“Mission Accomplished” or “Mission Impossible”:

Current Practices, Common Challenges and Innovative Solutions in State-Level Oil Pollution Regulation

By:

Josephine Sandberg Faass

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Written under the direction of

Michael Greenberg, Ph.D.

And approved by Joseph Seneca, Ph.D

Michael Lahr, Ph.D.

Thomas Rudel, Ph.D.

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Abstract of the Dissertation

By

Josephine Sandberg Faass

Dissertation Director:

Michael Greenberg, Ph.D.

This dissertation provides a comprehensive description of state-level oil pollution regulation within the United States. The study acts to identify challenges commonly experienced by those working in this field, and profiles innovative solutions that address these challenges. Recognizing that programs developed by one state may not be amenable to direct adoption by additional jurisdictions, alterations to the existing approaches are suggested, to improve both their effectiveness and generalizability.

A nationwide telephone survey of regulatory programs found to have jurisdiction over oil pollution was conducted; and the information gathered in this way was used to create a unique, in-depth portrait of the field. A set of common challenges were also identified, and paired with programmatic innovations found to exist in particular states. Four programs were identified as particularly promising model solutions, which the researcher visited to conduct multiple interviews.

Among the major findings of this research is the fact that the problem of oil pollution in the United States is likely much more severe than federal data indicate. Although data management practices at the state level are generally poor, it appears that most of the releases experienced today arise not from the activities of the oil industry itself, but from small, use-related sources, such as truck accidents and home heating oil tanks. Unable to address the myriad incidents they experience due to limited regulatory resources, many states opt for a cooperative, rather than a coercive

relationship with the regulated community. Very few pursue natural resource damages, despite reported concerns over injuries to use and non-use resource services resulting from spilled oil.

The case studies included in Chapters 5 and 6 of this document provide detailed discussion and analysis of Florida's Used Oil Recycling Program and Formulaic Approach to natural resource damage assessment; as well as of Wisconsin's Professional Nutrient Applicator's Certification Program and SERTS data management system. It is hoped that by sharing the findings of this research the true nature and extent of the nation's oil pollution problem will be realized, and that the kinds of innovative solutions needed to create a more uniform and effective regulatory environment adopted at a greater rate.

Dedication

I would like to dedicate this work to all of the people in my life who have helped me along the way and made it possible for me to reach the end of this long road.

To Roxanne Chronert, Phil Wieczynski, Domenic Letobarone, and all of the other regulators who work every day to protect our environment and our health, and whose generous donation of time and knowledge made this research possible. Thank you.

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To my grandparents, Carl and Maria, who inspired me to do more than I ever thought I could. Thank you.

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And most of all, to my husband and best friend Marco, who listened when I needed an ear, who played the clown when I needed a laugh, who never let me loose sight of my goals no matter how far away they seemed, and who is truly the best thing since sliced bread. Ti amo da morire.

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Introduction

The research contained here focuses on oil pollution regulation as carried out at the state level. Driving this effort is the desire to gain a holistic understanding of this field, of the most common challenges experienced by those within it, and of the unique and effective solutions that have been devised by individual states to address those very issues. This knowledge will then be shared widely so as to facilitate much needed conversations about this ubiquitous, yet often overlooked form of pollution, and to speed the rate of adoption of proven solutions by jurisdictions that might otherwise remain unaware that any had been developed. It is hoped, therefore, that the ultimate result of this study will take the form of real world policy changes, which will have the effect of enhancing the overall effectiveness and uniformity of regulatory efforts, ultimately producing greater protection of environmental quality and human welfare relative to that which exists today.

In its conception, the research contained herein is fundamentally different from previous studies in two important ways. These departures are at once this work's greatest strength, and its most important limitation. First, while it is not uncommon to delineate a study in terms of a particular law or regulatory program, boundaries based on the identity of the polluting substance are rarely used. It would appear that traditional research conventions arise at least partly out of convenience; as such specifications provide the resulting study with clearly delimited boundaries and readily identifiable information sources. However, everything from a storage tank slowly leaking number 2 fuel oil in a homeowner's basement, to a big rig jack-knifed on a highway overpass spilling diesel fuel from its saddle tank, to the breached hull of a tank ship spewing crude onto a coastline, fall equally under the heading of "oil pollution;" therefore, none can be omitted. Clearly then, the luxury of parsimony was forgone in the course of this research for the sake of completeness.

The second difference between this and more traditional research designs is found in this study's focus on *state-level* efforts. A wealth of previous work has investigated strategies to deter oil spills through federal policies, practices and interventions; however, almost without exception, these studies have focused on the efforts of federal agencies, in particular the U.S. Coast Guard. This is perhaps because spill data are widely available, readily affording opportunities to examine the effects of spatial variations and historical revisions in this agency's enforcement policies. Here the concentration is on states' regulatory approaches, in recognition of the important role played by these agencies and departments, especially with regard to handling the small-scale incidents, which on the whole, account for greater environmental degradation than do larger, more publicized incidents. Therefore, recognizing that there is much to be learned by studying the regulators with these "laboratories of democracy", this investigation is focused on the states.

Although different from previous research in some fundamental ways, this study also works to extend our understanding of a number of topics which have commanded considerable attention in the past. Previous scholars have, for example, explored the motivations, designs and impacts of various regulatory interventions, including natural resource damage assessment (NRDA) and penalization practices, giving rise to a number of theoretical constructs, many of which are discussed at length in the literature review chapter. This work examines whether the resulting theories and conclusions hold true with regard to oil pollution, and in this way acts to extend our understanding of these issues to an area of regulation not previously scrutinized in this way. The reasons for undertaking a new initiative, relations with responsible parties, and the sources and sufficiency of programmatic funding, are also among the topics considered herein.

The Current Research

To accomplish the goals set forth for this work, answers to a series of three questions are sought.

1) How is oil pollution regulated by each of the states and what factors influence their selection of a strategy for this purpose?
2) What challenges are common across jurisdictions and have any states developed effective means of addressing them?
3) What is the nature of these innovative solutions and how could they be generalized for widespread adoption?

The first research question is prompted by the fact that a comprehensive description of the state regulators' approaches the subject of oil pollution has not been compiled to date; meaning that a basic understanding of the ways in which this field operates, of its strengths and weaknesses, is lacking. While the nature of the oil pollution problem present in each state varies considerably, considerable commonalities exist, and it is the goal of this work to identify large-scale trends, as well as anomalous conditions and behaviors. The second question reflects the need to identify any shared challenges; in this way the stage is set for the third and final goal of this work: the identification and description of unique solutions developed by individual jurisdictions that could prove viable models for other states faced with similar concerns.

Through the course of the research and subsequent analyses, the processes of problem identification and innovation diffusion will be facilitated; the findings presented here are intended to be of use, not only within academic and theoretical circles, but among the ranks of regulatory practitioners as well. To answer the three research questions, therefore, data were first collected through a series of telephone interviews with state regulators, and supplemented with information from a variety of other, publicly-available sources.

