wetland uplands, buffers or transition areas. It was not until 2000 that the Army Corps and EPA provided formal guidance on freshwater wetlands buffers, despite these organizations having overseen implementation of the Clean Water Act and the Nationwide Permitting Program since 1972 (Federal Register, Vol. 65, No. 47 March 9, 2000). The Army Corps did not publish criteria for freshwater wetlands buffer strip design until 2002 (Army Corps of Engineers, 2002). Similarly, it was not until the late 1980s (after New Jersey passed the FWPA) that catalogues of regulatory approaches to wetlands and wetland buffers protection (Hey, 1988) and tools for the evaluation of plans involving wetland enhancements like buffers (Lowe & Salafrio, 1989) appeared in the academic literature.

### **Regulatory and conceptual precedents for setting buffer widths**

In the late 1970s and early 1980s communities throughout the United States began to advocate for regulatory protection of buffers as part of coastal and freshwater wetlands management programs

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<sup>57</sup> For example, in their 1994 review of 15 years of buffer width recommendations Castelle et al. reported variance from 30 meters (for water temperature moderation) to 60 meters (for sediment removal) to 90 meters (for nutrient removal) to greater than 150 meters (for species diversity).



(Magoon, 1983). Although federal policy made no provisions for wetland buffers, many states established regulatory buffer zones for some or all of the wetlands under the jurisdiction of their respective Wetlands Protection Acts, and dozens of regional and municipal buffer protection efforts accompanied freshwater wetland and other land use planning exercises. Regulatory standards from California, Massachusetts, Rhode Island, New York and New Hampshire were held up as models in the shaping of New Jersey's freshwater wetlands law. Precedents had also been set in New Jersey, with buffer delineation models established as part of the state's 1970 Coastal Wetlands Act (N.J.S.A. 13:9A-1 et seq.), the Hackensack Meadowlands Reclamation and Development Act of 1969 (N.J.S.A. 13:17-1 et seq.), and the Pinelands Protection Act of 1979 (N.J.S.A. 13:18A-1, et seq.). These home grown models were especially instrumental in shaping early versions of Ogden's draft FWPA legislation, and were crucial to the common understanding of buffer functions and buffer regulation in the state.

In this section I work from records of public hearings and the organizing materials of FWC members, DEP officials, legislators and others to describe the standards and models forwarded for consideration by New Jersey decision makers as they struggled with the freshwater wetlands buffers delineation question. To understand these models I build on a typology developed by Castelle et al. (1992, 1994) and originally applied by these authors to consider state and local approaches to delineating buffers for aquatic resources in the United States in the 1980s (Castelle et al., 1992). These models represent the scientific ideas of the time when New Jersey was considering buffers. Calling for a "rational strategy for protecting aquatic resources" the Castelle et al. typology emerged in response to concern that buffer size requirements had "typically been established by political acceptability, not scientific merit" (Castelle et al., 1994). These authors identified two "fixed width" and two "variable width" approaches to delineation. Although none of the New Jersey actors specifically advocated for these approaches I include a brief description of each to give insight into the emerging scientific perspectives of the time. To the Castelle et al. typology I add two additional regulatory options proposed for New Jersey: "no buffer widths" and the delineation approach adopted in New Jersey's Pinelands, "buffer widths based on an indexed combination of factors." I then detail the arguments forwarded for each approach. Although the Castelle et al. typology does not explicitly

address values as criteria, in my analysis of these precedents I attempt to indicate assertions of values not captured by science e.g. ecological functions, conservation, cost and convenience.

**Fixed width approaches.** Fixed width buffers are generally established based on a single factor, parameter, or function. These approaches offer advantages in terms of interpretation, application, and ease of administration and enforcement, but often fail to provide for multiple ecological functions and typically do not take the individual buffer into consideration (Castelle et al., 1994). Fixed width approaches include delineations based on the resource-functional value of the wetland and delineations based on land use and the intensity of land use or land use impacts.

**Resource-functional delineations.** Resource-functional approaches to buffer delineation require an assessment of the wetland resource's function with respect to some or all of the following criteria: surface water runoff, flood water storage, water quality, habitat, shoreline stabilization, aesthetics, and integration into the landscape. They often involve a classification or ranking of an aquatic (wetland) resource within a system of other wetland resources. Castelle et al. write:

Those systems which are extremely sensitive or have important functions will require larger buffers to protect them from disturbances, which may be of lesser threat to a different site. Where wetland systems are rare or irreplaceable (e.g. high quality estuarine wetlands, mature swamps, and bogs) larger buffer widths will ensure a lower risk of disturbance" (Castelle et al., 1994).

The resource value classifications assigned to the wetland by virtue of the criteria assessed then qualify it for some fixed measure of protective buffer.

The New York state buffers determination methodology, developed as part of the New York Freshwater Wetlands Act of 1975 and premised on an established wetlands classification system which recognized that "not all wetlands are of equal value and must therefore be regulated differently" offers an example of this approach (6 N.Y.C.R.R. 664.5(a) (1998). This Act divides wetlands into types, or zones, with varying suitability for particular uses and specifies fixed buffer widths based on each wetland type. Similarly, the Rhode Island Freshwater Wetlands Act of 1971 based buffer determinations on a "Wetland-Wildlife Evaluation Model," providing wetlands defined as "unique" or

“valuable” with an additional 50-foot regulated buffer. This approach informed the final freshwater wetlands buffers delineation approach adopted by New Jersey in its FWPA.

***Adjacent land use and intensity of land use delineations.*** Adjacent land use and intensity of land use based decisions associate the degradation of wetlands with construction and post-construction impacts including erosion, sedimentation, debris disposal, vegetation disturbance and noise. Buffer size is determined based on the nature of the proposed development, with each development category assigned a fixed required buffer width. Designating buffer areas between zones of incompatible land uses emerged as a mechanism for minimizing environmental impacts in the 1950’s. The approach was familiar, and the criteria relatively easy to regulate in that they could be applied widely applied with little variation. For example, waste management facilities and large scale developments would be assigned the largest buffers and single home developments would have minimal or no buffers.

Buffer zone determinations based on land use for “bordering vegetated wetlands” were included as part of the regulatory mechanism of the Massachusetts Wetlands Protection Act passed in 1983. The Massachusetts Act appears to justify wetlands buffers as a risk management tool as summarized by the Preface to the Massachusetts Wetlands Regulations:

Any project undertaken in close proximity to a wetlands resource area has a high likelihood of resulting in some alteration of that area, either immediately, as a consequence of construction activities, or over a longer period of time, as a consequence of daily operation of the completed project. The problem becomes particularly acute where bordering vegetated wetlands are involved; inadvertent damage to these sensitive areas can easily occur and in many instances is irreparable (310 CMR 10.00).

**Variable width approaches.** Variable-width buffer determinations have the potential to be more ecologically-based and protective than fixed width approaches, taking into consideration a variety of functions, characteristics and site conditions. These generally more scientific approaches are used when the goal is to optimize buffer functions or to address various buffer characteristics. They require additional inputs, can be more complicated to regulate, and are often considered more difficult to convey to the regulated community (Castelle et al., 1994). Variable width approaches include buffer characteristics and buffer function considerations.

***Buffer characteristics delineations.*** Variables such as relationship to slope and vegetative cover, location within the watershed, watershed topography and soil type combine to make buffers more or less sensitive to human impacts. For example, a wetland buffer in a flood plain area will react to impacts in a different way than a buffer around an isolated freshwater wetland or vernal pool. Accounting for these differences requires that buffer size determinations be made on a case by case basis. Delineation based on this approach can be used for strategic conservation purposes.

***Buffer functions delineations.*** Delineating buffers based on buffer functions focuses on the specific goals of maintaining a regulated buffer area (e.g. temperature moderation, sediment removal and erosion control, moderation of stormwater runoff, maintaining habitat diversity, or minimizing human impacts). Delineating buffers in this way requires assessing the buffers on a case by case basis and determining the desired buffer function for each situation. For example, it recognizes that temperature moderation “will require smaller buffer widths than some wildlife habitat or water quality functions” and that “buffer widths for wildlife may be generalized, but specific habitat needs of wildlife species depend on individual habitat requirements” (Castelle et al., 1994).

**No buffers.** In New Jersey, arguments against regulatory buffer provisions were built on the uncertainty of the new field of buffers science, with those opposed to regulatory freshwater wetlands buffers providing testimony at Public Hearings that no scientific evidence showed “an indisputable need for a protection area around a protection area” (Reilly, 1986). Linguistic confusion regarding the role of wetlands and buffers clearly contributed to confusion on the issue, as evidenced from other testimony at the Public Hearings, for example, Parsippany Mayor Frank Priore argued: “We do feel that the wetlands themselves...provide and act as buffer zones between dry land and water courses” (Office of Legislative Services, 1986a). And from these sentiments came the refrain of those opposed: “why buffer the buffers?” (Office of Legislative Services, 1986b) The burden of proof that buffers held value in addition to the value of the wetlands they protected was placed on those who wished to protect the upland areas. As the science in support of the value of wetland buffers was presented and gained credence, and as it became increasingly clear that some form of freshwater wetlands protection

measure would pass, the arguments against regulatory buffers focused less on challenging the science and more on the logistics of regulation.

Builders and developers began to focus on key Federal 404 Program transfer requirements as defined by the CWA: that any state law must be strong enough to successfully assume Federal regulation. Former New Jersey Audubon Society director Rich Kane recalled “The real political question was whether the buffers would fly, because that made the law quite different from the federal Clean Water Act” (Freshwater Wetlands Campaign Organizer #1, 1999). Represented by Assemblyman Jack Penn the regulated groups championed Michigan, the first state to obtain primacy of Section 404 permitting under the Clean Water Act, as a model:

Virtually everyone in both the environmental and development communities expresses dissatisfaction with the current state of wetlands management at the federal level. Full delegation to New Jersey can only be an improvement. In order to achieve that goal, I looked to the State of Michigan, since it is the only successful model in the country, and adopted much of what is working there in Assembly Bill 2499 (Office of Legislative Services, 1986b).

The Michigan law, Penn argued, met the federal standards for acceptability while not requiring buffers - why could New Jersey not adopt a similar approach?<sup>58</sup>

**Buffer delineation based on a combination of factors.** The last category of considerations, “buffer widths based on an indexed combination of factors,” blends the fixed and variable width approaches and can be illustrated by the standards adopted in the New Jersey’s Pinelands Protection Act. This Act was designed to provide protections and land use restrictions for areas within the Pinelands National Reserve, so distinctive a formation of oak-pine forests (pine barrens), freshwater wetlands and ecology that the area was determined to warrant a special approach to freshwater wetlands delineation. Proposed in 1983, field tested in 1984, and modified and adopted to aid in the

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<sup>58</sup> However, the fact was that the Michigan Department of Natural Resources did not subsume buffer provisions under the purview of the Federal 404 regulations because the state already relied on buffer provisions in the Goemaere-Anderson Statute (now Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451) to employ a fixed 25-foot wide wetland buffer around freshwater wetlands. It was through this Act that Michigan proved to Army Corps that its program would be at least as effective as the federal program, and that the legal and administrative foundations were in place to support the program. Michigan’s Goemaere-Anderson Act gave counties, municipalities and townships power to regulate freshwater wetland buffers through the enactment of local wetland ordinances.

implementation of the Pinelands Comprehensive Management Plan requirements for buffer protection in 1985, the Pinelands wetlands buffer delineation model was a collaborative effort by Rutgers - The State University of New Jersey, the NWI-USFWS, NJDEP, Army Corps and the Pinelands Commission. Known as the “Roman/Good Buffer Delineation Model for New Jersey Pinelands Wetlands” this model evaluated relative wetland quality, relative impacts of development, and the pollutant removal capacity of the buffer. Relative wetland quality was determined by vegetation, surface water quality, potential for water quality maintenance, wildlife habitat, and socio-cultural values. Relative impact of development was determined by the potential for site specific impacts, the potential for cumulative impacts on a regional basis, and the significance of watershed-wide impacts. Pollutant removal capacity was based on slopes, soils, vegetation and consideration of water / groundwater flow relations. From these inputs an index was developed, with final values assigned during a scoring process which determined final buffer requirements ranging from 50 to 300 feet. The index specified that prior to any evaluation a determination of the presence of threatened or endangered species be made and if the wetland was known to support such species and is critical to their survival it would automatically be assigned a buffer of 300 feet (N.J.S.A. 13:18A-1 to 13:18A-29).

This model, designed to enhance the numerous roles wetland buffers play in protecting wetlands values, was widely considered a novel, cutting-edge and well-researched approach, and was held up as an example for national replication by the D.C.-based Environmental Law Institute (ELI). Reporting on the results of Roman and Good’s research in their May-June 1986 issue of *The National Wetlands Newsletter*, the ELI wrote:

The recently developed buffer delineation model further supports the (Pinelands) program by providing a scientifically-derived and systematic approach to assigning buffer widths. It is hoped that aspects of the buffer model, and of the entire wetlands program, will be adapted and applied by resource managers from other local, regional, and state agencies (Groman & Powel, 1986).

### **Freshwater wetlands buffers debates in New Jersey**

This section summarizes the trajectory of the buffer width debates in New Jersey in the period between the introduction of the first freshwater wetlands legislation in 1983 and final passage of the

FWPA in 1987. The basic aspects of this trajectory are summarized in Table 4: Timeline of proposed freshwater wetlands legislation. It includes a summary of the conceptual approach to buffer width determinations based on the typology described above.

TABLE 4. TIMELINE OF PROPOSED WETLANDS LEGISLATION

Year	Environmental Community	Regulated Community	Compromise	Status of buffers
1983	Assembly #3757 Sponsor: Maureen B. Ogden  Senate #3562 Sponsor: John A. Lynch			No buffers - understood not as a strategic statement, but as an omission
1984	Assembly #672 Sponsor: Maureen B. Ogden  Senate #336 Sponsor: John A. Lynch  Conceptual approach: buffers based on the Pinelands' "combination of factors"	Assembly #2348 Sponsor: Dennis L. Riley  Conceptual approach: buffers based on resource functional determinations		Buffers
1985			Assembly Committee Substitute for Assembly Nos. 672 & 2348  Senate Committee Substitute No. 602 Sponsor: John A. Lynch (passed)  Conceptual approach: buffers based on adjacent land use and intensity of land use delineations	Buffers  Buffers (significantly compromised original version)
1986	Assembly #2342 Sponsor: Maureen B. Ogden  Senate #2003 Sponsor: John Lynch  Conceptual approach: buffers based on adjacent land use and intensity of land use delineations	Assembly #2499 Sponsor: John S. Penn  Senate: #2121 Sponsor: Raymond Zane  Conceptual approach: "no buffers"	Assembly Committee Substitute for Assembly Nos. 2342 & 2499 (passed)  Conceptual approach: Buffers based on resource functional determination and classification	Buffers in Ogden/Lynch, no buffers in Penn/Zane, ACS compromise = buffer widths were that of the final FWPA  Conceptual approach: Buffers based on resource functional determination and classification
1987			Senate Committee Substitute for Assembly Committee Substitute for 1987 Assembly Nos. 2342 and 2499 (approved July 1, 1987)  Conceptual approach: Buffers based on resource functional determination and classification	"transition areas"



**1983-1984: Making the case for the concept of freshwater wetlands buffers.** Introduced in 1983, Ogden's first freshwater wetlands bill, Bill No. 3757, made no specific mention of wetlands buffers or transition areas as discrete areas for regulation. In fact, the bill appears to have supported the notion of freshwater wetland-as-buffer, describing the "integral role" that freshwater wetlands play "in maintaining the quality of life through the material contributions to the water quality of the State, its economy, food supply, and fish and wildlife resources by...serving as a buffer zone between dry land and water courses, thereby retarding soil erosion." The bill was shaped with the assistance of the New Jersey Conservation Foundation (NJCF), an environmental non-profit formed in 1960 out of successful organizing activities around opposition to the building of a Port Authority jetport in the Great Swamp in Morristown, NJ. Through efforts to protect the Great Swamp and establish it as New Jersey's first National Wildlife Refuge in 1968, NJCF achieved national recognition as a powerhouse regional land conservation group, gaining access to national organizations like the D.C.-based Environmental Law Institute (ELI). Working with the NJCF, Ogden modeled Bill No. 3757 on municipal wetland protection ordinances in the recently-published ELI document "Our National Wetland Heritage: A Protection Guidebook" (Ogden, 1999). An examination of this guidebook and its models reveals ordinances designed "for local governments, conservation organizations, landowners and others interested in the protection of wetlands through local action" (Kusler, 1983). While noting that performance standards for wetland activities should "provide a buffer between the wetland and upland activities" (Kusler, 1983) guidance on buffer widths and delineation methods was left to local determinations and details were not provided.

It was not until the 1984 flooding in the Passaic River Basin that the concept of regulating wetlands buffers was introduced as part of the discussion about freshwater wetlands legislation.<sup>59</sup> The

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<sup>59</sup> However, in a letter to Daniel J. Dalton, Chairman of the Energy and Environment Committee, and Robert P. Hollenbeck, Chairman of the Agricultural and Environment Committee, dated November 2, 1983, Field Supervisor Charles Kulp from the U.S. Fish and Wildlife Service commented on Ogden's Assembly Bill 3757 suggesting that the idea of a "buffer zone" be included in future legislation. Kulp wrote "a definition of buffer zone should be included under Section 3 (and also incorporated into Section 4 as criteria for development that is proposed adjacent to wetlands)." The letter indicated that the lack

state held several Public Hearings in response to the floods, and at these Hearings groups like the Passaic River Campaign (PRC) worked to demonstrate the flood-protective benefits of freshwater wetlands buffers. These efforts prompted Ogden and the NJCF to include buffer zones (one of four “major changes”) in their new Bill No. 672 submitted to the Assembly in spring 1984 (Office of Legislative Services, 1984). Ogden’s Bill No. 672 was significantly revised, no longer drawing from the ELI materials but informed by a home grown model. New Jersey was on the cutting edge of wetlands buffers research because of the monies that flowed to the Pinelands after passage of the Pinelands Protection Act. Ogden’s friend, State Planning Commissioner Candace Ashmun, was a member of the Pinelands Commission and paid close attention to the freshwater wetlands buffers research coming out of the area. Ashmun brought the guidelines that emerged from this new science to Ogden’s attention and Ogden and the NJCF highlighted them in their proposal, now basing buffer widths on an indexed combination of factor as suggested by the Pinelands researchers. According to the former director of the New Jersey Audubon Society the buffer provision language in Bill No. 672 borrowed directly from the elaborate Roman and Good “Buffer Delineation Model for New Jersey’s Pinelands” (Freshwater Wetlands Campaign Organizer #1, 1999). Buffers in “Assembly Bill No. 672 for Protecting Freshwater Wetlands” were defined as “an area of land adjacent to a freshwater wetland which serves to protect the wetland from adverse impacts,” and regulatory buffer zones were required around all freshwater wetlands ranging from 100 to 300 feet in width depending on slope, proposed land use and the environmental sensitivity of the wetland. As in the Pinelands Protection Act, control over final buffer determinations was designed to be local, with authority given to each municipality:

The governing body of a municipality, with the advice of its environmental commission, may identify and map an area to serve as a buffer to the freshwater wetlands. The governing body may regulate, by ordinance, development activities in buffer areas which may induce significant adverse impacts on the freshwater wetlands (N.J.S.A. 13:18, 1979).

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of required buffer zones was a major weakness of the proposed bill, and noted that the Municipal Land Use Law, which the bill was based upon, recognized the biological intent and applicability of buffers: “The Municipal Land Use Law implies the use of buffers in the definition of ‘Drainage’ (c. 40:55D-4) and ‘Public Drainage Way’ (c. 10:55D-6).” The letter also stated that the inclusion of buffer zones in the final bill was necessary if the intent of the bill was to adequately protect wetlands, referencing a USFWS “general guideline” of a 100-ft buffer “required in most cases involving wetlands and streams” and a 200-ft buffer “necessary along streams.”

Significant pushback came from representatives for development interests. Represented at the Public Hearings by Assemblyman Dennis L. Riley (D-4<sup>th</sup> District, Camden and Gloucester Counties), these groups sought to limit the uncertainty of multiple municipal approaches to wetland regulation and to establish “clear and predictable procedures” (Office of Legislative Services, 1984). Representing the development community, Joseph Lomax criticized the buffers rules outlined by Ogden, associating them with “the misuse of buffer zones by regulatory agencies in southern New Jersey within the last five years” (Office of Legislative Services, 1984). This criticism referred to the broad and often confusing authority of the Pinelands Commission and Pinelands-area municipalities over wetland buffers in New Jersey’s Pinelands National Reserve. Influenced by differences in the geography, geology and ecology of the protected areas, motivated by a diversity of interests in the values provided by wetlands buffers, and modified by varying degrees of political acceptability, the approaches used to set regulatory buffer widths in the Pinelands Planning Areas varied greatly from one jurisdiction to another leading not just to confusion, but also to several legal actions. The building and development groups soon enlisted Assemblyman Riley as sponsor of the competing Assembly Bill No. 2348: “An Act providing for the management of freshwater wetlands.”

At the first Public Hearing on Assembly Bills 672 and 2348, held on September 24, 1984, Assemblyman Riley clarified the concerns of his constituents:

How can you go an unknown amount of feet - 100 to 300 - using no guidelines at all for the 200 feet in-between, from a line - namely, the freshwater wetland - which in itself is undefined and vague? To do so would be impossible and would invite court challenge” (Office of Legislative Services, 1984).

Under Riley’s bill No. 2348 all wetlands were to be “protected by an area of land referred to as the ‘buffer zone,’” buffers were to be “variable and functional depending upon the potential for adverse environmental impacts associated with landuse, natural conditions, and depending upon the environmental sensitivity of the wetlands” with buffer zones “treated in a similar manner as wetlands, meaning that no activities shall be permitted in the buffer zones unless it complies with this act.” Riley’s bill specified buffer distances varying from 50-250 feet. In a letter to Ogden, Pinelands

Environmental Specialist Robert A. Zampella suggested that with respect to the ease of implementation the builders had a point:

The builders provide an approach which, although the buffers are conservative, may provide greater consistency in the application of the buffer requirement. I suggest that a similar strategy, which employs larger buffers than those given by the builders, be included in your bill (Zampella, 1984).

The September 24, 1984 hearing, hosted by the Assembly Agriculture and Environment Committee and designed to provide for the “Systematic Review of Development Activities In and Around Freshwater Wetlands” made clear the areas of divergence between the Ogden and Riley bills. But it also seemed to identify common goals: “Both of the bills before the committee recognize the need for buffer zones around freshwater wetlands” (Hughey, 1984). The buffer provision was singled out by Commissioner Hughey as one of ten “basic” elements in a freshwater wetlands protection bill for the state going forward. Hughey contended: “The Act should provide for a wetlands buffer zone to protect freshwater wetlands from activities in adjacent uplands. This includes buffer zones around freshwater wetlands within the jurisdiction of the Corps of Engineers Section 404 Program” (Hughey, 1984). From the hearings came another attempt at compromise, this time spearheaded by the Assembly Legislative Office working in concert with Ogden and Riley. By the end of 1984, Assembly Committee Substitute for Assembly Bills Nos. 672 and 2348 was submitted to the Assembly for consideration. It incorporated the buffer guidelines based on the Pinelands’ Roman/Good Model instead of allowing for municipal-level determinations, proposing that buffers be applied uniformly to freshwater wetlands throughout the state.

**1985: framing positions on freshwater wetlands buffers.** On February 25, 1985, the Assembly Committee Substitute for Assembly Bills Nos. 672 and 2348 was passed through the Assembly by the Agriculture and Environment Committee. Scheduled to be posted for a vote on March 7, it soon became clear that politics would not give the bill a chance. Discord had been brewing within factions of the New Jersey Builder’s Association (NJBA). Some NJBA members were in support of the compromise Riley had hammered out with Ogden while others were swayed by the arguments of their sister organization, the National Association of Office Parks (NAIOP), and now staunchly opposed any

regulatory buffers protection measures. The era of office park building, which often targeted wetland areas, was at its peak in the early 1980s in New Jersey (Hughes, 2013). NAIOP had recently taken an interest in the New Jersey case, recognizing the potential for it to set a national precedent, and was interested in more than just lending muscle to the fight - it actively sought to define its boundaries. Although a limited constituency of professional members, these interests were wealthy and willing to use money to sway interests and votes. They had the backing of a powerful pro-development Assemblyman, John P. Doyle (D-Ocean)<sup>60</sup> and the sympathies of Assembly Speaker Alan J. Karcher (D-Middlesex). NAIOP helped Doyle shape a list of objections to the bill which he presented to the Assembly Speaker. Top among them was criticism of the Pinelands formula for regulatory buffers.<sup>61</sup> Karcher refused to bring the bill up for a vote.<sup>62</sup>

Regrouping, Maureen Ogden expanded alliances and began working directly with the PRC and other environmental organizations which were actively producing and disseminating scientific information about freshwater wetlands and freshwater wetlands buffers. These organizations soon joined in a new coalition effort called the Freshwater Wetlands Campaign (FWC) - the advocacy organization that would ultimately shepherd Ogden's FWPA to passage. The FWC built particularly on PRC research, which had recently been highlighted in a March 1984 report by the US Fish and Wildlife Service titled "Wetlands of the United States: Current Status and Recent Trends" using the Passaic River Basin as an example of urban wetlands problems. Galvanized by the 1984 floods and by the national attention to their concerns, the PRC developed a counter proposal to a multi-million dollar Army Corps of Engineers flood-mitigation tunnel project in the Passaic River Basin. This counter

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<sup>60</sup> In 1982, Bill A-855, sponsored by Assemblyman John P. Doyle, D-Ocean, exempted newly constructed single family homes from property taxes until a certificate of occupancy was issued and the home was actually occupied. This law exempted the price of the structure, but not the land, from property taxes prior to occupancy, as a means to reduce costs carried by developers building on speculation.

<sup>61</sup> Another issue in 1985 was that of freshwater wetlands classification. This was introduced by NJBA consultant Joe Lomax who pushed for reclassification of wetlands as either "dry" or "wet." Lomax argued that only those wetlands that had standing water year round should be protected. Lomax was ultimately discredited.

<sup>62</sup> Alan Karcher's obituary published in the New York Times on July 28, 1999 highlighted Karcher's unusual political power. The obituary quotes a former aide describing Karcher as making "the Legislature an equal branch of government with the Governor's administration." Karcher's obit also described how Governor Thomas Kean's bid for re-election made Karcher (as Speaker) and "Democrat obstructionism" a major campaign issue contributing to a Republican majority in the Assembly (Ravo, 1999).

proposal was grounded in extensive research about the flood-protective benefits of freshwater wetlands and freshwater wetlands buffers, much of it conducted by citizen scientists. The FWC used this as a springboard to design larger scale research activities in the Passaic River Basin, specifically the Flood Plain Watch (FPW) that would eventually prompt the Campaign to integrate ecological principles into their proposals for decision making about freshwater wetlands in the region.

Ogden's partnership with the PRC not only expanded the network of support for her bill but also provided the basis for a formal education campaign highlighting the technical action of wetlands and buffers in urban ecosystems. Working with the newly-formed FWC the PRC illustrated the beneficial roles played by buffers in wetlands protection (e.g. water quality, hydrology, and fish, wildlife and plant species diversity and abundance) and explained the hydrologic functioning of wetland systems in a series of public slide shows at meetings throughout the state. Ella Filippone of the Passaic River Coalition explains:

We would talk about these things, saying 'we just have to get something to show the fluctuations. A wetland isn't static - it doesn't always stay at the same place it keeps moving.' Once you explained it people could get it. But if you didn't bring it to their attention it's not going to happen (Filippone, 2006).

The education campaign distributed fact sheets at public meetings, to legislators, and submitted them for inclusion in public hearings documentation. Several of these fact sheets began by directly quoting the Roman and Good research conducted in the Pinelands: "Because development adjacent to wetlands can adversely affect wetlands through increased runoff, sedimentation, introduction of pollutants and a change in species composition, an important strategy to provide for preservation of their ecological integrity is the maintenance of an adequate buffer strip."<sup>63</sup> But the fact sheets also included data generated by citizen volunteers who had worked in the field, and discussed shifts in bird, plant and animal species found in the buffer zones of specific wetlands throughout the state over time. Supporters of regulatory buffers felt that this commitment to science

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<sup>63</sup> Roman and Good (1983) "Wetlands of the New Jersey Pinelands: Values, Functions, Impacts and Proposed Buffer Delineation Model" as quoted in Passaic River Campaign "Fact Sheets About Freshwater Wetlands" and Flood Control Proposals for the Passaic River Basin August 6, 1984 Public Hearing.

education and outreach on the part of Ogden and the PRC shifted public sentiment regarding the buffers:

It was by arm twisting and arguing and presenting the argument that a wetland system is not a static system, it is always changing. And of course when you have rainfall your water table rises. It goes up and down. So you are obligated, from our point of view, to have an area where the critters can move up to dry land. There has to be some place for them when this dynamic system is functioning at its peak. Down in the lower valley we called it the intertidal zone. Then we called it 'the area of transition.' I think that was the greatest achievement of this legislation: that we were able to focus on the science and explain why you need the transition area, why you have to have it (Filippone, 2006).

This relationship between Ogden and the PRC informed another major overhaul of the bill, particularly with respect to a new approach to regulatory buffers. The PRC perspective on regulatory buffers and wetlands had emerged in reaction to the proposed prioritization of engineered approaches to development in the region. As an alternative to the dominant technological ethic, the PRC forwarded ecological arguments to justify expansive freshwater wetlands buffers for development projects. The complicated Pinelands buffer delineation formula, clearly unpopular with the regulated community and considered a hard sell with them, was now completely discarded in favor of the "adjacent land use and intensity of land use" delineation approach, an explicit fixed-width criteria that established buffers based on the expected wetlands impacts of proposed development. Under the FWC's new formula industrial development would require a 300-foot buffer, public roads and projects a 200 foot buffer, and most residential and commercial development, 15-100 feet. This proposal was quickly framed by the NAIOP group as a direct attack on industrial developer's interests. In an attempt to bring the building and development community back to the table Ogden diminished the amount of buffer around wetlands to 15-100 feet for most developments, except for 200 feet for businesses engaged in handling hazardous waste substances. A new Bill No. 602 was championed in the Senate by John A. Lynch (D-Middlesex) and approved in December 1985.

**1986: Buffers, a "valid concept."** With Assembly Speaker Karcher at the helm of a lame duck Assembly, and partisan politics at play, Senate Bill No. 602 did not stand a chance.<sup>64</sup> The bill was never called for a vote and the process had to begin again. Working directly with the FWC, Ogden and

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<sup>64</sup> Karcher repeatedly instructed the Assembly Democrats to stay off the bill and let the Republicans pass it on their own – once it was passed each Democrat could vote their own conscience.

Senator John Lynch (D- 17<sup>th</sup> Legislative District) co-sponsored a significantly revised bipartisan bill in May of the 1986 legislative session. Assembly Bill 2342 and Senate Bill 2003 were designed to establish a state permit process for developments in freshwater wetlands to assume the Federal 404 Program, an approach agreed to by federal agencies, the governor, the environmental community. Per the request of the building and development community the revisions provided more specificity and detail regarding regulatory buffer zone requirements, but it was still based on land use and the intensity of adjacent land uses. Ogden, who thought negotiations were conducted in good faith, was blindsided when this legislation met significant opposition from the regulated community. Among the most vocal of the critics was Assemblyman John S. (“Jack”) Penn (R - 16<sup>th</sup> district including parts of Somerset, Hunterdon and Morris counties) who argued that the Ogden bill added another layer of permits instead of streamlining the process.

Contending that “virtually everyone in both the environmental and development communities expresses dissatisfaction with the current state of wetlands management at the federal level,” and believing that some wetlands measure would eventually come to pass, Penn submitted a bill of his own design (Narus, 1986). Backed by the NJBA Penn forwarded Assembly No. 2499, a bill also intended to assume the Federal 404 program. This bill (nicknamed “The Builder’s Bill” by the FWC) set its sights on full delegation of the Federal program to New Jersey and was fashioned after Michigan’s effort which was “the only successful model in the country [to assume the Federal program]” (Penn, 1986). Explaining why the NJBA reversed course in its support for a freshwater wetlands bill, NJBA representative David Fisher said that in streamlining the permitting process “we feel that we gain even more by the bill than we would by losing” (Carney, 1986). With respect to regulatory buffer provisions Penn was unwilling to yield. Bill No. 2499 did not provide for buffers “other than the wetland areas themselves” (Penn, 1986). Penn argued “We believe this position is upheld by the language of the Ogden bill, which states that wetlands serve ‘as a buffer zone between dry land and water courses....’ We believe there is no further need to restrict development in non-wetland areas because the wetland areas to be governed under both bills serve as a proper buffer” (Penn, 1986).



Despite these disagreements over buffers the door was again opened to compromise, with environmental groups and the NJBA agreeing in principle on the concept of a state-based freshwater wetlands protection bill that would allow New Jersey to assume the Federal 404 Program. A series of three public hearings to take testimony were scheduled for July 16, July 30, and August 1, 1986. These hearings were held under the auspices of the Energy and Natural Resources Committee, and although the Governor's office did not participate sponsors and representatives of the both the environmental and regulated communities were actively engaged. At each of these hearings buffers took center stage.

***July 16, 1986 - Assembly Energy and Natural Resources Committee Hearing, New Brunswick.*** The first public hearing on freshwater wetlands heard arguments for and against regulatory buffers. A frequent argument against expansion of protection into the upland transition areas highlighted the federal precedent: "Neither the U.S. Army Corps of Engineers nor the U.S. Fish and Wildlife Service have buffers defined in their mapping and regulatory programs" (Reilly, 1986). For the most part, however, the opposition focused on the element of uncertainty in regulation of buffers:

No good reason has been advanced by proponents [of Ogden's bill] to force New Jersey to adopt a higher standard in an area where the science is inexact, the economic impact would be significant, and the amount of acreage at issue is very significant" (Goldfein, 1986a).

Opponents returned to the anti-buffers refrain of years prior, calling into question the validity of buffers as a concept: "Since the legislative intent of both bills indicates that wetlands themselves act as buffer zones between dry land and water courses, we must ask the question 'why buffer the buffers?'" (Fisher, 1986)

The environmental community built their testimony in favor of regulatory buffers as an extension of the FWC's now-robust educational campaign.<sup>65</sup> FWC members provided specific examples

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<sup>65</sup> It also began to link the concept of buffers to the definition of freshwater wetlands. For example, Helen Fenske provided testimony to the effect that:

The buffer zones are actually part of the wetlands of New Jersey. Freshwater wetlands consist of areas with a prevalence of wetland vegetation. Buffer zones contain both wetlands and upland vegetation, and are important to many wildlife species for food,

of regulatory buffers in New York, Massachusetts, Rhode Island, California, New Hampshire, and the Pinelands in New Jersey to buoy their claims, focusing on scientific bases for freshwater wetlands buffers protection and drawing from terminology used in the Pinelands Buffer Delineation Model recently summarized in the May-June 1986 National Wetlands Newsletter article titled “Buffer Requirements for New Jersey Pinelands Wetlands” published by the Environmental Law Institute (Groman & Powel, 1986). The environmental community provided testimony explaining how regulatory buffers might benefit regulated interests in flood prone areas. To do so it used new terminology, introducing the broader theoretical concept of a “zone of transition” in terms they felt the regulated community might appreciate:

An equitable buffer zone, in addition to its ecological role, also provides the public with a zone of transition which allows the water table to fluctuate and not inflict damages to a development directly on the wetland’s edge, and thereby increasing the public costs of flood control (Fenske, 1986).

Although initially glossed over by regulated interests in the context of the Public Hearings, this “transition zone” concept would eventually serve as the basis for buffers provisions in the final bill.

***July 30, 1986 - Assembly Energy and Natural Resources Committee Hearing, Lincoln Park.***

The second Public Hearing held July 30, 1986 in Lincoln Park, NJ was the turning point in terms of support for regulatory buffers, shifting the debate from the validity of wetland buffers as a concept to a discussion regarding criteria for their delineation. Part of this shift can be credited to the testimony of Jason Cortell, a Boston-based biologist and environmental consultant representing NAIOP. Cortell and his firm, Jason Cortell and Associates, Inc., had developed multiple Environmental Impact Statements, and had related technical studies for projects in New Jersey over the years, most of them

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cover, resting, migration, and reproduction. Some wildlife species rely on both wetlands and uplands for their existence. The buffer zones are also known as ‘ecotones,’ areas which lie between wetland and upland ecosystems. The wetland buffer zones also protect the wetlands from intrusion by people, from soil erosion and sediment, from excessive stormwater flows, and from pollution – an important factor in the stressed Passaic River Basin....Buffer zones further keep development away from land with high water tables and floods; the delineation of such lines are continuously changing as more development occurs upstream. Allowing a wall of development around the edge of a wetland will destroy it as surely as direct filling (Fenske, 1986: 63).

dealing with the impacts of roadway expansions. Having worked to judiciously balance environmental and development concerns in the state he was well respected, and looked to as an expert in wetland delineation and mitigation by both the development and environmental communities. Called upon to address the buffers issue Cortell began his presentation stating: “Wetland buffer zones constitute a valid concept” (Cortell, 1986). Cortell then proceeded to detail regulatory buffers precedents and approaches in various places around the country. Of the land-use based buffers width proposal forwarded by the FWC he was critical:

I think that if you place your buffers with the idea that you want to protect water quality, that you want to protect rare and endangered species, that you want to protect critical habitats, that you want to protect floodways from being filled and having flooding downstream, then it is more important that those criteria are the ones that you legislate around, and not legislate around what the potential development is. And frankly, it seems to me that a bill which legislates against certain kinds of development tends to take on the view of an anti-development bill (Cortell, 1986).