In recognition of some states' tendencies to devise unique and innovative solutions to the problems they face, a set of four programs employed by regulators in two states are profiled here in the form of in-depth case studies. These programs act to address many of the most pressing challenges found to confront state-level oil pollution regulators, are proven effective, and appear amenable to adoption by other jurisdictions, as they are not overly dependent upon state-specific conditions, and for the most part can be implemented at minimal cost. Together, these characteristics make Florida's approach to Natural Resource Damage Assessment (NRDA) and used oil recycling, as well as Wisconsin's electronic data management systems and nutrient applicator's training program, promising models.

In preparation for the investigation which will form the bulk of this document, it must be made clear why the current research is needed. Since this work is intended, both to describe states' approaches to spill regulation and to identify those which are most effective at lessening the frequency and severity of releases, this task begins by familiarizing the reader with the nature and extent of the oil spill problem in the United States today. The remainder of this introductory chapter is dedicated to this purpose.

The Problem of Oil Spills

From Whence the Problem Comes: Petroleum Use in the United States

According to the Department of Energy, "Oil is the lifeblood of America's economy" (DOE, 2008). Approximately 40% of the nation's total energy demands are satisfied by this substance alone, making it the single largest power source. Coal and natural gas vie for a distant second place; while the more 'environmentally-friendly' energy sources, namely nuclear, renewables (such as geothermal) and hydropower, together comprise just over 14% of the country's energy portfolio. This dynamic has existed largely unchanged for decades, and is expected to remain in place for the foreseeable future (EIAa, 2007); that is, unless some as-yet unrealized technological or social development should occur, as may be prompted by environmental, political and/or economic concerns.

To say that oil provides the bulk of the energy used in the United States hints at its importance in a relative sense, however, more exact measurements are needed to impart a true understanding of the volume of this substance that is extracted, transported, and used here. In 2007, roughly 8.5 million barrels of petroleum, enough to fill about 540 Olympic-size swimming pools, were produced in the U.S. each day (EIAb, 2007). In comparison, only one of the OPEC nations, Saudi Arabia, generated more liquid product during this time span, producing more than 10 million barrels daily (EIAb, 2007).

Given that Saudi Arabia possesses what is estimated to be the world's largest oil reserve (more than 260 billion barrels), while America ranks a paltry 12^{th} in this regard, (EIAb, 2007) our high levels of production undoubtedly reflect attempts to quench the U.S.'s seemingly insatiable thirst for energy. The volume of oil used by American citizens far surpasses that of any other nation, even when the entirety of Europe serves as the comparison (EIAa, 2008). In the U.S., slightly less than 21 million barrels of petroleum are consumed every day; or about three gallons per person per day. The majority (67%) of this is used for transportation; most of the remainder in the industrial, residential and commercial sectors, and a small proportion is relied upon to generate electricity (EIAc, 2007).

Truly a ubiquitous substance, there is scarcely a good or service produced or consumed in this country that is not in some way dependent upon the use of oil. Petroleum products can be classified into three general categories: fuels, finished non-fuel products and petrochemical feed stocks. The use of gasoline and diesel fuel to power automobiles, and of kerosene and propane to heat homes, are familiar to many people. Less well known is petroleum's role in the manufacture of a multitude of goods including solvents, asphalt, medical products and toiletries (EIAc, 2007).

Even given our relatively high levels of production, domestic supply cannot keep pace with demand, making oil importation a necessity. America is the world's largest importer of crude oil which, risk-weighted economics dictates, is preferable for transport as compared to refined products. This substance enters the country by barge and pipeline; with the former serving as the most common method for intercontinental transfers, while the latter dominates transcontinental ones (EIAc, 2007).

Tankships of various sizes bring oil to U.S. shores from across the world's oceans. To accommodate these vessels, seaports of various sizes have been constructed along every major body of water, with the largest concentrations in the Gulf Coast and northeastern states and in California (EIAd, 2008). Louisiana's Offshore Oil Port (LOOP) is the only U.S. port capable of receiving the Very Large Crude Carriers (VLCCs) which typically carry oil from the Middle East. To deliver to other locales, therefore, this product must be offloaded to smaller vessels, either at sea[1] or at offshore ports[2]. South American and Caribbean tankers, in contrast, are generally smaller in size and able to enter most U.S. ports directly (EIAc, 2007).

Developed in WWII, nearly 200,000 miles of large-diameter pipeline crisscross North America, and about two-thirds of the oil shipments that occur within the U.S. are moved through these structures. Pipelines are used to transport crude from receiving ports and oil-producing centers to refineries, the heaviest concentrations of which are port areas. Not solely dedicated to crude transport, these pipelines also facilitate the movement of processed petroleum products to consuming regions (EIAc, 2007; EIAd, 2008).

The price of oil is an important economic indicator; and when prices change, American citizens feel those fluctuations directly at the gas pump and indirectly through variations in the costs of consumer goods. A variety of factors; including demand, the effects of natural disasters on extraction and refining capabilities, as well as political relations between net importing and exporting nations; together help set the price of oil (EIAe, 2008).

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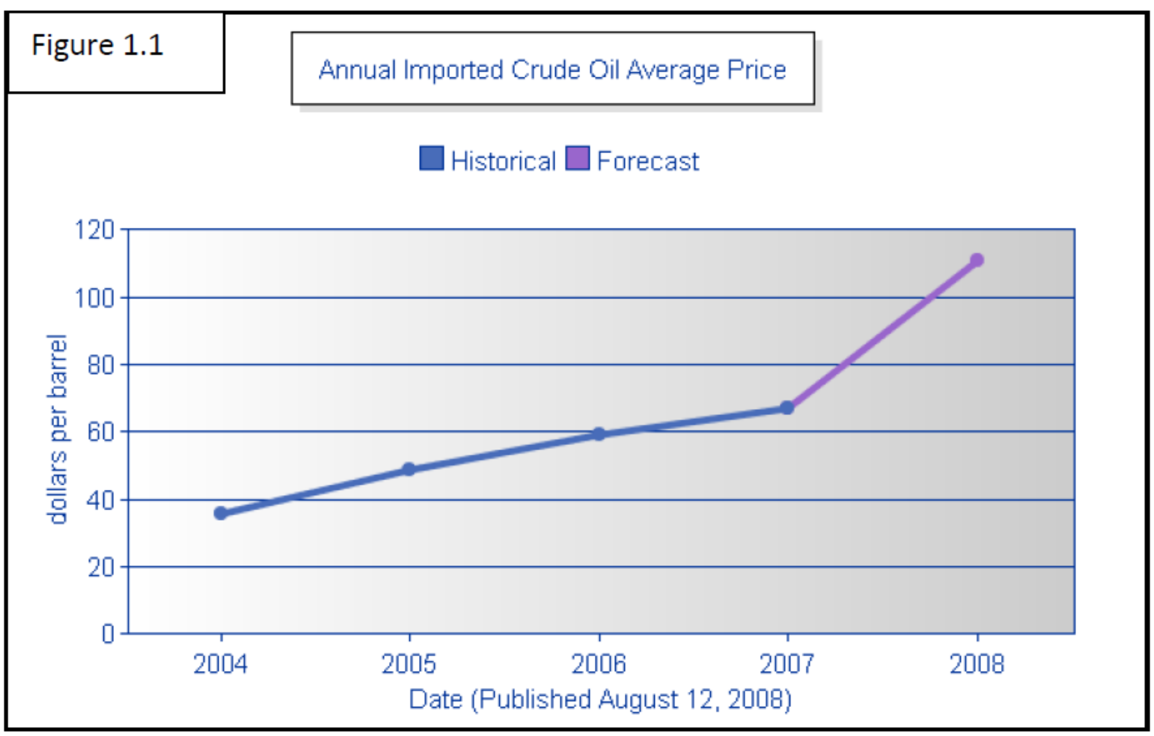
[1] Termed "lightering."
[2] Called "transshipment."

Valued at just over $13 per barrel in January 1978, some 30 years later, the spot price paid for crude in the U.S. has increased some 855%, to a previously unimaginable $111 per barrel (see Figure 1.1[3]). Much of this increase has occurred in recent years, with payments exceeding $30 per barrel for the first time in May 2004, and only breaching the $60 mark in 2006 (EIAb, 2008). Predictable only in its lack of predictability, the cost of oil has dropped considerably during the fall months of 2008, but experts agree that the overall future price trend will continue to move in a positive direction. Given the high demand for, and cost of oil, one might expect that every precaution would be taken to ensure that not a drop of this precious substance was wasted. Considerable amounts of oil are lost each year, however, through its release (accidental or otherwise) into the environment.



[3] Figure 1.1 was copied from the Energy Information Administration's website, and is available by selecting 'Imported Average' from 'Table 2: U.S. Energy Nominal Prices,' which can be accessed at: http://tonto.eia.doe.gov/cfapps/STEO_Query/steotables.cfm?periodType=Annual&startYear=2004&startMonth=1&endYear=2008&endMonth=12&tableNumber=8#

Oil Spills: The Nature of the Problem

Whether during extraction processes, transport, or use; there are ample opportunities for oil to be spilled; however, there remains no single source from which data can be attained representing all spills, regardless their location, source or amount. In the absence of such information, it is largely impossible to determine the exact nature of the oil pollution problem nationwide. For this reason, many analyses rely upon data collected and made available by the National Response Center (NRC), which is the sole point of contact for reporting all petroleum and chemical spills that occur anywhere within the United States and its territories. Coast Guard personnel staff a 24 hour telephone hotline and website within the Center, through which releases can be reported, and maintain a database where all incident reports are recorded. Calls are received for all manner of releases, and faxed alerts sent automatically from the Center to relevant agencies at the state level upon receipt of a report.

Despite its central role, the NRC has specific responsibility for tracking and disseminating information about incidents that act to violate a number of federal laws (including the primary piece of federal legislation dealing with oil pollution, the Oil Pollution Act of 1990 (OPA90)) (NRC, 2002). The NRC database, therefore, contains the most complete record of such incidents available for the U.S. as a whole, and has been utilized by researchers and government officials alike, to monitor trends in spill size, location and severity. What it fails to capture, however, are the myriad spills reported to local and state authorities, which have no obligation to notify the NRC of the incidents to which they respond unless they specifically violate federal legislation.

The origins of oil spills are many, but according to NRC data, the source of about one quarter of all reported incidents remains unknown[4]. Of those with documented origins, however, vessels (other than tankships and tankbarges) are the most common source[5](USCGc & f, 2006). In contrast, “all other non-vessels,” including tanker trucks and heating oil drums, account for slightly less than 5% of the incidents reported to the NRC. Facilities are a significant source of oil entering the environment, accounting for slightly less than 24% of reported releases from 1973 to 2004. Pipelines and tankships are each credited with about 3% of documented spills, while tankbarges caused just over 6% of such incidents during the 31 year time span (USCGc & f, 2006). Clearly then, spills originating from end user activities, such as passenger and recreational vessel operation, are a major concern; however, according to these data, much of the blame for spills lies with industry. This finding, however, is at least partly a reflection of the NRC’s reporting requirements, rather than an accurate and comprehensive accounting of all incidents involving petroleum.

Coastal spills are certainly a major concern, yet not all states border water bodies. This is in no way implies that the problem of oil pollution is limited to locales such as Alaska and California, however; and given the many sources of spills, it is not surprising to learn that great variation exists across states with regard to the number and volume of the releases they experience. Although these measures vary from year to year, states where large quantities of petroleum are refined, transported and/or used are plagued by more significant oil pollution than are jurisdictions that host relatively fewer of these activities. According to National Response Center statistics, Louisiana consistently leads

[4] Between 1973 and 2004, 63,239 of the 251,949 incidents recorded by the U.S. Coast Guard were of unknown origins.

[5] Fully 83,349 of the 251,649 spills recorded between 1973 and 2004 were attributed to vessels.

the nation in the number and volume of spills, with more than 1,100 incidents, totaling in excess of 91,000 gallons, in 2004 alone[6]. Also the locations of a great many releases, Alaska, Texas, California, Florida and Washington each typically account for about 5 – 9% of incidents reported annually. NRC data support the notion that states that do not host many petroleum-related activities appear much less prone to polluting incidents involving oil. New Hampshire, Missouri and Arizona, for example, each reported fewer than five spills in 2004 (USCGa, & d, 2006).

In light of the great disparities in spill characteristics, it follows that the types of ecosystems receiving the most oil pollution vary as well. The annual number of releases on land and in land-locked and coastal waters is typically far greater than those that occur in the oceans and contiguous zones[7]. Between 1973 and 2004, for example, nearly 180,000 oil spills were reported in the former environments, while the latter suffered about one-sixth that number (USCGb, 2006).

In spite of the considerable variation that exists across years and sources, it is worth noting that certain trends can be easily discerned. The number of releases attributed to facilities or listed as of unknown origin has remained fairly constant over the years. In contrast, the amount originating from vessels, all other non-vessels, pipelines, tankships and tankbarges, has decreased, sometimes considerably. For example, the number of spills caused by tankships dropped from a high of 846 in 1974, to just 35 such incidents in 2004. Similarly, the number of pipeline spills topped out at 667 in 1975, but had been virtually eliminated by 2004 as indicated by the reporting of just one such event (USCGc, 2006).

[6] This was about 28% of all releases reported in this year.
[7] The contiguous zone stretches from three to 12 miles off the coast of the United States.

The source of a spill is highly predictive of the volume released. Transport spills tend to be particularly large. The losses originating from the 35 tankships incidents in 2004 totaled nearly 640,000 gallons, with a single release[8] accounting for more than half of that amount. Tankbarge spills accounted for less volume overall during the same time span, however, the largest spill was more than 150,000 gallons in size. Smaller, but still significant, the single pipeline incident reported in 2004, resulted in the release of 15,000 gallons of oil into the environment. In contrast, in that same year, spills from non-vessels, other vessels and unknown sources averaged 345, 297 and 38 gallons respectively (USCGc & e, 2006).