Cortell proposed instead a detailed regulatory structure for New Jersey’s wetlands buffers based on the classification of wetlands. Tied to the definitions question (and a key element in securing a functioning definition of freshwater wetlands in Penn’s A-2499) classification required defining wetlands by class, or type, and then developing a regulatory strategy for wetlands protection based on those categorizations. This policy option was roughly consistent with wetlands definitions options forwarded by the Office of Technology Assessment (OTA) in its 1984 Wetland Study Report, which suggested wetlands programs throughout the country “...be tailored in a consistent and integrated manner to the broad categories of wetlands...” (Office of Technology Assessment, 1984). The precedents Cortell cited were close to home:

New York, for example, has four wetland classifications which recognize that not all wetlands are of equal value (6NYCRR 664.5) and are therefore regulated differently. The Massachusetts Wetlands Protection Act allows activity in bordering vegetated wetlands where it has been shown that the wetlands perform the stated functions atypically. The New Jersey Pinelands Act allows for reduction of the standard 300 foot buffer zone if the given wetland can be shown to have a low value (Cortell, 1986).

The FWC had fought hard against the concept of classification in the context of the definitions debates. Classifying freshwater wetlands and determining protections based on resource functional value was anathema to environmental interests that prioritized a more purely scientific definition of

freshwater wetlands, one that characterized inherent wetland qualities and that could be applied to all freshwater wetlands across the board. Until Cortell's testimony broke the stalemate this values debate regarding the functions vs. scientific qualities of freshwater wetlands had not formally entered in to the buffers discussions. With the environmental community no longer simply working to justify the validity of freshwater wetlands as a concept they could now leverage the resource-functional vs. scientific functions debate to justify specific freshwater wetlands buffers widths, and they began building a case for expanded buffer parameters.

***August 1, 1986 - Assembly Energy and Natural Resources Public Hearing, Mount Holly.***

Although the NJBA continued to resist the wetlands buffers in principle, the general sentiment in the legislature had changed to an attitude of support for the concept. At the final Public Hearing on freshwater wetlands held on August 1<sup>st</sup> in Mount Holly, Penn and NAIOP appeared to concede on the buffers issue, with one member of the development community admitting: "It would surprise me if we don't end up with some kind of compromise bill that has some type of buffers in there" (Merkle, 1986). The regulatory buffers debate now shifted to a debate over criteria for regulatory buffers delineation, with each side taking a different tack. Members of the FWC began to argue forcefully against classification, suggesting that this approach would negatively impact perceived values of freshwater wetlands. In his presentation at the hearing Derry Bennett, Executive Director of the American Littoral Society argued:

We were concerned that the classification would aim development toward the so-called "low quality" wetlands. This development would then impact on the "medium quality" wetlands, which would then become "low-quality" wetlands in future designations, and you would simply have a wave of development up into the better wetlands (Bennett, 1986).

The FWC was concerned that classification would introduce a high degree of uncertainty into the regulatory process since it would rely on value judgments, but also felt that degraded wetlands could be restored, and if classified as degraded, might be lost unnecessarily (The Freshwater Wetlands Campaign, 1986). To this point, representing the FWC, David Moore from the New Jersey Conservation Foundation used as examples the Hackensack Meadowlands and Great Swamp areas, both of which

would have originally been classified as “low-quality” wetlands and thus open for development under Penn’s configuration in A-2499:

...some of the areas that we classified, when we did do that kind of thing years ago, as degraded wetlands, are now first class places. That has happened as a result of pollution control activities and control of water quality. Hackensack Meadowlands, for example, although a saline system, was written off years ago. The Division of Fish, Game, and Wildlife at that time figured they wouldn’t spend any more time there at all. Today that’s not the case at all. They’re trying to preserve areas there. The Great Swamp...was also written off years and years ago. In fact, they were going to put a jetport there. That’s certainly not the case today (Moore, 1986).

Although now amenable to the concept of regulatory buffers, Penn responded by insisting that the bill clarify statutory determinations regarding their delineation. He called for specificity in the criteria, and for scientific decision making to be done by the legislature as part of the legislative process:

I would be against any legislation, any bill that we put forth, where the last sentence said ‘and rules and regulations will be promulgated by the Department of the Environmental Protection.’ That is a blank check. Our legislation should be strong enough that we do - that it will have all the rules and regulations written into the bill (Penn, 1986).

***Political horse trading and splitting the difference.*** Penn’s requirements significantly affected the rule making process. His political move prompted inquiry by the legislature into the scientific functioning of freshwater wetland buffers, and essentially required that the scientific parameters of the bill be approved by them in advance for inclusion in the legislation. But, as an official recalled, “legislation quickly became so complicated that very few people understood it” and the legislature was not prepared to debate the criteria for buffers delineation determinations in a meaningful way (NJDEP Official #1, 2006). A former DEP staffer explained the new process that evolved: “Unlike many of the other environmental acts written by experts and handed into a legislative process that was waiting for them, this one was different. This was a mass campaign and at a time when the organizations were really willing to work together” (NJDEP Official #4, 2009). With oversight from the EPA, a compromise team made up of the sponsoring legislators and representatives from both the environmental and building/development communities was established to develop the regulatory specifics for the legislation. The rest of 1986 saw this team, made up of Jack Penn, Maureen Ogden, Mario Del Vicario (EPA-Region II), David Fisher (NJBA), Tom Gilmore (New Jersey

Audubon Society), Lloyd Tubman (NAIOP), Tom Wells (NJCF) and Robert (“Bob”) Tudor (NJDEP), well on their way to hammering out a joint bill and working hard to detail the technical aspects of regulatory determinations per Penn’s insistence.

Although the development community appeared to be more comfortable communicating directly about incorporating regulatory buffers into the legislation, they called for buffers to be more flexible and wanted to revise the distances “to better reflect the different qualities of wetlands and to recognize the variable size of wetland areas” (New Jersey Builders Association, 1986). As NAIOP and NJBA appeared to soften on buffers the FWC began to yield on classification. One of the negotiators for the FWC called this a case of “political horse trading” and explained:

One of the ways we were able to make the buffers more palatable was by agreeing to classify wetlands. At the outset [of the definitions debate] we were saying that we didn't want to touch the issue of classifying wetlands because we didn't want to create second class wetlands from a resource standpoint. But when it came to the buffers the environmental community was willing to say that certain wetlands warrant larger buffers and certain wetlands warrant smaller ones....(Freshwater Wetlands Campaign Negotiator #1, 1999).

The FWC finally sensed momentum on the bill. Cognizant of support for Penn’s competing legislation, environmentalists were anxious to move Ogden’s compromise bill through the Assembly with provisions they knew they would fight later in the Senate. One of the FWC negotiators recalls:

Even though we knew there were flaws in it we had to get it out of the Assembly or lose the process of law. It was very important for us to hear from Judy [Judy Jengo, former DEP Deputy Commissioner] that the process was going to get this bill out no matter what the buffers were and we weren’t taking as much of a risk as you might think” (Freshwater Wetlands Campaign Negotiator #1, 1999).

While the specifics of classification were not determined, this period of bipartisan compromise provided the language and regulatory details for the “transition area averaging plan” included in the final piece of legislation, and set the regulatory freshwater wetland buffer widths for the FWPA.

The transition area averaging plan was an idea originally introduced by the PRC in the process of disseminating the ideas in Roman and Good’s Pinelands Buffer Delineation Model. The Pinelands formula involved averaging a relative wetland value index and a potential impacts index to derive a

buffer delineation index. This was then converted to an actual buffer distance. In the course of the freshwater wetlands negotiations, however, “transition area averaging” was creatively reinterpreted by the NJBA and NAIOP, becoming the “transition zone,” a tool by which to reduce the minimum width of a transition area.<sup>66</sup> In the words of a FWC representative, it was “a deliberate give to the builder community so that they could figure out how to work their projects into lands that had wetlands...we didn’t have the votes otherwise” (NJDEP Official #1, 2006).

Compromise on the setting of regulatory buffer widths was a less creative process. There had been “a significant back and forth [on the buffers]. How big do we make them? 50ft? 75ft? 100ft? 200ft? 300ft? All of that was based upon sort of a general sense of what would be technically appropriate against what was politically possible” (NJDEP Official #1, 2006). Ogden had originally proposed freshwater wetlands buffers at 300 feet per the Pinelands standards. Penn continued to argue that no buffers were warranted. But ultimately these legislators decided to “split the difference” in the name of compromise, and buffers for wetlands containing threatened and endangered species were set in the legislation at 150 feet (NJDEP Staff Member #1, 1999). Paying close attention to the buffers debate and the influence of this on support for the bill was the incoming Assembly Speaker, Charles L. (“Chuck”) Hardwick (R-21<sup>st</sup> District, Union County). Hoping to establish a strong presence at the outset of his Speakership, Hardwick had promised an early vote on the bill to Ogden (Carney, 1986). At the eleventh hour however, fearing he did not have enough votes, Hardwick pressured Ogden to reduce the buffers provision by half again, to 75 feet. Ogden put the question in front of the key negotiators for the FWC, Tom Wells and Tom Gilmore: She [Ogden] comes down and says “Speaker Hardwick just called me in - he wants to shrink the buffers down, it’s your

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<sup>66</sup> Advising the FWC in its negotiations in a December 17, 1986 memo to Robert Tudor, Supervising Environmental Specialist, Russell A. Cookingham, a NJDEP Division of Fish, Game and Wildlife staff member, was roundly critical of this reinterpretation:

The original intent was to provide upland buffer as a means to protect the wetlands against run-off and other conditions associated with upland development. In acceptance of the “transition zone” concept, especially since the Bill allows for its reduction in width and even elimination, the “buffer zone” concept is lost.

decision...don't even talk to me about it, you guys decide" (Freshwater Wetlands Campaign Negotiator #1, 1999).

Of Ogden's willingness to work with the environmental community one of the FWC negotiators reflected: "Most politicians would have said 'yes.' Some politicians would have said 'I had to compromise.' She was willing to take what we thought was important - she was willing to listen to the experts about what was important..." (Freshwater Wetlands Campaign Negotiator #1, 1999). And "the two Toms," as they were called, directly engaged the FWC, and most specifically members of the PRC, in the decision:

When Tom Gilmore, who represented NJ Audubon, and Tom Wells with the NJ Conservation Foundation, when they would be arguing over the transition zones the people that they were working with in the Legislature who were not supportive would continuously get this to be smaller areas. The strategy was that they have to call up their partner and I was of course not going to go along with any changes to the concept of the transition area. And the greater the transition area the happier I would be. I was the mean, nasty, un-cooperative person and they would then turn and say 'we can't do it you've got to give us this.' And it was really a game we played that worked (Filippone, 2006).

Reflecting on the process one of the negotiators commented: "I was really impressed with that. She let the environmentalists decide whether or not she could lose her bill" (Freshwater Wetlands Campaign Negotiator #2, 1999).

With Hardwick's reputation on the line, and with Deputy Commissioner Jengo assuring the FWC that the political process would get a bill out regardless of the final regulatory buffer distance, the FWC stood firm with the goal of getting as protective a set of buffers provisions as possible. Although the FWC negotiators refused to yield, all the time they feared that they may have killed the bill yet again (Freshwater Wetlands Campaign Negotiator #1, 1999). But had they known the ruse Hardwick had devised to achieve success when it came time to post the bill for a vote in January 1987 they might not have been as concerned.

**1987: The political will for freshwater wetlands buffers protection.** Assembly negotiations on ACS 2342 / 2499 ended December 12, 1986 and the bill was reported out of the Energy and Natural Resources Committee on December 15, 1986. A vote on the bill was taken on December 18, 1986, with



agreement reached on all issues but the regulatory buffers. In support of the bill Mort Goldfein, President of NAIOP, wrote to all members of the Assembly:

The Penn bill and an alternative measure suggested by Assemblywoman Maureen Ogden have been merged into the Committee Substitute expected to come to the Assembly floor on January 8. It is the product of a long and difficult negotiating process and while it does not reflect everything we would like to see in a wetlands bill we can recommend its favorable consideration...A system to classify wetlands based on their quality and environmental value is established as well as a program to delineate those wetlands so that owners may seek appropriate relief (Goldfein, 1986b).

Early January saw rushed attempts to further whittle the buffers including last-minute buffer reduction amendments introduced on the floor (Tudor, 1986). Ogden and the FWC negotiators knew that the buffer widths were theirs to lose. They believed that the NJBA was not negotiating in good faith and felt “their strategy was to get the bill as weak as possible in case it passed, but to oppose it in the end” (Freshwater Wetlands Campaign Negotiator #1, 1999). The FWC recognized that they would have to stay firm on the buffers if they wished to get Assembly support on any of the Senate’s changes to the legislation. The bill passed the full Assembly on January 8, 1987, surviving in part because of cunning action by Hardwick. As recounted by one of the FWC negotiators, when Hardwick posted the bill:

Forty-one votes were needed for passage. Hardwick had a board behind him that listed the legislators and their electronic votes. Only he and the clerk had controls that opened and closed the vote. Hardwick told the clerk “When I say the vote is closed, don’t close it.” After a few moments of voting he announced “O.K., we got it. Close the vote.” The Democrats screamed, wanting to cast their votes with the apparent political wind. Hardwick “reopened” the votes and closed it as soon as it hit forty-one (Schreck, 1997).

The bipartisan compromise bill was significantly diminished in the Assembly with a definition of freshwater wetlands that was not consistent with the federal delegation requirements for assumption of the 404 program, making it un-implementable by the NJDEP, at least in the eyes of the EPA and Army Corps. But with respect to the freshwater wetlands buffers debates the environmentalists had established a new precedent for compromise. On December 15, ACS 2342 / 2499 moved from the Assembly to the Senate with transition area widths set at “No greater than 150 feet nor less than 75 feet for a freshwater wetland of exceptional resource value; No greater than 50 feet nor less than 25

feet for a freshwater wetland of intermediate value; and No transition area for a freshwater wetland of ordinary resource value” (New Jersey State Assembly, 1986).

As reported in the May 9, 1987 *New Jersey Star Ledger*, In March of 1987 in a written warning to the Senate identifying “Critical Issues” of concern with respect to the NJDEP’s ability to implement an effective wetlands program under the proposed ACS 2342/2499 regulations, Governor Kean threatened to veto the bill passed by the Assembly saying that it would lead to a “plundering, not a protection, of wetlands.” Kean was working to bring national attention to the wetlands issue and referred to New Jersey’s failure to establish freshwater wetlands protection measures a “national embarrassment.” Developers cried foul, exclaiming: “the efforts to amend the bill’s excessive buffer provisions were thwarted by parliamentary procedure!” (New Jersey Builders Association, 1987) But Kean didn’t back down. Putting more heat on the Senate, Kean refused acceptance of the chairmanship of the high profile National Wetlands Policy Forum, saying that he would not accept the position until New Jersey’s legislature enacted a strong bill.

Charged with strengthening the bill in the Senate was Senator Dan Dalton (D - 4<sup>th</sup> Legislative District) Chair of the Senate Environmental Committee and a representative from Assemblyman Dennis Riley’s district. Working to move the bill through the committee and the Senate, Dalton sought the assistance of Mark Smith, a former OLS staff member who had worked closely with Ogden and the environmental community in the drafting of the bill in the Assembly. Smith now worked for the Environmental Protection Agency, and was the EPA representative at the negotiations in Senator Dalton’s Committee. Smith’s boss, EPA Region II Administrator Chris Daggett, was a former member of Governor Kean’s staff. FWC members felt that Smith perceived Daggett as being close to Tom Kean and, believing that Kean wanted to preserve New Jersey’s freshwater wetlands, thus worked to make the bill as strong as possible (Schreck, 1997). According to one of the FWC negotiators who worked with Smith throughout the FWPA process:

When things got contentious in the committee negotiations Dalton would ask Mark, “Do you need this in the bill?” Mark would say “yes” and it was in the bill - no questions asked. The builders could not argue because they had insisted on no dual regulation. If they had dual regulation, they could have argued every case in their favor. They got hung on their own petard (Freshwater Wetlands Campaign Negotiator #1, 1999).

It seemed that a crucial element of the buffers issue was resolved once the definitions question was settled in early April 1987 and it was agreed that the DEP would use the Federal definition to develop a system for the classification of freshwater wetlands based upon criteria distinguishing among wetlands of exceptional resource value, intermediate resource value, and ordinary resource value. But the FWC was cautious with their optimism, and for good reason. The building and development community, thinking they would be able to exclude freshwater wetlands buffers regulations from the final bill, argued that wetlands buffers were not consistent with federal delegation. Although the NJBA and NAIOP had a sympathetic ear in Senate President John Russo (D-Ocean), who fought the buffers provision in committee negotiations, stalling the bill in the Senate, the FWC had secured a place for the legitimacy of their science. Legal counsel for the FWC recalls “the governor decided to become a player in that drama,” when he stepped in on June 8, 1987 to announce in Executive Order No. 175, an eighteen month moratorium on building and development in the state’s three hundred thousand freshwater wetlands. On the buffers issue Kean’s Executive Order was clear:

WHEREAS, development and construction in areas adjacent to freshwater wetlands (buffer areas) can adversely affect such wetlands through increased runoff, sedimentation and introduction of pollutants; and

WHEREAS, such buffer areas which support stands of native vegetation perform ecological and physical functions such as the stabilization of soil and prevention of erosion, the filtration of suspended solids (silt) to prevent their deposition on wetlands, water turbidity control, and serve as ecotones supporting species diversity and use, and as wildlife movement corridors; and

WHEREAS, the regulation of development and construction in areas which serve as buffers for regulated areas is recognized as appropriate and necessary for the protection of coastal wetlands... (Kean, 1987).

Although the NJBA initiated legal challenge to the moratorium (which the court denied), they knew Kean meant business. In ten days both houses of the legislature responded, and sent Governor Kean a bipartisan compromise bill that included the January 8, 1987 buffer width provisions detailed by the Ogden-Penn negotiating team. The only modification reflecting compromise, shaped on the last day of the negotiations, changed “buffers” to “transition areas” in the language of the bill. NAIOP legal counsel Morton Goldfein described this agreement in a post-passage video discussion with David Fisher, Mike Catania of NJDEP and Mark Smith:

When I came to head NAIOP the term buffer was so anathema to membership that when I attended the last meeting and learned that the bill the governor was going to sign was going to include it I pleaded that the word buffer not be there. And I think if I got anything from the Department [of Environmental Protection] that I dearly loved it was that they didn't use the word in the bill. So I could say [to NAIOP] there was no buffer" (National Association of Industrial and Office Parks, 1987).

Mark Smith said of the change in terminology that it reflected "perhaps a distinction without a difference" (National Association of Industrial and Office Parks, 1987).

### **(Re)defining environmental value: from wetlands buffers to "transition areas"**

This story of New Jersey's regulatory transition zones is an account of the co-production of new scientific discourses, new social identities, and new legislative processes to affect a change in freshwater wetlands buffers policies and standards at the state level under Section 404 of the Federal Clean Water Act. Regulatory freshwater wetland buffer determinations in the context of New Jersey's freshwater wetlands evolved through at least three stages prior to the mandate for their inclusion in the FWPA rules: agreement that the concept of a "freshwater wetlands buffer" was legitimate; a determination of the regulatory approach for buffers areas delineation; and re-conceiving of "buffers" as "transition areas" for the language of the legislation. Following this evolution we can trace the co-productive forces of the social and scientific on establishing the boundaries that distinguish developable from undevelopable land under New Jersey's FWPA.

In the first stage we see the validity of buffers as a concept established and agreed upon, a surprisingly difficult task. Unlike the definitions issue described in Chapter Four whereby legislators were challenged to first agree upon a scientific definition of a freshwater wetland and then establish a regulatory definition, the buffers debates began as a contest over whether freshwater wetlands buffers existed as a concept separable from the freshwater wetlands they surrounded. Buffers were a political problem. The regulated community balked at the prospect of expanding protection to include buffer areas, unlike the freshwater wetlands these areas were not particularly costly to develop. The environmental community argued that the transition zone was an integral component of the freshwater

wetlands ecological system, and that any efforts to protect freshwater wetlands needed to factor in transition area protections. Although there were already regulatory freshwater wetland buffers in New Jersey included as part of the Pinelands Protection Act, we recognize the Pinelands precedent as a liability to the environmentalist's claims. Although the building and development community lacked supportive analytic evidence regarding freshwater wetlands buffers, the legacy of jurisdictional and regulatory confusion associated with the Pinelands Act prompted this group to work to reduce the general argument over buffers to one of underlying values vs. the use of science to legitimize protection of these easily developable wet sites. Also important was the perception of the national development community that in regulating freshwater wetland buffers as part of assumption of the Federal 404 Program, New Jersey's FWPA would set a national precedent - something this group wanted to avoid.

Through these competing frames we observe a sub-movement emerge around the protection of freshwater wetlands buffers. This movement is at first defined by the buffer science emerging from the Pinelands. When met with resistance from the regulated community it is then re-defined through the creation and dissemination of new freshwater wetlands research conducted by the PRC. This research is produced in the context of Ogden's legislation and in opposition to what was perceived as the dominance of technological fixes to environmental problems in the flood prone Passaic River Basin. This research was important in that it heralded a new perspective regarding freshwater wetland buffers, putting a focus on ecological principles and cultivating a new understanding of how buffers functioned in ecological terms. With this new discourse emerged a new expert identity that took to the task of translating freshwater wetlands buffers science for political interests. Although in the end it was a representative from the development community who prompted general agreement that buffers were a valid concept, in bringing about this shift in understanding the new environmental sub-movement established itself as a key and legitimate player in the freshwater wetlands buffers debates.

In the second stage of the legislation's development we see attention to the regulatory approach that would be used to establish the buffers. Finally agreeing to transition area protections but wanting to limit the political uncertainty associated with the scope of regulation, the regulated

community insisted on predictability in the transition area requirements. They conditioned their support for the legislation on detailing transition area widths in the bill, an activity typically the domain of resource agencies in charge of implementing regulation. We see that once the scientific arguments for freshwater wetlands buffers protection became part of policy making that the door was opened for not only the environmental community but also the development community to deploy science politically. But legislators were clearly not qualified to do the work. A legislative staff member recalls of their discussions:

You should have been a participant in some of the discussions about how you would determine wetlands. You had the three-pronged tests with soils and vegetation and, you know, people just didn't get it. It was like jelly on the wall, they just couldn't figure it out. So even if you accepted the premise that wetlands were important, nobody understood what a wetland was or wasn't. And then we've got wetlands of exceptional resource value and intermediate resource value, and what is that all about? The different size buffers, and transition area averaging, and this was like three-dimensional high level math (NJDEP Official #1, 2006).

Ogden and Penn appointed a negotiating team to work with them in hammering out the details of a bill. The team included one lawyer each from the building and the development community two citizen experts from the FWC, and a representative from the EPA who was charged with providing oversight for the process. In this second stage of buffer area determinations these negotiators identified the regulatory approach that would be used to establish buffers (classification), agreed on flexibility in buffer area determinations ("transition area averaging"), and established minimum regulatory buffer widths that we can begin to trace changes in standards for policy making. In witnessing the insertion of citizen experts into the legislative decision-making processes and in observing citizen expert contributions to the stabilization and closure of a new regulatory technological artifact as part of these practices, we can begin to conceive of legislative processes as changeable institutions, observing these changes within the framework of co-production.

Finally, in the third stage of buffer determinations we observe New Jersey's freshwater wetlands buffers metamorphose most explicitly. They are given a "classier name," a "new title," in what was ostensibly a give to NAIOP and the development community. With the research presented here, however, we can understand the great influence that environmental advocacy can have not just on public perceptions but also on shifts in public values. We observe that shifting from "buffer" to

“transition zone” (re)inserts the scientific, bringing the intent of the legislation from the environmentalist’s perspective - the protection of uplands adjacent to freshwater wetlands - into relief and in line with the ecological understandings that brought the artifact of “buffer” into existence in the first place.

## Chapter Five: Reference List

Alexander, D. E. (1999). Ecotones. In D.E.Alexander (Ed.), *Encyclopedia of Environmental Science* (.).

Anderson, P. H. (1977). *Delineation of Deciduous Wetland Forests in Northeastern Connecticut*.

Anderson, P. H., Lefor, M. W., & Lennard, W. C. (1978). *Transition Zones of Forested Inland Wetlands in Northeastern Connecticut* (Rep. No. Special Reports: Paper 28). University of Connecticut.

Army Corps of Engineers (2002). *Technical and Scientific Considerations for Upland and Riparian Buffer Strips in the Section 404 Permit Process* Washington, DC: Army Corps of Engineers.

Bennett, D. (8-1-1986). American Littoral Society Presentation at the Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Carney, Leo H. (1986, November 24). The Environment. *New York Times*.

Carter, V. (1990). The Great Dismal Swamp: An Illustrated Case Study. In *Forested Wetlands* (pp. 201-211). New York: Elsevier Science Publishing Co.

Carter, V., Garrett, M. K., and Gammon, P. T. (1988, April). Wetland Boundary Determination in the Great Dismal Swamp Using Weighted Averages. *Water Resources Bulletin WARBAQ*, 24, 297-306.

Castelle, A. J., Connolly, C., Emers, M., Meyer, S., Witter, M., Mauerman, S. et al. (1992). Wetland buffers: Use and effectiveness. Adolfson Associates, Inc. Pub. No. 92-10. Olympia, WA, Washington Department of Ecology. Shorelands and Coastal Zone Management Program.

Ref Type: Serial (Book, Monograph)



Castelle, A. J., Johnson, A. W., & Connolly, C. (1994). Wetland and Stream Buffer Size Requirements - A Review. *Journal of Environmental Quality*, 23, 878-882.

Cheschier, G. M., Skaggs, R. W., Gilliam, J. W., & Broadhead, R. G. (1987). Wetland Buffer Areas for Treatment of Pumped Agricultural Drainage Water. In *American Water Resources Association Coastal Water Resources Symposium* (pp. 255-263). Bethesda, MD: American Water Resources Association.

Cortell, J. M. (7-30-1986). Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Day, J. W. & Kemp, G. P. (1995). Long-Term Impacts of Agricultural Runoff in a Louisiana Swamp Forest. In P. Godfrey (Ed.), *Ecological Considerations in Wetlands Treatment of Municipal Waste Water* (pp. 317-326). New York: Van Norstrand Reinhold, Co.

Demo, T., Loggy, W. D., & West, R. (1989). Development of Wetlands Mapping Procedures for Forest Planning in Southeast Alaska. In *American Water Resources Association Wetlands Symposium 1989* (pp. 45-59). Bethesda, MD: American Water Resources Association.

Erwin, K. L. (1990). Freshwater Marsh Creation and Restoration in the Southeast. In J.A. Kusler & M. E. Kentula (Eds.), *Wetland Creation and Restoration: The Status of the Science* (pp. 233-265). Washington, DC: Island Press.

Feierabend, J. S. (1989). Wetlands: The Lifeblood of Wildlife. In *Constructed Wetlands for Wastewater Treatment: Municipal, Industrial and Agricultural* (pp. 107-118). Chelsea, MI: Lewis Publishers.

Fenske, H. (7-16-1986). Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Filippone, E. (6-22-2006). Interview with Ella Filippone, Executive Director of the Passaic River Coalition -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Fisher, D. (7-16-1986). David Fisher - Testimony before the Assembly Energy and Natural Resources Committee on Assembly Bill 2342 and Assembly Bill 2499. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Fletcher, S. W. (1983). *Wetlands research program. Evaluation of methods for sampling vegetation and delineating wetlands transition zones in southern Louisiana, January 1979-May 1981* Gainesville, FL: Environment, Science and Engineering, Inc.

Freshwater Wetlands Campaign Negotiator #1. (4-20-1999). Interview with Freshwater Wetlands Campaign Negotiator #1 -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Freshwater Wetlands Campaign Negotiator #2. (4-5-1999). Interview with Freshwater Wetlands Campaign Negotiator #2 - conducted by Heather Fenyk.

Ref Type: Personal Communication

Freshwater Wetlands Campaign Organizer #1. (3-30-1999). Interview with New Jersey Freshwater Wetlands Campaign Organizer #1 -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Goldfein, M. (7-16-1986a). Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Goldfein, M. (12-17-1986b). Dear Assembly Member Letter to The Hon. Alan J. Karcher. Karcher, Alan J.

Ref Type: Personal Communication

Groman, Hazel A. and Powel, Ann (1986). National Wetlands Newsletter. *National Wetlands Newsletter*, May-June.

Gupta, T. R. (1972). Economic Criteria for Decisions on Preservation and Use of Inland Wetlands in Massachusetts. *Journal of Northeastern Agricultural Economics Council*, 1, 201-210.

Hart, R. (1984). *Transition Zones in Coastal West-Central Florida: January 1979-May 1981* (Rep. No. Army Engineer Technical Report Y-84-2). Springfield, VA: U.S. Army Corps of Engineers.

Hey, D. L. (1988). Wetlands: A future nonpoint pollution control technology. In *Nonpoint Pollution: 1988—Policy, Economy, Management, and Appropriate Technology* ( American Water Resources Association.

Holland, M. M., Whigham, D. F., & Gopal, B. (1990). The Characteristics of Wetland Ecotones. In *The Ecology and Management of Aquatic-Terrestrial Ecotones* (pp. 171-198). New York and London: The Parthenon Publishing Group.

Hughes, J. (3-19-2013). Dinosaurs or Diamonds? Re-imagining New Jersey's Suburban Office Spaces. A public presentation at the Helderich Hotel, New Brunswick, NJ.

Ref Type: Generic

Hughey, R. E. (9-24-1984). Statement of Honorable Robert E. Hughey, Commissioner NJDEP. Assembly Bills 672 and 2348. Assembly Agriculture and Environment Committee.

Ref Type: Hearing

Johnson, W. C., Mayes, R. A., & Sharik, T. L. (1982). *Use of Vegetation in Delineating Wetland Borders in Upper Missouri River Basin; North-Central United States* (Rep. No. Technical Report Y-82-1). Vicksburg, MS.

Jorgensen, S. E., Hoffman, C. C., & Mitsch, W. J. (1988). Modelling Nutrient Retention by a Reedswamp and Wet Meadow in Denmark. In W.J.Mitsch, M. Straskraba, & S. E. Jorgensen (Eds.), *Wetland Modelling. Developments in Environmental Modelling* (pp. 133-151). New York: Elsevier Scientific Publishing.

Kadlec, R. H. & Tilton, D. L. (1979). The use of freshwater wetlands as a tertiary wastewater treatment alternative. *Critical Review of Environmental Control*, 9, 185-212.

Kean, T. (6-8-1987). New Jersey Executive Order No. 175: Freshwater Wetlands Development Moratorium. 175.

Ref Type: Unenacted Bill/Resolution

Keddy, P. A. (1989). Effects of competition from shrubs on herbaceous wetland plants: A 4-year field experiment. *Canadian Journal of Botany*, 67, 708-716.

Kudrna, F. (1979). Water Quality Effects of Land Use Management and Vegetation. In The American Society of Civil Engineers (Ed.), *Water Problems of Urbanizing Areas* (pp. 152-156). New York: The American Society of Civil Engineers.

Kusler, J. A. (1980). *Strengthening State Wetland Regulations* Washington, DC: U.S. Government Printing Office.

Kusler, J. A. (1983). *Our National Wetland Heritage: A Protection Guidebook* Washington, DC: Environmental Law Institute.

Lowe, G. & Salafrio, C. (1989). The Evolution of Wetland Regulation Under Chapter 40C-4, F.A.C. In *American Water Resources Association Conference, Tampa, Fla., Sept. 17-22, 1989* American Water Resources Association.

Magoon, O. T. (1983). Coastal Zone '83: Proceedings of the Third Symposium on Coastal and Ocean Management. In The American Society of Civil Engineers.

McElfish, James, Kihslinger, Rebecca, and Nichols, Sandra (2008). Setting Buffer Sizes for Wetlands. *National Wetlands Newsletter*, 30, 6-17.

Merkle, M. (8-1-1986). Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Mitsch, W. J., Reeder, B. C., & Klarer, D. M. (1989). The role of wetlands in the control of nutrients with a case study of western Lake Erie. In W.J.Mitsch & S. E. Jorgensen (Eds.), *Ecological Engineering: an Introduction to Ecotechnology* (pp. 129-158). John Wiley & Sons.

Moore, D. (8-1-1986). Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Narus, Bob (1986, February 9). *New York Times*.

National Association of Industrial and Office Parks. Post-FWPA De-Brief Video with NJDEP and NAIOP. 1987.

New Jersey Builders Association. (1986). Proposed changes to ACS-2342/2499 "The Freshwater Wetlands Act".

Ref Type: Generic

New Jersey Builders Association. (1987). NJBA Memo.

Ref Type: Generic

New Jersey State Assembly. (12-15-1986). Assembly Committee Substitute for Assembly Nos. 2342 and 2499.

Ref Type: Unenacted Bill/Resolution

NJDEP Official #1. (6-22-2006). Interview with NJDEP Official #1 - conducted by Heather Fenyk.

Ref Type: Personal Communication

NJDEP Official #4. (12-1-2009). Interview with NJDEP Official #4 - conducted by Heather Fenyk.

Ref Type: Personal Communication

NJDEP Staff Member #1. (5-5-1999). Interview with NJDEP Staff Member #1 - conducted by Heather Fenyk and David H. Guston.

Ref Type: Personal Communication

Odum, E. P. (1983). *Systems Ecology: An Introduction*. New York: John Wiley.

Office of Legislative Services. (9-24-1984). Public Hearing on Bills 672 and 2348: Provides for the Systematic Review of Development Activities in and Around Freshwater Wetlands. 672 and 2348. Assembly Agriculture and Environment Committee.

Ref Type: Hearing

Office of Legislative Services. (8-1-1986a). Public Hearing before Assembly Energy and Natural Resources Committee on Assembly Bill 2342 and Assembly Bill 2499. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Office of Legislative Services. (7-16-1986b). Public Hearing before Assembly Energy and Natural Resources Committee on Assembly Bill 2342 and Assembly Bill 2499. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Office of Technology Assessment (1984). *Wetlands: Their Use and Regulation* (Rep. No. OTA-O-206). Washington, D.C.: U.S. Congress.

Ogden, M. (4-15-1999). Interview with Maureen Ogden, former New Jersey State Assemblywoman -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Parikh, A., Ferren, W. R., Jones, S., & Callaway, R. M. (1990). Ecology of a Mediterranean-Climate Estuarine Wetland at Carpinteria, California: Plant Distributions and Soil Salinity in the Upper Marsh. *Canadian Journal of Botany*, 68, 1139-1146.

Penn, J. (7-16-1986). Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Porter, B. W. (1981). The Wetland Edge as a Community and Its Value to Wildlife. In Minnesota Water Planning Board (Ed.), *Midwest Conference of Wetlands Values and Management: Minnesota Water Planning Board* St. Paul.

Ravo, Nick (1999, July 28). Alan Karcher's obituary. *New York Times*.

Reilly, S. M. (7-16-1986). New Jersey Freshwater Wetlands Regulation: Issues to be Considered for Amendment to Bill A-672/2348 (Appendix). Bill 2342 and Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Roesner, L. A. (1988). Nonpoint Pollution: 1988-Policy, Economy, Management, and Appropriate Technology. In *American Water Resources Association Wetlands Symposium, 1988* (pp. 213-223). Bethesda, MD: American Water Resources Association.

Roman, C. T. & Good, R. (1983). *Wetlands of the New Jersey Pinelands: Values, Functions and Impacts* New Brunswick, NJ: Division of Pinelands Research, Center for Coastal and Environmental Studies.

Schreck, A. (1997). Implementation: The New Jersey Freshwater Wetlands Protection Act.

Ref Type: Unpublished Work

Schreiner, W. C. (1989). Wetland Preservation - Par for the Course. In *Wetlands: Concerns and Successes. Conference of the American Water Resources Association* (pp. 335-343).

Sharp, M. N. & Keddy, P. A. (1986). A quantitative technique for estimating the boundaries of wetlands from vegetation data. *Environmental Management*, 10, 107-112.

Shisler, J. K., Waidelich, P. E., Russell, H. G., & Piel, R. B. (1987). Buffer zones in wetland management practice. In *The Tenth National Conference of the Coastal Society* New Orleans, LA.