A 2008 report to Congress on oil spills in U.S. coastal waters focused in on some of the general trends discussed above; as is customary, its conclusions were largely informed by NRC data. One of the major findings contained in that document was that both the number and severity of releases, particularly those arising from vessels, have decreased considerably since the passage of OPA90. The author attributed this outcome to a combination of increased regulatory effort and liability standards, as well as to better industry practices. These statements were tempered somewhat, however, by warnings that the nation's ever-increasing thirst for oil and the expected upward trend in over-sea importation could lead to increases in coastal spills in the future, the frequency of which already appears to have reached an equilibrium, rather than continuing to decline. The report also alluded to the possibility that the post-OPA90 successes with regard to reductions in spill frequencies and severities may have acted to lessen the perceived

[8] On December 4, 2004, the Selendang Ayu lost power of the coast of Unalaska Island. Attempts to tow the tanker to safety resulted in the release of more than 321,000 gallons of intermediate fuel oil and nearly 15,000 gallons of marine diesel. (USCG 2004 report)

importance of the issue, perhaps resulting in a loss of expertise and response capacity as resources have been diverted to other areas of need (Ramseur, 2008).

Although the statistics and trends quoted in this section are illustrative, and arguably provide the best possible representation of historic and current conditions throughout the United States, it must be kept in mind that they may not provide a wholly accurate or reliable depiction of the nation's oil pollution problem. This is because these data are collected in conjunction with federal, rather than state laws, and because they are dependent upon a less than all-inclusive reporting scheme. One of the tasks of this research, therefore, is to create a more holistic picture of this issue by speaking directly with state regulators regarding the type and severity of the oil pollution problem that exists within their individual jurisdictions.

Calculating the Consequences of a Spill

Like many areas of environmental law, modern day spill regulation, which as described above, arguably got its start with the passage of the OPA90, is founded on the notion that the polluter pays. To be sure, the value of the lost product and any damages incurred to vessels, equipment or other property, represent direct monetary losses incurred by those responsible. However, there are a variety of other related costs such as penalties, response-related expenditures and damage assessments, the amount of which can quickly escalate.

In an ideal world, polluters are identified, and through appropriate regulation, induced to provide full compensation for the damages they have caused. Through the enforcement efforts of federal and state agencies, responsible parties are made to pay costs the associated with responding to a release, including those associated with salvage and lightering activities, containment, cleanup, wildlife rehabilitation and waste disposal. Oil spills often produce environmental damages, and as a result, act to diminish public welfare by reducing the quality and quantity of the services provided by affected natural resources. These losses are recouped through natural resource damage assessments, which make spillers liable for restoring affected habitats to baseline conditions and compensating the public for interim service losses. Third party claims may also result due to a spill's impact on commercial fishing, the tourist trade, marine equipment, and other private losses suffered by those in the vicinity. Finally, federal and state regulators may level fines and penalties associated with the incident (Helton et. al., 1999).

Although costs vary considerably across cases, discussion of a few well-known spills[9] helps to illustrate the range of expenditures that can be necessitated because of a single release. Perhaps the most infamous of all spills occurred in 1989, when the *Exxon Valdez* ran aground on Bligh Reef in Alaska's Prince William Sound, releasing some 11 million gallons of crude oil into the bay. All told, the costs associated with this incident totaled nearly $11.9 billion.[10] Of this, the highest proportion went to third party suits (57.8%), followed by response costs (27.3%). Less than 10% of the total was dedicated to natural resource damage claims; public response and penalties each garnered less than 2% and the remainder covered miscellaneous expenses (Helton, et al., 1999).

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[9] These cases were chosen for inclusion here because complete cost data were available. By law, responsible parties are not required to disclose information related to third party suits and internal spill-related expenses (such as personnel overtime, equipment damages, etc.), so it is usually impossible to create a comprehensive description of spill costs.
[10] All dollar amounts are given in 1997 dollars and reflect judgments, some of which have yet to be honored.

The *Colonial Pipeline* and *World Prodigy* incidents, while much smaller in volume than the *Valdez*, proved quite costly as well. The *Colonial* release, which occurred in 1993, totaled more than 400,000 gallons of diesel fuel, resulting in over $33 million in damages, allocated in much the same way as those associated with the Alaskan spill. When the tanker *World Prodigy* dropped some 288,000 gallons of #2 fuel oil in Narraganset Bay, Rhode Island, the resulting damages were just over $9 million. In this instance, however, public response claimed a high proportion of this amount (22%), as did penalties (13.9%) and third party suits (14.6%) (Ibid.).

The above examples illustrate not only how expensive oil spills can be, but how widely the associated costs can vary. As a result of *Valdez*, for example, Exxon was ordered to pay out more than $1,000 for each gallon spilled. In contrast, the expenses associated with the *Colonial Pipeline* and *World Prodigy* spills were just over $81 and $31 per gallon respectively.

Based upon cost information from these and other incidents, the Environmental Protection Agency (EPA) has created a Basic Oil Spill Cost Estimation Model (BOSCEM). Using the BOSCEM, the socioeconomic and environmental damages, as well as the response costs of actual or hypothetical spills can be estimated. In this way, it has been determined that for all reported releases into EPA jurisdictional waters[11]

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[11] Non-marine waters and adjoining shorelines, including: i.) All waters currently used, used in the past, or may be used in interstate or foreign commerce, including all waters subject tidal ebb and flow; ii.) All interstate waters, including interstate wetlands; iii.) All other waters such as intrastate lakes, rivers, and streams (including intermittent streams), mudflats, sandflats, wetlands, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters: (A) that are or could be used by interstate or foreign travelers for recreational or other purposes; or (B) from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or (C) that are or could be used for industrial purposes by industries in interstate commerce. iv.) All impoundments of waters otherwise defined as waters of the US under this section; v.) Tributaries of waters identified in (i) through (iv); and vi.) Wetlands adjacent to waters identified in (i) through (vii).

between 1980 and 2002, about $63 billion (roughly $2.7 billion annually)[12] in damages have occurred (Etkin, 2004).

The Cost of Making the Polluter Pay

Given the magnitude of the losses resulting from oil spills, it comes as little surprise that the costs associated with their regulation are considerable. Agencies in virtually all states, even those that lack major ports and other industry-related sources of oil pollution, dedicate substantial resources to spill-related activities.

In 2005, for example, regulators in Rhode Island, the nation's smallest state, responded to some 654 oil spills and engaged in 129 re-inspections of ongoing responses. In the course of these actions, more than 16,000 gallons of product were removed from the environment, as were 3,100 tons of oily debris. In that year alone, more than $1.4 million were taken from the state's Oil Spill Prevention, Administration and Response (OSPAR) fund to cover the costs of these activities (Mulhare, 2005). To put this number in perspective, the Rhode Island Department of Environmental Management's non-personnel expenditures for the period totaled less than $20 million (RIDEM, 2005).

Federal regulators tend to intervene in very large spill events; however, it is not unheard of for state agencies to be left to respond to sizable releases alone. Although wrecked in 1965, it was not until 2006, when a beachcomber observed oil within the hull of the S.S. Catala, that Washington's Spill Prevention, Preparedness and Response Program became aware that action was needed to contain an ongoing release. State-hired contractors constructed a wall around the ship to contain the spill and subsequently recovered some 31,000 gallons of heavy fuel oil and excavated 1,300 cubic yards of

[12] All costs reported in 2002 dollars.

contaminated sand, all without federal assistance (Cameron, 2007). Responses such as this make clear why the 2005-2007 biennium appropriation for Washington's spill program totaled more than $27 million (Frazier, 2006).

Recognizing that considerable costs are often incurred as a result of governmental spill response, OPA90 created the Federal Oil Spill Liability Trust Fund (OSLTF). The Fund is used to pay for the emergency response, removal activities and NRDA carried out by federal resource trustees and for other duties specified under OPA. It can also be accessed by state regulators seeking reimbursement for a variety of spill-related expenses, such as uncompensated removal costs and natural resource damages. Since its creation, every state has accessed the OSLTF. New Jersey has made the greatest use of these moneys, receiving in excess of $132 million between 2002 and 2006. California and Louisiana have also been the recipients of considerable Fund allocations, each claiming more than $29 million during this four year period (USDHS&CG, 2007).

Regulatory Costs: Why so high?

As illustrated above, oil spills are costly events. Current legislation, particularly at the federal level, is intended to ensure that responsible parties bear these expenses. As evidenced by the many spills reported of unknown origin; however, it is sometimes impossible to determine who is at fault for a release, making the recovery of damages not feasible. At other times, spillers can be identified, yet lack the resources to cover all of the associated expenses. In such instances, federal and/or state funds are used to cover response-related costs, which helps explain why programmatic funding levels are often so high.

Responsible parties may skirt costs in other ways, too, such as when government trustees fail to fully recoup expenses stemming from the response and restoration activities they undertake. This can occur, either because the accounting necessary for reimbursement is too convoluted to be worthwhile, or because by forgiving some debts, settlement can be reached more easily. In addition, natural resource damage assessments are carried out in only a small number of cases (less than 1%), largely because of the considerable time, expense and expertise needed to complete them (Helton et al, 1999).

When responsible parties are not made to provide full compensation for the impacts of a spill for any reason, negative externalities result. Public resources may be dedicated to correcting the environmental injuries, or they may remain at least partially uncorrected, as may any private losses. State regulators are often able to acquire some money from responsible parties through penalties and other cost recovery mechanisms; however, other supplemental funding streams are typically required. Some states, such as South Carolina and Idaho, fund their response efforts through appropriations from the general fund. Other jurisdictions, including Oregon, Maryland and Florida, have devised elaborate funding schemes, which work to target the monetary burden for spill response more directly on potential spillers through the use of fees and taxes on oil imports and sales.

Even given regulators cost recovery efforts, much of the money needed to mitigate spill effects is not acquired from responsible parties. For the period spanning fiscal years 2002 to 2006, for example, in excess of $300 million were dispersed from the Oil Spill Liability Trust Fund to cover the oil removal activities and claims of both state and federal regulators. Of this total, only slightly more than $50 million were recouped from spillers (USDHS&CG, 2007). This discrepancy was particularly concerning because collection of the 5 cent per barrel tax that had been imposed on the oil industry in order to create the fund[13] had ceased in December, 2004. Luckily, however, it was reinstated in April, 2006, per requirements set forth in the Energy Policy Act of 2005 (Ramseur, 2008).

In addition to direct outlays for response and restoration, legal battles may act to increase regulators' expenditures related to oil pollution. This is because when spillers challenge damage determinations and penalties, finite regulatory resources must be used to mount legal battles. The threat of court challenges has been shown to prompt excessively complex, time-consuming and expensive assessments by regulators, so as to ensure an 'iron clad' case. Yet the findings of the non-market estimation techniques often employed for this purpose (most notably, contingent valuation) have proven to be highly dependent upon model specifications, and therefore, susceptible to legal challenges.

Even under the best conditions, as when a responsible party can be identified and is willing and able to provide the required compensation for spill-induced injuries, it is not certain that the associated environmental, economic and welfare damages will be completely offset. Limitations, both in our ability to fully recognize and accurately measure such impacts, as well as to restore affected ecosystems, call into question the very notion that the public can be 'made whole'[14] from an oil spill.

The final obstacle to mitigating the negative impacts of a release stems from the fact that our ability to launch an effective physical response to a spill can be quite limited.

[13] Through the Omnibus Budget Reconciliation Act of 1989.
[14] This idea is borrowed from common law and is specified as the primary objective of regulatory responses undertaken under the authority of the Oil Pollution Act of 1990.

Responders are often trained to use dispersants or steam to remove spilled product, but these techniques have been shown to cause environmental damages above and beyond those resulting from the release itself. Habitat restoration is often prescribed, particularly for large spill events, as a way to reinstate lost resource services. However, both the unpredictable nature of ecosystems, and our limited understanding of their composition and functioning, make this idea, however appealing it may be, largely unrealistic.

Where Do We Go From Here?

The above discussion provides an overview of a variety of topics, many of which are treated in greater depth in the literature review which forms the second chapter of this document. Despite the brevity of this introduction, the motivations for the research contained here should now be clear. Oil is here to stay, and therefore, so is the problem of oil pollution. While we have a general sense of the nature and extent of the challenge faced by regulators from a federal perspective, there is no reliable way of gauging its true scope because no single data repository exists in which all spill reports, no matter the sources, impacts or locations, are recorded. Despite this dearth of information, it is reasonable to expect that state regulatory agencies are called upon to prevent, respond to and remediate the effects of oil spills originating from a number of different sources.

It goes without question that response efforts are typically expensive and seldom sufficient to compensate for spill-induced losses. Among the states, a variety of approaches to oil spill regulation are currently in use, yet their exact strategies have yet to be catalogued and commonly-experienced challenges identified. It seems only logical, therefore, that an examination of what has been developed in these 'laboratories of democracy,' might reveal a variety of innovative and effective solutions to these regulatory hurdles.

Given all this, the current research is carried out in order to first gain a clear understanding of the nation's oil pollution problem as it exists today, as well as of the state-level regulatory programs and interventions used to combat it. In the course of gathering this information, the problems with which regulators must frequently contend will be identified, as will the most effective and efficient of the existing solutions to these challenges such that they can be analyzed and described in order to facilitate more widespread adoption.

The remainder of this document contains a summary of the prior research, of which this work is a natural extension, as well as a presentation of this study and its findings. The literature review occupies chapter two, and provides a comprehensive summation of past research and thought on a variety of topics related to the current investigation, thereby completing the task of situating and justifying the present work. Chapter three contains an overview of the methodology employed throughout the conduct of this study, which includes, among other things, a large number of interviews with oil pollution regulators.

The fourth chapter commences the presentation of the study's findings and contains data generated through the administration of a telephone survey, as well as a number of indicators gathered from other, publicly-available sources. This chapter works to describe the current and historical regulatory landscape, a goal articulated by the first research question; and whenever feasible, relates these findings to the theories and suppositions found within the extant literature. In answer to the second and third questions, it also acts to identify a number of challenges that are typically experienced by those engaged in oil pollution regulation, as well as to introduce a series of innovative initiatives that have been designed by individual states to address a number of these needs.