Stockton, M. B. & Richardson, C. J. (1987). Wetland development trends in coastal North Carolina, USA, from 1970 to 1984. *Environmental Management*, 11, 1-9.

Szczepanski, A. J. (1990). Forested Wetlands of Poland. In *Forested Wetlands: Ecosystems of the World* (pp. 437-446). Amsterdam: Elsevier Science Publishing Co.

The Freshwater Wetlands Campaign. (10-31-1986). Letter from the Freshwater Wetlands Campaign to Senator Dalton. Senator Dalton.

Ref Type: Personal Communication

Tudor, R. (12-17-1986). Memorandum from NJDEP Planning Coordinator to Assistant Commissioner Helen Fenske. Fenske, Helen.

Ref Type: Personal Communication

Turner, R. E., McKee, K. L., Sikora, W. B., Sikora, J. P., & Mendelssohn, I. A. (1984). Impact and Mitigation of Man-Made Canals in Coastal Louisiana. *Water Science and Technology*, 16, 497-504.



Vaughn, B. F. Jr., Cooper, R. J., Brashwell, J. H., & Hart, R. (1984). *Delineation of wetland boundaries using vegetation within the Altamaha River Basin of Georgia* Atlanta, GA: EnviroSphere, Co.

Vought, L. B. M., Dahl, J., Petersen, C. L., & Lacoursiere, J. L. (1994). Nutrient retention in riparian ecotones. *Ambio*, 23.

Wetzel, R. G. (1979). The role of the littoral zone and detritus in lake metabolism. *Ergebnisse der Limnologie*, 13, 145-161.

Wharton, C. H., Kitchens, W. M., Pendleton, E. C., & Sipe, T. W. (1982). *The Ecology of Bottomland Hardwood Swamps of the Southeast: A Community Profile* Biological Services Program.

Wilpiszewska, I. (1990). Productivity and chemical valorization of mire vegetation in postglacial agricultural landscape. *Ekologia Polska*, 38, 3-72.

Zampella, R. A. (8-17-1984). Letter to Assemblywoman Maureen Ogden from Pinelands Commission Environmental Specialist Robert A. Zampella. Assemblywoman Maureen Ogden.

Ref Type: Personal Communication

Zedler, J., Josselyn, M., & Griswold, T. (1990). Wetland Mitigation Along the Pacific Coast of the United States. In J.A.Kusler & M. E. Kentula (Eds.), *Wetland creation and mitigation: the status of the science* (pp. 3-36). Washington, DC: Island Press.

Zedler, J., Josselyn, M., & Onuf, C. (1982). Restoration Techniques, Research, and Monitoring: Vegetation. In *Wetlands Restoration and Enhancement in California* (pp. 63-74). San Francisco State University.

## CHAPTER SIX: WETLANDS MITIGATION

In the 1970s the United States federal government deployed the concept of “compensatory environmental mitigation” as a regulatory tool to achieve the objectives of minimizing or lessening unavoidable impacts of development on natural resources like wetlands. This policy approach, a core element of Section 404(b)(1) of the Clean Water Act (CWA), allowed for the replacement of impacted wetlands resources using establishment, or creation, of new wetlands. These practices emerged at a time of heightened tensions between the development pressures of a suburbanizing nation and the increasing societal appreciation for environmental goods. In including compensatory mitigation in its 1987 Freshwater Wetlands Protection Act (FWPA), New Jersey moved decisively beyond ongoing national debates of whether it was possible or even desirable to mimic an original ecosystem through mitigation, and whether the creation of artificial wetlands was sufficient action to permit the destruction of natural freshwater wetlands.

New Jersey’s mitigation debates coincided with the 2<sup>nd</sup> national conference on wetlands held in 1986. At that conference organizers described the challenges posed by mitigation as including a “lack of consensus on scientific issues, lack of awareness by regulators of the status of scientific knowledge, and a desire on the part of both agencies and many developers to maintain ‘flexible’ standards” (Kusler, 1986a). Regulators and academics were simply not sure if wetlands creation worked.<sup>67</sup> In New Jersey, legislator’s understanding of mitigation was also viewed as lacking:

Talking to legislators about wetlands mitigation in the mid 80’s - they’d look at you like you were from Mars. Nobody anywhere in the United States understood it. They still don’t. But 20 years ago in the middle of a politically controversial piece of legislation you’d talk about mitigation and they’d look at you like you were crazy” (ANJEC Representative #1, 2011).

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<sup>67</sup> Even today many scientists believe these basic questions to be unresolved. For example, in considering wetlands losses under the CWA the National Research Council determined that “much more research is needed before we can be assured that wetlands created to replace wetlands destroyed for development can be successful” (NRC, 2001). Noted wetland scientist and ecological engineer William Mitsch argues that a systematic, scientific approach to the problem is imperative: first determine how wetlands work, then if we can create and restore them, and finally the best approaches to their creation and restoration (Mitsch, 2005).

The story of how the state's legislators came to a resolution on these issues, and how they agreed to allow compensatory mitigation of the state's freshwater wetlands given no viable regulatory precedents and little guidance from the new field of mitigation science, holds value as an example of the variable relationships between science and politics in public policy.

New Jersey legislator's understanding of mitigation was informed by two opposing viewpoints: that of the regulated community of builders and developers, and that of the state's environmental community, organizing as the Freshwater Wetlands Campaign (FWC). The New Jersey Builders Association (NJBA) and the National Association of Industrial and Office Parks (NAIOP) forwarded a common view of the building and development community, that of environmental mitigation as an unwanted exaction or tax. Although these groups would prefer not to provide any compensation, they saw in wetlands creation an opening to a quid pro quo: the exchange for filling an acre of wetland in one location was creation of another acre of wetland somewhere else. This provision, they argued, gave them free rein to develop where they liked without undue restrictions as long as they provided replacements for the impacts. New Jersey environmentalists, on the other hand, viewed wetlands creation as the last and least desirable option in a sequence of federal policy actions that included avoidance, minimization, restoration and enhancement, or stood firm against it in principle arguing that it was an uncertain science and human (re)creation of wetland areas a form of hubris:

Wetlands cannot be completely mitigated. No matter how many drainage ditches, yards of filter fabric, or new earthen buffers are created, we do not believe that man can successfully recreate a wetland area. These areas have been constantly changing and adding new vegetation as nature provides for wet and dry periods. None of us is competent enough to duplicate nature (Gruber, 1986).

In the early 1980s New Jersey environmental groups had organized as the "Freshwater Wetlands Campaign" to build a case for a state-specific freshwater wetlands law, in part by linking freshwater wetlands losses in the state to what they saw as the failures of the federal compensatory mitigation exercises of the 1970s. Seeking greater protections for the state's freshwater wetlands the FWC argued that a state wetlands protection bill would be more effective than federal legislation in

preventing wetlands impacts due to filling because state oversight would allow for greater control over development in areas of critical environmental concern. This group successfully shifted public perceptions of freshwater wetlands as valueless to valuable. From this we can imagine that the FWC could have prompted a movement against mitigation on par with world-wide movements against nuclear power, or GM foods. New Jersey's activists could have proceeded, as environmentalists did in other U.S. states (e.g. Maine and Rhode Island) on the assumption that mitigation is not inevitable. Activists in these states and, in fact, many in the FWC community, critiqued the politics around mitigation-in-lieu-of-development. The question is why was the FWC not successful in this regard?

In what follows I consider this question. As in the definitions and buffers sub-movement chapters, I also examine the ways in which co-production is at work. More specifically I consider co-production with respect to the development of the artifact of New Jersey's mitigated freshwater wetlands and the creation of the institution of the state's Freshwater Wetlands Mitigation Council, a citizen's advisory group formed as part of the FWPA legislation. I use devices from social movement theory, including frame, to suggest that New Jersey's acceptance of mitigation should not be understood as uncritical validation of the anthropogenic replication of valued freshwater wetlands as I explore how science is made to matter by the environmental community in this case. I also trace the role of science in environmental advocacy more broadly to consider what is gained and what is lost by the environmental movement taking up science as a source of moral authority to speak about the environment.

Mitigation was the final major issue to be resolved in the political debates between the environmental community and the regulated community on the freshwater wetlands legislation. It is with mitigation that the practical realities of freshwater wetlands intrude on the environmental community's goals, and where the pushback from the regulated community really starts to shape up. A SCOT analysis helps us see that although the environmental activists had a significant advantage with respect to their scientific understanding of freshwater wetlands and their function, and although they had become more confident in their use of science through the course of their negotiations in the definitions and buffers sub-movements, the lines are much more clearly drawn by the time they arrived

at the mitigation fight. In this sub-movement we see the environmental community in reactive mode rather than leading the way through science on this policy.

As mitigation science does not ultimately influence decision making in this sub-movement to the degree that it did in the definitions and buffers cases, I give less attention to the field's disciplinary evolution and more to aspects of co-production that illustrate the intertwined nature of science with law. This chapter begins by tracing the development of compensatory mitigation as a regulatory practice in the United States and by situating purposeful freshwater wetlands creation in emerging approaches adopted by environmental managers in the 19<sup>th</sup> and 20<sup>th</sup> centuries. In this I consider tensions between the scientific and environmental management approaches in the years leading up to passage of the FWPA. Although I most closely follow the efforts of New Jersey's environmental actors as they shape research into the on-going mitigation activities in the state and as they developed an understanding of the technical feasibility of wetlands replication, I also consider the legacy of ecosystem recovery practices on support for wetlands creation, and examine mitigation science as a component of the FWPA debates and as a movement around which both the FWC and the regulated community organized. I describe not only an increasingly scientized but an increasingly politicized decision making in which the environmental community and the regulated community are "repeat players" and recognize the extent to which they are bound together in the negotiation process. In the five year course of freshwater wetland negotiations the mitigation debate was the last significant dispute to be settled before the legislation moved to passage. In this time both groups had grown in sophistication with respect to integrating science in policy development and with respect to the institutionalization of their movements. I look at how these actors leveraged the emerging science in their negotiations, but also consider the influence of their growing organizational sophistication on the tenor of the mitigation discussions and on the path compromise.

## Compensatory Mitigation in the United States

“Mitigate” is a late Middle English term combining the past participle Latin *mītigāre*, meaning to calm, soften, or soothe, with the form of “-agere,” meaning to do, cause to do, or to make.<sup>68</sup> The present day meaning of “to mitigate” is to make less severe, or to moderate. In the United States “environmental mitigation” refers to measures taken to address undesirable impacts of actions that affect natural or historic resources. With respect to regulating development in the nation’s waterways and wetlands, mitigation encompasses a broad swath of ideas including avoidance and minimization of impacts and compensation for those impacts that do occur, and involves a consideration of the public interest and public values associated with the site(s) of impact.<sup>69</sup> Current federal policy allows compensatory environmental mitigation to offset permitted wetlands impacts within or contiguous to the site of wetland impact (called “on-site” mitigation) or off-site, and either directly or indirectly. Direct mitigation activities include the restoration, enhancement or creation of wetlands functions. Indirect mitigation is most commonly achieved via market based approaches that use a development credits system. These approaches include mitigation banking, the donation of land to Mitigation Banks, or the purchase of mitigation credits for an already-improved, created, or restored resource.

This section provides a historical review of the evolution of federal environmental mitigation measures and agency approaches to these measures followed by a summary of wetlands mitigation practices in New Jersey prior to passage of the FWPA. It illustrates the early ecological thinking of the Inland Waterways Commission to demonstrate a long standing federal precedent for a philosophical approach to environmental management juxtaposed against the navigational focus of federal laws and Army Corps oversight. It also considers these federal influences on the strictly hydrological reach of New Jersey laws pre-FWPA. I aim to make clear why New Jersey environmentalists judged the federal approaches of the 1970s as inadequate, but also to explain why they felt constrained to use at least

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<sup>68</sup> [www.dictionary.com](http://www.dictionary.com) accessed July 10, 2011.

<sup>69</sup> Often posited as rival approaches, regulatory trends have vacillated between avoidance/minimization and compensation of impacts. As major environmental statutes of the 1970s began to include mitigation as an option for agency action, and as regulating agencies struggled to interpret legislative intent and clarify jurisdiction, the divergence of these perspectives became increasingly clear.

some aspects of the federal debates and policies about freshwater wetlands mitigation as they negotiated with the regulated community to shape the state's new freshwater wetlands legislation.

**Early federal environmental mitigation measures.** Present day federal mitigation policy has its roots in the 1824 Rivers and Harbors Act. A program of waterway improvements aimed at facilitating navigation on the Mississippi and Ohio Rivers, this legislation established the first of what would become a patchwork of limits on obstructions to the navigable capacity of the nation's waters, particularly the growth in railroads and steamboat travel that had proceeded with the blessing of local legislatures. Reacting to arguments that these limits proved "to prevent rather than promote development" (Pinchot, 1945) the federal government moved to assert a more coherent set of controls over internal waters with the 1899 Rivers and Harbors Act. Sections 9 and 10 of the 1899 Act gave the United States Army Corps of Engineers oversight of projects and activities in the nation's navigable waters, and of harbor and river improvements. This created a new dynamic between the Army Corps, the state legislatures, and Congress that would endure for seventy years.<sup>70</sup> This legislation came with few guidelines and no criteria to be used in granting or withholding permits, leaving the Army Corps to fashion its own. The Army Corps' interpretations came to be characterized as narrowly focused on navigation: "it is the water body's capability of use by the public for purposes of transportation or commerce which is the determinative factor" (§209.260(e)).<sup>71</sup> A long history of litigation (*Wilson v. Black Bird Creek Marsh Co.*, 1829; *Pennsylvania v. Wheeling & Belmont Bridge Co.*, 1851; *United States v. Appalachian Elec. Power Co.*, 311, 1940) demonstrates the extent to which this focus on navigation

<sup>70</sup> 33 U.S.C. 403 provides that the creation of any obstruction not affirmatively authorized by Congress, to the navigable capacity of any of the waters of the United States is hereby prohibited; and it shall not be lawful to build or commence the building of any wharf, pier, dolphin, boom, weir, breakwater, bulkhead, jetty, or other structures in any port, roadstead, haven, harbor, canal, navigable river, or other water of the United States, outside established harbor lines, or where no harbor lines have been established, except on plans recommended by the Chief of Engineers and authorized by the Secretary of War; and it shall not be lawful to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of, any port, roadstead, haven, harbor, canal, lake, harbor of refuge, or enclosure within the limits of any breakwater, or of the channel of any navigable water of the United States, unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of War prior to beginning the same.

<sup>71</sup> The Army Corps also acknowledged this focus in the "Final Rule for the Regulatory Program of the Corps of Engineers" of 1986: "Until 1968 the primary thrust of the Corps' regulatory program was the protection of navigation." 51 FR 41220, Nov. 13, 1986 "Final Rule for the Regulatory Program of the Corps of Engineers" Accessed on-line December 5, 2011: <http://www.orn.usace.army.mil/cof/pdf/allregs.pdf>

excluded other criteria including health considerations, public nuisance and power generation (Hankey, 1980). Concepts of avoiding and minimizing environmental impacts were generally not part of regulatory guidance.<sup>72</sup> The Army Corp's navigation-focused vision of waterways oversight was consistently upheld by the Attorney General<sup>73</sup> and reiterated time and again in legislation.<sup>74</sup> Furthermore, its broad exercise of closely-held administrative powers was sustained by default: although Congressional and state legislative approval was now required for the development of dikes, dams, causeways and bridges over interstate waterways there was no regulatory structure for inter-agency coordination.

Some notable attempts were made to balance waterways control and broaden the criteria considered at the regional level. For example, in 1907 President Theodore Roosevelt established the Inland Waterways Commission "To Investigate the Problems of Waterways." This Commission was charged with developing plans that "consider and include all the uses to which streams may be put, and...bring together and coordinate the points of view of all users of waters...in the light of the widest knowledge of the country and its people, and from the most diverse points of view" (New York Times, 1907). Gifford Pinchot, Chief Forester of the United States from 1905-1910 and Inland Waterways Commissioner, recalled that Roosevelt made clear in his appointment letter the intent that checks on the development of natural resources reflect the newly formulated policy on conservation:

It is not possible to properly frame so large a plan as this for the control of our rivers without taking account of the orderly development of other natural resources. Therefore, I ask that the Inland Waterways Commission shall consider the relations of the streams to the use of all the great permanent natural resources and their conservation for the making and maintenance of prosperous homes (Pinchot, 1945).

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<sup>72</sup> One example to the contrary: Studt and Sokolove (1996) write of a 1933 Army Corps decision to deny a permit for development along the Potomac River "because alternatives existed that would be less damaging to the overall aesthetic of the Virginia shoreline of the river" (Studt & Sokolove, 1996). This ruling was upheld by the Supreme Court to the effect that the Army Corps could consider factors other than navigation.

<sup>73</sup> One of the most significant examples of navigation trumping other criteria is exemplified in the Federal Water Power Act of 1920, which prioritized the nation's navigation needs over non-federal hydropower projects.

<sup>74</sup> 33 C.F.R. §209.330(a)(1967): "The decisions as to whether a permit will be issued must rest primarily upon the proposed work on navigation."



From the Inland Waterways Commission came a policy report written by Pinchot and geologist W.G. McGee which established precedents for river management including the concepts “that every river system is a unit from its source to its mouth and should be treated as such...” and that plans for use of inland waterways “take account of the purification of the waters, the development of power, the control of floods, the reclamation of lands by irrigation and drainage, and all other uses of the waters or benefits to be derived from their control” (Pinchot, 1945). These were the foundational principles for the National Waterways Commission from which developed, in 1933, the first large regional planning authority of the federal government, the Tennessee Valley Authority. Although the Waterways Commissions did not directly affect Army Corps oversight of national waterways or prompt formal mitigation efforts as part of permitting it did establish, in a regional context, procedures for coordination and ecological consideration of waterways development.

The first national attempts to condition Army Corps permitting and bring mitigation considerations into environmental regulation came with the 1934 Fish and Wildlife Coordination Act (FWCA) and its amendments. The FWCA opened the door to inter-agency coordination of development projects that could affect the environment by stipulating that federal agencies involved in dam permitting and construction had to first consult with the Bureau of Fisheries to make provisions for fish migration prior to taking action (16 U.S.C. § 661-667e; the Act of March 10, 1934; Ch. 55; 48 Stat. 401. Public Law 73-121). The FWCA amendments enacted in 1946 went a bit further, requiring interagency consultation to prevent “loss of and damage to wildlife resources” in those cases where “waters of any stream or other body of water are proposed or authorized, permitted or licensed...or otherwise controlled or modified” by any agency under a Federal permit or license (16 U.S.C. § 662a). And the 1958 amendments added even more strident provisions “to recognize the vital contribution of wildlife resources to the Nation and to require equal consideration and coordination of wildlife conservation with other water resources development programs” (US Fish and Wildlife Service, 2013).

The Waterways Commissions and the FWCA set a precedent for what would eventually become Army Corp’s procedures for defining public interests in determining water uses as part of the Rivers and Harbors Act permitting process. Codified in the December 18, 1968 Code of Federal Regulations Title

33 Navigation and Navigable Waters was the “Public Interest Review” process which required consideration of the “full public interest by balancing the favorable impacts of a project against the detrimental impacts” (33 CFR Part 320). Environmental criteria were now relevant factors deemed important enough to the needs and welfare of the people to be considered part of the permit process:

(d) General policies on issuing permits (1) The decision as to whether a permit will be issued must rest upon an evaluation of all relevant factors, including the effect of the proposed work on navigation, fish and wildlife, conservation, pollution, aesthetics, ecology, and the general public interest (33 CFR 18670 and codified in 33 CFR §209.120(d)(1)).

By 1969 the Army Corps had denied permits solely on environmental grounds with *Zabel v. Tabb* (Duke Environmental Law, 1970). The 5<sup>th</sup> Circuit upheld this approach:

...nothing in the statutory structure compels the Secretary to close his eyes to all that others see or think they see. The [Corps] was entitled, if not required, to consider ecological factors and, being persuaded by them, to deny that which might have been granted routinely five, ten or fifteen years ago before man's explosive increase made all, including Congress, aware of civilization's potential destruction from breathing its own polluted air and drinking its own infected water and the immeasurable loss from a silent spring-like disturbance of nature's economy (Brown, 1970).

**Evolving concepts of mitigation in federal statutes.** The FWCA and Waterways Commissions gradually broadened thinking about the environmental impacts of development projects, intimating a path for the mitigation measures established as part of the 1969 National Environmental Protection Act (NEPA). With NEPA, Congress set national environmental policy goals “to create and maintain conditions under which man and nature can exist in productive harmony” (42 U.S.C. § 4331a), set forth expectations of agency conformity and cooperation (42 U.S.C. § 4334), and outlined components to be included in detailed statements of environmental impacts for major federal actions (42 U.S.C. § 4332c). To the extent that mitigation options were detailed in the original law, the focus was on preservation and enhancement of important environmental resources (Sec 101 (42 USC 4221 b)) and on specific impacts like shoreline erosion (Woodhouse & Knutson, 1982). Like the FWCA, NEPA gave consultation authority (review and comment powers) to resource agencies including the USFWS, National Marine Fisheries Service (NMFS) and the EPA, but also sought broader public involvement in government decision making through area-wide planning and the development of Environmental Impact Statements (EISs). In this way it challenged Army Corps sovereignty in the nation's wetlands and

waterways. Although NEPA established a new oversight entity called the Council on Environmental Quality (CEQ) to shape environmental goals and provide guidance for the EIS process, the CEQ lacked authority of enforcement: while NEPA required an explanation of mitigation decisions as part of the planning process, mitigating environmental impacts was not compulsory.

NEPA was the first of several federal environmental statutes, including the 1973 Endangered Species Act (ESA) and the 1972 Federal Water Pollution Control Act (renamed the Clean Water Act in 1977), to address mitigation. Lawyers and scientists involved with shaping NEPA refined their efforts with the ESA, providing in the new law for “the conservation of ecosystems upon which threatened and endangered species of fish, wildlife and plants depend” and protecting them from extinction as a “consequence of economic growth and development un-tempered by adequate concern and conservation” (16 U.S.C. 1531-1544 87 Stat 884 approved December 28, 1973). Recognizing NEPA’s primarily prescriptive effect they sought to give regulatory bite to the ESA’s “Habitat Conservation Plan” requirements for takings of listed (endangered) species. The oversight agencies, including FWS and NOAA’s National Marine Fisheries Service, could require that permittees consider a project’s “likely impact, the steps to minimize and mitigate the impact, the funding for the mitigation,” and “the alternatives that were considered and rejected” (Corn, Buck, & Baldwin, 2006).

Like the ESA, the CWA incentivizes protecting the functional integrity of habitat. It was with the CWA that the Army Corps’ responsibility for permitting fill into navigable channels was expanded into authority over fill of freshwater wetlands. Three federal agencies, the Army Corps, EPA and USFWS share regulatory responsibility under the CWA (33 U.S.C. § 1344g(3)). The Army Corps has ultimate permitting authority under the law, and upon issuance of a CWA Section 404(b)(1) “Individual Permit” is required to conduct evaluations based on the Public Interest Review and NEPA. The EPA is enlisted in goal-setting to “restore and maintain the chemical, physical and biological integrity” of the Nation’s waters (33 U.S.C. § 1314 2a). The EPA also has the authority to veto proposals to discharge fill into water bodies in cases in which it might “have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas” (33 U.S.C. § 1344c). Both the EPA and the Army Corps are required to seek input

on permit applications from the USFWS, although per a 1980 ruling it was determined that they were not required to follow the USFWS's recommendations.<sup>75</sup>

Mitigation is an important part of permitting under Section 404 of the CWA because the issuance of a Section 404 permit triggers NEPA and its mitigation requirement (Berry & Dennison, 1993). The CWA gives wetlands special protections not afforded other habitat types, and with its passage ideas of wetlands mitigation and wetlands mitigation techniques began to mature (Ambrose, 2000). Although the terms “mitigate” and “mitigation” were not used in the original 404 permitting program, and although the 404(b)(1) guidelines did not expressly authorize the Army Corps to require mitigation as part of permitting, the statute did provide implicit authority for the Army Corps to require permit applicants to avoid and minimize wetland impacts with requirements based on the criteria identified in CWA Section 403(c) specifying minimization of adverse environmental impacts (Federal Water Pollution Control Act Public Law 92-500). The CWA permitted discharges of pollutants in the nation's waters via the Section 404 program, regulated quality standards for surface waters, and established guidelines for considering alternatives to and minimization of unavoidable impacts. In doing so the CWA became the most significant piece of federal legislation protecting federal waterways and in establishing approaches to wetlands mitigation.<sup>76</sup>

***Refining and defining concepts of mitigation in the context of the nation's freshwater wetlands.***

Although the concept of mitigation in these early environmental statutes implied a focus on avoidance and minimization of impacts, none of the laws provided a specific definition of the term. The first federal definition of mitigation did not emerge until 1978 when the President's Council on Environmental Quality (CEQ) implemented procedural provisions for NEPA (43 Fed Reg. 55978-56007, November 29, 1978). These CEQ guidelines defined environmental mitigation along a continuum:

- (a) Avoiding the impact altogether by not taking a certain action or parts of an action;
- (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation;

<sup>75</sup> *Sierra Club v. Alexander*, 484 F. Supp. 455 (D.C.N.Y.) 1980.

<sup>76</sup> Section 401 is also important in that it addresses environmental mitigation as part of water quality certifications and isolated wetland permitting.

- (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- (e) Compensating for the impact by replacing or providing substitute resources or environments (40 CFR Part 1508.20 (a-e)).

This definition surfaced just before promulgation of the new 1980 CWA Section 404(b)(1) guidelines which provided specific instructions relating to compensatory mitigation: “Habitat development and restoration techniques can be used to minimize adverse impacts and to compensate for destroyed habitat” (Environmental Protection Agency, 1980). A year later in 1981 President Reagan established the Task Force on Regulatory Relief, headed by Vice President George H.W. Bush, with the goal that “Regulatory action shall not be undertaken unless the potential benefits to society from the regulation outweigh the potential costs to society” (Reagan, 1981). With respect to development in wetlands, Reagan’s Task Force viewed the Section 404 approach to compensatory mitigation as a way to speed up permitting processes while ostensibly satisfying concerns about the loss of ecosystems and functions (Task Force on Regulatory Relief, 1982). This interpretation built on the 1980 Section 404(b)(1) definition of mitigation guidelines, and in a significant shift it expanded the understanding of mitigation, at least within the building and development community, as a *quid pro quo*.

Although the trend toward compensatory mitigation as part of the CWA seemed certain to continue there were still no instruction manuals, guidelines for mitigation projects, or detailed criteria by which to judge project success. Each of the CWA oversight agencies articulated their own interpretations of implementation procedures, applying unique conceptions of mitigation to its own mandates and political environments. The Army Corps focused on fulfilling its Public Interest Review mandate as part of dredge and fill permitting under the Rivers and Harbors Act, often in lieu of the Environmental Impact Statement (EIS) and Environmental Assessment (EA) requirements under NEPA (Studdt & Sokolove, 1996). In its Public Interest Review determinations Army Corps permitting decisions were to be based on a broad qualitative evaluation of technological, economic, social and logistic considerations rather than the more narrow assessment of environment impacts. This widened the range of options for compensatory mitigation to include physical restoration, enhancement of existing

degraded wetlands, creation or replacement of wetlands, land donation, and mitigation banking, and resulted in “decisions that sometimes included compensatory mitigation for impacts even if the impacts could have been avoided” (Studdt & Sokolove, 1996). As continuing wetlands losses appeared to prove onsite mitigation ineffective, the Army Corps actively encouraged states to adopt off-site indirect practices like mitigation banking as the go-to environmental regulatory tool.<sup>77</sup>

The EPA and USFWS, established as science agencies, viewed mitigation differently from the transportation and navigation-focused Army Corps. Although the Army Corps issued permits, some approvals were needed from EPA and the USFWS. Both the EPA and USFWS approached their CWA oversight responsibilities with the aim of avoiding and reducing wetland impacts and preserving wetlands functions, and sought guidance in their approach from NEPA. The USFWS, with its early focus on supplying wildlife for hunting, and its later concern with species and ecosystem sustainability as part of its mandate under the ESA, was the first federal agency to adopt the NEPA/CEQ definition of mitigation. It used this definition to frame its 1981 policy and recommendations “on mitigating the adverse impacts of land and water developments on fish, wildlife, their habitats, and uses thereof” (Federal Register, 1981). Like the USFWS the EPA embraced the broad process concepts inherent in the NEPA rules and CEQ guidance. In CWA determinations the EPA was willing to give approval to the Army Corps to permit based on compensatory mitigation, but only after the applicant had demonstrated attempts to avoid freshwater wetland impacts and/or preserve in situ. As the Army Corps prioritized its Public Interest Review approach over EIS, EA and other NEPA considerations, compensatory mitigation gradually took root as the focus of regulatory policy in the early 1980s. Unhappy with this shift, the FWC and USFWS became outspoken critics of an approach they viewed as lacking in scientific grounding. In 1986 the EPA successfully prohibited a Corps of Engineers wetland fill permit in Massachusetts, maintaining that the science of mitigation was “uncertain and high-risk”

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<sup>77</sup> The California Coastal Conservancy spearheaded the first mitigation bank in the US in 1980. The 14 acre Bracut Marsh Mitigation Bank, designed to mitigate wetlands losses in Eureka, California, was by all accounts an unmitigated disaster. Two more banks emerged in the 1980s, one in Louisiana, another in Wisconsin. In the 1990’s, mitigation banking took off as a practice, with additional banks established in Florida, California, Georgia, Ohio, Wisconsin, South Carolina and New Jersey. New Jersey’s first mitigation bank, the “Willow Grove Mitigation Bank” operated by The Nature Conservancy, opened in 1994.

(51 Federal Register, 1986). And in testimony at the New Jersey freshwater wetlands protection hearings in 1986 the USFWS argued:

The Service has had much experience over the past decade or so with mitigation for losses under the Federal Permit System. We find that mitigation, although often recommended, is an extremely flawed process which is either not done at all, often trades off one habitat type for another and, if successful, doesn't result in replacement of all wetland values. Mitigation is also often used as an excuse to avoid consideration of project alternatives benefitting the public (Kulp, 1986).

### **Pre-FWPA wetlands restoration and mitigation in New Jersey**

Prior to passage of the FWPA many of the state's freshwater wetlands were directly regulated by the NJ Department of Environmental Protection (NJDEP) as part of a patchwork of federal, coastal and resource area-specific laws. Most of the rest of the state's freshwater wetlands were regulated under the federal CWA combined with an assortment of state statutes, with the NJDEP responsible for implementing both federal and state policy. Each of these laws forwarded different approaches to mitigation. However, to the extent that the state laws addressed non-hydrologic considerations, these laws did not affect federal compliance. The ultimate permitting authority for the majority of New Jersey's freshwater wetlands, and the ultimate decision-making authority with respect to the approach to mitigation, was held by the US Army Corps of Engineers.

New Jersey's early mitigation requirements for both coastal wetlands and freshwater wetlands emerged in response to both federal and state laws. Coastal wetlands mitigation requirements developed as part of the Federal Coastal Zone Management Act of 1972 (CZMA). This law formally introduced the idea of wetlands mitigation into the national environmental protection vocabulary. Mitigation procedures and standards were therefore set for coastal wetlands earlier than for freshwater wetlands. In New Jersey the CZMA smoothed a path for the comprehensive coastal mitigation policy (part of the mandatory management strategy for the Bay and Ocean Shore segment of the coastal zone, N.J.A.C. 7:7E-1.6) that by 1978 would guide all coastal wetland mitigation permit applications (New Jersey Office of Coastal Zone Management, 1978). In 1973 New Jersey responded to the CZMA by creating its first artificial wetland to attenuate shoreline erosion in the coastal plain estuary of

Delaware Bay (Kantor & Charette, 1986b). The CZMA also influenced regulatory guidance for New Jersey's 1970 Wetlands Act, which delegated authority to the newly formed New Jersey Department of Environmental Protection (DEP) to delineate and regulate development in all coastal wetlands from the Raritan River Basin southward (N.J.S.A. 13:9A). Per these requirements, shaped in 1973, the DEP could require wetlands restoration or creation as a condition for permit approval, or as a penalty for violating the prohibition against temporary or illegal disturbance to the State-regulated coastal wetlands in the area (New Jersey Department of Environmental Protection, 1974). The NJDEP's Department of Coastal Resources (DCR) was created to oversee this coastal area permitting and by 1977 had required construction of the state's first replacement coastal wetlands in Margate (Atlantic County) as a condition of permit approval for a sewerage pipe installation (New Jersey Freshwater Wetlands Mitigation Council, 1991).

The DCR found the oversight of coastal mitigation easy compared to ensuring compliance with the new freshwater wetlands mitigation requirements, which that agency was also charged to implement. It managed mitigation of freshwater wetlands as part of the 1973 Coastal Area Facility Review Act (CAFRA) (N.J.S.A. 13:19) and shepherded development of mitigation standards as part of the Hackensack Meadowlands and Pinelands Commission planning exercises (part of the 1968 Hackensack Meadowlands Reclamation and Development Act (N.J.S.A. 13:17), and the 1979 Pinelands Protection Act (N.J.S.A. 13:18), respectively), shaping an internally coherent and resource-based approach to mitigation in the process. It did not, however, have authority to apply non-hydrologic considerations in granting permits for state statutes including the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et seq. and implementing rules, also commonly referred to as the Stream Encroachment rules N.J.A.C. 7:13); the Waterfront Development Law (N.J.S.A. 12:5-3); and the Tidelands (Riparian) ownership statutes (N.J.S.A. 12:3). Ultimate regulatory authority for these lands was administered by the Army Corps as part of the Federal 404 Program. The DCR found its environmental resource-focused philosophy and mandate increasingly at odds with laws that regulated freshwater wetlands based strictly on flood carrying capacity and property rights, a remnant of the



early navigational focus of state and federal laws, and the DCR struggled to implement the diverse and frequently incompatible set of mitigation requirements attendant these laws.

Although the conflicting guidelines of the state statutes consistently complicated wetlands regulatory action in the state, the DCR was especially powerless in the face of Army Corps oversight. Lacking specific criteria to mitigate and compensate for environmental damages the DCR (and the NJDEP) simply could not protect the state's freshwater wetlands from the Army Corp's permit decisions (Kulp, 1983). This was illustrated in a 1984 USFWS report on permit violations in northern New Jersey (State College Field Office, 1984). The USFWS study examined outcomes of 40 developments in wetlands for which it had made recommendations to the Army Corps either prior to a permit being issued or after an illegal fill had been reported. It found that the response of the Army Corps to its recommendations was almost always to grant permits without the recommended stipulations, to grant permits to the illegal projects to make them legal, and to ignore the developers' failures in mitigation and wetland damage (State College Field Office, 1984). The USFWS report also documented the lack of penalties for ignoring the conditions of the permit processes and for failing to obtain a permit at all. Many of the larger mitigation failures documented by the USFWS, including the Timber Properties and Hartman & Hartman in South Jersey, the Mount Olive Township Trade Zone Heliport, and the Belle Meade and Hartz Mountain projects in the Hackensack Meadowlands, were already well known to the DCR and the NJDEP, and had generated public interest in the state's freshwater wetlands degradation problems. Nevertheless, the USFWS report lent legitimacy to the state agency's concerns and made clear the need for a state-specific set of mitigation criteria by which to hold the Army Corps accountable.

Federal and state agencies were not the only entities desiring clarity in regulatory guidance and mitigation standards. With compensatory mitigation gaining momentum as a tool for meeting wetlands protection requirements, the development community also sought streamlined and consistent rules. A lawyer for the development community recalled the confusion that resulted from inconsistencies in mitigation requirements at the state and federal levels, particularly with respect to the Army Corps Nationwide Permit 26 (NWP 26), which expedited filling of small, isolated wetlands

“with little, if any, delay, or paperwork” (33 C.F.R. § 321(a)(3)) and the state’s stream encroachment rules, which focused on flood hazard permitting:

With a project that had a Corps of Engineers approval via Nationwide 26, I could fill up to one acre. But to qualify for Nationwide 26 I had to prove to the Corps of Engineers that I had water quality certification from the state of NJ. NJ had no rules for water quality certification - it would say address your wetlands and show me you can’t reduce the impact, maybe we’re going to need some mitigation. The same process occurred if I didn’t need a nationwide permit but I needed a stream encroachment permit. DEP was putting mitigation requirements in those permits. So when I say something was inevitable it was already happening, but it was happening without rules on an ad hoc basis (Building and Development Community Counsel Subject #1, 1999).

Before the NJDEP (and DCR) could develop a coherent approach to compensatory mitigation it needed an adequate body of wetlands mitigation science. This was a particular challenge. A member of the DCR research team described coastal mitigation science in the 1970’s as “still in its infancy,” with freshwater wetlands mitigation science “a blank slate, or pretty close” (NJDEP Official #4, 2009). The available research often seemed uninformed by theory or practice. For example, the first state-specific study on wetlands mitigation exercises, an analysis of Army Corps-required mitigation in Ocean County (Fauer & Gritzuk, 1979), failed to yield meaningful data because of inadequate baseline assessments: the transplanted wetlands grasses died because the species were inappropriate for high levels of salt exposure. Not surprisingly the authors concluded that future projects start with “more rigorous pre-restoration ecological surveys” (Fauer & Gritzuk, 1979). Even internally the DEP lacked consistent and complete mitigation violation files and other relevant data on Division wetland permits, and there were no guidelines by which to identify and evaluate successful and unsuccessful mitigation techniques (Kantor & Charette, 1986a). The DEP would soon use this gap in mitigation knowledge to launch a concerted research campaign into mitigation practices in the state, focusing on the viability of mitigation as an aspect of freshwater wetlands protection.

### **Situating wetlands mitigation in wetlands science**

Situating wetlands mitigation practices in the emerging science allows us to see how the environmental community developed the landscape perspective they brought to bear in freshwater

wetlands decision making. It informs an understanding of how scale in wetlands creation ultimately contributed to the FWC's strategies and negotiating choices. With greater insight into the differences between these research approaches we can begin to conceive of how the different tacks of the new field of freshwater wetlands mitigation science contributed to the growing politicization of the issues of mitigation at the federal level. We can also better understand how, in New Jersey, the different ontological biases affected environmental actors' positions and choices vis-a-vis those of the development community.

Prior to passage of the environmental laws of the 1970s and their attendant mitigation requirements, there was little or no incentive to undertake expensive non-agricultural restoration or creation exercises in the United States. There was also very little documentation of restoration or creation in the scientific literature. That does not mean that these practices were unprecedented. Although typically credited with wide-scale wetlands destruction, humans have played important historic roles in wetlands creation. For example, early Asian agriculturalists developed complex wetland irrigation in terrace systems for mountain-side rice cultivation (Glover & Higham, 1996), and for at least two millennia people in countries like Poland, Romania, Iraq, and Iran have built livelihoods from the wetlands formed as the result of development and upstream water resource management projects (Maltby & Barker, 2009).

Purposeful wetlands creation in the United States, achieved by excavating and creating dikes next to streams, dates back to at least the 1850s trade in cranberries in states like Wisconsin, Massachusetts and New Jersey. These activities influenced one of the earliest non-agricultural restoration efforts in the United States, Frederick Law Olmsted's plan for Boston's Back Bay Fens (1879), a project considered an integral element of the city's "Emerald Necklace" park system. Olmsted's proposed response to Boston's problems of wetlands degradation, the result of channel siltation, garbage dumping and erosion, was to build a series of intersecting sewers and gates and replant salt marsh vegetation (Broome, 1989). The primary technical objective of the landscape architect's project was to establish a storage basin for the storm waters of Stony Brook, with a second aim "to restore the salt marsh to its original condition" (Zaitzevsky, 1982). Olmsted's re-introduction

of salt tolerant plants and engineered landscaping allowed the Fens to be flushed by the tides as they were when the first Europeans settled the area (Martin, 2011).

While Olmsted's approach was consistent with general conservationist aims, his focus on actively engineering a broad ecological landscape did not fit neatly into the popular theoretical frameworks of forestry conservation or conservation biology that dominated the research academies. The preservationists did not embrace it either, as reconstructing a landscape was not consistent with the paramount goal of keeping an original ecosystem safe from harm. Without a home in academia, lacking champions in the realm of environmental advocacy, and without a regulatory mandate or the political will driving interest in the approach, this unique form of environmental management went under-theorized, and was not situated in the scientific literature for another hundred years. "Ecological restoration" emerged just as environmental mitigation, specifically wetlands restoration and creation, began to be championed as an environmental management technique in the context of NEPA, the ESA, and the CWA.

The first "National Wetland Protection Symposium" held in June of 1977 and hosted by the U.S. Fish and Wildlife Service in partnership with the Environmental Law Institute, was attended by more than 70 regulators, environmentalists and academics (Kusler & Montanari, 1978). A review of the conference program shows that the Symposium, designed to "facilitate exchange of wetland documents and ideas," included only two (of forty five total) presentations addressing concepts of wetlands mitigation. One of these presentations introduced mitigation as "a concept for wetland restoration," summarizing difficulties in the early years of Oregon's dredged fill and removal law (LaRoe, 1978), while the other made clear many of the unresolved scientific and policy issues surrounding wetlands mitigation in general:

Wetland rehabilitation - the restoration and establishment of wetlands - is a subject of increasing importance in the management and protection of the natural resource. Can wetlands be rehabilitated? If so, what are the techniques and the associated costs? How much time can be expected to elapse before the rehabilitated wetland functions as a natural one? (Garbisch, Jr., 1978)

By the second “National Wetland Symposium: Mitigation of Impacts and Losses” (the word “Protection” had now been dropped from the conference title) held in October 1986, the sentiment had shifted, as had the make-up of the symposium registrants, now majority engineers and developers. As people realized there was money to be made in mitigation these interests began to dominate the conferences. If the conference title had not driven home the point, the introduction to the published conference proceedings made no bones about the political muscle driving acceptance of mitigation:

In the decade since the 1977 symposium, important changes have occurred in public and developer attitudes toward wetlands loss. In this time, the major issue for most regulators and much of the development community has shifted from “should wetlands be destroyed?” to “how can compensation be provided for unavoidable wetland losses?” (Kusler, 1986b)

Another important change in the interim between these two Symposiums occurred in academia. A conservation biology conference held in 1978, just months after the first Symposium, introduced the term “ecological restoration” into the environmental management lingo. Described as an applied science, “an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability,” (Society for Ecological Restoration, 2013) it spawned the expression “restoration ecology” in reference to a “technique for basic research” a few years later (Jordan, Gilpin, & Aber, 1987). Not surprisingly, the 1986 Wetland Symposium championed restoration ecology as a concept whose time had come. Presentations now described wetlands mitigation practices as “ecological restoration,” framing the approach as a valid science that could respond directly to the new policy demands of a rapidly changing political landscape. It appeared as if the development of a body of research into mitigation practices was evolving separately from the scientific understanding of wetland ecosystems and their replication. As restoration ecology began to come into its own as an academic discipline it was often described in the literature in terms of how it differed from conservation biology. Examining these differences gives insight into the distinction between the science of mitigation and the science of wetlands ecosystems. It also gives insight into the philosophical and disciplinary underpinnings of the research into wetlands degradation and mitigation practices that informed New Jersey’s freshwater wetlands debates.

Although restoration ecology and conservation biology share strong disciplinary ties and biodiversity goals there are distinct differences between them in terms of focus, research approach, methods of implementation, and spatial concern. The science of habitat and biodiversity loss, conservation biology concerns itself with threats of permanent (usually zoological) population losses, species diversity, and individual species protection. Conservation biologists structure their efforts in response to declining populations, examining the forces that prompt these declines, and working to identify and address specific risks (Caughley, 1994). Quammen (1996) traces a history of recurring concern by conservation biologists in issues of habitat and population fragmentation, and Young (2000) argues that fragmentation is an overarching theme in their research. Restoration ecologists, on the other hand, are motivated by dual beliefs in the value of ecological diversity and the potential “ecosystem services” benefits of mitigated habitats, and view environmental degradation as an at-least-somewhat reversible process (Young, 2000). The ecological restoration literature did not immediately concern itself with issues of habitat and population fragmentation (Quammen, 1996), and further distinguished itself from conservation biology with a focus on plants as the dominant taxon in an ecosystem (as opposed to zoological species) (Young, 2000). The mode of scientific inquiry was described as “manipulative” and “explicitly experimental,” and restoration ecologists were said to approach wetlands creation and restoration from the perspective of battlefield medicine: “Actions need to be taken even with imperfect scientific knowledge and practical knowledge develops separately from hard scientific research” (Young, 2000). Young also makes a distinction between the prevailing mode of scientific inquiry adopted by each approach: “Research in conservation biology is...more often descriptive and theoretical. In contrast, ecological restoration is by definition a manipulative activity, and the majority of research is explicitly experimental” (Young, 2000).

As described in Chapter Three, and in the definitions and buffers sub-movement chapters Four and Five, the champions of freshwater wetlands protections in New Jersey emerged as naturalists concerned with environmental degradation, and concerned specifically with losses in freshwater wetlands habitat. This group cultivated an expertise by cataloguing and describing New Jersey’s freshwater wetlands and by documenting changes in this environment over time. In doing so it

gradually shaped a new theoretical understanding of the state's freshwater wetlands ecosystems. Theirs was an approach tied to the research techniques of conservation biology, and linked philosophically and ideologically to the pollution control- and habitat protection-oriented concerns of the EPA and USFWS. The FWC built much of their legitimacy using methods consistent with a conservation biology approach to identify freshwater wetland losses, conduct programmatic evaluations of freshwater wetland acreage composition, and examine the Army Corps as a permitting agency. From this the environmental community gradually developed an interest in comprehensive land use policies and recognized that the land use policy aspect of the CWA was not adequately addressed by the Army Corps (Fair, 1999). The Army Corps, as chief permitting agency for wetland filling, was focused on transport and navigation, and not at all interested in becoming a land use agency. It took the "battlefield medicine" approach to freshwater wetlands research and practices - an approach embracing of mitigation as a first line of action for municipal level projects - and was more aligned with the research trajectory of restoration ecology. We will see the legacy of these approaches later in this chapter in a description of how the environmental actors used science to shift thinking regarding the determination of restoration and creation decisions based on landscape level processes vs. project-by-project.

### **Compensating for wetlands losses in New Jersey**

In the years leading up to New Jersey's freshwater wetlands debates the Federal 404 Program required that developers, prior to receiving an Army Corps permit, agree to mitigate unavoidable damage to freshwater wetlands by restoring, enhancing, or creating new wetlands or by upgrading the biological productivity of neighboring wetlands to compensate for the damage. Under the CWA, developers were expected to replace wetlands on at least a 1:1 basis, or to upgrade a larger acreage of wetlands than were destroyed.<sup>78</sup> These requirements were often not applied uniformly, or went unenforced. National violations records and mapping exercises indicated that many thousands of acres

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<sup>78</sup> Developers were given considerable latitude with respect to the location of mitigation projects (on-site vs. off-site) and the extent of direct and indirect approaches.

of inland wetlands were at risk, prompting several states (e.g. New York, Connecticut, Massachusetts Rhode Island and New Jersey) to enact laws to address these shortcomings (Tiner, 1985). Some states, like Rhode Island, shaped strong environmentally preservationist regulatory systems to avoid off-site mitigation entirely (O'Connell, 1997). Others, notably New Jersey, worked to forge both an accommodation of a wide array of mitigation options (including market based approaches) and a more robust and environmentally protective set of mitigation parameters than required by federal law.

The New Jersey case illustrates reconciliation of the federal level mitigation debates at the state level. Bipartisan willingness to compromise was a key to passage of the bill. Also important to passage of the bill was an understanding of freshwater wetlands degradation and the functioning of freshwater wetlands, and a general awareness of the very political nature of (and will for) compensatory mitigation. What follows provides a legislative history of the FWPA, simultaneously exploring how environmental actors (including the USFWS, NJDEP and FWC) used basic scientific research to document the effects of prior mitigation efforts in New Jersey to generate data and a conceptual model of freshwater wetlands degradation that ultimately influenced the FWPA legislation.

**Introducing mitigation in the FWPA draft legislation, 1983-1984.** In the summer of 1983 Assemblywoman Maureen Ogden and the New Jersey Conservation Foundation (NJCF) introduced the first version of their freshwater wetlands protection legislation called the "Inlands Wetlands Bill." Ogden's first bill gave no opportunities to wetlands encroachment, a stance that made mitigation virtually irrelevant. The practical limitations of this approach, at least with respect to situations of linear development, were recognized early on by the sponsors and discussed at the Great Swamp Conference in 1984 (Ashmun, 1999). Ashmun recalls that mitigation was discussed specifically in the context of linear development, a particular problem in densely populated New Jersey:

That's where mitigation came in, not in 'alright, let's fill over here and build an office building on it and then mitigate over there.' It was 'If you do have to build a road, if you do have to put in a pipeline, if you do have to do a power line what do you do then?' (Ashmun, 1999)

Ogden's bill was soon reworked to include mitigation provisions. When Bill #A-672 was re-introduced in 1984 it had company. In addition to Senator Lynch's pre-filed #S-602 "An act concerning



the regulation of freshwater wetlands” that mirrored Ogden’s Assembly Bill, Assemblyman Riley and the New Jersey Builders Association had submitted their own competing “freshwater wetlands protection bill” #A-2348 which declared an intent and purpose of balancing “the public’s right to regulate land use and the private landowner’s right to utilize his land.”

The environmental community had a powerful friend at the NJDEP who helped them respond to Riley’s legislation. NJDEP Assistant Commissioner Helen Fenske was linked to the environmental community through her prior advocacy in the Great Swamp protection efforts, and she remained committed to building on the momentum around freshwater wetlands protection generated at the grassroots level. Fenske also recognized the important role of information dissemination about freshwater wetlands. Believing that the NJDEP could contribute to the growing understanding of freshwater wetlands and their functions in the state Fenske pulled representatives from each of DEP’s natural resource teams to form a public education campaign on freshwater wetlands. Referring to this as her “Wetlands Team” Fenske framed its efforts as important to a timely and successful passage of a freshwater wetlands protection bill:

All the major environmental and watershed groups are in support of the Ogden wetlands legislation and will work strenuously on its behalf. If they are joined by the sportsmen, wildlife, and fishery constituencies, there is hope effective wetlands legislation will pass this year.

As you know, each of our natural resources’ programs is impacted negatively by wetlands destruction. A coordinated information effort on our part may help to secure finally the public support necessary for protection of these critical lands which do so much to serve the public good for water quality and supply, flood control, wildlife and recreation (Fenske, 1984).

Launched in August 1984 the NJDEP’s education campaign focused on examining mitigation practices around the state. It was aided by a diverse set of research approaches including traditional experimental research by academics, project evaluation conducted by DCR staff, and basic research conducted by the DCR. For example, each of the Division’s natural resources programs was expected to develop a white paper outlining how their program related to freshwater wetlands (Backes, 1984). Fenske coordinated other mitigation-related activities encouraging research into mitigation activities as part of the state’s coastal management program (Kantor & Charette, 1986b) and publicizing earlier

research findings like the “Evaluation of Artificial Salt Marshes in New Jersey” conducted for the DEP by Rutgers University, considered the first scientific analysis of restored and artificially-created wetlands in New Jersey (Shisler & Charette, 1984).<sup>79</sup> Most significantly, Fenske connected the DEP with non-profit partners in the environmental community, working most closely with the Passaic River Coalition to document mitigation activity around the state. From this partnership was developed the DCR’s computerized monitoring system for wetlands mitigation projects. This tool aided the “evaluation, tracking, and enforcement of well over one hundred mitigation projects, each with a unique geographic context and design attributes” (Kantor & Charette, 1986a). Fenske eventually sought a broad audience for the DCR’s research. For example, portions of the salt marsh study were published in the May-June 1986 National Wetlands Institute (NWI) Newsletter, and the computerized database was the subject of a conference session at the 1986 National Wetland Symposium: Mitigation of Impacts and Losses (Groman & Powel, 1986).

While Fenske worked with her Wetlands Team at the DEP, partnering with the PRC and others to amass a meaningful set of data on mitigation, three distinct positions on compensatory mitigation were taking shape in the state debates. Highlighting the dynamic nature of freshwater wetlands, many in the environmental community were critical of any allowances for mitigation. Others from the environmental community looked at the growing number of mitigation projects in the state and appeared to believe the horse was already out of the gate. Although sympathetic to those who argued against any form of mitigation, this group framed their objections to mitigation in less philosophical terms. They grounded their arguments in practical concern with the extent to which mitigation practices or monetary contributions could be used for approval of building or filling permits. The third position, held by the regulated community, was one of virtually uncritical acceptance of mitigation practices.

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<sup>79</sup> This project set out to examine and evaluate past artificial salt marsh projects (defined as man-made marsh creation and restoration projects) and to develop guidelines for reviewing potential project problems. The results indicated that artificial marsh project in New Jersey were not successful when compared to adjacent natural marshes.

Environmentalists who accepted mitigation as a component of freshwater wetlands protection legislation differed from the regulated community perspective in two significant ways: the basis on which freshwater wetlands would be created or replaced, and the process by which mitigation would be necessitated. Riley and those in the building and development community proposed that mitigation directly address acreage destroyed, arguing that replacement be conducted based on the *quantity* of wetlands impacts and proposing a 1:1 mitigation ratio. With respect to process they forwarded mitigation and monetary compensation as acceptable preconditions for approval of a building or a filling permit.<sup>80</sup> Those representing the view of the more conservationist faction of the environmental community focused on replacing the *qualities* of wetlands impacted by development in their legislation. With respect to process they modeled their mitigation provisions after the state's coastal policy, a policy consistent with NEPA sequencing requirements which allowed mitigation only if several other conditions were met.

Synthesizing the growing body of mitigation research generated and collected by the PRC and the NJDEP's Wetlands Team, Assistant Commissioner Fenske was largely critical of any form of mitigation. The NJDEP's findings were presented in a document titled "Wetlands: Perception of Value," which summarized available research on mitigation and catalogued the public values of freshwater wetlands in the state (McLain, 1984). These findings were also reflected in the thorough technical reviews submitted by the DEP Natural Resources Group on both freshwater wetlands bills submitted to the Assembly. These reviews argued that Riley's approach would allow "for the continued mind-set that wetlands are to be manipulated and that they are a secondary consideration in choice of site and design of site" (NJDEP Natural Resources Group, 1984a). This group also challenged language in Ogden's #A-672 and Senator Lynch's #S-602 that referenced situations in which mitigation might be acceptable, directly addressing those portions of the draft bills that gave allowances to

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<sup>80</sup> It should be noted that this group did recognize uncertainties in the quantity-focused approach, referring to mitigation as "a national philosophy now that is being generated...but it is not completely resolved and in place at this time" (Lomax, 1984). Mr. Lomax of Joseph Lomax and Associates, an environmental consulting agency, drafted the Riley bill. Lomax was a distinguished lecturer at Stockton State College, ecologist for the State Pesticide Control Council, Trustee and past-President of the Wetlands Institute, Supervisor of the Cape Atlantic Soil Conservation District, Vice President of the New Jersey Association of Conservation Districts, and member of the Society of Wetlands Scientists.

mitigation in cases in which development would “result in minimum feasible alteration or impairment of the natural contour” (NJDEP Natural Resources Group, 1984a). They called such an approach “questionable when the contours of wetlands may change by virtue of the dynamic system comprising wetlands,” and argued that the water recharge and filtering functions of freshwater wetlands were almost impossible to duplicate (NJDEP Natural Resources Group, 1984b).

Despite the growing body of research that pointed to uncertainties and failures in mitigating freshwater wetlands, Fenske was unsuccessful in her attempts to convince NJDEP Commissioner Robert Hughey that mitigation provisions should not be included in a state freshwater wetlands bill. At the first Public Hearing on freshwater wetlands protection held September 1984, Commissioner Hughey asked Ogden and Riley to work together to merge their perspectives in a bipartisan bill, and outlined expectations with respect to mitigation for such a bill:

The basic test for deciding whether or not to issue a freshwater wetlands permit should be whether or not the proposed activity has a prudent or feasible alternative; whether or not the proposed activity would result in minimal feasible alteration of the freshwater wetlands; and, whether or not the applicant will restore or create freshwater wetlands to mitigate any significant alteration of freshwater wetlands. Each of these tests should be passed before a permit is issued (Hughey, 1984).

**Environmental advocacy, 1985.** Co-sponsors Ogden and Riley submitted Assembly Committee Substitute for Bills #672 and #2348 to the Assembly in early 1985. This compromise legislation included mitigation but was perceived as so restrictive in its broad protections for freshwater wetlands that mitigation would be irrelevant. The building and development did not see any give. The February 26, 1985 *Atlantic City Press* reported that although the bill passed several Assembly Committees, Assembly Speaker Alan J. Karcher (D-Middlesex), a friend of the development community, repeatedly refused to bring it up for a vote. Karcher, along with lawyers in the building and development community, soon pressured Riley to drop out of the negotiating process (Schreck, 1997).

While Ogden and Riley were struggling to get ACS #672/#2348 posted for a vote, the non-profit Passaic River Coalition (PRC) formally launched its “Flood Plain Watch” (FPW) in close partnership with the DEP (Fenske, 1986). Funded by a grant from the Fund for New Jersey, a non-partisan public-policy

focused grant-maker (founded in the early 1900s by the inventor of “the chlorinator,” a device used globally to purify drinking water ((The Fund for New Jersey, 2013)), the FPW received all available permit data from the DEP (Filippone, 2006). FPW staff took this data and entered it into an operational database management file system developed as part of coastal wetlands monitoring. FPW staff re-worked the database for freshwater wetlands mitigation projects, expanding it to document changes observed in the mitigated lands (Passaic River Coalition Representative #1, 2006). This effort was specifically designed to track violations of the state’s flood plain permitting program, including those permits approved by the Army Corps. The automated monitoring system was intended to aid internal DEP review of Coastal Division wetland permits and wetland violation files (Passaic River Coalition Representative #1, 2006) and to assist in summarizing relevant mitigation project data, wetlands mitigation permit applications, and violation information (Kantor & Charette, 1986a). At the direction of Ella Fillipone, PRC administrator, the FPW soon expanded the DEP’s database to include information collected during field visits of permitted sites, adding descriptive and qualitative assessments of how well the projects met permit objectives (e.g. bird species counts and vegetation coverage), and measurements of how well the permitted projects preserved wetlands acreage (Filippone, 2006).

The primary intent of the FPW was to reveal patterns of failure in meeting permit conditions. It was quite successful in this regard:

We all knew intuitively from what we could see that there were violations out there but of course no one had bothered to take the time to go and dig and find out. The real highlight of the program came probably around 1986 when we discovered that Fairfield Borough, which has probably a greater number and percentage of wetlands than anybody else in the Passaic River Basin, probably more than anybody else in NJ, was not only giving out these permits to developers, but was encouraging them to not go and get their state wetland stream encroachment permits and had actually entered into negotiations, secret negotiations, with the state to have what they call “fill credits” that would allow the town to almost in essence take over the state floodplain and wetlands program and give out credits to people in most of the town for preserving land in Great Piece Meadows which is north of Route 80.

The idea was that Fairfield was increasing the property taxes on people in Great Piece meadows and foreclosing on those properties and taking title to hundreds if not thousands of acres of that property, and was offering in essence to trade that so that developers could absolutely develop every inch of wetlands in all the rest of town. And we uncovered this in our review of DEP files and in talking to some of the violators. So this pattern began to come clear. And we met with the DEP commissioner, it was Dick Dewling at the time, and the negotiations were actually fairly well along and we pointed out that there was nowhere in the

rules that allowed them to do this. And that even if they did this that they violated the Clean Water Act rules. And that quickly fell apart. That was something of a flashpoint for the rest of the environmental community jumping in saying “you know, this is now out of hand and we need to do something to make this better.” I think up until that point people intuitively knew that things were out of hand, but they didn’t have any data to lean back on (Passaic River Coalition Representative #1, 2006).

This new data focused attention on the problem of permitting violations in the state, and provides an example of how the lack of regulatory uncertainty harmed the regulated community. This data galvanized both the preservationist and conservationist factions of the environmental community, and contributed significantly to creation of the Freshwater Wetlands Campaign (FWC) (Filippone, 2006). In fact, the FWC began its work by distributing handouts describing the FPW’s stream encroachment findings and by shaping a direct attack on the violators, linking them to the building and development industry which had supported Karcher’s refusal to post the bill for a vote:

It was devastating because the other side couldn’t counter the violations - they could always talk about the need for more development, but nobody wants to be on the side of the violators. Nobody wants to say “yeah, they broke the law, but that’s ok.” So we really got in all these free shots, free publicity, and there was no way to counter any of that. The usual types of things the builder’s lobby was saying: “we need more affordable housing, we need more jobs” you can only say so many different ways before nobody is listening anymore. Meanwhile our message was really dramatic, and it gathered a lot more interesting publicity. So I think that really helped us win the information battle at the time. And that, in some ways, really turned the tide for this. Because before that it was just sort of a political arm wrestling match to see who would outlast who. But when this new information came into play, it strengthened our hand to the point where we were able to win (Passaic River Coalition Representative #1, 2006).

The FPW effort proved valuable beyond simple awareness-building around permit violations and beyond serving as a springboard for FWC organizing. The additional data that Ella Fillipone requested be collected, and the tweaking of the automated monitoring system to track freshwater wetlands mitigation projects, helped the PRC and the newly-formed FWC to develop a conceptual model of wetland degradation and restoration. These entities developed this model using measures of hydrologic, soil, and biodiversity characteristics from the reference standard sites, degraded wetlands, and newly created wetlands overseen by the Army Corps (Passaic River Coalition Representative #1, 2006). The emerging model dovetailed nicely with the PRC’s much-publicized cost-benefit analysis of structural vs. non-structural options to the state’s flooding issues developed the year prior. The earlier

1984 PRC report included an economic valuation of wetlands functions, most specifically the flood storage capacity of wetlands (estimating the values of wetlands in ameliorating the damage of floods to properties), but also water quality and critical habitat valuations. With this information the PRC slowly began to establish meaningful criteria by which to measure mitigation project success, using its own evolving standards of protection for wetlands functions. With Helen Fenske at the NJDEP implicitly supporting these efforts by, for example, encouraging her staff to begin using the PRC criteria in the field when conducting their own evaluations of mitigation projects in the state (NJDEP Staff Member #1, 1999), the PRC and FWC gradually began to recognize their unique position. A Passaic River Coalition representative recalls: “We had a very different role than a lot of other environmental organizations - we had a lot more data about what was actually happening” (Passaic River Coalition Representative #1, 2006).

Although developing criteria by which to evaluate mitigation projects was not part of the PRC’s original strategy with respect to the freshwater wetlands protection legislation, once it began working with the FWC it recognized a certain power associated with their emerging scientific understanding of freshwater wetlands and their ecosystems. The PRC began to use the emerging criteria strategically to push requirements for greater precision in regulatory parameters, as reflected in a PRC document developed in response to Lynch’s bill #S-602 still in the Senate:

Section 6.h. contains mitigation requirements which are broad in scope but fuzzy in detail. Language should be added to require a replacement of lost public values in wetlands, such as habitat, flood control, hydrologic functions, etc (Passaic River Coalition, 1985).

Working with the FWC the PRC used their criteria to shape a new more strategic position on mitigation, bringing evidence in support of at least 3:1 mitigation offsets, and focusing on articulating process demands (Filippone, 2006). The PRC’s arguments for checks and balances, for establishing an effective process, for coordinated DEP oversight, and for mitigation activities to occur in advance of wetlands losses were included in testimony before the Senate Committee on Energy and Environment on Lynch’s #S-602 by PRC Chairman Robert J. Myers. This testimony was prepared with the assistance

of the PRC's first Technical Director, Daniel Van Abs, a Rutgers University graduate with a degree in Environmental Science:

Mitigation through the creation of new wetlands is difficult. Created wetlands also must be maintained until they become stabilized. Therefore, the DEP should be authorized to require creation of mitigation wetlands prior to elimination of the existing wetlands. The DEP should also retain the right to require additional mitigation should the created wetlands fail or result in a less productive ecosystem. We strongly urge consideration of this provision, so that the intent of this legislation is not lost. Such a provision will result in better mitigation technologies in the long run (Myers, 1985).

The PRC elaborated on the ideas of uncertainty and assurances in a position paper a few months later:

The law should require assurances that the mitigation will work, either through performance bonds or a reservation clause allowing the DEP to require additional mitigation if the original mitigation work does not achieve expected results (Passaic River Coalition, 1985).

**Common goals give mitigation political traction, 1986.** By 1986 issues of process with respect to compensatory mitigation were more defined at both the federal and state levels, and had largely replaced concerns about the readiness of mitigation science and techniques for application in the field. The Army Corps had just revamped its mitigation policy pursuant to developments in Section 404 that now required the satisfaction of "mitigation sequencing" as a condition of freshwater wetlands permitting and mitigation sequencing was employed in the Federal Swampbuster (Food Security) Act of 1985 to discourage conversion of wetlands to croplands (P.L. 99-198). The USFWS had refined its mitigation policy and goals, developed as part of shaping procedures to evaluate functional values of wetlands for wildlife habitat. In doing so it established a new freshwater wetlands classification system linking the degree of mitigation to the value and scarcity of the habitat at risk (46 Fed. Reg. 7644 (Nov. 13, 1986). In New Jersey those involved in the freshwater wetland negotiations were focused on the goal of the state's assumption of the federal 404 program, which required that the legislation maintain consistency with the intent of EPA and Army Corps standards developed for the implementation of the CWA. A DEP representative explained the influence of the compromise effort on including mitigation as an element of freshwater wetlands protection legislation going forward: "the details in terms of...how mitigation was approached...sort of fell out of the Federal 404 program so that we could achieve the development community's goal of assuming the 404 program" (NJDEP Staff



Member #1, 1999). Assemblywoman Ogden (who had debated between entering politics or going to planning school) and others negotiating on behalf of the FWC, recognized in the CWA the potential for it to function as a land use policy, extending regulatory control to landscape ecosystems of specific geographic areas. With this in mind, attention turned to the details of process provisions and regulatory tools in two sets of new freshwater wetlands protection bills introduced in both the Assembly and Senate.<sup>81</sup>

Now working with Senator Lynch, Assemblywoman Ogden introduced #A-2342 in March of 1986, with Lynch's #S-2003 introduced in the Senate in April. Moving forward with the idea of assuming regulatory control of the CWA 404 Program, Ogden and Lynch sought to ensure consistency with the federal mitigation sequencing requirements while still maintaining broad protection for the state's freshwater wetlands. Their bills would give the DEP authority to require wetlands creation or restoration as a condition of a permit for linear development, but only if the activity met four criteria: it had to require access to water or be water dependent; have no feasible alternative site; not disrupt the wetland resources; and prove to be in the public interest. Their bills gave discretion to the DEP in determining the regulatory tools used for mitigation.

Representing the building and development community Assemblyman Penn and Senator Zane submitted #A-2499 in the House and #S-2121 in the Senate. Like the earlier Riley legislation these bills upended NEPA sequencing protocol, offering wetlands creation in direct exchange for a permit to develop in freshwater wetlands. A permit could be secured if the applicant could demonstrate one of the following: that the proposed activity was primarily dependent on being located in a wetland, or a practicable alternative did not exist. Unlike the Riley legislation, which focused on replacement of the quantity of wetlands destroyed, Penn and Zane's bills introduced a new dimension to the debate: the provision that the DEP accept mitigation measures provided that the "ecological value" of the created

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<sup>81</sup> As evidenced in the transcripts of three Public Hearings on the bills held in the summer of 1986, legislator's concerns over issues of process largely overshadowed the more scientific and technical questions about mitigation. Legislators did not ask how wetlands mitigation would impact specific ecosystems or habitat, nor did they address the technical aspects of mitigation practices. The most specific mitigation-related question, posed by Assemblyman Hollenbeck, clearly did not emerge from a scientifically-informed perspective: "Do you think it is okay to develop wetlands as long as there is mitigation, or compensation, provided in another area?" (Assemblyman Hollenbeck).

or restored wetland be equivalent to, or greater than, that of the pre-developed wetland. These wetland values were to be identified by NJDEP in a classification system that would rank or prioritize them so that they could be regulated “consistently with the benefits they provide.” Attendant to the concept of “equal ecological value” was the implication of protection based on a hierarchy of wetlands functions, and the idea that wetlands of lower value could be easily developed and replaced. A NJDEP Official recalled that “One side would say ‘we don’t want to begin classifying wetlands because that’s a slippery slope, and whatever comes out at the low end would not be protected.’ The other side said ‘But all wetlands are not created equal, they have variable habitat, water quality benefit, flood storage, all those things and that’s got to be in there’” (NJDEP Official #2, 1999). A representative from the building and development community argued that: “Recognizing the distinction in wetland values leads naturally to mitigation techniques” (Fisceglia, 1986). Penn and Zane agreed. They saw in a hierarchical system of wetlands protection a way to connect the dots in support of tools like mitigation banking, a device integral to their desire for flexibility in a state freshwater wetlands protection law, but one not included in the Federal 404 provisions.

The environmental community was immediately critical of the treatment of compensatory mitigation in the Penn/Zane bill and seized on its inconsistencies with the federal law. One of the principal negotiators from the environmental community, Thomas Wells, Assistant Director of the New Jersey Conservation Foundation argued that the stern requirements of the federal bill had no room for concessions in bargaining between developer and permit agency to allow for creation of wetlands in one area in exchange for the fill of wetlands in another, and that without a conditional permit any freshwater wetland could be developed regardless its functional value with the result that “all the state’s natural wetlands in the path of development would be destroyed, in return for mitigation of questionable value” (Wells, 1986). The FWC also took issue with provisions in the bills which substituted compensatory mitigation for meeting either the practical alternatives test, or the water dependency test, approaches to defining freshwater wetlands that were inconsistent with both EPA and Army Corps interests.

In a sign of dissent in the environmental community, several environmental interests continued to highlight issues of uncertainty at public hearings, focusing on the inadequacy of the existing science to justify opposition to the core concept of mitigation. Derry Bennett, Executive Director of the American Littoral Society argued:

Our experience with tidal wetlands regulation is that mitigation doesn't work. Attempts to duplicate wetlands by building them from upland, or filling in tidelands have proven futile. The built wetlands look like wetlands, and you can plant spartina grasses on them, and they turn nice and green in the summer. They look just like a wetland, but if you walk on them, if you test them, you find out that the species are different, the diversity is lower, and productivity decreases. The way to protect wetlands is to keep them, not develop on them and then turn around and try to build some new wetlands somewhere else (Bennett, 1986).

Perhaps Eleanor Gruber, Cochairman of the Natural Resources Committee for the League of Women Voters in New Jersey captured the politics of the situation best, arguing:

Not one of us is competent enough to duplicate nature; we can imitate, but we cannot duplicate. We see proof of this in our shore communities, which have tried expensive and ultimately ineffective methods of preventing beach erosion, rather than taking the unpopular but correct step of prohibiting building at the shore line. It comes down to a matter of dollars; more homes at the beach means more tourist dollars for the community. But at what cost? (Gruber, 1986)

Still, among those in the FWC the prevailing attitude toward wetlands creation was one of nose-holding while agreeing it was a political necessity. Reflecting on the FWC's internal debates on the issue a member of the environmental community recalled:

You had to have some safety valve in the legislation, and every once in a while you were running up against something like - oh, let's see, an interstate highway that's going to be built. I don't care who you are or how many frogs you know, that sucker is going in. And you had to have a way to get 10% or 20% or some back from those things. It was almost like arguing for blankets in the winter when you're on the Indian reservation - it was distasteful, but we knew that some wetlands would be destroyed (ANJEC Representative #1, 2011).

By October a letter from the FWC sent to all members of the Senate Energy and Environment Committee clarifying its support for the concept of wetlands mitigation:

Is mitigation a practical tool in regard to wetlands? YES. Mitigation (creation of artificial wetlands/enhancement of existing wetlands) is essential to compensate the public for UNAVOIDABLE wetlands losses - caused by projects that have an over-whelming public need. Mitigation is not in the public interest when it is used as an EXCUSE to destroy wetlands, as it is in S.2121 (The Freshwater Wetlands Campaign, 1986).

By November, Ogden, Penn and the EPA, which, at the request of New Jersey Governor Thomas Kean was now serving in an advisory capacity to ensure consistency with the federal act, were working together to shape a bill that would assume the Federal 404 Program. Ogden recalled that Mario DelVicario, the EPA Official assigned to the job, was supportive of the idea of Assumption (Ogden, 1999). And the environmental community was happy to have him at the table, especially as DelVicario appeared eager to bring his ecological expertise and 10 years experience working with the Clean Water Act to address gaps in the program at the federal level by closing them at the state level (Freshwater Wetlands Campaign Negotiator #1, 1999). The new bill that emerged, #ACS-2342/2499, would require developers to mitigate losses in a wetland as a condition of gaining a building permit from the DEP as “a condition instead of a reason for issuing the permit.” The December 25, 1986 *Bernardsville News* reported that developers were told “Now you have to meet the DEP’s permit standards first.” To this the FWC added homegrown research from New Jersey’s Coastal Management Program (Kantor & Charette, 1986b) and pointed to state precedents in CAFRA and the Waterfront Redevelopment Act to argue for mitigation offsets greater than the federal 1:1 ratio. Describing the process by which the 2:1 ratio was eventually stabilized as part of the artifact of New Jersey’s mitigated freshwater wetlands a FWC negotiator recalls:

... the 2:1 was, in itself, another compromise on the part of the builders. They wanted 1:1, the environmentalists wanted 3:1, and they settled on 2:1. It was not a very scientific way of doing it, but again, it was a political choice that environmentalists felt they could give on theirs and builders felt that they could give on theirs (Freshwater Wetlands Campaign Negotiator #1, 1999).