Chapters five and six present case studies focused on particularly promising programs in use in Florida and Wisconsin, respectively. These sections not only contain detailed descriptions of these efforts, they work to analyze their strengths and weaknesses, so as to facilitate the process of innovation diffusion. Finally, chapter seven contains a number of important conclusions to arise from this research, and acts to describe not only a number of avenues for future exploration, but highlights a series of policy-related suggestions, the validity of which is underscored throughout this document.

- Chapter 2 -

LITERATURE REVIEW

In as much as this work is unique with regard to its focus on state-level oil spill regulation, the discussion presented here serves to ground it more generally within the contexts of regulatory, ecological, economic and ethical thought. In this chapter, selected bodies of literature are reviewed for this purpose. It is upon the knowledge contained within these pages that the three questions[15] motivating this research are based, and it is with this information in mind that the desired answers are sought.

The material contained within this chapter is presented under a number of topical headings. Together these sections act to familiarize the reader with a large number of areas of previous research, theoretical traditions and trends, all of which played an important role in the design and conduct of the study described throughout the remainder of this document. The initial portion of this review explains the selection of this study's area of focus.

WHY FOCUS ON STATE-LEVEL OIL POLLUTION REGULATION?

Little Previous Research

While federal regulation under the Oil Pollution Act of 1990 (OPA) has received considerable academic attention, similar actions initiated by the states have not (Daley et al., 2005; Potoski et al., 2002; Ringquist, 1994). Previous studies of state-level

[15] 1) How is oil pollution regulated by each of the states and what factors influence their selection of a strategy for this purpose? 2) What challenges are common across jurisdictions and have any states developed effective means of addressing them? 3) What are the 'best practices' in the field of oil pollution regulation and how could they be generalized for widespread adoption?

environmental policy have mostly concentrated on hazardous waste, and to a lesser extent, on air and water pollution issues. The dearth of research focused on petroleum-related interventions is especially surprising given the finding by Ando et al. (2004b) that states dedicate the majority of their regulatory attention to correcting resource injuries resulting from oil releases, along with those resulting from other hazardous substances.

The Nature of the Problem

The problem of oil pollution has several characteristics which set it apart from other, better studied phenomena. Unlike hazardous materials and other pollutants that exist in relatively well-defined locales, oil is ubiquitous. The producers and users of oil (and hence, potential spillers) range from large corporations to small-scale operators and even private homeowners (Anderson et al., 1995; Cohen, 1987; Grau et al., 1997; Weber et al., 2000). This presents a challenge for regulators because as the diversity and size of the (potential) regulated community increases, the cost and difficulty of enforcement generally rise and the level of compliance often drops (Cohen et al., 2005).

Further complicating matters from a regulatory standpoint is the fact that oil-related injuries are largely unpredictable (Ando et al., 2004b). They are not a guaranteed byproduct of manufacturing or other processes as are many other kinds of injurious releases.[16] This makes it difficult to correlate damages accurately with production or use levels (as might be done for air pollution emissions, for example) (Cohen et al., 2005). In addition, since the transport of oil is not subjected to significant scrutiny, as is for example, hazardous waste, the relationships between oil spills and transportation mode and/or route are not well known (Sullivan, 2001). For all of these reasons, predicting the

[16] Examples of more 'predictable' pollution include discharges of gaseous emissions from power generating facilities (regulated under the Clean Air Act), or of the water used to cool nuclear reactors (regulated under the Clean Water Act).

locations and intensities of potential environmental degradation resulting from spilled oil is more difficult than it is with most other pollutants.

Finally, oil is mobile, and once spilled, can spread and contaminates areas irrespective of jurisdictional boundaries (Ando et al., 2004b). However, unlike some other types of pollution, such as emissions to air, the effects of a spill do not disperse to such a degree that they opponents of regulation can argue that the resulting externalities are insignificant[17]. Oil pollution is a localized phenomenon that demands a localized solution (Hannah et al., 1996).

An Interesting Regulatory Dynamic

Despite the void in the literature, much can be gained from studying states' approaches to regulating spills within their jurisdictions. First, like many other pollutants, oil is both socially and economically beneficial, but has the potential to cause significant environmental harm if improperly handled. Prevention of all spills would necessitate the cessation of oil-related activities; an outcome that, in the absence of a satisfactory replacement (which at the moment, is not forthcoming) is clearly untenable. Regulatory incentives, therefore, must be designed to strike a balance between the benefits associated with oil production and use, and the environmental costs they impose (Anderson et al., 1995; Cohen, 1987; Grau et al., 1997; Weber et al, 2000).

Unlike the regulation of environmental contamination under the Superfund Program, however, much of which takes place long after the polluting-activities have

[17] It has been demonstrated that Midwestern power plants were largely responsible for acidic precipitation in the Northeastern states and Canada (Solomon, 1999); however, the spatial disconnect between the polluting activities and the negative environmental consequences fueled a lengthy debate in which those responsible continually denied culpability.

ceased (Daley et al., 2005), penalties for oil releases are imposed concurrent with extraction, transport, and use. To be truly effective, therefore, regulatory interventions must be structured so as to discourage polluting behaviors, and/or encourage consistent reporting and cleanup (Anderson et al., 1995; Cohen, 1987; Grau et al., 1997; Weber et al, 2000).

Finally, in their management of air and water pollution and of hazardous waste, states have the option of assuming primacy over federally-designed programs. In so doing, they take on the regulatory mantle, coupled with federal reporting requirements, but are eligible for considerable support in the form of funding and training. While delegation of the Environmental Protection Agency's (EPA's) Underground Storage Tank program is an option[18], this federally-designed and supported program is relatively narrow in its focus and since many releases of oil do not originated from tanks, states must decide for themselves whether and how to address many of the spills they experience.

SPILL REGULATION

Environmental regulation can be thought of as an ongoing social exchange between the government, the citizenry and in many cases, private business. Such manifestations of collective choice rely not on a simple aggregation of individuals' preferences, but are the outcome of political deliberation and the selection of a representative government. Guided by legislatively-determined mandates and policies, regulatory agencies intervene in the behaviors of particular groups to ensure that they do

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[18] Articulated in Subtitle 1 of the Resource Conservation and Recovery Act (RCRA). See: http://www.epa.gov/swerust1/ for more information about this program.

not compromise the public good; a goal often achieved through the minimization of negative externalities or the establishment of distributional equity. Accomplishing these ends with the minimum expenditure of public resources is also a necessity (Alford, et al., 2006).

While the passage of a law often sets the stage for environmental protection, the agencies responsible for enforcing that legislation exert considerable control over the nature of the resulting policies. Similarly, the level of compliance (and therefore, the efficacy of the government's action) depends largely upon the characteristics and positioning[19] of those who must comply. (Alford et al., 2006; Cohen et al., 2005; Firestone, 2003; Fredriksson et al., 2002; Sapat, 2004)

There exist a variety of factors that impact whether and how regulatory interventions are undertaken. Presented here are an overview of the potential motivations for states to engage in oil pollution regulation, as well as a discussion of the likely outcomes associated with different strategies.