In exchange, environmentalists agreed to the concept of a mitigation bank as a tool to authorize off-site wetlands creation. But this, too, was a strategic compromise: the FWC believed that modeling the bill on the CWA would afford greater power over land use, allowing New Jersey’s wetland mitigation banking to be done in the context of the character of the region’s freshwater wetlands (Freshwater Wetlands Campaign Negotiator #1, 1999). The bill passed in the Assembly in December. Although generally supportive of freshwater wetlands protection, Governor Kean indicated that he would not support the Ogden/Lynch legislation not because of mitigation, but because issues including the

classification of wetlands, definition, and oversight structure had not been adequately resolved. The bill did not receive support in the Senate, and it went back to the drawing board for renegotiation in 1987.

**Compromise, 1987.** New Jersey's freshwater wetlands had a powerful champion in Governor Kean. The Governor was committed to seeing his state take an advocacy stance on freshwater wetlands protection to assume regulatory control of the CWA. Although supportive of freshwater wetlands protection legislation from the introduction of Ogden's first bill, he did not use his political muscle until the end of July, 1987. At this time he issued a moratorium on building and development in freshwater wetlands to push both parties to continue to work together in spite of considerable disagreements.

The first half of 1987 saw intense debates between the regulated and environmental communities. They remained at odds on the definition of a freshwater wetland, the buffers issue, and in their general philosophical approaches to regulation. With respect to mitigation the groups still differed over a regulatory model. The regulated community sought to proceed with mitigation as the Army Corps had since passage of the CWA, pushing for discretion given to the permittee to determine appropriate mitigation techniques. The FWC blended guidance from the USFWS and EPA, and sought to give this power to the DEP and EPA. Christopher Daggett, Governor Kean's former Deputy Chief of Staff specializing in education policy and now Regional Administrator for the EPA, delivered guidance on consistency with the Federal 404 Program. In commenting on the Ogden/Penn Assembly Committee Substitute for Assembly Bills #2342/2499, Daggett's was the last word on the issue of mitigation as it related to the federal law:

We are concerned with the treatment of mitigation in this bill. Under the present bill, the applicant is given the option of choosing the form of mitigation. If the program was assumed by the State, at a minimum it would have to be the decision of EPA and NJDEP as to what form of mitigation would be appropriate on a case-by-case basis. EPA must be included in the review and approval process for each mitigation proposal (Daggett, 1987).

There were still questions, however, regarding the regulatory tools that would be available to implement mitigation, and on the standards and criteria by which to gauge the appropriateness or

adequacy of mitigation projects. Joint publication of The Wetland Identification and Delineation Model by the Army Corps, EPA and USFWS on April 1, 1987 helped settle the issue of tools. This model reinforced the NEPA mitigation sequence, establishing a common definition of freshwater wetlands which included the USFWS's wetlands classification system and a hierarchical system of wetlands protection based on wetlands functions. New Jersey's legislators agreed to follow the new federal model. This gave them a scaffolding of sorts on which to build wetlands creation and mitigation banking into their legislation, guiding them on determining layers of oversight. Legislators crafted a compromise charging the DEP with ensuring adequate mitigation, giving them responsibility over permitting, and allowing a broad scope of decision-making power:

The department may require the creation or restoration of an area of freshwater wetlands of equal ecological value to those which will be lost, and shall determine whether the creation or restoration of freshwater wetlands is conducted onsite or offsite (13.a.8-11).

Legislators did not, however, hand the DEP complete regulatory control. At the prompting of the FWC they forged a new model of regulatory oversight for the state, creating the Freshwater Wetlands Mitigation Council to oversee land use decision making funded by the newly established Wetlands Mitigation Bank. This politically appointed body would look something like the negotiating team pulled together by Ogden and Penn to hammer out the details of the FWPA. Its creation coincided with a national trend toward de-politicizing environmental decision making by putting it in the hands of quasi-politically accountable decision-making bodies with just enough distance from the formal political system to minimize its political character. The Council was to be comprised of seven members representing the building and development community, environmental and conservation organizations, institutions of higher learning in the State, and a representative from the New Jersey Department of Environmental Protection. The DEP's professional staff, after making permitting decisions, was to provide support and make recommendations regarding mitigation to the Council, but the Council was given complete control over the Mitigation Bank. Whereas the DEP could require that an applicant for a wetlands permit create or restore a wetland, or contribute to the Wetlands Mitigation Bank in lieu of restoring or creating a wetland, the Council was responsible:

for disbursements of funds from the bank to finance mitigation projects” and was given “the power to purchase land to provide areas for the restoration of degraded freshwater wetlands, and to preserve freshwater wetlands and transition areas determined to be of critical importance in protecting freshwater wetlands (15.a.1-8).

Having determined regulatory oversight and process parameters, legislators could turn their attention to the uncertainties in wetland science specific to “equal ecological value” and out-of-kind replacements. The USFWS was especially concerned that the legislation lacked a rigorous scientific rationale:

...how will the department and/or applicant determine whether a wetland mitigation proposal is of equal ecological value to wetlands destroyed by a proposed project? For example, will the NJDEP require an applicant to plant 60 foot tall trees in a mitigation area to replace the loss of forested wetlands? In any case, you must recognize that the words “equal ecological value” relate directly to the biotic components of the wetlands. Which and how many species should be used for this evaluation? Should they be game species or endangered species? Time species or Phragmites? (McColligan, 1987)

In the end, however, these concerns were not central to the negotiations. Governor Kean’s moratorium pressured legislators to pass compromise legislation as quickly as possible and addressing the USFWS’s concerns was pushed off for consideration by the new Freshwater Wetlands Mitigation Council.

### **Post-passage rule-making and implementation**

The FWPA envisioned mitigation as a core component of wetlands conservation, but did not condition it on regulatory improvements or administrative structural changes. Nor did it establish specific standards to guide evaluations of mitigation projects. Some believed this to be an advantage in the face of a nascent science of freshwater wetlands and the lack of longitudinal data on mitigation practices:

I'm so glad that we didn't write the details of the mitigation process into the legislation. If the legislation had said “acre for acre mitigation shall be the rule of the land,” that would have been tremendously damaging, instead it says “the department shall require mitigation.” And

they left it open so that what is mitigation has changed over the years (NJDEP Official #4, 2009).

Others saw that the absence of hydrologic and geomorphic standards in particular posed greater challenges, particularly in the early years of the program:

[New Jersey environmental activist x] probably told you this story, but I'll tell her story for you. She was out in the field with a developer's consultant who was really proud of their wetlands mitigation projects for a development. And they went out and took a look at the wetlands, and they looked pretty good. And she was walking around and she encountered this hose. She said "what's the hose for?" "Well, sometimes it gets too dry so we have to put water into the wetlands" (Passaic River Coalition Representative #1, 2006).

In a 1991 Report to the Governor and New Jersey State Legislature Evaluating the State of the Art of Wetlands Mitigation that the DEP and Mitigation Council formally recognized the limitations on their ability to determine "equal ecological value":

The Department does not have sufficient information to determine if artificially created wetlands have provided 'equal ecological value,' compared to natural wetlands as required by the Freshwater Wetlands Protection Act...It would be desirable for the Department to contract for a multi-disciplinary scientific investigation of previous mitigation projects to determine their value (New Jersey Freshwater Wetlands Mitigation Council, 1991).

The report suggested that this be achieved via "the stimulation of interest of the academic community and nature groups to conduct regular monitoring of a network of mitigation sites by local members" (New Jersey Freshwater Wetlands Mitigation Council, 1991). In the end the DEP did not contract with the PRC, NJCF or any of the FWC-affiliated "nature groups" for such expert analysis. Instead in 1992 it secured a grant from the EPA to assess the success of mitigation projects in the state with reference to ecological value and as a reference for future permit requirements. This research was conducted by DEP staff, and served as the foundation for a subsequent EPA grant to develop a mitigation strategy that would serve as a model for other states.



### New institutions for an uncertain science

Although mitigation has been a component of freshwater wetlands permitting under the Clean Water Act since it was passed in 1972, many scientists argue that the basic questions regarding mitigation are still unresolved. For example, in considering wetlands losses under the CWA, the National Research Council determined that “much more research is needed before we can be assured that wetlands created to replace wetlands destroyed for development can be successful” (National Research Council, 2001). In the 1970s and 1980s, as states were just beginning to design freshwater wetlands protection measures, they had an opportunity to choose their approach to wetlands mitigation. Philosophically preservationist states like Rhode Island immediately dismissed the concept of compensatory mitigation as inconsistent with their values. States like New Jersey struggled to understand the scientific and technical aspects of mitigation, embracing it as an unwanted but politically necessary tool. In this sub-movement we observe New Jersey’s environmental community at this crossroads, choosing between rejecting mitigation and taking it on as a component of their freshwater wetlands protection bill, and we can move to consider activist choices to marshal science as opposed to other values as they work to inform state legislation.

Understanding how and why New Jersey’s activists made these choices is important because mitigation has become the central element of wetlands policy in the state today. This sub-movement provides an example of why choices made early in the framing of an advocacy campaign may have lasting consequences. In this case the consequences were not inevitable, but have been produced by businesses and consultants, themselves acting strategically to respond to regulations. The research also moves us closer to understanding how politics and the push for compromise helped the regulators and industry move from a concept imbued with such scientific uncertainty, to practice, so quickly. This case is also important in that it lends insight to present day federal processes. Debates in New Jersey over mitigation in the freshwater wetlands legislation revealed the contours of disagreement regarding mitigation between the two principal federal agencies responsible for oversight of the CWA, the Army Corps and the EPA. Federal officials suggest that New Jersey’s approach to compensatory mitigation bridged the divergent policies of these agencies, and in doing so intimated a path for

consensus that informed the 1989 Memorandum Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines (the MOA) (Federal Official #1, 2000). Furthermore, within a month of signing the FWPA into law and lifting his moratorium on building in the state's freshwater wetlands, New Jersey Governor Thomas H. Kean, who had just become chair of the bi-partisan National Wetlands Policy Forum formed by the EPA, shepherded publication of the Forum's consensus recommendations that informed another enduring aspect of federal wetlands policy, the national goal of "no net loss" of wetlands.

By this third sub-movement New Jersey's FWC is almost ideally positioned to shift thinking on compensatory mitigation in the state. In the first sub-movement we see the environmental community successfully cultivate a movement around freshwater wetlands protection, a decidedly unglamorous subject, ushering in a new worldview of freshwater wetlands as valuable. This community developed itself further by producing and leveraging viable science in the course of the buffers negotiations (the second sub-movement). It used this science to bring attention to freshwater wetlands as ecological systems, and in doing so took steps toward institutionalizing the FWC. In the mitigation sub-movement we see that the environmental community is split, wavering between building on the original philosophically preservationist impulse on behalf of the freshwater wetlands vs. building on the increasingly substantive science it has amassed, and on its professionalized status. As issues of mitigation politicize the debates, the FWC makes choices to use science to buoy its arguments. It shapes a vision rooted in basic science and essentially validates wetlands creation, restoration ecology and mitigation by treating them as scientific subjects.

As soon as mitigation was treated as inevitable in this way a distinctive mode of inquiry claimed dominance. This shift in mode of inquiry was one that the FWC could not directly leverage. Now functioning as if mitigation was a political necessity, the FWC sought to walk a fine line in its arguments between opposing the concept and risking alienating political partners, or supporting a concept they were opposed to but taking some control over the definition of parameters. In the end, with the FWC leading the way, New Jersey heralded a paradigmatic shift in governance frameworks

related to mitigation and mitigation banking. What the FWC found with compensatory mitigation was the potential for a regionalized environmental management strategy, a state-wide banking system that would have the potential to champion watershed-based planning and a more systems, or ecological approach. Viewed this way the mitigation sub-movement facilitates an understanding of the roots of an emergent form of environmental sensitivity - a sensitivity guiding a complex morphology of urban development in New Jersey. It reveals the FWPA as a piece of legislation that does not describe an ideal of an environmentally-sensitive land form, but rather a process for shaping it. The framework of the FWPA as shaped through compromise between the FWC and the regulated community, and inclusive of the new Freshwater Wetlands Mitigation Council, can be viewed as a co-productive strategy to treat freshwater wetlands as the ecosystem they are, while working toward equilibrium within a changing environment and society.

## Chapter Six: Reference List

51 Federal Register. (6-24-1986). Final Determination of the Assistant Administrator for External Affairs Concerning the Sweedens Swamp Site in Attleboro, Massachusetts Pursuant to Section 404(c) of the Clean Water Act. 22977-22978.

Ref Type: Statute

Ambrose, R. F. (2000). Wetland Mitigation in the United States: Assessing the Success of Mitigation Policies. *Wetlands (Australia)*, 19, 1-27.

ANJEC Representative #1. (4-5-2011). Interview with Association of New Jersey Environmental Commission (ANJEC) Representative #1 -- conducted by Heather Fenyk. 4-5-2011.

Ref Type: Personal Communication

Ashmun, C. (9-24-1999). Interview with Candace Ashmun, former Executive Director of New Jersey Environmental Commissions (ANJEC) -- conducted by Heather Fenyk and David H. Guston.

Ref Type: Personal Communication

Backes, M. (9-10-1984). Letter from Maude Backes to Helen Feske accompanying the white paper "Freshwater Wetlands and the Programs of the Office of Natural Lands Management".

Ref Type: Personal Communication

Bennett, D. (8-1-1986). Statement of Derry Bennett, Executive Director of the American Littoral Society. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Berry, J. F. & Dennison, M. S. (1993). Wetland Mitigation. In M.S.Dennison & J. F. Berry (Eds.), *Wetlands: Guide to science, law and technology* (pp. 278-303). Park Ridge, NJ: Noyes Publications.

Broome, S. W. (1989). Creation and Restoration of Tidal Wetlands of the Southeastern United States. In J.A.Kusler & M. E. Kentula (Eds.), *Wetlands Creation and Restoration: The Status of Science Volume 1* (pp. 37-72).

Brown, J. R. (8-10-1970). Zabel v. Tabb Denial of Rehearing.

Ref Type: Generic

Building and Development Community Counsel Subject #1. (6-18-1999). Interview with Building and Development Community Counsel #1 - conducted by Heather Fenyk.

Ref Type: Personal Communication

Caughley, G. (1994). Directions in conservation biology. *Journal of Animal Ecology*, 63, 215-244.

Corn, L. M., Buck, E. H., & Baldwin, P. (2006). *CRS Report for Congress: The Endangered Species Act* (Rep. No. RL31654). Congressional Research Service.

Daggett, C. J. (3-25-1987). Letter to Maureen Ogden and Jack Penn regarding Assembly Committee Substitute for Assembly Bills No. 2342/2499.

Ref Type: Personal Communication

Duke Environmental Law. (1970). Ecology held valid criterion for denying dredge and fill permit under section 10, Rivers and Harbors Act of 1899. *Duke Law Journal* , 1239-1247.

Ref Type: Journal (Full)

Environmental Protection Agency. (1980). Guidelines for Specification of Disposal Sites for Dredged or Fill Material. *Federal Register* Vol. 45 No. 249, 85336-85357.

Ref Type: Bill/Resolution

Fair, A. (9-16-1999). Interview with Abigail Fair, Director of New Jersey's Freshwater Wetlands Campaign (FWC) -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Fauer, S. E. & Gritzuk, M. (1979). An Environmental Assessment of Restored Salt Marshes in New Jersey. In D. P. Cole (Ed.), *Sixth Annual Conference on Wetlands Restoration and Creation* (pp. 175-190).

Federal Official #1. (2000). Interview with Federal Official #1 -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Federal Register. (1-23-1981). US Fish and Wildlife Service Mitigation Policy. Vol. 46, No. 15, 7656.

Ref Type: Statute

Fenske, H. (8-24-1984). Memo to DEP Natural Resources Staff.

Ref Type: Generic

Fenske, H. (7-16-1986). Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Filippone, E. (6-22-2006). Interview with Ella Filippone, Executive Director of the Passaic River Coalition -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Fisceglia, F. (7-30-1986). Presentation by Frank Fisceglia representing Federal Business Centers and Raritan Center. Assembly Bill 2342 and Assembly Bill 2499. Assembly Agriculture and Environment Committee.

Ref Type: Hearing

Freshwater Wetlands Campaign Negotiator #1. (4-20-1999). Interview with Freshwater Wetlands Campaign Negotiator #1 -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Garbisch, E. W., Jr. (1978). Wetland Rehabilitation. In J. A. Kusler & J. H. Montanari (Eds.), *The First National Wetland Protection Symposium* (pp. 217-219). Washington, DC: US Fish and Wildlife Service.

Glover, I. C. & Higham, C. F. W. (1996). New Evidence for Early Rice Cultivation in South, Southeast and East Asia. In D.R.Harris (Ed.), *The Origins and Spread of Agriculture and Pastoralism in Eurasia* (pp. 413-441). Washington, DC: Smithsonian Institution Press.

Groman, Hazel A. and Powel, Ann (1986). National Wetlands Newsletter. *National Wetlands Newsletter*, May-June.

Gruber, E. (7-30-1986). Public Hearing Presentation of the Co-chairman of the Natural Resources Committee for the League of Women's Voters of New Jersey. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Hankey, D. L. (1980). Sections 9 and 10 of the Rivers and Harbors Act of 1899: The Erosion of Administrative Control by Environmental Suits. *Duke Law Journal*, 170-204.

Hughey, R. E. (9-24-1984). Statement of Honorable Robert E. Hughey, Commissioner NJDEP. Assembly Bills 672 and 2348. Assembly Agriculture and Environment Committee.

Ref Type: Hearing

Jordan, W. R. I., Gilpin, M., & Aber, J. D. (1987). *Restoration Ecology: A Synthetic Approach to Ecological Research*. Cambridge, UK: Cambridge University Press.

Kantor, R. A. & Charette, D. J. (1986a). *Computerized Monitoring System for Wetlands Mitigation Projects in New Jersey* (Rep. No. ASWM Technical Report 3). US Fish and Wildlife Service.

Kantor, R. A. & Charette, D. J. (1986b). Wetlands Mitigation in New Jersey's Coastal Management Program. *National Wetlands Newsletter*, 8, 14-15.

Kulp, C. (7-30-1986). Supervisor of the Fish and Wildlife Service Office for Pennsylvania and New Jersey, speaking on behalf of Boston Regional Director Howard Larson. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.

Ref Type: Hearing

Kulp, C. J. (7-7-1983). Letter to William Whipple, New Jersey Division of Water Resources Water Supply Administration Administrator from USFWS Field Supervisor Charles J. Kulp.

Ref Type: Personal Communication

Kusler, J. A. (1986a). Executive Summary and Recommendations: Mitigation of Impacts and Losses. In J. A. Kusler & M. L. Quammen (Eds.), *National Wetlands Symposium* Fish and Wildlife Service ASWM.

Kusler, J. A. (1986b). Preface. In J. A. Kusler & M. L. Quammen (Eds.), *National Wetlands Symposium: Mitigation of Impacts and Losses* Washington, DC: US Fish and Wildlife Service.

Kusler, J. A. & Montanari, J. H. (1978). Proceedings of the First National Wetland Protection Symposium. In Office of Biological Services (Ed.), *First National Wetland Protection Symposium* Washington, DC: US Fish and Wildlife Service.

LaRoe, E. T. (1978). Mitigation: A Concept for Wetland Restoration. In J. A. Kusler & J. H. Montanari (Eds.), *The First National Wetland Protection Symposium* (pp. 221-224). Washington, DC: US Fish and Wildlife Service.

Lomax, J. (9-24-1984). Public Hearing testimony of Josephy Lomax of Lomax and Associates before the Assembly Agriculture and Environment Committee. Assembly Bills 672 and 2348. Assembly Agriculture and Environment Committee.

Ref Type: Hearing

Maltby, E. & Barker, T. (2009). *The Wetlands Handbook*. Wiley-Blackwell.

Martin, Justin (2011, May 29). A body of water so foul. *The Boston Globe*.



McColligan, E. (6-12-1987). Memorandum to Robert Tudor, NJDEP, from Eugene McColligan, Principal Environmental Specialist on the subject of the OLS FWPA.

Ref Type: Generic

McLain, P. D. (8-27-1984). Memo to Helen Fenske, Assistant Commissioner New Jersey Department of Environmental Protection from the Deputy Director, Division of Fish, Game and Wildlife.

Ref Type: Generic

Myers, R. J. (7-25-1985). Passaic River Coalition testimony before the Senate Committee on Energy and Environment on S-602 "Freshwater Wetlands Act".

Ref Type: Hearing

National Research Council (2001). *Compensating for Wetland Losses Under the Clean Water Act*. Washington, DC: National Academy Press.

New Jersey Department of Environmental Protection. (1974). Program Summary of the New Jersey Coastal Management Program.

Ref Type: Generic

New Jersey Freshwater Wetlands Mitigation Council (1991). *Wetlands Mitigation: A Report to the Governor and New Jersey Legislature Evaluating the State of the Art of Wetlands Mitigation*.

New Jersey Office of Coastal Zone Management (1978). *New Jersey coastal program: bay and ocean shore segment and final environmental impact state* Washington, DC: U.S. Office of Coastal Zone Management.

New York Times (1907, March 17). Roosevelt Plans to Employ Rivers. He Appoints a Commission to Investigate the Problems of Waterways. Would Control Freshets. Praises Railroads for their Progress but says they cannot Move the Nation's Commerce. *New York Times*.

NJDEP Natural Resources Group (1984a). *A Summary and Technical Review of A-2348* New Jersey Department of Environmental Protection.

NJDEP Natural Resources Group (1984b). *Freshwater Wetlands: Perception of Value* NJ Department of Environmental Protection.

NJDEP Official #2. (4-21-1999). Interview with NJDEP Official #2 -- conducted by Heather Fenyk and David H. Guston.

Ref Type: Personal Communication

NJDEP Official #4. (12-1-2009). Interview with NJDEP Official #4 - conducted by Heather Fenyk.

Ref Type: Personal Communication

NJDEP Staff Member #1. (5-5-1999). Interview with NJDEP Staff Member #1 - conducted by Heather Fenyk and David H. Guston.

Ref Type: Personal Communication

O'Connell, J. B. (1997). *Master's Thesis: Assessment of the Viability of Mitigation Banking in Rhode Island*. Brown University.

Ogden, M. (4-15-1999). Interview with Maureen Ogden, former New Jersey State Assemblywoman -- conducted by Heather Fenyk.

Ref Type: Personal Communication

Passaic River Coalition. (10-7-1985). PRC Analysis and Position of the Freshwater Wetlands Act Proposed Senate Committee Substitute to S. 602.

Ref Type: Online Source

Passaic River Coalition Representative #1. (3-22-2006). Interview with Passaic River Coalition Representative #1 - conducted by Heather Fenyk.

Ref Type: Personal Communication

Pinchot, G. (1945). The Long Struggle for Effective Federal Water Power Legislation. *George Washington Law Review*, 14.

Quammen, D. (1996). *The Song of the Dodo: Island Biogeography in an Age of Extinctions*. Scribner.

Reagan, R. (2-17-1981). Creation of the Task Force on Regulatory Relief. Executive Order 12291, 46 Federal Register 13193, 3 CFR, Federal regulation Section 2b.

Ref Type: Bill/Resolution

Schreck, A. (1997). Implementation: The New Jersey Freshwater Wetlands Protection Act.

Ref Type: Unpublished Work

Shisler, J. K. & Charette, D. J. (1984). *Evaluation of artificial salt marshes in New Jersey*. New Brunswick, NJ: New Jersey Agricultural Experiment Station.

Society for Ecological Restoration. (2013). History of Ecological Restoration. 12-9-2013.

Ref Type: Online Source

State College Field Office (1984). *An assessment of the Corps of Engineers' Section 404 Permit Program in Northern New Jersey 1980-1984* Washington, D.C.: U.S. Fish and Wildlife Service.

Studt, J. & Sokolove, R. D. (1996). Federal Wetland Mitigation Policies. In L.L.Marsh, D. R. Porter, & D. A. Salvesen (Eds.), *Mitigation Banking: Theory and Practice* ( Washington, DC: Island Press in cooperation with the Urban Land Institute.

Task Force on Regulatory Relief. (1982). Processing Times: Specifies time limits for permit processing and acceptable reasons for delay. RGL-82-07.

Ref Type: Bill/Resolution

The Freshwater Wetlands Campaign. (10-31-1986). Letter from the Freshwater Wetlands Campaign to Members of the Senate Energy and Environment Committee.

Ref Type: Personal Communication

The Fund for New Jersey. (2013). The Fund for New Jersey: History of the Fund. 12-11-2013.

Ref Type: Online Source

Tiner, R. W. (1985). *Wetlands of New Jersey*. Newton Corner, Mass.: U.S. Fish and Wildlife Service.

US Fish and Wildlife Service. (2013). Fish and Wildlife Coordination Act. Digest of Federal Resource Laws of Interest to the U.S. Fish and Wildlife Service.

Ref Type: Online Source

Wells, T. (10-16-1986). Testimony of Thomas Wells, Assistant Director of the New Jersey Conservation Foundation, Concerning Freshwater Wetlands Bills S-2003 (Lynch) & S-2121 (Zane). Senate Bills S-2003 and S-2121. Senate Energy and Environment Committee.

Ref Type: Hearing

Woodhouse, W. W. Jr. & Knutson, P. L. (1982). Atlantic Coastal Marshes. In *Creation and Restoration of Coastal Plant Communities* (.).

Young, T. P. (2000). Restoration ecology and conservation biology. *Biological Conservation*, 92.

Zaitzevsky, C. (1982). *Frederick Law Olmsted and the Boston Park System*. Cambridge, MA: The Belknap Press of Harvard University Press.

## CHAPTER SEVEN: NEW MODELS FOR CO-PRODUCTION

This case of the emerging science of freshwater wetlands, creation of a new bottom-up community of scientific practice organized as the Freshwater Wetlands Campaign, and passage in 1987 of New Jersey's Freshwater Wetlands Protection Act (FWPA) has demonstrated that the idiom of co-production extends to "citizen science," or scientific knowledge emerging from the grassroots. This research was designed to engage debates over the source of knowledge inputs to environmental governance, and has sought to know whether accounts of the co-production of citizen science, collective action and institutions to affect environmental protection changes can inform these debates. In recent years research examining science advising has acknowledged that citizens have an inherent interest in the science-politics interface, but little attention has been given to "bottom up" knowledge contributions. Furthermore theories of science and social change have not yet addressed vital questions regarding pluralism in descriptions of the co-production of science, new discourses, new identities and new institutions. This study represents a departure from strategies at the policy-science interface that have emerged from political science. It presents a broad case that provides examples of marrying science to action and has sought to answer two of these questions:

- Given our political system how can citizens translate scientific knowledge to policy action and effective environmental decision making?
- Are new institutional structures required for effective insertion of citizen expertise in environmental decision making?

The first section of this chapter provides a brief summary of what is revealed through contextualization. In the second section I review the main empirical findings as identified in the case study chapters and work to synthesize them to answer the study's two principal research questions. This section validates the use of citizen science by citizens to constitute policy. It also describes

certain changes - in the artifacts, discourses, communities of practice, policy processes and public institutions - that result from the insertion of citizen science in the FWPA debates. In section three I draw out implications of the empirical findings for theory, and in section four I do the same for policy. In this I aim to enrich understandings of both pluralism and science advising while demonstrating the value of the idiom of co-production. Expanding on co-production in section three, I suggest that the analytic power of this framework can be enhanced by a theory of social movements and propose the formation of a new theory of “grassroots” social movements for STS that I call “bootstrap science.” In the fifth section I make recommendations for future research. To conclude, in section six I discuss how this study contributes to current understandings of environmental governance.

In the last several decades communities throughout the United States have increasingly faced the challenges of understanding and balancing the biologic and economic impacts of anthropogenic environmental change. Historical research into environmental protection initiatives provides a backdrop to address some of the most challenging issues of our times. Enduring problems such as sprawl, watershed management, water rights issues and species protection are rooted in environmental history in general and the history of environmental policy in particular. An examination of the role of citizen science and collective action in an historic case of environmental decision making and policy processes not only broadens our perspective regarding potential agents of change within our power structures, but moves us closer to understanding the normative standards at play in structuring environmental politics.

### **Findings from context**

The historical approach to the project provides a periodization of the treatments of science in policy. The history of federal policies shows a destabilization in the postwar political order: the 1969 National Environmental Policy Act (NEPA) created new opportunities for the insertion of public knowledge in decision making, and the 1972 Clean Water Act (CWA) marked a shift from productivist “natural resources” policies to ecological policies based on at least some science. This periodization

yields three important insights for the FWPA case. First, the new science of freshwater wetlands takes root in a space carved out by a combination of “Green State” statutes and new ecological discourses, and emerges in the context of where policy is being made. Observing this earlier governmental role is important in showing that science does not become politicized in the course of the FWPA case so much so as there is no science without politics. That is, as people’s environmental awareness expanded in this time and place in which the nature of science was open and as NEPA and state entities like New Jersey’s Association of New Jersey Environmental Commissions (ANJEC) developed as repositories for public knowledge, people began to project this new body of “common knowledge” and emerging understandings of basic freshwater wetlands science on the heretofore ill-defined artifacts of freshwater wetlands, freshwater wetland buffers and mitigated freshwater wetlands. They recognized that in using science they could “create” new cultural objects, or regulatory artifacts, more in line with their new ecological understandings and values. Second, the collective action to advance freshwater wetlands protection and the new identities and sub-movements that form around it are co-produced with the new freshwater wetlands science and, like this new science, also come into view in the context of where policy is being made. Third, a formal body of freshwater wetlands science does not pre-exist the policy in New Jersey or exist in its current form until movement activists bring it to bear. This insight is important in showing that how policy is made cannot be adequately explained without a description of the actors involved. Who enacts the new freshwater wetlands science and how they use this science to mobilize around freshwater wetlands protection affects how policy gets done and how policy processes unfold.

We can also appreciate just how much this was a moment in time by considering the demographic trends described in chapter three. For example, Salmore & Salmore (Salmore & Salmore, 1998) describe the post-war push to develop New Jersey’s suburbs with office parks and corporate campuses as the primary driver of the state’s freshwater wetlands losses. In examining more recent trends Hughes (Hughes, 2013) works to imagine uses for these now-empty spaces, referring to the state’s former corporate campuses as “dinosaurs, not diamonds.” We see that the New Jersey Builder’s Association (NJBA) and the National Association of Industrial and Office Parks (NAIOP) built

their campaign against freshwater wetlands protection on the ephemeral promise of suburban sprawl. Understanding these trends helps to justify the importance of this study: if New Jersey's environmentalists had not galvanized a science and taken action to protect the state's freshwater wetlands then there would have been even more freshwater wetlands destroyed - for uses that turn out to be temporary.

### **Empirical findings**

Periodizing science in policy shows how certain decision making pathways in New Jersey were conditioned by the institutional setting. Understanding the context for decision making in this way we can see that the emergence of citizen science as an input to legislative decision making is rooted to a normative democratic core of policy making upheld by existing institutional structures. But if we wish to know how the knowledge contributions of the grassroots might create a more robustly democratic decision making, we also need to characterize the relationships between citizens and their science, and to examine how these relationships shape and are shaped by our policy processes and institutions. More specifically we need accounts of co-production that include considerations of agency and that examine, for example, how citizens establish their knowledge claims, how they bring them to bear in policy processes, and how they insert them in decision making. To produce these accounts we need to ask how citizens use science in politics, and then examine the effects - on policy, policy processes, institutions, science, and on the actors themselves. In this section I first highlight the main empirical findings that address these concerns. These findings are chapter specific and were summarized within the respective chapters four, five and six. They address two primary empirical questions:

- How was science enacted and used in the three sub-movements (definitions, buffers and mitigation) that emerge to advance freshwater wetlands protection?



- How were conflicts over scientifically and technically complex subjects resolved in the definitions, buffers and mitigation disputes?

I then synthesize these findings in three steps. First I discuss how certain changes in debates, collective action, policy processes and institutions are related to the strategic use of science by the FWC. Second, I discuss the role of science in resolution of the central disputes of the case. Finally, I show that the different ways the FWC used science at the beginning and middle of organizing efforts for the sub-movements had a positive effect on their ability to successfully join political and technical considerations in bringing about closure in the buffers and mitigation disputes at the end of legislative efforts. This section concludes with a discussion of how these findings inform the two central questions of the project.

I take an historical approach to the definitions, buffers, and mitigation sub-movements to investigate how science was used to affect change in New Jersey's freshwater wetlands policies and standards and to discuss the three new regulatory artifacts - freshwater wetlands, freshwater wetland buffers and mitigated freshwater wetlands - and the process of the institutionalization of these artifacts. I show that the original impetus for each sub-movement was the presentation of science that suggested a different course of action than what either existed or was proposed for freshwater wetlands regulation in the state. For example, the definitions sub-movement developed in response to the push for a mechanistic regulatory definition of freshwater wetland as opposed to the evolving ecological understanding of freshwater wetlands and their functions. The buffers sub-movement emerged as environmental actors recognized the flood protective and ecological benefits of undeveloped ecotones. And with the mitigation sub-movement we see the FWC on the defensive, reacting to the environmental uncertainties presented by restoration and mitigation.

This is a case of a bulwark. The FWC had no money, yet they identified new problems of policy and produced useful science that contributed to the development of environmental policy and to changes in freshwater wetlands, freshwater wetland buffers and mitigated freshwater wetlands as artifacts. The important aspect is that the advocates help to develop the science that drives each sub-movement and that they shape each artifact. This citizen response - which simultaneously shapes a

new community of practice - comes in part as a critique of elite science and in part as a strategy for engaging in politics. Movement actors deploy science as one of several armaments in their battle with developers, who wish to limit restrictions to development in freshwater wetlands and thus seek to shape the artifacts in different ways. Although the environmentalists do, at certain points, call in traditional academic experts we witness multiple instances in which movement actors actively enact new science, engage existing science for political purposes, and shape strategies for generating politically useful freshwater wetlands science. I show science used variously in each sub-movement, but here I identify the most salient uses of science in each effort. In the definitions sub-movement it is used to identify social problems, as an organizing tool and to advance a new ontological view of freshwater wetlands. In the buffers sub-movement it is used primarily to define a new policy area, to gain credibility, and as a negotiating step. In the mitigation sub-movement science is deployed politically and is used to reduce uncertainty, develop new conceptual models of wetlands protection and restoration, and to democratize decision making processes.

Having explored how science was used in the sub-movements I then employ a modified scientific construction of technology (SCOT) analysis to examine how closure was determined in the central scientific conflicts for each dispute, and to observe how stabilization of the regulatory technological artifacts (the definition of a freshwater wetland, freshwater wetland transition areas, and criteria for mitigated freshwater wetlands) was achieved. This approach helps to identify when science is validated in policy and which aspects of science are incorporated in policy. The analysis shows that science does not directly inform resolution of any of these conflicts - in no case are determinations made based on specific scientific findings - but it is clear that science matters, and that the strength of the science does weigh in strategic negotiation.

**Definitions.** In the definitions sub-movement environmental activists seek to bring about a change in the regulatory treatment of freshwater wetlands by redefining them. This research shows activists using science strategically to identify the failures of the Army Corps to protect freshwater wetlands under the federal regulatory definition, foster a movement around freshwater wetlands protection, and legitimize appeals for an alternative definition of a freshwater wetland to be included as part of

regulatory guidance. The central conflict was over whether regulatory guidance should be determined by scientific vs. regulatory definitions of freshwater wetlands. This conflict had filtered down from federal-level disputes. The regulated community hewed to the Army Corp's regulatory definition of freshwater wetlands inscribed in the federal CWA, a definition that had grown out of the mandate to limit obstructions to the navigable capacity of the nation's waterways. Concerned with the history of freshwater wetlands losses in New Jersey under the Army Corps definition the FWC argued that any new freshwater wetlands law be grounded on a scientific definition, and proposed adoption of an ecological approach to identifying freshwater wetlands used in the field by the USFWS. Because of its tremendous political implications - the ecological definition, in focusing on the functions of freshwater wetlands based on hydrology, hydric soils and hydrophytes, classified significantly more land as "wetland" to be put off limits to development - this was the central conflict of the FWPA negotiations, and disagreement on the issue stalled passage of the legislation for years.

In the end, the definition of a freshwater wetland for New Jersey was not determined by negotiation but by a strategic choice. Evidence suggests that the federal agencies were pushed along for a final determination by the New Jersey debates, and that the state-level debates brought the Environmental Protection Agency, the Army Corps and the US Fish and Wildlife Service to the table to reach consensus. On April 1, 1987, just three months before passage of New Jersey's FWPA, these agencies jointly published the Wetland Identification and Delineation Manual in which they adopted the definition of freshwater wetlands used by the Army Corps. New Jersey actors were presented with a new regulatory technological artifact stabilized at the federal level. Recognizing legitimacy in the federal process that led to consensus, state actors chose to use this definition as the basis for negotiations going forward. Although stabilization of the definition of a freshwater wetland for New Jersey occurred at the federal level, and final determinations in the state were guided by the federal resolutions, were it not for the strategic use of science by these activists at earlier stages of movement organizing and legislative action, New Jersey's FWPA would likely not exist, or at least would have taken a very different form.

**Buffers.** In the buffers sub-movement the FWC seeks to establish the validity of freshwater wetlands buffers as a concept. Their specific goal is to expand regulatory protections for freshwater wetlands to include upland buffer areas. Cultivating acceptance of buffers for regulatory purposes was especially difficult because buffers pose political problems. Builders were loathe to see freshwater wetlands buffers - what they viewed as easily developable tracts of land - set aside from development. This research shows the FWC producing and then using buffers-specific science to educate the general public about the various functions of freshwater wetlands. Through this statewide education campaign the FWC gained credibility, defined a new policy area, and established a place for environmental actors at the negotiating table. At the table it then used the new buffers science as a tool to shift the general discussion from one over values to one over science. This case shows that once buffers science becomes part of policy making it can be deployed politically, both by environmentalists and developers. This is observed in Assemblyman Jack Penn's requirement that specificity in criteria be determined as part of the legislative process, and in the FWC's response: the FWC used the emerging buffers science to detail parameters for buffers area protections in the state. The FWC viewed wetlands buffers as dynamic ecological systems and were reluctant to shape these parameters, but they recognized developers' needs for clear guidance. Although the FWC reconciled itself to establishing a fixed freshwater wetland transition area it did so only after having put the power of science into action to move the ecological concept of a "freshwater wetland buffer" from idea to artifact.

Closure in the buffers dispute shows that in the end the extent of the transition area was neither technologically nor socially determined. The FWC forwarded a scientifically established proposal for 300 foot buffers. The development community required none. Stabilization of the buffer artifact occurred through agreement to "split the difference" between the two proposals, and the parties arrived at a maximum 150 foot buffer for regulatory protection. The FWC recognized that closure determined in this fashion might yield a solution several yards short of being truly able to protect the wetlands and the freshwater wetlands could perish, but saw with the approach an opportunity to move the broader agenda forward. Although on its face closure in this way appears to be a mechanical

solution, treating the quantitative proposals equally and disregarding the scientific substance, it provides the strongest example of the use of citizen science in decision making of the sub-movements. The FWC understood the inherent uncertainty in buffers science, and recognized that “splitting the difference” would not necessarily yield a fully protective buffer zone. But it also recognized that in accepting the compromise it would secure creation of the “transition zone” as an artifact through the legislation. In this sub-movement we see that had the FWC not deployed a homegrown science to underscore claims for buffers protection and, in doing so, established negotiating rights, New Jersey’s freshwater wetlands transition areas would likely not exist.

**Mitigation.** Unlike the definitions and buffers sub-movements, in the mitigation sub-movement the FWC does not organize for something, but rather works in opposition to including mitigation as part of regulatory practices under the FWPA. Although like the buffers sub-movement mitigation is initially framed as a values conflict, in this sub-movement movement actors do not use science to put mitigation on the agenda. In the early years of wetlands legislation discussions the FWC argues against mitigation. The substitution of manmade freshwater wetlands in exchange for the development of “natural” freshwater wetlands was viewed as a form of man’s hubris. Pushed to agree to mitigation as part of assumption of the Federal 404 Program, the FWC “sees the writing on the wall,” and changes tack. As in the definition sub-movement the FWC produces and then uses new scientific findings to demonstrate the failures of on-going projects to meet regulatory objectives and the stated goals of mitigation. In doing so it discredits the “authoritative” model of restoration disseminated by the Army Corps and establishes a space for an alternative contextualized and scientifically-based mitigation permit criteria. Although the FWC did not hold specific expertise on “wetlands restoration,” their scientific authority is formally acknowledged in Public Hearings (where the line of questioning still focused on value questions), and by the legislature. The FWC used this authority to bring attention to the general scientific uncertainties associated with the new field of wetlands restoration science and to argue for 3:1 wetlands replacement ratio, a ratio larger than the 1:1 proposed by the development community and larger than what was allowed under the Federal 404 Program. As in the buffers sub-

movement, the final 2:1 ratio is achieved by “splitting the difference.” Again, stabilization of the artifact is achieved through mechanical means.

What is interesting regarding technical decision making in this sub-movement is not so much the influence of the FWC’s science on the final mitigation ratio, although the FWC’s achievement in doubling the regulatory ratio is significant, but rather the use of science by the FWC to “push off” closure on significant technical decision making for later through a newly designed system of collaborative democratic engagement. Still pointing to issues of uncertainty and using science to argue against the efficacy of the developer’s proposal, the FWC forestalled treatment of some of the most significant technical questions requiring substantive scientific input until after passage of the FWPA. The FWC also articulated process demands, leveraging the credibility and authority they had established throughout the definitions, buffers and mitigation discussions, to stipulate that these more technical mitigation questions be addressed not by the legislature or by the New Jersey Department of Environmental Protection (NJDEP) staff, but by the Freshwater Wetlands Mitigation Council, a new system designed to ensure accountability in decision making by a collaboration of experts. With the Freshwater Wetlands Mitigation Council, citizen representatives from both the environmental and development communities would be afforded permanent legitimate engagement power to manage an aspect of environmental decision making in the state.

This sub-movement demonstrates the tremendous influence of citizen science to shift socio-technical debates. Had the FWC not used science strategically to establish its authority as expert it most likely would have been unable to effectively leverage questions of uncertainty to increase mitigation ratios. It is also unlikely that it would have been able to delay the development of mitigation criteria for treatment through the new and democratized decision making process. However, considering examples of two US states (Rhode Island and Maine) that were successful in blocking mitigation as a component of freshwater wetlands protection measures, we can imagine that had the FWC stuck with their earlier, more philosophical rhetoric regarding opposition to the man-made creation of freshwater wetlands rather than forwarding scientific rhetoric, that they might have been able to block mitigation entirely.

**Synthesis of empirical findings.** The degree to which social movement actors were engaged in co-production only becomes evident after tracing their engagement through all three sub-movements. In comparing the definitions sub-movement to the buffers and mitigation sub-movements we see, for example, that in the definitions case that while movement actors were epistemically ignorant and had to make science up as they went along that they still had a lot of freedom in addition to an emerging power and authority. As the social movement actors gained experience in science, and as they gained an indigent epistemic standing, they took steps toward institutionalizing the movement and, in doing so, lost significant freedoms. Analysis of these sub-movements reveals four significant shifts that occur with the insertion of science in environmental decision making by social movement actors: a politicization of the debates, a professionalization of the citizen knowledge holders involved, a shift in the location of expertise in the process, and a new alignment of institutions that manifests in tandem with these changes.

First, the nature of the debates changed and became increasingly politicized. These were political issues from the start, but with the insertion of science they became increasingly so. In each subsequent sub-movement scientific information and research was less important to the political infrastructure of decision making than it was to the earlier movement organizing efforts. Each sub-movement provides examples of how the education component of the sub-movement brought negotiators close to the ideal of having all science available equally to all partners so that people can start from a common body of knowledge. As negotiators identified mutually agreeable information as a basis for their engagement, the playing field was leveled and the importance of science as a resource decreased.

Second, the use of science in these processes changed the community of practice over time, turning backyard naturalists into proto-ecologists who asked theoretical questions about how the world works. Continued engagement with science shifted their approach to research. Maturing in their understanding of science through the sub-movements they shifted from a focus on cataloging species and other data, an approach similar to early naturalists like Bertram and Linneas, to an “expository science” akin to the outreach efforts of the Scientific Naturalists movement of the late 19<sup>th</sup> century.

We see them then moving to the work of mapping patterns of diversity in the freshwater wetlands and within and between ecosystems and in doing so positioning themselves at the vanguard of a new freshwater wetlands science. But we recognize, too, that the citizen scientists gradually come to see themselves as political actors in a political setting. The science they enact in the buffers and mitigation sub-movements is no longer philosophical ecology. Even though they clearly have a sense that they are not protecting enough in their agreements to “split the difference,” that is no longer their concern. Their concern shifts to creating artifacts in a way that they felt would be maximally politically protective. In this we see a final shift in the community of practice. Concerns with basic science trend to an increasing interest in regulatory science as the FWC begins to use science strategically to maximize their agency as political actors speaking on behalf of freshwater wetlands protections.

Third, not only do New Jersey’s citizen scientists become increasingly professionalized but through this transformation, delivery of their contributions becomes increasingly institutionalized. This is observed first as they transition from citizens bringing attention to the issues, to advocates presenting a case for change, to expert advisors as they work toward consensus on a state-specific freshwater wetlands bill to assume the Federal 404 Process, and finally to “Mitigation Council Members” in the mitigation case. The insertion of science in the debates shifted the location of expertise in policy processes, gradually making it more directly accessible to decision makers.

Fourth, as new mechanisms for the development and delivery of science advising emerged, organizational structures aligned to accommodate the increasingly formalized relationships between activism and government work. In fact, expertise is repositioned through institutional change, first through formation of the FWC, then in creation of a legislative negotiating group that included citizen appointees, and finally in the creation of a new ad hoc institution, the Freshwater Wetlands Mitigation Council.

Answering the two empirical questions gives insight into the elements of the case that science affected. It also reveals those elements in which science was less directly important. The historical perspective shows that the relative influence of scientific inputs changed over time as other variables



gained in significance. This is borne out with the observation that the advocates changed the ways they used science as a tool at the beginning, middle, and end of legislative efforts. In each sub-movement we see the advocates use science first to examine knowledge(s) and assumptions. They criticize policies that lack science, and in working to change policy, develop a science. In the middle of organizing efforts they then use this science to shape and forward alternatives, to articulate the foundations of these alternatives, and to clarify the range of their disagreement from prior views. At the end of the legislative process, as the people disposed to work together to assume the Federal 404 Program begin their formal negotiations, the FWC takes on an advisory role and does not use science to enlighten so much as to articulate their authority over technical matters. This is a decidedly instrumental use of science and a strategic political move. It suggests that the FWC understood scientific authority would not be the final word in these socio-technical debates, and that what was necessary to bring about closure in decision making was neither purely technical nor purely political. The research shows that science took a back seat in political decision making, but that it still played a crucial role in the closure of the debates, having been successfully and meaningfully inserted at earlier stages in the deliberations.

**Empirical findings: conclusion.** This study has sought to know given our political system how can citizens translate scientific knowledge to policy actions and effective environmental decision making. It has demonstrated that citizens working in New Jersey in late century translated scientific knowledge to policy action and effective decision making about the state's freshwater wetlands through a combination of advocacy and the strategic use of science. These citizens enacted and marshaled scientific information not only to set standards, but to create new artifacts, and they created artifacts and standards that mattered politically: their creation cost people money. This research has shown that the translation of scientific knowledge to policy action in the FWPA case - the definition of a policy area, the definition of standards for policy, and the (re) definition of policy processes - is part of the co-production of knowledge and mobilization. It has also shown that the translation of scientific knowledge for effective decision making is directly tied to the processes of

organizing around the sub-movements and the strategic use of science at different stages of movement emergence.

Although I did not devote this study to institutions per se, I have sought to know whether new institutional structures are required for effective insertion of citizen expertise in environmental decision making. With my research design I cannot settle this definitively, but in the process of my research I did not find support for arguments that if we create new institutions for public decision making that we will better engage people in democratic processes. In the case of New Jersey's FWPA the insertion of citizen expertise in environmental decision making did not require the creation of new institutional structures. While science did not in any of these sub-movements "provide the answers," it did help to ensure that significant issues were addressed, and it helped to level the playing field in political decision making. Although the principal quantitative success criteria for mitigation, the 2:1 ratio, was mediated by compromise, as was the 150 foot buffer, the requirements of the FWPA went beyond what industry was known to be capable of and what researchers said was possible. This was influenced specifically by what environmental actors said was needed to meet environmental protection goals in the face of uncertainty. Furthermore, the mitigation sub-movement clearly illustrates the way in which institutions, science, collective action and identities change together through co-production of an environmental issue. This sub-movement shows that with creation of the Freshwater Wetlands Mitigation Council the representative structure (re)aligns with shifts in the character and location of expertise, naturally accommodating new requirements for democratic participatory engagement. This research shows that through the strategic use of science, New Jersey's FWC successfully engaged the representative democratic system to both provide input in the legislative process and to constitute policy, and in doing so changed the nature of the system itself.

### **Theoretical implications**

From the beginning of my research into passage of New Jersey's FWPA this case has appeared to have a lot to say about the nature of science and "bottom up" contributions. Anybody who was

involved in the push for state assumption of Section 404 of the Federal CWA would have acknowledged the impact of these contributions, and would have acknowledged that had the activists not pressed on the issue of science this law would not have passed. I thought that the active development of science by citizens played a role in passage of the law, and chose to study this because it was a precedent-setting policy in the US and because it seemed likely the case could indicate some needs to expand theories about Science and Technology Studies and Social Movement Studies. Relatively early in the process of research and analysis I realized that STS could not accommodate what I observed of citizen science and citizen activism: STS does not consider the role of the non-professional scientists. As I worked on the project new literature emerged on co-production. The co-production framework emerging from STS modifies the standard policy analytic approaches by expanding the account of the social. In this it reveals links between scientific inputs to policy and certain social identities, discourses and institutions, providing valuable insights in the relationships between these scientific inputs and political power. But you cannot completely account for this case without a consideration of who enacts the new freshwater wetlands science and how they use this science to mobilize around freshwater wetlands protection. STS does not afford theories that can adequately characterize the “who” of New Jersey’s freshwater wetlands protection efforts. Although it became clear that this was a case of co-production, it was also clear that this was a case that would require inclusion of non-credentialed scientists, more specifically social movement actors, as producers of science. But in spite of the tremendous analytical power of the co-production framework it cannot account for the agency of citizens to produce science in response to a social problem, to use this science to mobilize around these problems, and to use science strategically through activism to constitute freshwater wetlands protection legislation representative of their world view. STS and co-production needs a theory of bottom up social movements.

Looking to the SMS literature we see that social movement theory does not present science as something special. While science is considered formative of social movements, it is just another resource to be deployed. Although in SMS there is an interest in the experiences of social movement actors, none of this theory deals with social movement actors creating science, or with the process of

discovery, as a way of defining what it is they want, what they want to find in the world, and what should be done about it. In passage of New Jersey's FWPA we see non-academic and non-governmental actors generating a new science of freshwater wetlands with the goal of protecting these environmental lands. These actors then use the new science to foster a grassroots movement and to gain standing in policy debates and decision making about scientific and technical aspects of freshwater wetlands degradation and protection. Existing theory and terminology cannot adequately capture what was observed in this case. Research into "whose knowledge" as inputs into environmental decision making has historically missed treatment of "bottom up" scientific inquiry. Likewise, research into social movement organizing has not looked at scientific inquiry as driven by the non-professional grassroots. With respect to existing terminology, notions of lay science, local knowledge, situated knowledge and contextualized knowledge, while useful, do not convey the drive to engage with the political, or the element of grassroots organizing, witnessed with the emergence of the FWC. Participatory action research (PAR) and community based participatory research (cbpr), while more activist, suggest relationships with science and policy that are navigated with the help of government planners or academia. The notions of citizen experts and citizen science are closer to theorizations of a democratic intent and frame useful notions of engagement with policy and decision making but fail to accommodate conceptions of movement organizing. Furthermore they do not address how actors weigh options as they engage with science or as they organize on the path to effecting policy change.

Neither STS nor SMS stake out the territory at the nexus of "bottom up" scientific inquiry and social movement organizing. With the exception of the top-down theory of Scientific Intellectual Movements (SIMS) (Frickel & Gross, 2005), neither discipline thinks it important to explain how social movement actors use science. In this project I suggest that central concerns of STS and SMS cannot be explained without explaining this formative use of science. In this case we cannot explain the development of freshwater wetlands science as engaged in regulations without acknowledging the role of citizen activist scientists, what I am calling "bootstrap scientists."

I develop a new catchphrase, “bootstrap science,” to describe the organic convergence of citizen expertise and activism that emerges to forward a new scientific approach to a social problem.<sup>82</sup> With “bootstrap science” I am setting out an argument for the formation of a new theory for STS, a theory that includes a “bottom up” model of knowledge contributions from the grassroots and that conveys a sense of the agency that brings meaning to these contributions. I define bootstrap science as the synergistic production of science and advocacy by non-professionals in response to critical social problems. Bootstrap science is not mediated by academics or government. It lacks disciplinary identity and exists outside typical disciplinary practices. It is directly tied to normative action around creating new knowledge(s) and new contexts for knowledge and thus allows for an examination of strategies and tactics around the use of science. As a concept bootstrap science requires consideration not just of the co-production of a community of practice, but also considerations of agency. The FWPA case shows that science is not just pushed down by elites to advance policy, but that it can be “pulled up” from the grassroots to do the same. A theory of bootstrap science for STS expands understandings of social movement organizing and bottom up scientific inquiry, opening the door to enhanced discussions of democracy in decision making and governance.

### Policy implication

Responding to the failure and authoritarian character of top-down rational policy approaches to environmental resource management, current themes in a variety of disciplines suggest new roles for citizen knowledge and participation in the democratic governance of the environment, including suggestions that we should limit representative democracy’s capacity to identify expert inputs for environmental decision making and substitute instead more structurally participatory approaches. This

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<sup>82</sup> To “bootstrap” implies an ideal of self-reliance. It suggests a certain power in unaided efforts to attain what was previously viewed as unattainable. The term is often attributed to Rudolf Erich Raspe’s *The Singular Adventures of Baron Munchausen* (Raspe, 1950), and these origins have special resonance to the use of the term in my research: in Raspe’s story the Baron “pulls himself up by his bootstraps” to get out of a swamp.

project provides several responses to these suggestions and makes additional suggestions for policy development and analysis.

First, this research identifies new frameworks in the convergence of STS and social movement studies that are less hierarchical and more pluralistic, opening the door for improved understandings of how new identities, including citizen and bootstrap scientists, can advise on environmental decision making beyond contributing to values discussions. This research shows citizens enacting science and translating scientific knowledge to policy action and effective environmental decision making. Furthermore these non-academic, non-governmental social identities can be understood as contributing in novel ways to knowledge production by, for example 1) identifying problems worthy of research; 2) identifying knowledge gaps and uncertainties in research; 3) shaping research to address these problems; 4) conducting research to address these problems; 5) adopting new techniques and tactics for the presentation of findings; 6) influencing changes in the channels of communication; and 7) influencing changes in the policy process itself. It is important to recognize that it is by virtue of will that New Jersey's citizen activists insert themselves into the regulatory process. There are no objective "opportunities," but there are actions. People identify these opportunities and take them. Although this research does not present a full theory of social mobilization, I do show that it is important, and suggest that policy makers would be wise to be aware of, and to remain open to these contributions.

Second, this research suggests that policy makers should look, too, to non-traditional locales of citizen science. A salient aspect of New Jersey's freshwater wetlands protections is that unlike so many other locales of citizen science (e.g. fisheries, oyster beds, mangroves), shaping New Jersey's freshwater wetlands science was not directly tied to the livelihood interests of the citizen scientists. In this case people created a certain moral authority as landowners. They are residents of these places and use a new ecological science to constitute their moral authority.

Third, through the organizing efforts of the FWC, freshwater wetlands became a new public sphere for knowledge and information sharing about the environment. New Jersey's freshwater wetlands became a new place for conflict and controversy. FWC actors produced a freshwater

wetlands science, and then used this science to force a more detailed geography on an alienated space, thus transforming it into a place. In doing so they established a proverbial foothold in a wetland for improved democratic engagement in decision making. This research shows that the FWC used science to effectively establish the NJ environment in general and the freshwater wetlands in particular, as a new space for the purpose of social integration and deliberative democracy - a new sphere for policy influence.

Fourth, New Jersey's FWC engaged in political contests that simultaneously shaped freshwater wetlands as a science and defined the geographical territory of freshwater wetlands in the state. Through advocacy these environmental actors heralded new concerns with the ecology of place and married an interpretation of place with the emerging freshwater wetland science. This suggests that policy makers should consider viewing expertise and advocacy as cooperating rather than rivalrous endeavors.

Fifth, this research presents a case in which institutional change manifests organically and in tandem with new knowledge(s) and new identities. While this research presents findings from just one study of environmental decision making, the changes described in this case indicate an inherent capacity of our democratic representative structures and policy processes to respond to the presentation of new knowledge(s) for incorporation in decision making and to regularly realign through a reciprocal relationship between knowledge-making and state-making. In other words, decision contexts do not necessarily require reconfiguring. In this historical case of New Jersey's freshwater wetlands we see that the institutional structures for environmental decision making in the United States at the end of the 20<sup>th</sup> century afforded, and created, opportunities for the insertion of citizen science.

Sixth, although this research does not investigate the institutionalization of federal processes per se, research is situated in the middle of processes of the institutionalization of the CWA and we see that New Jersey's FWPA was an important influence over federal agencies coming to a conclusion on definitions and mitigation. It provides a glimpse into an alternative decision making process to current growth industry of consultants, academics and lawyers that developed in the late 1980s in response to

the push for collaborative decision making. We observe a time just prior to the dispute resolution industry's arrival at the environmental conflict table, and we can juxtapose New Jersey's form of coalition development, empowered and motivated largely by the insertion of a homegrown science of freshwater wetlands, with dispute resolution approaches in which citizens state preferences in a public forum, but science is engaged and delivered by outside experts.

Finally, in that this research shows that a knowledgeable, informed population affects the distance between those who govern and those who are governed, perhaps more contextual orientation for policy analytic practices can benefit from a similar approach. I suggest that an approach that requires researcher involvement in the local knowledge of the ordinary citizen might have similar benefits.

### **Recommendations for future research**

This research opens the door to additional research in STS, SMS and policy in general. Some avenues and questions for additional exploration include the following:

- What is gained and lost when grassroots movements take up science as a source of their moral authority to speak about the environment?
- To what extent was citizen science a force in intellectual change in the broader field of freshwater wetlands science?
- How does New Jersey's FWPA debate compare to the national policy debates on freshwater wetlands protection?
- How can the results of this study be configured in a way that is of value to environmental activists?

Finally, this study raises an additional set of theoretical questions about the distinction between the central concern of democracy, understood as the attempt to ensure citizen access to and recognition in decision making processes, and the basic task of "good governance," understood as how political authority draws on expertise. Certainly that New Jersey's citizen scientists contributed to



decision making about scientifically and technically complex subjects, and that their contributions helped to shape regulatory technological artifacts, challenges commonly held notions about the relationships between knowledge and decision making in the policy process. Writing mid-century E.E. Schattschneider argued for a conception of democracy that delineates between the knowledge of experts, amateurs, specialists and generalists (Schattschneider, 1975: 1). In this the notion that citizen advocacy and expertise can influence policy raises theoretical questions about relationships between governance and democracy e.g. is it appropriate to place demands of time and expertise on our citizenry.

### **Co-producing artifacts, institutions, and “bootstrap scientists”**

This research provides an account of the co-production of science, identities, collective action and institutions to affect a change in the policies and standards at the state level under Section 404 of the Federal CWA. It shows how New Jersey’s “bootstrap scientists” enacted a new freshwater wetlands science and engaged a certain agency in doing so that allowed them to create new contexts for knowledge, foster a more pluralist and open culture of decision making, shape new regulatory artifacts and constitute freshwater wetlands policy. It then extends these fresh understandings of pluralism to co-production. We see that New Jersey’s citizens were full participants in the transition from “wasteland” to wetlands. There is no freshwater wetland as it evolved with the federal definition and no “transition areas,” there is no regulatory artifact without this process and without the involvement of the citizens in the process.

These findings can be linked to definitional issues and conflicting interests in emerging science and technology like nanotechnology and synthetic biology where definitions are similarly hard to come by, but they are perhaps best positioned relative to other environmental policy concerns. Particularly in those decisions that impact human health, e.g. air quality or other pollutants, or home e.g. flooding or encroaching development, issues of citizen participation weigh heavily in the practice of decision making. But with respect to normative standards in structuring environmental politics and

environmental governance, examining how science was used in the sub-movements and to create New Jersey's regulatory freshwater wetland artifacts fits the knowledge contributions of New Jersey's FWC into the broad scope of public reasoning and collective sense making of problems and solutions. In this case we see New Jersey's bootstrap scientists pushed into the role of policy decision makers, weighing scientific rationality and standards of evidence against regulatory rationality and standards of evidence. We see them clearly aware of how one can link to the other in ways that lead to normatively superior or inferior outcomes. This is important in that although separating basic science from regulatory science in a field like this is nearly impossible, science has been funded when it has been determined that these things are politically important. Studying policy in this way is justified in that so much of our science derives directly from funding policy priorities.

Retrospective interviews reveal that these activists would have preferred to see more science used in shaping the regulatory artifacts, but that they were aware in practice that science was less important than other resources. In this we can envision that as the FWC championed creation of the state's Freshwater Wetlands Mitigation Council - the entity that would replace it in future decision making about freshwater wetlands in the state - that it was not just working to democratize science, but was designing an institution that might provide opportunities for future agency and engagement. The FWC was, perhaps, putting the pieces in place for a new institution to co-evolve with future manifestations of freshwater wetlands science.

## Chapter 7: Reference List

Frickel, S. & Gross, N. (2005). A General Theory of Scientific/Intellectual Movements. *American Sociological Review*, 70, 204-232.

Hughes, J. (3-19-2013). Dinosaurs or Diamonds? Re-imagining New Jersey's Suburban Office Spaces. A public presentation at the Heldrich Hotel, New Brunswick, NJ.

Ref Type: Generic

Raspe, R. E. (1950). *The Singular Adventures of Baron Munchausen*. London: R. Hunt (Parrish).

Salmore, B. & Salmore, S. (1998). Government and Politics in Localities. In *New Jersey Politics and Government: Suburban Politics Comes of Age* (2nd Edition ed., University of Nebraska Press.

Schattschneider, E. E. (1975). *The Semisovereign People: A Realist's View of Democracy in America*. Fort Worth: Harcourt Brace Jovanovich College Publishers.

**APPENDIX A: RESEARCH PARTICIPANTS LISTED BY IDENTIFIER**

Reference Type: Personal Communication

ANJEC Representative #1. (4-5-2011). Interview with Association of New Jersey Environmental Commission (ANJEC) Representative #1 -- conducted by Heather Fenyk. 4-5-2011.

Ashmun, C. (9-24-1999). Interview with Candace Ashmun, former Executive Director of New Jersey Environmental Commissions (ANJEC) -- conducted by Heather Fenyk and David H. Guston.

Building and Development Community Counsel Subject #1. (6-18-1999). Interview with Building and Development Community Counsel #1 - conducted by Heather Fenyk.

Counsel for Governor Kean. (2000). Interview with Counsel for New Jersey Governor Thomas Kean -- conducted by Heather Fenyk.

Fair, A. (9-16-1999). Interview with Abigail Fair, Director of New Jersey's Freshwater Wetlands Campaign (FWC) -- conducted by Heather Fenyk.

Federal Official #1. (2000). Interview with Federal Official #1 -- conducted by Heather Fenyk.

Fenske, H. (4-12-1999). Interview with Helen Fenske, Former Assistant Commissioner of the New Jersey Department of Environmental Protection -- conducted by Heather Fenyk.

Filippone, E. (6-22-2006). Interview with Ella Filippone, Executive Director of the Passaic River Coalition -- conducted by Heather Fenyk.

Freshwater Wetlands Campaign Negotiator #1. (4-20-1999). Interview with Freshwater Wetlands Campaign Negotiator #1 -- conducted by Heather Fenyk.

Freshwater Wetlands Campaign Negotiator #2. (4-5-1999). Interview with Freshwater Wetlands Campaign Negotiator #2 - conducted by Heather Fenyk.

Freshwater Wetlands Campaign Organizer #1. (3-30-1999). Interview with New Jersey Freshwater Wetlands Campaign Organizer #1 -- conducted by Heather Fenyk.

Freshwater Wetlands Campaign Organizer #2. (11-17-2009). Interview with Freshwater Wetlands Campaign Organizer #2 -- conducted by Heather Fenyk.

New Jersey Association of Realtors Representative #1. (1999). Interview with New Jersey Association of Realtors Representative #1 - conducted by David H. Guston.

New Jersey Builder's Association Counsel. (7-21-2001). Interview with New Jersey Builder's Association Counsel -- conducted by Heather Fenyk.

New Jersey State Reference Librarian. (4-19-2012). Interview with New Jersey State Reference Librarian -- conducted by phone by Heather Fenyk.

NJDEP Official #3. (4-21-1999). Interview with NJDEP Official #3 - conducted by Heather Fenyk and David H. Guston.

NJDEP Official #1. (6-22-2006). Interview with NJDEP Official #1 - conducted by Heather Fenyk.

NJDEP Official #2. (4-21-1999). Interview with NJDEP Official #2 -- conducted by Heather Fenyk and David H. Guston.

NJDEP Official #4. (12-1-2009). Interview with NJDEP Official #4 - conducted by Heather Fenyk.

NJDEP Staff Member #1. (5-5-1999). Interview with NJDEP Staff Member #1 - conducted by Heather Fenyk and David H. Guston.

Office of Legislative Services Research Staff #1. (4-28-1999). Interview with Office of Legislative Services Research Staff #1 -- conducted by Heather Fenyk and David H. Guston.

Ogden, M. (4-15-1999). Interview with Maureen Ogden, former New Jersey State Assemblywoman -- conducted by Heather Fenyk.

Passaic River Coalition Representative #1. (3-22-2006). Interview with Passaic River Coalition Representative #1 - conducted by Heather Fenyk.

**APPENDIX B: INTERVIEW PROTOCOL**

NAME OF SUBJECT

TITLE OF SUBJECT

CONTACT INFORMATION

ADDRESS

PHONE

FAX

EMAIL

IDENTIFIER:

NONE

TITLE (SPECIFY)

NAME

Interview Subject ID #\_\_\_\_

My name is Heather Fenyk and I'm doing some research on the Freshwater Wetlands Protection Act and making political decisions about technically complex subjects, and I'd like to ask you a few questions about your experiences. Unless you agree otherwise, this interview will be confidential -- that is, you will not be identified personally when I report my research. I would, however, like your permission to tape record the interview, which best assures both of us that I have properly understood what you have said. Is that okay?

[turn tape recorder on]

Again, it's okay that I'm taping this?

Do I have your permission to be identified personally when I report my research?

First I'm going to start with a couple of general questions.

1. Could you tell me when and how you first became aware of freshwater wetlands as an issue? [probe: was there any specific event that attracted your attention?]

2. And then what became your involvement?

Now I'm going to ask some questions about the political environment around wetlands protection.



3a. Was there a general, political consensus around the idea that wetlands should be protected? Yes

No [circle one]

3b. [If yes, probe] Everyone was in complete agreement that the wetlands should be protected?

3c. [If no] What were the different sides of the debate?

3d. What were the signs of that [consensus/disagreement]?

4a. Was there involvement by groups or individuals who claimed to have expert knowledge about wetlands? Yes No [circle one]

4b. [If no, probe] There were no environmental scientists or technical reports or advocacy groups claiming expertise or anything like that?

4c. [If yes] Can you recall who these experts were?

4d. Was there a general consensus among these experts around wetlands protection?

4e. What were the signs of that [consensus/disagreement]?

5. Do you think that the [consensus/disagreement] among experts had any effect on politicians' views of wetlands protection? [probe: For example, if the experts disagreed, did the politicians think that it might not be worth doing, or that they could treat the facts more flexibly? Or if the experts agreed, then the politicians felt more constrained or found reaching their own consensus easier?]

6. Do you think that the [consensus/disagreement] among the politicians had any effect on the view of experts on wetlands protection? [probe: For example, if the politicians disagreed, did the experts line up behind political interests? Or if the politicians agreed, did that agreement squelch expert disagreement?]

Now I'm going to ask a couple of questions about what actually went on in the legislative process about wetlands protection.

7a. Did legislative staff provide legislators with background work on the issue? Yes No

7b. [If yes] Like what?

8a. Could you describe any particular difficulties the legislature faced with respect to the proposal to preserve the wetlands?

8b. what about the definition of wetlands -- did the definition cause any problem?

Yes No [circle one]

8c. what about the issue of a buffer zone around the wetlands -- did that cause any problem? Yes No [circle one]

9a. Did people disagree about the definition of wetlands? Yes No [circle one]

9b. [If no, probe] Everybody agreed with the definition that ended up in the legislation?

9c. [If yes] How did the legislature come to a decision, given this disagreement?

10a. Did people disagree over the size of the buffer zone? Yes No [circle one]

10b. [If no, probe] Everybody agreed that it should be the distance it finally ended up being?

10c. [If yes] How did the legislature come to a decision, given this disagreement?

11a. Was there any new information that came to light in the midst of the decision making?

Yes No [circle one]

11b. [If yes] What impact did it have?

12a. Are there other bills that you can think of in which something like this occurred?

Yes No [circle one]

12b. [If yes] Can you tell me about that?

13a. Are there other bills that you can think of in which the legislators used other ways to come to their decision?

13b. [If yes] Can you tell me about that?

Now I'd like to ask you some questions about how you would evaluate or appraise the process of coming to a decision about Freshwater Wetlands Protection: [probe: how the politicians and experts interacted and how any disagreement was resolved]

14a. Do you think that that way of coming to a decision is adequate, in terms of making a sound decision? Yes No [circle one]

14b. Why or why not?

15a. Was it a valuable way of coming to a decision to the legislators, in that it served their interests? Yes No [circle one]

15b. Why or why not?

16a. Was it valuable to the experts? Yes No [circle one]

16b. Why or why not?

17. Was it valuable to anybody else in particular?

18a. Do you think that this way of coming to a decision was an effective one for this particular issue? [probe: did it help resolve conflict for wetlands protection?]

18b. Did it have any bearing on the way other issues were debated or decided? [probe: did the style or the substance of the decision influence any other decisions?]

19a. Did anybody criticize this way of coming to a decision? Yes No [circle one]

19b. [If yes] Who?

19c. [If yes] Why?

20a. Has anybody criticized the law itself? Yes No [circle one]

20b. [If yes] Who?

20c. [If yes] Why?

21. Is there anything else you'd like to add?

Thank you.

**APPENDIX 3: PUBLIC HEARINGS ON FRESHWATER WETLANDS PROTECTION****1984**

Public Hearing before Passaic River Restoration Subcommittee of the Assembly Agriculture and Environment Committee on flood control proposals for the Passaic River Basin. Held August 6, 1984. Nutley Town Hall, Nutley, New Jersey.

Public hearing before Assembly Agriculture and Environment Committee on Assembly Bills 672 and 2348 Held September 24, 1984. Assembly Chamber, State House, Trenton, New Jersey.

**1986**

Public Hearing before Assembly Energy and Natural Resources Committee on Assembly Bill 2342 and Assembly Bill 2499. Held July 16, 1986. Labor Education Center Auditorium, Rutgers Campus, New Brunswick, New Jersey.

Public Hearing before Assembly Energy and Natural Resources Committee on Assembly Bill 2342 and Assembly Bill 2499. Held July 30, 1986. Municipal Building Council Chambers. Lincoln Park, New Jersey.

Public Hearing before Assembly Energy and Natural Resources Committee on Assembly Bill 2342 and Assembly Bill 2499. Held August 1, 1986. Burlington County Office Building, Mount Holly, New Jersey.

#### **APPENDIX 4: CHRONOLOGY OF NEW JERSEY WETLANDS PROTECTION MEASURES**

**1968 - Hackensack Meadowlands District Act**

The first NJ law protecting wetlands the HMDA provides for the development of a “balanced” master plan for wetlands protection and development.

**1970 - Wetlands Act of 1970**

This Act established protections for 200,000 coastal wetlands south of the Raritan River.

**1972 - Flood Hazard Area Control Act**

This Act made no explicit provisions for freshwater wetlands protection although some protection is provided through flood plain regulations.

**1972 - Federal Water Pollution Control Act Amendments**

This Act establishes the Federal 404 Program and also 401(b) Water Quality Certification Program.

**1972 - Federal Coastal Zone Management Act**

This Act provides incentives and funding for state development of coastal zone management programs which may include protection of natural resources whose loss affects coastal zone.

**1973 - Coastal Area Facilities Review Act**

This Act authorizes the NJ Department of Environmental Protection (NJDEP) to establish regulations for the control of major developments in coastal zones up to 12 miles wide and establishes the Office of Coastal Zone Management within the NJDEP.

**1978 - Bay & Ocean Shore Segment of the New Jersey Coastal Management Program approved**



The NJCMP regulates major development and includes strict controls over alterations of freshwater wetlands.

1978 - Pinelands National Reserve

Federal legislation establishes the Reserve and funds provided for State planning and land acquisition.

1979 - Pinelands Moratorium and Pinelands Protection Act

Governor Byrne signs a moratorium on State permits in the Pinelands area (1 million acres) effectively halting development including wetlands development. The Pinelands Protection Act passed the same year, providing for strict regulations to preserve natural resources including wetlands.

1980 - NJ Coastal Management Plan approved

This Plan includes strict regulation of coastal and freshwater wetlands alterations and also mitigation requirements.