Spill Response and Remediation:

Although dependent upon the nature of the spill and the identity of the spiller, regulatory actions generally proceed along a predetermined continuum. The task of preventing releases is one which many state programs take quite seriously, as evidenced by the language and outreach materials contained on their websites[20]. Once a spill has occurred and is reported, however, initial efforts are focused on containing and removing

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[19] In terms of identity (private firm, government agency, etc.), likelihood of committing a violation, wealth, and other such characteristics.

[20] See for example, the Alaska Department of Environmental Conservation's Division of Spill Prevention and Response's website (http://www.dec.state.ak.us/spar/) and the Washington Department of Ecology's Spills Program's website (http://www.ecy.wa.gov/programs/spills/spills.html).

the contaminants and ensuring that human and environmental health are safeguarded. Such actions are described as ‘short-term removals’ in the context of the EPA’s Superfund Program (EPA, 2007), but similar procedures are standard fair among regulatory programs of this type.

Only after basic safety concerns have been addressed can regulators shift their focus to the issues of ‘long-term remedial response,’ a moniker adopted by the EPA to describe site-specific cleanup procedures used to remove or render harmless, any contaminants that cannot be immediately addressed in the aftermath of an incident (Ibid.). Such undertakings may span years, others lifetimes, because their timelines vary according to site and contaminant characteristics, as well as on the cleanup technologies employed. Decisions regarding penalization and/or the pursuit of damages are also made once initial response efforts have concluded.

Clearly, logistical constraints necessitate some level of consistency across efforts at spill response and regulation. The details regarding how exactly these tasks are accomplished, however, have not previously been explored in any comprehensive or detailed manner; a void which will be filled in the course of this research.

Working in Tandem with Federal Efforts

In addition to potential federal involvement through the UST program, state regulators can and sometimes do take action under other federally-derived authorities. All, for example, may file suit under the Oil Pollution Act of 1990 (OPA) [21], the primary piece of federal legislation covering petroleum contamination (Daley et al., 2005; Lester,

[21] OPA is most likely to be invoked by states that lack their own authorizing legislation for large or particularly injurious spills.

1994; Potoski et al., 2002; Ringquist, 1994). More often, however, these agencies act as participants in federally-led spill responses, or initiate proceedings under the authority of a state law (Ando et al, 2004a and 2004b). Given these conditions and the fact that federal regulation may provide a model for states in designing their own legislation and programs, some discussion of OPA is included here.

OPA was promulgated in direct response to a series of four major oil spills[22] that occurred between 1989 and1990, the best known of which was the *Exxon Valdez*. Its goal is reminiscent of common law principles, as it is not designed to exact punitive penalties against responsible parties. Rather, suits brought under this legislation must aim to "make the public whole" from losses due to natural resource injuries and the resulting diminution of services, through the acquisition of what are termed "compensable values." This goal, which is accomplished through natural resource damage assessment (NRDA) and restoration, is largely believed to have come about in order to avoid the kinds of controversy and legal challenges that ensued as a result of actions taken under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (Lee et al., 2002; Ofiara et al., 2001; Wickham et al., 1993).

Under OPA, federal resource trustees (i.e. agencies including the EPA and the National Oceanographic and Atmospheric Administration (NOAA)) are tasked with regulating spills that occur within their designated resource jurisdictions. State regulators and other groups, such as Indian tribes, may also become involved in the process as co-

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[22]Apart from the *Exxon Valdez*, the spills which prompted the passage of OPA were: the *Apex Houston* which released crude oil into San Francisco Bay in 1989, the *Nautilus* in New Jersey and New York's Kill Van Kull1990, the *World Prodigy* spill, which occurred in Rhode Island within 24 hours of the *Nautilus*, and the *Presidente Riviera* release into the Delaware River, also in 1990. (Ibid.)

trustees, forming a "Unified Command System." The Unified Command acts collectively (often together with the responsible party) to respond to a spill once reported and to assess its impacts (Lee et al., 2002.).

In addition to compensable values, OPA allows trustees to seek compensation for restoration costs[23], defined as the actual cost of assessment, resource reclamation, replacement or acquisition of equivalent resources. Liability ceilings are spelled out in the law, which limit the amount a spiller can be required to pay in the aftermath of a release; that is unless gross negligence, intentionality, or other mitigating circumstances can be proven. In addition to their responsibilities under OPA, spillers are also often subject to third party lawsuits, and in some instances, to penalties originating under other applicable legislation (Ibid.).

In general, spill prevention and response are costly activities; however, state regulators can seek reimbursement for some of these expenditures from the Federal Oil Spill Liability Trust Fund, which was initiated with OPA's passage. The availability of this money has undoubtedly provided much needed support to state programs and represents another important tie between state and federal spill regulation efforts. Since its creation, every state has accessed the fund at least once. (OSLTF Report, 2007). When the original funding source sunsetted, there was fear that the Fund would be exhausted, but specification of a mechanism within the text of the Energy Act of 2005 ensured its continued viability (Ramseur, 2008).

Despite the numerous linkages between state and federal approaches to oil pollution regulation, great variation has been observed across states in terms of their

[23]In the event that more than one satisfactory restoration alternative is identified, the most cost effective option must be selected.

degree of involvement with their federal counterparts. Also, considerable differences exist with regard to whether and how states penalize spillers. What is clear, however, is that although NRDA is a routine element of federally-led spill responses, it is much less common when state agencies act alone; in such cases, cost recovery and the imposition of penalties appear to be the primary focus (Ando et al. 2004 a and b.).

REGULATORY DRIVERS

Given the apparent differences that exist between states with regard to oil pollution regulation, it is important to understand why such disparities exist. The literature reviewed here provides some potential explanations for this state of affairs.

External Pressures

The importance of interest groups in the design of environmental legislation at the state level has been the subject of considerable study. Some evidence has been found that the presence of strong industry organizations is associated with weaker regulation, whereas high levels of public participation in environmentally-focused associations leads to more stringent legislation (Daley et al., 2005; Lester et al., 1983; Potoski et al., 2002; Ringquist, 1994).

In addition to the often unseen pressure applied by interest groups, a highly publicized, usually negative event, such as a terrorist attack or instance of severe environmental degradation, can also be a catalyst for policy creation or change. Upon learning of these ‘focusing events,’ people may demand governmental intervention to prevent future such occurrences. Under intense public scrutiny, policy windows often open through which laws and policies designed to address the issue of concern can pass. The momentum created by a focusing event may be such that governmental action occurs almost immediately, even if prior attempts at legislation floundered against entrenched opposition or as a result of scarce resources (Birkland, 1998; Kingdon, 2003; Kurtz, 2004).

History reflects the importance of focusing events in the field of oil pollution regulation. For example, prior to 1990, federal legislation designed specifically to address oil spills had been proposed in nearly every session of Congress since 1976 (CIS, 1990). Less than one year after the *Exxon Valdez* ran aground, releasing some 11 million gallons of crude oil into Alaska's waters, the Oil Pollution Act of 1990 (OPA) was enacted, superseding existing legislation to create a comprehensive federal regulatory approach for oil spills[24] (Lee, 2002; Offiara et al, 2001; Paine et al, 1996). Not only was the *Valdez* incident the largest spill in U.S. history, it suspect causes and poorly managed cleanup efforts both received extensive media coverage and incited public outrage (Kurtz, 2004; Heller, 1989; Mathews, 1989; Paine et al, 1996; and Schneider, 1989).