#### 1981 - Pinelands Comprehensive Management Plan adopted

This Plan includes strict regulation of approximately 200,000 acres of freshwater wetlands, wetland buffer areas, and mitigation requirements with buffer areas based on a model developed by Rutgers University.

#### 1981 - NJ Water Pollution Control Act

This Act authorizes regulation of disposal of dredged and fill material into “waters of the State,” but regulations were ultimately not developed due to potential for duplication of Federal 404 Program.

#### 1983 - First Freshwater Wetlands Protection Bill Drafted

A committee of environmental representatives and State officials was convened by Candace Ashmun (Governor’s representative to the Pinelands Commission and former Executive Director of the Association of NJ Environmental Commissions, then on State Planning Commission) and a framework of a freshwater wetlands bill developed. Legislation was drafted with sponsor, Assemblywoman Maureen Ogden (R - Essex/Union), and the NJ Conservation Foundation taking lead for the environmental movement. The Bill proposes local regulation generally, with county or state regulation where development crosses political boundaries. Federal 404 delegation was not sought. Water dependency was required for permitted uses. Wetland buffers also provided for. The Bill was introduced at end of the session with no action.

#### 1984 - Freshwater Wetlands Bill reintroduced

Assemblywoman Ogden and Senator John Lynch (D, Middlesex) are sponsors.

Committee hearings held. Bill is eventually amended to provide for state regulation of freshwater wetlands. The regulated community supports change to avoid differing ordinances in 567 municipalities. The DEP offers qualified support.

Development industry supports opposing legislation introduced by Assemblyman Dennis Riley. Major differences include no buffers, different definition of wetlands, less stringent regulations. Negotiations lead to compromise bill in 1985 which passes the Senate, dies in Assembly when it was not posted for a vote in the last day of the session. Duplication of the 404 program becomes a major issue.

#### 1984 - Flood Hazard Area Control Regulations amended

Following year-long development and major flooding in the Passaic River Basin, NJDEP adopted major tightening of regulations. Freshwater wetlands indirectly regulated from some actions.

NJDEP begins extensive use of 401(b) water quality certification program to affect Army Corps 404 permit review process.

#### 1986 - Freshwater Wetlands Act reintroduced

New Ogden / Lynch bill introduced which strengthens buffer provisions, limits grandfathering provisions and calls for the delegation of the Federal 404 Program to State. Full support of major provisions is declared by NJDEP.

Development industry supports alternate bill sponsored by Assemblyman John Penn (R - Somerset) which emulates the 404 program structure but with significant weakening, and requires 404 delegation before law becomes effective.

140+ environmental and civic organizations form the Freshwater Wetlands Campaign as the first major organizing effort for the Ogden / Lynch legislation.

Compromise legislation passes the Assembly in December, supported by Assemblywoman Ogden and Assemblyman Penn. Support from environmentalists and builders is mixed. The water dependency criterion for permits is deleted. Buffer provisions are included but are weaker. Federal 404 delegation to the state is required for the law to become effective.

Formal opinion sought from EPA on suitability of legislation for 404 delegation prior to Senate consideration of the bill.

1987 - Passage of New Jersey's Freshwater Wetlands Protection Act

## BIBLIOGRAPHY

- Abel, T. D. & Stephan, M. (2000). The limits of civic environmentalism. *American Behavioral Scientist*, 44, 614-628.
- Alexander, D. E. (1999). Ecotones. In D.E.Alexander (Ed.), *Encyclopedia of Environmental Science*.
- Allen, B. (2003). *Uneasy Alchemy: Citizens and Experts in Louisiana's Chemical Corridor Disputes*. Cambridge, MA: MIT Press.
- Ambrose, R. F. (2000). Wetland Mitigation in the United States: Assessing the Success of Mitigation Policies. *Wetlands (Australia)*, 19, 1-27.
- Anderson, P. H. (1977). *Delineation of Deciduous Wetland Forests in Northeastern Connecticut*.
- Anderson, P. H., Lefor, M. W., & Lennard, W. C. (1978). *Transition Zones of Forested Inland Wetlands in Northeastern Connecticut* (Special Reports: Paper 28). University of Connecticut.
- ANJEC Representative #1. (4-5-2011). Interview with Association of New Jersey Environmental Commission (ANJEC) Representative #1 -- conducted by Heather Fenyk.
- Arbesman, P. (1983). *New Jersey's water emergency: September 1980-April 1982 Volume 1 & 2* New Jersey Department of Environmental Protection.
- Armitage, S. (2008). *Sir Gawain and the Green Knight (A New Verse Translation)*. London: W.W. Norton & Co.
- Army Corps of Engineers (2002). *Technical and Scientific Considerations for Upland and Riparian Buffer Strips in the Section 404 Permit Process* Washington, DC: Army Corps of Engineers.
- Arnstein, S. (1969). A Ladder of Citizen Participation. *Journal of the American Planning Association*, 35, 216-224.
- Arts, B. (2012). Forests policy and theory use: Overview and trends. *Forest Policy and Economics*, 16, 7-13.
- Ashmun, C. (9-24-1999). Interview with Candace Ashmun, former Executive Director of New Jersey Environmental Commissions (ANJEC) -- conducted by Heather Fenyk and David H. Guston.
- Assembly Agriculture and Environment Committee. (8-6-1984). Public Hearing before the Passaic River Restoration Subcommittee: Flood Control Proposals for the Passaic River Basin. Assembly Agriculture and Environment Committee, Passaic River Restoration Subcommittee.
- Backes, M. (9-10-1984). Letter from Maude Backes to Helen Feske accompanying the white paper "Freshwater Wetlands and the Programs of the Office of Natural Lands Management".
- Backstrand, K. (2004). Scientisation vs. civic expertise in environmental governance: Eco-feminist, eco-modern and post-modern responses. *Environmental Politics*, 13, 695-714.
- Balkwill, M. (2003). *Building Hope Together: Strategies for Creating Housing in Uncertain Times* Ontario, CN: Halton Social Planning Council.
- Barnard, William D., Ansell, Christopher K., Harn, Joan G, and Kevin, Daniel (1985, December 6). Establishing Priorities for Wetland Management. *American Water Resources Association Water Resource Bulletin*, 21.

- Bartram, W. (1958). *The Travels of William Bartram: Naturalist's Edition*. New Haven: Yale University Press.
- Batzer, D. P. & Sharitz, R. R. (2006). *Ecology of Freshwater and Estuarine Wetlands*. Berkeley, CA: University of California Press.
- Bäckstrand, K. (2003). Civic Science for Sustainability: Reframing the Role of Experts, Policy-Makers and Citizens in Environmental Governance. *Global Environmental Politics*, 3, 24-41.
- Beierle, T. C. & Cayford, J. (2002). *Democracy in Practice: Public Participation in Environmental Decisions*. Washington, D.C.: Resources for the Future.
- Benford, R. D. (1997). An Insider's Critique of the Social Movement Framing Perspective. *Sociological Inquiry*, 67, 409-430.
- Benford, R. D. & Snow, D. A. (2000). "Framing Processes and Social Movements: An Overview and Assessment. *Annual Review of Sociology*, 26, 611-639.
- Bennett, D. (8-1-1986). American Littoral Society Presentation at the Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.
- Berger, J. J. (1991). The federal mandate to restore: laws and policies on environmental restoration. *The Environmental Professional: the official journal*, 13, 195-206.
- Berry, J. F. & Dennison, M. S. (1993). Wetland Mitigation. In M.S.Dennison & J. F. Berry (Eds.), *Wetlands: Guide to science, law and technology* (pp. 278-303). Park Ridge, NJ: Noyes Publications.
- Bevir, M. & Rhodes, R. A. W. (2003). Interpretive Theory. In *Interpreting British Government* (pp. 131). London: Routledge.
- Bevir, M. & Kedar, A. (2008). Concept formation in political science: An anti-naturalist critique of qualitative methodology. *Perspectives on Politics*, 6, 503-517.
- Bijker, W. E., Hughes, T. P., & Pinch, T. (1987). *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. Cambridge, MA: MIT Press.
- Bijker, W. E. & Bal, R. (2009). *The paradox of scientific authority: the role of scientific advice in democracies*. Cambridge: MIT Press.
- Bloor, D. (1973). Wittgenstein and Mannheim on the Sociology of Mathematics. *Studies in the History and Philosophy of Science Part A*, 4, 173-191.
- Bocking, S. (2004). *Nature's Experts: Science, Politics and the Environment*. New Brunswick, NJ: Rutgers University Press.
- Bosso, C. J. (2005). *Environment Inc.: From Grassroots to Beltway*. Lawrence, KS: University Press of Kansas.
- Bowler, S., Todd, D., & Karp, J. A. (2007). "Enraged or Engaged? Preferences for Direct Citizen Participation in Affluent Democracies". *Political Research Quarterly*, 60, 351-362.

- Brandwein, P. (2006). Studying the Careers of Knowledge Claims: Applying Science Studies to Legal Studies. In D. Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 228-243). Armonk, New York: M.E. Sharpe.
- Brian, W. (1989). Sheepfarming after Chernobyl: a case study in communicating scientific information. *Environment*, 31.
- Broder, John M. (2007, July 6). After Concerted Lobbying, Rules Governing Protected Wetlands are Narrowed. *The New York Times*.
- Broome, S. W. (1989). Creation and Restoration of Tidal Wetlands of the Southeastern United States. In J.A. Kusler & M. E. Kentula (Eds.), *Wetlands Creation and Restoration: The Status of Science Volume 1* (pp. 37-72).
- Brosi, B. J. & Biber, E. G. N. (2012). Citizen Involvement in the U.S. Endangered Species Act. *Science*, 17, 865.
- Brown, J. R. (8-10-1970). Zabel v. Tabb Denial of Rehearing.
- Brown, L. (2009). *Plan B 4.0: Mobilizing to Save Civilization*. Washington, DC: W.W. Norton & Co.
- Brown, M. (2007). Can Technologies Represent Their Publics? *Technology and Society*, 29, 327-338.
- Bryner, G. C. (1995). *Blue Skies Green Politics: The Clean Air Act of 1990 and Its Implementation*. (2nd ed.) Washington, D.C.: Congressional Quarterly Inc.
- Building and Development Community Counsel Subject #1. (6-18-1999). Interview with Building and Development Community Counsel #1 - conducted by Heather Fenyk.
- Burgess, J. (2005). Follow the argument where it leads: some personal reflections on 'policy-relevant' research. *Transactions of the Institute of British Geographers*, 30, 273-281.
- Burkhardt, N. (2012). *Use of Science in Decision Making and Conflict Resolution* US Geological Survey.
- Busenberg, G. J. (2000). Resources, political support, and citizen participation in environmental policy: A reexamination of conventional wisdom. *Society & Natural Resources*, 13, 579-587.
- Busenberg, G. J. (2007). Citizen participation and collaborative environmental management in the marine oil trade of coastal Alaska. *Coastal Management*, 35, 239-253.
- Campbell, M. C. (2003). Intractable Conflict. In R.O'Leary & L. B. Bingham (Eds.), *The Promise and Performance of Environmental Conflict Resolution* (pp. 90-110). Washington, D.C.: Resources for the Futures.
- Carney, Leo H. (1986, November 24). The Environment. *New York Times*.
- Carter, V., Garrett, M. K., and Gammon, P. T. (1988, April). Wetland Boundary Determination in the Great Dismal Swamp Using Weighted Averages. *Water Resources Bulletin WARBAQ*, 24, 297-306.
- Carter, V. (1990). The Great Dismal Swamp: An Illustrated Case Study. In *Forested Wetlands* (pp. 201-211). New York: Elsevier Science Publishing Co.
- Casey, Kathleen (1986, December 16). *Star Ledger*.

- Cash, D. W., Clark, W. C., Alcock, F., Dickson, N. M., Eckley, N., Guston, D. H. et al. (2003). Knowledge systems for sustainable development. *Proceedings of the National Academy of Sciences*, 100, 8086-8089.
- Castelle, A. J., Connolly, C., Emers, M., Meyer, S., Witter, M., Mauerman, S. et al. (1992). Wetland buffers: Use and effectiveness. Adolfson Associates, Inc. Pub. No. 92-10. Olympia, WA, Washington Department of Ecology. Shorelands and Coastal Zone Management Program.
- Castelle, A. J., Johnson, A. W., & Connolly, C. (1994). Wetland and Stream Buffer Size Requirements - A Review. *Journal of Environmental Quality*, 23, 878-882.
- Castells, M. (1997). *The Power of Identity, The Information Age: Economy, Society and Culture Vol. II*. Malden, MA: Blackwell.
- Caughley, G. (1994). Directions in conservation biology. *Journal of Animal Ecology*, 63, 215-244.
- Chase, L. C., Decker, D. J., & Lauber, T. B. (2004). Public participation in wildlife management: What do stakeholders want? *Society & Natural Resources*, 17, 629-639.
- Cheschier, G. M., Skaggs, R. W., Gilliam, J. W., & Broadhead, R. G. (1987). Wetland Buffer Areas for Treatment of Pumped Agricultural Drainage Water. In *American Water Resources Association Coastal Water Resources Symposium* (pp. 255-263). Bethesda, MD: American Water Resources Association.
- Chickering, H. D. (1977). *Beowulf: A Dual-Language Edition*. New York: Doubleday Anchor.
- Clark, W. C. & Dickson, N. M. (2003). Sustainability science focuses on the dynamic interactions between nature and society. *Proceedings of the National Academy of Sciences*, 100, 8059.
- Corburn, J. (2007). Community knowledge in environmental health science: co-producing policy expertise. *Environmental Science & Policy*, 10, 150-161.
- Corburn, J. (2005). *Street Science: Community Knowledge & Environmental Health Justice*. Boston: The MIT Press.
- Corburn, J. (2009). *Toward the Healthy City: People, Places, and the Politics of Urban Planning*. Boston: The MIT Press.
- Corn, L. M., Buck, E. H., & Baldwin, P. (2006). *CRS Report for Congress: The Endangered Species Act* (Rep. No. RL31654). Congressional Research Service.
- Cortell, J. M. (7-30-1986). Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.
- Counsel for Governor Kean. (2000). Interview with Counsel for New Jersey Governor Thomas Kean -- conducted by Heather Fenyk.
- Cowardin, L. M., Carter, V., Golet, F. C., & LaRoe, E. T. (1979). *Classification of wetlands and deepwater habitats of the United States* Washington, DC: U.S. Department of the Interior Office of Biological Services.
- Cozzens, S. & Woodhouse, E. (1995). Science, Government and the Politics of Knowledge. In S. Jasanoff, G. E. Markle, J. C. Petersen, & T. Pinch (Eds.), *Handbook of science and technology studies* (pp. 533-553). Thousand Oaks: Sage.



- Cunningham, C. (1992). Sea defences: a professionalized network? In D.Marsh & R. A. W. Rhodes (Eds.), *Policy Networks in British Government* ( Oxford: Oxford University Press.
- Daggett, C. J. (3-25-1987). Letter to Maureen Ogden and Jack Penn regarding Assembly Committee Substitute for Assembly Bills No. 2342/2499.
- Dahl, T. E. & Johnson, C. E. (1991). *Status and Trends of Wetlands in the Conterminous United States, mid-1970's to mid-1980's* U.S. Department of the Interior, Fish and Wildlife Service.
- Dahl, T. E. (1991). *Status and Trends of Wetlands in the Conterminous United States, mid-1970s to mid-1980s* U.S. Department of the Interior Fish and Wildlife Service.
- Day, J. W. & Kemp, G. P. (1995). Long-Term Impacts of Agricultural Runoff in a Louisiana Swamp Forest. In P.Godfrey (Ed.), *Ecological Considerations in Wetlands Treatment of Municipal Waste Wate* (pp. 317-326). New York: Van Norstrand Reinhold, Co.
- Demo, T., Loggy, W. D., & West, R. (1989). Development of Wetlands Mapping Procedures for Forest Planning in Southeast Alaska. In *American Water Resources Association Wetlands Symposium 1989* (pp. 45-59). Bethesda, MD: American Water Resources Association.
- Dickinson, E. (1896). "Sweet is the Swamp With Its Secrets". In *Poems by Emily Dickenson* Amherst, MA: Project Gutenberg E-Book of Poems Second Series.
- Duke Environmental Law. (1970). Ecology held valid criterion for denying dredge and fill permit under section 10, Rivers and Harbors Act of 1899. *Duke Law Journal* , 1239-1247.
- Edge, D. (1995). Reinventing the World. In S.Jasanoff, G. E. Markle, J. Peterson, & T. Pinch (Eds.), *Handbook of Science and Technology Studies*. Thousand Oaks, CA: Sage.
- Edwards, M. (2004). *Future Positive: International Cooperation in the 21st Century*. London: Earthscan.
- Edwards, M. (2007). Have NGOs 'made a difference?': From Manchester to Birmingham with an elephant in the room. In A.J.Bebbington, S. Hickey, & D. C. Mitlin (Eds.), *Can NGOs Make a Difference?: The Challenge of Development Alternatives* (pp. -368). London: Zed Books.
- Ellis, R. & Waterton, C. (2004). Environmental citizenship in the making: The participation of volunteer naturalists in UK biological recording and biodiversity policy. *Science and Public Policy*, 31, 95-105.
- Environmental Protection Agency. (1980). Guidelines for Specification of Disposal Sites for Dredged or Fill Material. Federal Register Vol. 45 No. 249, 85336-85357.
- Environmental Protection Agency. (2013). EPA History: The Birth of EPA. Washington, DC, Environmental Protection Agency.
- Erwin, K. L. (1990). Freshwater Marsh Creation and Restoration in the Southeast. In J.A.Kusler & M. E. Kentula (Eds.), *Wetland Creation and Restoration: The Status of the Science* (pp. 233-265). Washington, DC: Island Press.
- Ezrahi, Y. (1990). *The Descent of Icarus: Science and the Transformation of Contemporary Democracy*. Cambridge, MA: Harvard University Press.
- Fainstein, S. (1994). *The city builders: Property, politics, and planning in London and New York*. Oxford: Blackwell.

- Fainstein, S. (2000). New directions in planning theory. *Urban Affairs Review*, 4, 478.
- Fair, A. (9-16-1999). Interview with Abigail Fair, Director of New Jersey's Freshwater Wetlands Campaign (FWC) -- conducted by Heather Fenyk.
- Fauer, S. E. & Gritzuk, M. (1979). An Environmental Assessment of Restored Salt Marshes in New Jersey. In D. P. Cole (Ed.), *Sixth Annual Conference on Wetlands Restoration and Creation* (pp. 175-190).
- Federal Official #1. (2000). Interview with Federal Official #1 -- conducted by Heather Fenyk.
- Federal Register. (1-23-1981). US Fish and Wildlife Service Mitigation Policy. Vol. 46, No. 15, 7656.
- Feierabend, J. S. (1989). Wetlands: The Lifeblood of Wildlife. In *Constructed Wetlands for Wastewater Treatment: Municipal, Industrial and Agricultural* (pp. 107-118). Chelsea, MI: Lewis Publishers.
- Fenske, H. (8-24-1984). Memo to DEP Natural Resources Staff.
- Fenske, H. (7-16-1986). Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.
- Fenske, H. (4-12-1999). Interview with Helen Fenske, Former Assistant Commissioner of the New Jersey Department of Environmental Protection -- conducted by Heather Fenyk.
- Fenyk, H. & Guston, D. H. (2006). Citizen Expertise and Advocacy in Creation of New Jersey's 1987 Freshwater Wetlands Protection Act. In N. Maher (Ed.), *New Jersey's Environments*. New Brunswick, NJ: Rutgers University Press.
- Filippone, E. (6-22-2006). Interview with Ella Filippone, Executive Director of the Passaic River Coalition -- conducted by Heather Fenyk.
- FindLaw for Legal Professionals. (2013). LEONARD v. VICKSBURG, SHREVEPORT & P R CO, 198 U.S. 416 (1905). 11-24-2013.
- Fisceglia, F. (7-30-1986). Presentation by Frank Fisceglia representing Federal Business Centers and Raritan Center. Assembly Bill 2342 and Assembly Bill 2499. Assembly Agriculture and Environment Committee.
- Fischer, F. (1993). Citizen Participation and the Democratization of Policy Expertise - from Theoretical Inquiry to Practical Cases. *Policy Sciences*, 26, 165-187.
- Fischer, F. (1995). *Evaluating Public Policy*. Belmont, CA: Wadsworth/Nelson-Hall.
- Fischer, F. (1998). Beyond Empiricism: Policy Inquiry in Postpositivist Perspectives. *Policy Studies Journal*, 26, 129-146.
- Fischer, F. (2000). *Citizens, Experts, and the Environment: The Politics of Local Knowledge*. Durham, NC: Duke University Press.
- Fischer, F. (2003). *Reframing Public Policy: Discursive Politics and Deliberative Practices*. Oxford: Oxford University Press.
- Fischer, F. (2007). Deliberative Policy Analysis as Practical Reason: Integrating Empirical and Normative Arguments. In F. Fischer, G. J. Miller, & M. S. Sidney (Eds.), *Handbook of Public Policy Analysis: Theory, Politics, and Methods* (pp. 223-236). Boca Raton: CRC Press - Taylor & Francis Group.

- Fischer, F. (2010). *Participatory Governance* (Rep. No. Working Paper 24). Jerusalem: The Hebrew University.
- Fish and Wildlife Service (2002). *National Wetlands Inventory: A Strategy for the 21st Century* Washington, DC: Fish and Wildlife Service.
- Fisher, D. (7-16-1986). David Fisher - Testimony before the Assembly Energy and Natural Resources Committee on Assembly Bill 2342 and Assembly Bill 2499. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.
- Fisher, D. B. (1984). New Jersey Builder's Association.
- Fletcher, S. W. (1983). *Wetlands research program. Evaluation of methods for sampling vegetation and delineating wetlands transition zones in southern Louisiana, January 1979-May 1981* Gainesville, FL: Environment, Science and Engineering, Inc.
- Flyvbjerg, B. (1998). *Rationality and Power: Democracy in Practice*. Chicago: University of Chicago Press.
- Flyvbjerg, B. (2001). *Making Social Science Matter: Why social inquiry fails and how it can succeed again*. Cambridge: Cambridge University Press.
- Freshwater Wetlands Campaign Negotiator #1. (4-20-1999). Interview with Freshwater Wetlands Campaign Negotiator #1 -- conducted by Heather Fenyk.
- Freshwater Wetlands Campaign Negotiator #2. (4-5-1999). Interview with Freshwater Wetlands Campaign Negotiator #2 - conducted by Heather Fenyk.
- Freshwater Wetlands Campaign Organizer #1. (3-30-1999). Interview with New Jersey Freshwater Wetlands Campaign Organizer #1 -- conducted by Heather Fenyk.
- Freshwater Wetlands Campaign Organizer #2. (11-17-2009). Interview with Freshwater Wetlands Campaign Organizer #2 -- conducted by Heather Fenyk.
- Frickel, S. (2004). *Chemical Consequences: Environmental Mutagens, Scientist Activism, and the Rise of Genetic Toxicology*. New Brunswick: Rutgers University Press.
- Frickel, S. & Gross, N. (2005). A General Theory of Scientific/Intellectual Movements. *American Sociological Review*, 70, 204-232.
- Frickel, S. & Moore, K. (2006). *The New Political Sociology of Science: Institutions, Networks, and Power*. Madison, WI: University of Wisconsin Press.
- Frickel, S. (2006). When Convention Becomes Contentious: Organizing Scientist Activism in Genetic Toxicology. In S. Frickel & K. Moore (Eds.), *The New Political Sociology of Science: Institutions, Networks, and Power* (pp. 185-214). Madison, WI: University of Wisconsin Press.
- Gans, H. (1979). *Deciding what's news: A study of CBS Evening News, NBC Nightly News, Newsweek and Time*. New York: Vintage.
- Garbisch, E. W., Jr. (1978). Wetland Rehabilitation. In J. A. Kusler & J. H. Montanari (Eds.), *The First National Wetland Protection Symposium* (pp. 217-219). Washington, DC: US Fish and Wildlife Service.

- Geertz, C. (1973). *The interpretation of cultures: Selected essays*. New York: Basic Books.
- Gezelius, S. S. & Refsgaard, K. (2007). Barriers to rational decision-making in environmental planning. *Land Use Policy*, 24, 338-348.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The New Production of Knowledge: The dynamics of society and research in contemporary societies*. (First ed.) London, England: Sage Publications.
- Giddens, A. (1979). *Central Problems in Social Theory*. Berkeley and Los Angeles: University of California Press.
- Giddens, A. (1984). *The Constitution of Society: Outline of the Theory of Structuration*. Oxford: Polity Press.
- Gieryn, T. (1995). Boundaries of Science. In S.Jasanoff, G. E. Markle, J. Peterson, & T. Pinch (Eds.), *Handbook of Science and Technology Studies* (pp. 393-443). London: Sage.
- Gilmore, T. Comments on Buffers at the New Jersey Wetlands Conference. 5-8-1988.
- Ginger, C. (2007). Interpretive Content Analysis: Stories and Arguments in Analytic Documents. In D.Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 331-348). Armonk, NY: M.E. Sharpe.
- Glover, I. C. & Higham, C. F. W. (1996). New Evidence for Early Rice Cultivation in South, Southeast and East Asia. In D.R.Harris (Ed.), *The Origins and Spread of Agriculture and Pastoralism in Eurasia* (pp. 413-441). Washington, DC: Smithsonian Institution Press.
- Goffman, I. (1959). *The Presentation of Self in Everyday Life*. Carden City, NY: Doubleday Anchor Books.
- Goldfein, M. (7-16-1986). Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.
- Goldfein, M. (12-17-1986). Dear Assembly Member Letter to The Hon. Alan J. Karcher from the National Association of Office and Industrial Parks.
- Gottweis, H. (2006). Argumentative Policy Analysis. In B.G.Peters & J. Pierre (Eds.), *Handbook of Public Policy* ( London/New Delhi: Sage.
- Gottweis, H. (2007). Rhetoric in Policy Making: Between Logos, Ethos, and Pathos. In F.Fischer, C. A. Miller, & M. S. Sidney (Eds.), *Handbook of Public Policy Analysis: Theory, Politics, and Methods* (pp. 237-250). Boca Raton, FL: CRC Press.
- Graefe, P. (2007). Political Economy and Canadian Public Policy. In M.Orsini & M. Smith (Eds.), *Critical Policy Studies: Contemporary Canadian Approaches* (pp. 9-40). Vancouver: UBC Press.
- Great Swamp Watershed Association. (1985). Great Swamp Watershed Association Newsletter. Great Swamp Watershed Association.
- Groman, Hazel A. and Powel, Ann (1986). National Wetlands Newsletter. *National Wetlands Newsletter*, May-June.
- Gruber, E. (7-30-1986). Public Hearing Presentation of the Co-chairman of the Natural Resources Committee for the League of Women's Voters of New Jersey. Assembly Bill 2342 and Assembly Bill

2499. Assembly Energy and Natural Resources Committee.
- Gupta, T. R. (1972). Economic Criteria for Decisions on Preservation and Use of Inland Wetlands in Massachusetts. *Journal of Northeastern Agricultural Economics Council*, 1, 201-210.
- Guston, D. H. (1997). Critical appraisal in science and technology policy analysis: The example of Science, the endless frontier. *Policy Sciences*, 30, 233-255.
- Guston, D. H., Jones, M., & Branscomb, L. M. (1997). The demand for and supply of technical information and analysis in state legislatures. *Policy Studies Journal*, 25, 451-469.
- Guston, D. H. (2000). *Between Politics and Science: Assuring the Integrity and Productivity of Research*. Cambridge: Cambridge University Press.
- Haas, P. M. (2004). When does power listen to truth? A constructivist approach to the policy process. *Journal of European Public Policy*, 11, 569-592.
- Hagendijk, R. (2004). The Public Understanding of Science and Public Participation in Regulated Worlds. *Minerva*, 42, 41-59.
- Hall, P. & Taylor, R. (1996). Political science and the three new institutionalisms. *Political Studies*, - 952.
- Hamilton, J. D. & Wills-Toker, C. (2006). Reconceptualizing dialogue in environmental public participation. *Policy Studies Journal*, 34, 755-775.
- Hammersly, M. & Atkins, P. (1993). *Ethnography: Principles in practice*. London: Routledge.
- Hammersly, M. & Gomm, R. (2008). Assessing the radical critique of interviews. In M. Hammersly (Ed.), *Questioning qualitative inquiry: Critical essays* (pp. 89-100). Los Angeles: Sage.
- Hankey, D. L. (1980). Sections 9 and 10 of the Rivers and Harbors Act of 1899: The Erosion of Administrative Control by Environmental Suits. *Duke Law Journal*, 170-204.
- Harper, D. (2013). Online Etymology Dictionary. Lancaster, PA. 9-21-2008.
- Hart, R. (1984). *Transition Zones in Coastal West-Central Florida: January 1979-May 1981* (Rep. No. Army Engineer Technical Report Y-84-2). Springfield, VA: U.S. Army Corps of Engineers.
- Hawken, P. (2007). *Blessed Unrest: How the Largest Movement in the World Came Into Being and Why No One Saw It Coming*. New York: Viking Press.
- Hempel, L. C. (1996). *Environmental Governance: The Global Challenge*. Washington, DC: Island Press.
- Hey, D. L. (1988). Wetlands: A future nonpoint pollution control technology. In *Nonpoint Pollution: 1988—Policy, Economy, Management, and Appropriate Technology*. American Water Resources Association.
- Hibbing, J. R. & Theiss-Morse, E. (2002). *Stealth Democracy: Americans' Beliefs About How Government Should Work*. (1st ed.) Cambridge University Press.
- Hird, J. A. (2005). Policy analysis for what? The effectiveness of nonpartisan policy research organizations. *Policy Studies Journal*, 33, 83-105.

- Hjelmar, U. (1996). *The political practice of environmental organisations*. Avebury: Ashgate Publishing.
- Holland, M. M., Whigham, D. F., & Gopal, B. (1990). The Characteristics of Wetland Ecotones. In *The Ecology and Management of Aquatic-Terrestrial Ecotones* (pp. 171-198). New York and London: The Parthenon Publishing Group.
- Howarth, W. (1999). Imagined Territory: The Writing of Wetlands. *New Literary History*, 30, 509-539.
- Hughes, J. (3-19-2013). Dinosaurs or Diamonds? Re-imagining New Jersey's Suburban Office Spaces. A public presentation at the Heldrich Hotel, New Brunswick, NJ.
- Hughes, T. P. (2012). The Evolution of Large Technological Systems. In W.E.Bijker, T. P. Hughes, & T. Pinch (Eds.), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Anniversary Edition) Cambridge, MA: The MIT Press.
- Hughey, R. (7-8-1983). Letter from Robert Hughey, Commissioner NJDEP to William R. Gianelli, Assistant Secretary of the Army - Civil Works.
- Hughey, R. E. (9-24-1984). Statement of Honorable Robert E. Hughey, Commissioner NJDEP. Assembly Bills 672 and 2348. Assembly Agriculture and Environment Committee.
- Innis, H. A. (1951). *The Bias of Communication*. Toronto: University of Toronto Press.
- Irwin, A. (1995). *Citizen Science: A Study of People, Expertise and Sustainable Development*. London: Routledge.
- Jacobs, K., Lebel, L., Buizer, J., Addams, L., Matson, P., McCullough, E. et al. (2008). Linking knowledge with action in the pursuit of sustainable water-resources management. In W. C. Clark (Ed.).
- Jasanoff, S. (1990). *The fifth branch; advisors as policy makers*. Boston: Harvard University Press.
- Jasanoff, S. (1996). Is Science Socially Constructed -- And Can it Still Inform Public Policy? *Science and Engineering Ethics*, 2, 263-276.
- Jasanoff, S. & Wynne, B. (1998). Science and Decisionmaking. In S.Rayner & E. Malone (Eds.), *Human Choice and Climate Change: The Societal Framework*. Columbus, OH: Battelle Press.
- Jasanoff, S. & Wynne, B. (1998). Science and decision making. In S.Raynor & E. Malone (Eds.), *Human choice and climate change. Volume one. The societal framework* (pp. 1-87). Columbus, OH: Batelle Institute.
- Jasanoff, S. (2003). Technologies of Humility: Citizen Participation in Governing Science. *Minerva*, 41, 223-244.
- Jasanoff, S. & Martello, M. L. (2004). *Earthly Politics: Local and global in Environmental Governance*. Cambridge: MIT Press.
- Jasanoff, S. (2004). *States of Knowledge: The co-production of science and social order*. London: Routledge.
- Jasanoff, S. (2012). *Science and Public Reason*. Oxford: Routledge, Taylor & Francis Group.
- Jasper, J. M. (1997). *The Art of Moral Protest*. Chicago: University of Chicago Press.

- Jasper, J. M. (2004). A Strategic Approach to Collective Action: Looking for Agency in Social-Movement Choices. *Mobilization: An International Journal*, 9, 1-16.
- Jessop, B. (1990). *State Theory. Putting the Capitalist State in its Place*. University Park, PA: Penn State University Press.
- Johnson, W. C., Mayes, R. A., & Sharik, T. L. (1982). *Use of Vegetation in Delineating Wetland Borders in Upper Missouri River Basin; North-Central United States* (Rep. No. Technical Report Y-82-1). Vicksburg, MS.
- Jordan, G. & Maloney, W. (1997). *The Protest Business? Mobilizing Campaign Groups*. Manchester: Manchester University Press.
- Jordan, L. & Van Tuijl, P. (2000). Political Responsibility in Transnational NGO Advocacy. *World Development*, 28, 2051-2065.
- Jordan, W. R. I., Gilpin, M., & Aber, J. D. (1987). *Restoration Ecology: A Synthetic Approach to Ecological Research*. Cambridge, UK: Cambridge University Press.
- Jorgensen, S. E., Hoffman, C. C., & Mitsch, W. J. (1988). Modelling Nutrient Retention by a Reedswamp and Wet Meadow in Denmark. In W.J.Mitsch, M. Straskraba, & S. E. Jorgensen (Eds.), *Wetland Modelling. Developments in Environmental Modelling* (pp. 133-151). New York: Elsevier Scientific Publishing.
- Joss, S. & Durant, J. (1995). *Public Participation in Science: the Role of Consensus Conferences in Europe*. London: Science Museum.
- Kadlec, R. H. & Tilton, D. L. (1979). The use of freshwater wetlands as a tertiary wastewater treatment alternative. *Critical Review of Environmental Control*, 9, 185-212.
- Kantor, R. A. & Charette, D. J. (1986). Wetlands Mitigation in New Jersey's Coastal Management Program. *National Wetlands Newsletter*, 8, 14-15.
- Kantor, R. A. & Charette, D. J. (1986). *Computerized Monitoring System for Wetlands Mitigation Projects in New Jersey* (Rep. No. ASWM Technical Report 3). US Fish and Wildlife Service.
- Kean, T. (6-8-1987). New Jersey Executive Order No. 175: Freshwater Wetlands Development Moratorium. 175.
- Keddy, P. A. (1989). Effects of competition from shrubs on herbaceous wetland plants: A 4-year field experiment. *Canadian Journal of Botany*, 67, 708-716.
- Kent, D. M. (2000). *Applied Wetlands Science and Technology*. (2nd ed.) CRC Press.
- Kinney, A. G. & Leschine, T. M. (2002). A procedural evaluation of an analytic-deliberative process: The Columbia River Comprehensive Impact Assessment. *Risk Analysis*, 22, 83-100.
- Kirtlan, E. J. B. (1912). *Sir Gawain and The Green Knight*. London: Epworth.
- Klein, H. K. & Kleinman, D. L. (2002). The Social Construction of Technology: Structural Considerations. *Science, Technology, & Human Values*, 27, 28-52.
- Kleinman, D. L. (1998). Beyond the science wars: Contemplating the democratization of science. *Politics and the Life Sciences*, 17, 133-145.

- Knetsch, J. (2004). *A brief history of swamp and overflowed lands*. Professional Surveyor Magazine.
- Knorr-Cetina, K. (1988). The Internal Environment of Knowledge Claims: One Aspect of the Knowledge-Society Connection. *Argumentation*, 2, 369-389.
- Kock, B. E. (2006). Engaging Non-Governmental Organizations with International Environmental Negotiations: Institutional Approaches to Reforming State-NGO Interactions. Clearinghouse Program on Negotiation at Harvard Law School [On-line]. Available: [Http://www.pon.org/downloads/len15.4.Kock.pdf](http://www.pon.org/downloads/len15.4.Kock.pdf)
- Koontz, T. M. (2005). We finished the plan, so now what? Impacts of collaborative stakeholder participation on land use policy. *Policy Studies Journal*, 33, 459-481.
- Koontz, T. M. (2004). *Collaborative Environmental Management: What Roles for Government?* (First ed.) Washington, D.C.: Resources for the Future.
- Koopmans, R. & Duyvendak, J. W. (1995). The Political Construction of the Nuclear-Energy Issue and its Impact on the Mobilization of Antinuclear Movements in Western Europe. *Social Problems*, 42, 235-251.
- Kudrna, F. (1979). Water Quality Effects of Land Use Management and Vegetation. In The American Society of Civil Engineers (Ed.), *Water Problems of Urbanizing Areas* (pp. 152-156). New York: The American Society of Civil Engineers.
- Kulp, C. (7-30-1986). Supervisor of the Fish and Wildlife Service Office for Pennsylvania and New Jersey, speaking on behalf of Boston Regional Director Howard Larson. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.
- Kulp, C. J. (7-7-1983). Letter to William Whipple, New Jersey Division of Water Resources Water Supply Administration Administrator from USFWS Field Supervisor Charles J. Kulp.
- Kusler, J. A. (1980). *Strengthening State Wetland Regulations* Washington, DC: U.S. Government Printing Office.
- Kusler, J. A. (1983). *Our National Wetland Heritage: A Protection Guidebook* Washington, DC: Environmental Law Institute.
- Kusler, J. A. (1986). Executive Summary and Recommendations: Mitigation of Impacts and Losses. In J. A. Kusler & M. L. Quammen (Eds.), *National Wetlands Symposium* Fish and Wildlife Service ASWM.
- Kusler, J. A. (1992). Wetlands Delineation: An Issue of Science or Politics. *Environment*, 33.
- Kusler, J. A. & Montanari, J. H. (1978). Proceedings of the First National Wetland Protection Symposium. In Office of Biological Services (Ed.), *First National Wetland Protection Symposium* Washington, DC: US Fish and Wildlife Service.
- Kusler, J. A. (1986). Preface. In J. A. Kusler & M. L. Quammen (Eds.), *National Wetlands Symposium: Mitigation of Impacts and Losses* Washington, DC: US Fish and Wildlife Service.
- LaRoe, E. T. (1978). Mitigation: A Concept for Wetland Restoration. In J. A. Kusler & J. H. Montanari (Eds.), *The First National Wetland Protection Symposium* (pp. 221-224). Washington, DC: US Fish and Wildlife Service.



- Lasswell, H. D. (1956). *The Decision Process: Seven Categories of Functional Analysis*. College Park: University of Maryland Press.
- Lebel, L., Contreras, A., Pasong, S., & Garden, P. (2004). Nobody knows best: alternative perspectives on forest management and governance in southeast Asia. *International Environmental Agreements: Politics, Law and Economics*, 4, 111-127.
- Leighninger, M. (2006). *The Next Form of Democracy: How Expert Rule Is Giving Way to Shared Governance...and Why Politics Will Never Be the Same*. (1st ed.) Nashville: Vanderbilt University Press.
- Leith, Rod (1984, April 12). Building in wetlands: tomorrow's disaster. *The Bergen Record*.
- Light, A. & Higgs, E. S. (1996). The Politics of Ecological Restoration. *Environmental Ethics: An interdisciplinary journal dedicated to the philosophical aspects of environmental problems*, 18, 227-247.
- Lincoln, Y. S. & Guba, E. G. (1985). *Naturalistic Inquiry*. Beverly Hills, CA: Sage Publications, Inc.
- Lindblom, C. E. & Cohen, D. K. (1979). *Usable Knowledge: Social Science and Social Problem Solving*. New Haven: Yale University Press.
- Lindblom, C. E. (1990). *Inquiry and Change: The Troubled Attempt to Understand and Shape Society*. New Haven: Yale University Press.
- Lomax, J. (9-24-1984). Public Hearing testimony of Josephy Lomax of Lomax and Associates before the Assembly Agriculture and Environment Committee. Assembly Bills 672 and 2348. Assembly Agriculture and Environment Committee.
- Louis, K. S. & Barton, A. C. (2002). Tales from the science education crypt: A critical reflection of positionality, subjectivity, and reflexivity in research. *Forum Qualitative Sozialforschung/ Forum: Qualitative Social Research*, 3.
- Lowe, G. & Salafrio, C. (1989). The Evolution of Wetland Regulation Under Chapter 40C-4, F.A.C. In *American Water Resources Association Conference, Tampa, Fla., Sept. 17-22, 1989* American Water Resources Association.
- MacKenzie, D. & Wajcman, J. (1985). *The Social Shaping of Technology*. Buckingham: Open University Press.
- Magoon, O. T. (1983). Coastal Zone '83: Proceedings of the Third Symposium on Coastal and Ocean Management. In *The American Society of Civil Engineers*.
- Maher, F. & Tetreault, M. K. (1994). *The Feminist Classroom*. New York: Basic Books.
- Maltby, E. & Barker, T. (2009). *The Wetlands Handbook*. Wiley-Blackwell.
- Marsh, D. & Rhodes, R. A. W. (1992). *Policy Networks in British Government*. Oxford: Clarendon Press.
- Marsh, D. & Stoker, G. (2002). *Theory and methods in political science*. New York: Palgrave Macmillan.
- Martin, B. (2006). Strategies for Alternative Science. In S. Frickel & K. Moore (Eds.), *The New Political Sociology of Science: Institutions, Networks, and Power* (pp. 272-298). Madison, WI: University of Wisconsin Press.

- Martin, Justin (2011, May 29). A body of water so foul. *The Boston Globe*.
- Martins, B. & Richards, E. (1995). Scientific knowledge, controversy, and public decision-making. In S. Jasanoff, G. E. Markle, J. C. Petersen, & T. Pinch (Eds.), *Handbook of Science and Technology Studies* (pp. 506-526). Newbury Park, CA: Sage.
- May, J. V. & Wildavsky, A. B. (1978). Volume editor's introduction. In *The policy cycle* (pp. 10-14). Beverly Hills, CA: Sage.
- McAdam, D., McCarthy, J., & Zald, M. (1996). *Comparative Perspectives on Social Movements: Political Opportunities, Mobilizing Structures, and Cultural Framings*. New York: Cambridge University Press.
- McAdam, D. (1999). *Political Process and the Development of Black Insurgency, 1930-1970*. (2nd ed.) Chicago: University of Chicago Press.
- McAdam, D., Tarrow, S., & Tilly, C. (2001). *The Dynamics of Contention*. Cambridge: Cambridge University Press.
- McCarthy, J. & Zald, M. (2002). The Enduring Vitality of the Resource Mobilization Theory of Social Movements. In *Kluwer Academic/Plenum Publisher* (pp. 533-565). New York: J.H. Turner.
- McColligan, E. (6-12-1987). Memorandum to Robert Tudor, NJDEP, from Eugene McColligan, Principal Environmental Specialist on the subject of the OLS FWPA.
- McElfish, James, Kihlsinger, Rebecca, and Nichols, Sandra (2008). Setting Buffer Sizes for Wetlands. *National Wetlands Newsletter*, 30, 6-17.
- McLain, P. D. (8-27-1984). Memo to Helen Fenske, Assistant Commissioner New Jersey Department of Environmental Protection from the Deputy Director, Division of Fish, Game and Wildlife.
- McNie, E. C. (2007). Reconciling the supply of scientific information with user demands: an analysis of the problem and review of the literature. *Environmental Science & Policy*, 10, 17-38.
- Melucci, A. (1996). *Challenging codes: Collective action in the information age*. Cambridge, MA: Cambridge University Press.
- Merkle, M. (8-1-1986). Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.
- Miller, C. A. & Edwards, P. N. (2001). *Changing the Atmosphere: Expert Knowledge and Environmental Governance*. Cambridge, MA: The MIT Press.
- Miller, C. A. & Edwards, P. N. (2001). Introduction: The Globalization of Climate Science and Climate Politics. In C.A. Miller & P. N. Edwards (Eds.), *Changing the Atmosphere: Expert Knowledge and Environmental Governances* (.).
- Mitsch, W. J., Reeder, B. C., & Klarer, D. M. (1989). The role of wetlands in the control of nutrients with a case study of western Lake Erie. In W.J. Mitsch & S. E. Jorgensen (Eds.), *Ecological Engineering: an Introduction to Ecotechnology* (pp. 129-158). John Wiley & Sons.
- Mitsch, W. J. & Gosselink, J. G. (2007). *Wetlands*. (4th ed.) New York: John Wiley & Sons, Inc.

- Moore, D. (8-1-1986). Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.
- Moore, K. (2006). Powered By the People: Scientific Authority in Participatory Science. In S. Frickel & K. Moore (Eds.), *The New Political Sociology of Science: Institutions, Networks, and Power* (pp. 299-323). Madison, WI: University of Wisconsin Press.
- Moore, K. (2008). *Disrupting Science: Social Movements, American Scientists, and the Politics of the Military, 1945-1975*. Princeton: Princeton University Press.
- Moore, S. A. (2007). *Alternative Routes to a Sustainable City*. Lanham: Lexington Books.
- Moser, S. C. (2007). In the Long Shadows of Inaction: The Quiet Building of a Climate Protection Movement in the United States. *Global Environmental Politics*, 7, 124-144.
- Moyer, B., McAllister, J., Finley, M. L., & Soifer, S. (2001). *Doing Democracy: The MAP Model for Organizing Social Movements*. Gabriola Island, BC, Canada: New Society Publishers.
- Myers, R. J. (7-25-1985). Passaic River Coalition testimony before the Senate Committee on Energy and Environment on S-602 "Freshwater Wetlands Act".
- Narus, Bob (1986, February 9). *New York Times*.
- National Association of Industrial and Office Parks. Center for Legal Education Video. 1984.
- National Association of Industrial and Office Parks. Post-FWPA De-Brief Video with NJDEP and NAIOP. 1987.
- National Research Council (1995). *Wetlands Characteristics and Boundaries* Washington, DC: National Academy Press.
- National Research Council (2001). *Compensating for Wetland Losses Under the Clean Water Act*. Washington, DC: National Academy Press.
- National Resources Council Water Science and Technology Board (1995). *Wetlands: Characteristics and Boundaries* Washington, DC: National Academy of Sciences.
- Nelkin, D. (1995). *Selling Science: How the Press Covers Science and Technology*. (2nd ed.) New York: W.H. Freeman and Company.
- New Jersey Association of Realtors Representative #1. (1999). Interview with New Jersey Association of Realtors Representative #1 - conducted by David H. Guston.  
Ref Type: Personal Communication
- New Jersey Audubon Society. (1983). Position Paper on Inland Wetlands Bill.
- New Jersey Builder's Association Counsel. (7-21-2001). Interview with New Jersey Builder's Association Counsel -- conducted by Heather Fenyk.
- New Jersey Builders Association. (1986). Proposed changes to ACS-2342/2499 "The Freshwater Wetlands Act".
- New Jersey Builders Association. (1987). Internal NJBA Memo.

- New Jersey Department of Environmental Protection. (1974). Program Summary of the New Jersey Coastal Management Program.
- New Jersey Freshwater Wetlands Mitigation Council (1991). *Wetlands Mitigation: A Report to the Governor and New Jersey Legislature Evaluating the State of the Art of Wetlands Mitigation*.
- New Jersey Office of Coastal Zone Management (1978). *New Jersey coastal program: bay and ocean shore segment and final environmental impact state* Washington, DC: U.S. Office of Coastal Zone Management.
- New Jersey Pinelands Commission (2013). Our Country's First National Reserve. New Jersey Pinelands Commission website [On-line]. Available: <http://www.state.nj.us/pinelands/>
- New Jersey State Assembly. (12-15-1986). Assembly Committee Substitute for Assembly Nos. 2342 and 2499.
- New Jersey State Reference Librarian. (4-19-2012). Interview with New Jersey State Reference Librarian -- conducted by phone by Heather Fenyk.
- New York Times (1907, March 17). Roosevelt Plans to Employ Rivers. He Appoints a Commission to Investigate the Problems of Waterways. Would Control Freshets. Praises Railroads for their Progress but says they cannot Move the Nation's Commerce. *New York Times*.
- Ng, S. H. (1996). Power: An Essay in Honour of Henri Tajfel. In P.W.Robingson (Ed.), *Social Groups and Identities* (pp. 191-214). Oxford: Butterworth-Heinemann.
- Niering, W. A. (1985). *Wetlands*. New York: A.A. Knopf.
- NJDEP Natural Resources Group (1984). *A Summary and Technical Review of A-2348* New Jersey Department of Environmental Protection.
- NJDEP Natural Resources Group (1984). *Freshwater Wetlands: Perception of Value* NJ Department of Environmental Protection.
- NJDEP Official #3. (4-21-1999). Interview with NJDEP Official #3 - conducted by Heather Fenyk and David H. Guston.
- NJDEP Official #1. (6-22-2006). Interview with NJDEP Official #1 - conducted by Heather Fenyk.
- NJDEP Official #2. (4-21-1999). Interview with NJDEP Official #2 -- conducted by Heather Fenyk and David H. Guston.
- NJDEP Official #4. (12-1-2009). Interview with NJDEP Official #4 - conducted by Heather Fenyk.
- NJDEP Staff Member #1. (5-5-1999). Interview with NJDEP Staff Member #1 - conducted by Heather Fenyk and David H. Guston.
- Nowotny, H., Scott, P., & Gibbons, M. (2001). *Rethinking science: knowledge in an age of uncertainty*. Cambridge: Polity.
- Nowotny, H., Scott, P., & Gibbons, M. (2003). Introduction: Mode 2 Revisited: The New Production of Knowledge. *Minerva*, 41, 179-194.
- O'Connell, J. B. (1997). *Master's Thesis: Assessment of the Viability of Mitigation Banking in Rhode Island*. Brown University.

- O'Leary, R. (2006). Guerrilla Government and the Nevada Wetlands. In *The Ethics of Dissent: Managing Guerrilla Government* (pp. 26-40). Washington, DC: CQ Press.
- Odum, E. P. (1983). *Systems Ecology: An Introduction*. New York: John Wiley.
- Office of Legislative Services. (9-24-1984). Public Hearing on Bills 672 and 2348: Provides for the Systematic Review of Development Activities in and Around Freshwater Wetlands. 672 and 2348. Assembly Agriculture and Environment Committee.
- Office of Legislative Services. (8-1-1986). Public Hearing before Assembly Energy and Natural Resources Committee on Assembly Bill 2342 and Assembly Bill 2499. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.
- Office of Legislative Services. (7-16-1986). Public Hearing before Assembly Energy and Natural Resources Committee on Assembly Bill 2342 and Assembly Bill 2499. Assembly Bill 2342 and Assembly Bill 2499. Assembly Energy and Natural Resources Committee.
- Office of Legislative Services Research Staff #1. (4-28-1999). Interview with Office of Legislative Services Research Staff #1 -- conducted by Heather Fenyk and David H. Guston.
- Office of Technology Assessment (1984). *Wetlands: Their Use and Regulation* (Rep. No. OTA-O-206). Washington, D.C.: U.S. Congress.
- Ogden, M. (9-24-1984). Statement before the New Jersey Assembly Agriculture and Environmental Committee on Assembly Bills 672 and 2348. 672 and 2348. Agriculture and Environmental Committee.
- Ogden, M. (4-15-1999). Interview with Maureen Ogden, former New Jersey State Assemblywoman -- conducted by Heather Fenyk.
- Olson, R. & Rejeski, D. (2005). *Environmentalism & The Technologies of Tomorrow*. Washington, DC: Island Press.
- Oren, I. (2006). Political Science as History: A Reflexive Approach. In D. Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 215-227). Armonk, NY: M.E. Sharpe.
- Orsini, M. & Smith, M. (2007). Critical Policy Studies. In M. Orsini & M. Smith (Eds.), *Critical Policy Studies* (pp. 1-14). Vancouver: UBC Press.
- Ottinger, G. & Cohen, B. R. (2011). *Technoscience and Environmental Justice: Expert Cultures in a Grassroots Movement*. Cambridge, MA: MIT Press.
- Paehlke, R. C. (1990). Environmental Values and Democracy: The Challenge of the Next Century. In N.J. Vig & M. E. Kraft (Eds.), *Environmental policy in the 1990's: toward a new agenda* (pp. 349-367). Washington, D.C.: Congressional Quarterly Press.
- Palumbo, D. J. (1988). *Public policy in America: Government in action*. San Diego, CA: Harcourt Brace Jovanovich.
- Parikh, A., Ferren, W. R., Jones, S., & Callaway, R. M. (1990). Ecology of a Mediterranean-Climate Estuarine Wetland at Carpinteria, California: Plant Distributions and Soil Salinity in the Upper Marsh. *Canadian Journal of Botany*, 68, 1139-1146.

- Passaic River Coalition. (10-7-1985). PRC Analysis and Position of the Freshwater Wetlands Act Proposed Senate Committee Substitute to S. 602.
- Passaic River Coalition Representative #1. (3-22-2006). Interview with Passaic River Coalition Representative #1 - conducted by Heather Fenyk.
- Pellizzoni, L. (2003). Uncertainty and participatory democracy. *Environmental Values*, 12, 195-224.
- Penn, J. (7-16-1986). Public Hearing before Assembly Energy and Natural Resources Committee. Assembly Bill 2342 and Bill 2499. Assembly Energy and Natural Resources Committee.
- Penn, J. (7-16-2013).
- Petts, J. & Brooks, C. (2006). Expert conceptualisations of the role of lay knowledge in environmental decisionmaking: challenges for deliberative democracy. *Environment and Planning A*, 38, 1045-1059.
- Pinch, T. & Bijker, W. E. (1987). The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other. In W.E.Bijker, T. P. Hughes, & T. Pinch (Eds.), Cambridge, MA: MIT Press.
- Pinchot, G. (1945). The Long Struggle for Effective Federal Water Power Legislation. *George Washington Law Review*, 14.
- Polletta, F. & Ho, M. K. (2006). Frames and Their Consequences. In R.E.Goodin & C. Tilly (Eds.), *The Oxford Handbook of Contextual Political Studies*. Oxford: Oxford University Press.
- Poole, M. S., Seibold, D. R., & McPhee, R. D. (1996). The structuration of group decisions. In R.Y.Hirokawa & M. S. Poole (Eds.), *Communication and group decision making* (pp. 114-146). Thousand Oaks, CA: Sage.
- Porter, B. W. (1981). The Wetland Edge as a Community and Its Value to Wildlife. In Minnesota Water Planning Board (Ed.), *Midwest Conference of Wetlands Values and Management: Minnesota Water Planning Board* St. Paul.
- Quammen, D. (1996). *The Song of the Dodo: Island Biogeography in an Age of Extinctions*. Scribner.
- Raritan Headwaters Association (2013). History of Raritan Headwaters Association. Raritan Headwaters Association website [On-line]. Available: <http://www.raritanheadwaters.org/about-us/history/>
- Raspe, R. E. (1950). *The Singular Adventures of Baron Munchausen*. London: R. Hunt (Parrish).
- Ravo, Nick (1999, July 28). Alan Karcher's obituary. *New York Times*.
- Reagan, R. (2-17-1981). Creation of the Task Force on Regulatory Relief. Executive Order 12291, 46 Federal Register 13193, 3 CFR, Federal regulation Section 2b.
- Reichertz, J. (2010). Abduction: The logic of Discovery of Grounded Theory. In A.Bryant & K. Charmaz (Eds.), *The SAGE Handbook of Grounded Theory*. London: Sage.
- Reilly, S. M. (7-16-1986). New Jersey Freshwater Wetlands Regulation: Issues to be Considered for Amendment to Bill A-672/2348 (Appendix). Bill 2342 and Bill 2499. Assembly Energy and Natural Resources Committee.

- Roberts, N. (2004). Public deliberation in an age of direct citizen participation. *American Review of Public Administration*, 34, 315-353.
- Roesner, L. A. (1988). Nonpoint Pollution: 1988-Policy, Economy, Management, and Appropriate Technology. In *American Water Resources Association Wetlands Symposium, 1988* (pp. 213-223). Bethesda, MD: American Water Resources Association.
- Roman, C. T. & Good, R. (1983). *Wetlands of the New Jersey Pinelands: Values, Functions and Impacts*. New Brunswick, NJ: Division of Pinelands Research, Center for Coastal and Environmental Studies.
- Roth, W. M. & Lee, S. (2002). Scientific literacy as collective praxis. *Public Understanding of Science*, 11, 33-56.
- Rowe, G. & Frewer, L. J. (2000). Public participation methods: A framework for evaluation. *Science Technology & Human Values*, 25, 3-29.
- Rowe, G. & Frewer, L. J. (2005). A Typology of Public Engagement Mechanisms. *Science, Technology and Human Values*, 30, 251.
- Rutgers New Jersey Agricultural Experiment Station. (1999). Wetlands Delineation Certificat Series.
- Ryan, C. (1991). *Prime Time Activism: Media Strategies for Grassroots Organization*. Boston: South End Press.
- Sabatier, P. A. (1988). An Advocacy Coalition Framework of Policy Change and the Role of Policy-Oriented Learning Therein. *Policy Sciences*, 21, 129-168.
- Sabatier, P. A. (2007). *Theories of the Policy Process*. Boulder, CO: Westview Press.
- Salmore, B. & Salmore, S. (1998). Government and Politics in Localities. In *New Jersey Politics and Government: Suburban Politics Comes of Age* (2nd Edition ed., University of Nebraska Press.
- Sarewitz, D. & Pielke, R. A. (2007). The neglected heart of science policy: reconciling supply of and demand for science. *Environmental Science & Policy*, 10, 5-16.
- Schaffer, F. C. (2006). Ordinary Language Interviewing. In D. Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 150-160). Armonk, New York: M.E. Sharpe.
- Schattschneider, E. E. (1975). *The Semisovereign People: A Realist's View of Democracy in America*. Fort Worth: Harcourt Brace Jovanovich College Publishers.
- Schneiberg, M. & Bartley, T. (2001). Regulating American industries: Markets, politics, and the institutional determinants of fire insurance regulation. *American Journal of Sociology*, 101-146.
- Schneiberg, M. (2007). What's on the path? Path dependence, organizational diversity and the problem of institutional change in the US economy, 1900-1950. *Socioeconomic Review*, 5, 47-80.
- Schön, D. A. (1983). *The Reflective Practitioner: How Professionals Think in Action*. London: Temple Smith.
- Schön, D. A. & Rein, M. (1994). *Frame Reflection: Toward the Resolution of Intractable Policy Controversies*. New York: Basic Books.

- Schreck, A. (1997). Implementation: The New Jersey Freshwater Wetlands Protection Act. Ref Type: Unpublished Work
- Schreiner, W. C. (1989). Wetland Preservation - Par for the Course. In *Wetlands: Concerns and Successes. Conference of the American Water Resources Association* (pp. 335-343).
- Schwartz-Shea, P. & Yanow, D. (2012). *Interpretive Research Design: Concepts and Processes*. New York: Routledge.
- Sclove, R. E. (1995). *Democracy and Technology*. New York: The Guilford Press.
- Semeniuk, V. & Semeniuk, C. (1997). A geomorphic approach to global classification for natural inland wetlands and rationalisation of the system used by the Ramsar Convention - a discussion. *Wetlands Ecology & Management*.
- Shakespeare, W. (1972). Macbeth. In S.Barnet (Ed.), *The Complete Signet Classic Shakespeare* (pp. 1227-1136). New York: Harcourt Brace Jovanovich.
- Sharp, M. N. & Keddy, P. A. (1986). A quantitative technique for estimating the boundaries of wetlands from vegetation data. *Environmental Management*, 10, 107-112.
- Shaw, S. P. & Fredine, G. (1956). *Wetlands of the United States - their extent and their value to waterfowl and other wildlife: Circular 39* U.S. Department of the Interior.
- Shisler, J. K. & Charette, D. J. (1984). *Evaluation of artifical salt marshes in New Jersey*. New Brunswick, NJ: New Jersey Agricultural Experiment Station.
- Shisler, J. K., Waidelich, P. E., Russell, H. G., & Piel, R. B. (1987). Buffer zones in wetland management practice. In *The Tenth National Conference of the Coastal Society* New Orleans, LA.
- Simmons, W. M. & Grabill, J. T. (2007). Toward a civic rhetoric for technologically and scientifically complex places: Invention, performance, and participation. *College Composition and Communication*, 58, 419-448.
- Simmons, W. M. & Grabill, J. T. (2007). Toward a civic rhetoric for technologically and scientifically complex places: Invention, performance, and participation. *College Composition and Communication*, 58, 419-448.
- Skocpol, T. & Pierson, P. (2002). Historical Institutionalism in Contemporary Political Science. In I.Katznelson & H. V. Milner (Eds.), *Political Science: The State of the Discipline* (pp. 693-721). New York: W.W.Norton.
- Snow, D. A., Rochford, E. B., Worden, S. K., & Benford, R. D. (1986). Frame Alignment Processes, Micromobilization and Movement Participation. *American Sociological Review*, 51, 464-481.
- Snow, D. A. & Benford, R. D. (1988). Ideology, frame resonance, and participant mobilization. In B.Klandermans (Ed.), *International Social Movement Research V.1* Greenwich, CT: JAI Press.
- Snow, D. A. & Benford, R. D. (1992). Master Frames and Cycles of Protest. In A.D.Morris & C. M. Mueller (Eds.), *Frontiers in Social Movement Theory* (pp. 133-155). New Haven: Yale University Press.
- Society for Ecological Restoration. (2013). History of Ecological Restoration. 12-9-2013. Ref Type: Online Source



- Soss, J. (2006). Talking Our Way to Meaningful Explanations: A Practice-Centered View of Interviewing for Interpretive Research. In D. Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 127-149). Armonk, NY: M.E. Sharpe.
- State College Field Office (1984). *Clean Water Act Assessment*.
- State College Field Office (1984). *An assessment of the Corps of Engineers' Section 404 Permit Program in Northern New Jersey 1980-1984* Washington, D.C.: U.S. Fish and Wildlife Service.
- Stine, J. K. (1983). Regulating Wetlands in the 1970s: U.S. Army Corps of Engineers and the Environmental Organizations. *Journal of Forest History*, 27, 60-75.
- Stockton, M. B. & Richardson, C. J. (1987). Wetland development trends in coastal North Carolina, USA, from 1970 to 1984. *Environmental Management*, 11, 1-9.
- Strauss, A. & Corbin, J. (1998). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. (2nd ed.) Thousand Oaks, CA: Sage Publications.
- Stringer, L. C., Dougill, A. J., Fraser, E., Hubacek, K., Prell, C., & Reed, M. S. (2006). Unpacking "participation" in the adaptive management of social ecological systems: A critical review. *Ecology and Society*, 11.
- Studt, J. & Sokolove, R. D. (1996). Federal Wetland Mitigation Policies. In L.L. Marsh, D. R. Porter, & D. A. Salvesen (Eds.), *Mitigation Banking: Theory and Practice* Washington, DC: Island Press in cooperation with the Urban Land Institute.
- Sturgeon, N. (1995). Theorizing movements: direct action and direct theory. In N. Darnovsky, B. Epstein, & R. Flacks (Eds.), *Cultural Politics and Social Movements* (pp. 35-51). Philadelphia: Temple University Press.
- Sumara, D. J. (2002). Creating commonplaces for interpretation: Literary anthropology and literacy education research. *Journal of Literacy Research*, 34, 237-260.
- Szczepanski, A. J. (1990). Forested Wetlands of Poland. In *Forested Wetlands: Ecosystems of the World* (pp. 437-446). Amsterdam: Elsevier Science Publishing Co.
- Tarrow, S. (1992). Mentalities, Political Cultures, and Collective Action Frames. In A.D. Morris & C. M. Mueller (Eds.), *Frontiers in Social Movement Theory* (pp. 174-202). New Haven: Yale University Press.
- Tarrow, S. (1998). *Power in Movement*. Cambridge: Cambridge University Press.
- Task Force on Regulatory Relief. (1982). Processing Times: Specifies time limits for permit processing and acceptable reasons for delay. RGL-82-07.
- The Freshwater Wetlands Campaign. (10-31-1986). Letter from the Freshwater Wetlands Campaign to Senator Dalton. Senator Dalton.
- The Freshwater Wetlands Campaign. (10-31-1986). Letter from the Freshwater Wetlands Campaign to Members of the Senate Energy and Environment Committee.
- The Fund for New Jersey. (2013). The Fund for New Jersey: History of the Fund.
- Thomas, R. (2008). *State Wetland Protection: Status, Trends & Model Approaches* (Rep. No. Corp Agreement WD-83329501). Washington, DC: Environmental Protection Agency.

- Tilly, C. (1978). *From Mobilization to Revolution*. Reading, MA: Addison-Wesley.
- Tilly, C. (1986). *The Contentious French: Four Centuries of Popular Struggle*. Cambridge, MA: Belknap Press.
- Tilly, C. & Tarrow, S. (2006). *Contentious Politics*. Boulder, CO: Paradigm Press.
- Tiner, R. (1984). *Wetlands of the United States: current status, recent trends*. Washington, DC.
- Tiner, R. W. (1985). *Wetlands of New Jersey*. Newton Corner, Mass.: U.S. Fish and Wildlife Service.
- Tiner, R. W. (1999). *Wetland Indicators: A Guide to Wetland Identification, Delineation, Classification, and Mapping*. Boca Raton, FL: Lewis Publishers.
- Triandafyllidou, A., & Fotiou, A. (1998). Sustainability and modernity in the European frame: a frame theory approach to policy making. *Sociological Research online*, 3.
- Tudor, R. (12-17-1986). Memorandum from NJDEP Planning Coordinator to Assistant Commissioner Helen Fenske. Fenske, Helen.
- Tudor, R. (12-3-1992). Memo on "Mitigation Banking" to Rob Piel, NJDEP Land Use Regulation Team.
- Turner, R. E., McKee, K. L., Sikora, W. B., Sikora, J. P., & Mendelssohn, I. A. (1984). Impact and Mitigation of Man-Made Canals in Coastal Louisiana. *Water Science and Technology*, 16, 497-504.
- US Army Corps of Engineers (1978). Press Release, Department of Army, Office of Chief of Engineers May 6, 1975. In Environmental Policy Division of the Congressional Research Service of the Library of Congress (Ed.), *4 Legislative History of the Clean Water Act of 1977: a continuation of the legislative history of the Federal Water Pollution Control Act: together with a section-by-section index*. Washington, DC: US Library of Congress.
- US Fish and Wildlife Service. (2013). Fish and Wildlife Coordination Act. Digest of Federal Resource Laws of Interest to the U.S. Fish and Wildlife Service.
- US Fish and Wildlife Service. (2013). Questions and Answers About Status and Trends of Wetlands in the Conterminous US 2004 to 2009. 5-31-2013.
- Van de Graaf, H. & Hoppe, R. (1989). *Policy and Politics (Beleid en politiek)*. Muiderberg, The Netherlands: Coutinho.
- van Kerkoff, L. (2005). Integrated research: concepts of connection in environmental science and policy. *Environmental Science & Policy*, 8, 439-463.
- Vaughn, B. F. Jr., Cooper, R. J., Brashwell, J. H., & Hart, R. (1984). *Delineation of wetland boundaries using vegetation within the Altamaha River Basin of Georgia* Atlanta, GA: Envirosphere, Co.
- Vought, L. B. M., Dahl, J., Petersen, C. L., & Lacoursiere, J. L. (1994). Nutrient retention in riparian ecotones. *Ambio*, 23.
- Wagenaar, H. (2011). *Meaning in Action: Interpretation and Dialogue in Policy Analysis*. M.E. Sharpe, Inc.

- Wagner, P. (2007). Public Policy, Social Science, and the State: An Historical Perspective. In F. Fischer, C. A. Miller, & M. S. Sidney (Eds.), *Handbook of Public Policy Analysis* (pp. 29-42). Boca Raton, FL: CRC Press - Taylor & Francis Group.
- Warren, W. A. (2006). A Review of: Eckersley, Robyn. *The Green State: Rethinking Democracy and Sovereignty*. *Society & Natural Resources*, 19, 377-380.
- Webler, T., Tuler, S., & Krueger, R. (2001). What is a good public participation process? Five perspectives from the public. *Environmental Management*, 27, 435-450.
- Webster, A. (1991). *Science, Technology and Society: New Directions*. New Brunswick, NJ: Rutgers University Press.
- Weible, C., Sabatier, P. A., & Lubell, M. (2004). A comparison of a collaborative and top-down approach to the use of science in policy: Establishing marine protected areas in California. *Policy Studies Journal*, 32, 187-207.
- Weible, C. M. (2007). An advocacy coalition framework approach to stakeholder analysis: Understanding the political context of California marine protected area policy. *Journal of Public Administration Research and Theory*, 17, 95-117.
- Weimer, D. L. (2005). Institutionalizing neutrally competent policy analysis: Resources for promoting objectivity and balance in consolidating democracies. *Policy Studies Journal*, 33, 131-146.
- Weir, M. & Ganz, M. (1997). Reconnecting people and politics. In S.B. Greenberg & T. Skocpol (Eds.), *The New Majority: Toward a popular progressive politics* (pp. 149-171). New Haven, CT: Yale University Press.
- Weird New Jersey (2013). The Jersey Devil. Weird New Jersey [On-line]. Available: <http://weirdnj.com/stories/jersey-devil/>
- Wells, T. (10-16-1986). Testimony of Thomas Wells, Assistant Director of the New Jersey Conservation Foundation, Concerning Freshwater Wetlands Bills S-2003 (Lynch) & S-2121 (Zane). Senate Bills S-2003 and S-2121. Senate Energy and Environment Committee.
- Wetzel, R. G. (1979). The role of the littoral zone and detritus in lake metabolism. *Ergebnisse der Limnologie*, 13, 145-161.
- Wharton, C. H., Kitchens, W. M., Pendleton, E. C., & Sipe, T. W. (1982). *The Ecology of Bottomland Hardwood Swamps of the Southeast: A Community Profile* Biological Services Program.
- White, D. D. & Hall, T. E. (2006). Public understanding of science in Pacific Northwest Salmon recovery policy. *Society & Natural Resources*, 19, 305-320.
- White, D. D. & Hall, T. E. (2006). Public Understanding of Science in Pacific Northwest Salmon Recovery Policy. *Society & Natural Resources*, 19, 305-320.
- Wilpiszewska, I. (1990). Productivity and chemical valorization of mire vegetation in postglacial agricultural landscape. *Ekologia Polska*, 38, 3-72.
- Woodhouse, W. W. Jr. & Knutson, P. L. (1982). Atlantic Coastal Marshes. In *Creation and Restoration of Coastal Plant Communities*.

- Wynne, B. (2003). Risks as globalizing 'democratic' discourse? Framing subjects and citizens. In M. Leach, I. Scoones, & B. Wynne (Eds.), *Science and Citizens, Globalization and the Challenge of Engagement*. London: Zed Books.
- Wynne, B. (2006). Public engagement as a means of restoring public trust in science -- hitting the notes, but missing the music? *Community Genetics*, 211-220.
- Yanow, D. (2000). *Conducting Interpretive Policy Analysis*. Newbury Park, CA: Sage.
- Yanow, D. & Schwartz-Shea, P. (2006). *Interpretation and Method: Empirical Research Methods and the Interpretive Turn*. Armonk, NY: M.E. Sharpe.
- Yanow, D. (2006). Thinking Interpretively: Philosophical Presuppositions and the Human Sciences. In *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 5-26). Armonk, NY: M.E. Sharpe.
- Yanow, D. (2006). Neither Rigorous Nor Objective? Interrogating Criteria for Knowledge Claims in Interpretive Science. In D. Yanow & P. Schwartz-Shea (Eds.), *Interpretation and Method: Empirical Research Methods and the Interpretive Turn* (pp. 67-88). Armonk, NY: M.E. Sharpe.
- Yanow, D. (2007). Qualitative-Interpretive Methods in Policy Research. In F. Frank, C. A. Miller, & M. S. Sidney (Eds.), *Handbook of Public Policy Analysis: Theory, Politics, and Methods* (pp. 405-416). Boca Raton: CRC Press - Taylor & Francis Group.
- Yanow, D. (2012). Interpretive Analysis and Comparative Research. In I. Engeli & C. Rothmayr (Eds.), *Comparative policy studies: conceptual and methodological challenges*. Palgrave.
- Yearley, S. (2000). Making systematic sense of public discontents with expert knowledge: two analytical approaches and a case study. *Public Understanding of Science*, 9, 105-122.
- Yin, R. K. (1994). Applications of case study research. *Applied Social Research Series*, 34.
- Yin, R. K. (2003). *Case Study Research: Design and Methods*. (3rd ed.) Thousand Oaks, CA: Sage.
- Young, T. P. (2000). Restoration ecology and conservation biology. *Biological Conservation*, 92.
- Zaitzevsky, C. (1982). *Frederick Law Olmsted and the Boston Park System*. Cambridge, MA: The Belknap Press of Harvard University Press.
- Zampella, R. A. (8-17-1984). Letter to Assemblywoman Maureen Ogden from Pinelands Commission Environmental Specialist Robert A. Zampella. Assemblywoman Maureen Ogden.
- Zedler, J., Josselyn, M., & Onuf, C. (1982). Restoration Techniques, Research, and Monitoring: Vegetation. In *Wetlands Restoration and Enhancement in California* (pp. 63-74). San Francisco State University.
- Zedler, J., Josselyn, M., & Griswold, T. (1990). Wetland Mitigation Along the Pacific Coast of the United States. In J. A. Kusler & M. E. Kentula (Eds.), *Wetland creation and mitigation: the status of the science* (pp. 3-36). Washington, DC: Island Press.