State-Specific Conditions

Wealth, legislative and regulatory professionalism, as well as the severity of environmental degradation, have also been suggested as important predictors of states' behaviors. Since regulation is expensive and technically challenging, affluent

[24] It is also worth noting that in the wake of the *Valdez* scandal, the State of Alaska acted to fundamentally alter its regulation of the oil industry's activities. Despite the state's reliance upon petroleum-related activities for over 80% of its annual budget, new legislation was enacted and much stricter regulations created.

jurisdictions, characterized by professional legislatures and well-staffed agencies, are more likely to take actions to curtail polluting behaviors. Similarly, the greater the damage caused by a particular industry or substance, the more likely states are to take measures to regulate the injurious behavior (Daley et al., 2005; Hays et al., 1996; Lester et al., 1983; Ringquist, 1994).

Finally, because resource use patterns form a kind of property rights regime (Hannah et al., 1996) states with a propensity for the protection of public rights, rather than the a strict adherence to the Lockean view of government as the protector of essential private rights (Frug, 1999), may be more likely to create legislation to regulate spills, and particularly to pursue NRDA. Guided by this logic, one might expect states such as Oregon and New Jersey,[25] in which private property rights have been diminished to preserve the overall character or the quality of their natural resources, would be more likely to seek resource damages than would those states in which no measures of this kind have been pursued, or the legitimacy of such actions struck down by the judiciary. Existing literature has little to say about the strength or nature of the relationship between natural resource management and states' treatment of other types of property rights; however, given that resource use is inherently about these rights, it is an area worthy of exploration.

SELECTING A REGULATORY STRATEGY

Once the need for regulation is recognized, a variety of factors influence how it is carried out, and with the exception of deciding programmatic funding levels, state

[25] Referring specifically to the decisions to place a growth ring around Portland and to restrict development in the New Jersey Pinelands and Highlands, however, many other similarly-intentioned examples can doubtless be found in these and other states.

regulatory agencies often have considerable autonomy in selecting their regulatory strategies (Cohen et al., 2005; Sapat, 2004). The resources needed, as well as the likely outcomes, influence states' selection from among available approaches.

Innovation in Regulation

Integral to any discussion of regulatory design at the state-level is a recognition that each jurisdiction can be thought of as having a distinct 'personality' in this regard. Some, such as California, Washington and New Jersey, are often identified as environmental innovators. These states are consistently among the early adopters of new and more stringent regulations; such as those related to allowable emissions levels, technological safeguards and waste treatment; and develop unique instruments to enforce them (Fredriksson, 2002; Duerksen, 1983; Greenberg et al, 1991; Sapat, 2004). Given the considerable variation that exists between states, it is worth exploring why some are consistently at the fore with regard to embracing new regulatory designs, while others adopt these policies much later, or not at all.

The characteristics of individual states, and of the agencies responsible for implementing oil spill policies, likely explain at least some of the observed variation. Leaders in a particular arena, for example, may be less likely than their lower-status counterparts to act innovatively, due to their relative risks of failure. Conversely, the degree of technological advancement and wealth of a group, appear to be positively correlated with probability of embracing new ideas (Wejnert, 2002).

To a large degree, connectedness with other, similarly-focused organizations can influence whether or not an innovation is adopted. Developers and initial implementers of new approaches are often driven by the desire to increase efficiency or effectiveness, however, strategies are thought to reach a tipping point at which their adoption symbolizes more of an affirmation of the adoptee's belonging to a particular organizational culture, than confirmation that the specific intervention provided the best possibly solution to a recognized need (DiMaggio et al., 1983). Intra-organizational contacts, particularly in the form of direct interactions such as face-to-face communications and community ties, are critical to facilitating this type of diffusion, as groups that are largely isolated appear more likely to adopt approaches that can satisfy their specific needs. Diffusion of this kind may be vertical (occurring, for example, from legislature to department) or horizontal (in this instance, from state to state). Whether isolated or well-connected, the greater the familiarity of a group with a particular approach, the more likely its adoption (Wejnert, 2002).

With regard to state policies in particular, certain factors appear especially important in influencing innovative behaviors. Rule-like behavioral models and media attention have been shown to play an instrumental role (Ibid.). Evidence of the importance of such channels in the context of oil pollution regulation may be manifest in jurisdictions' actions, particularly in the period of time following the *Exxon Valdez* spill. The incident garnered considerable national coverage in the media and prompted the federal government to pass OPA; two factors which may have incited changes in state spill policy.

Also important is structural equivalence, or the degree to which entities resemble one another with regard to cultural, economic or behavioral traits. Such similarities have been shown to be particularly influential when state bureaucracies decide whether to embrace a practice already in use by their counterparts (Abbott et al., 1992). This finding lends credence to the "organizational isomorphism" hypothesis advanced by DiMaggio et al. (1983) and others, one of the central arguments of which is the claim that as organizations change over time, they tend to assume more similar forms and practices. This trend is a result, not so much of competition, or of efforts towards increased efficiency converging upon a single best approach. Rather, the tendency towards sameness observed within established organizational fields is thought to result because of the "structuration" which typifies such endeavors, a term which refers simply to the constrained parameters within which problems can be approached, particularly a bureaucratic context.

Cooperation: A Popular Strategy

Despite this study's focus on the state agencies' perspective, regulation is not a one-way street, rather, a reciprocal relationship exists whereby the appropriateness of particular policy instruments is dictated by existing conditions; yet the nature of those circumstances is in many ways changed by the policies that are adopted. The continual exchange between regulators and the groups whose behaviors they seek to modify is perhaps the most important element of this dynamic (Alford et al., 2006).

Agencies tasked with enforcing laws do so by creating and maintaining a procedural framework in which those who are obligated to comply must operate. Among the most powerful tools in a regulator's arsenal, therefore, is the ability to control the methods and ease with which their requirements can be met. Regulatees, for their part, make the decision as to whether, and to what extent, they will behave in accordance with an agency's mandates. This choice is in part a function of a group's capacity and orientation; but is also influenced by how fair and transparent it perceives the regulations, and the agency enforcing them, to be (Alford et al., 2006). Given this dynamic, therefore, consideration must be given to the kinds of bureaucratic, political and economic realities in which both enforcement agencies and the regulated community operate.

Regardless the innovativeness of individual jurisdictions, on the whole, agencies have been shown to be embracing alternatives to traditional enforcement styles with increasing frequency (Baldwin et al., 1998). As evidence of this trend, the cultivation of cooperative relationships with regulatees, particularly when pollution prevention is a stated regulatory goal, has been widely observed (Andoa et al., 2004; Sapat, 2004).

This movement towards increased cooperation is likely due to the perceived wastefulness and susceptibility to corruption of more traditional command and control strategies[26] (Baldwin et al., 1998). Sometimes referred to in terms of a 'client focus,' and understood as a form of social exchange[27]. The goal is to create a dynamic in which parties voluntarily comply with regulators' desires, rather than relying on the power of coercion to incite desired behaviors. This task is generally accomplished using a combination of positive and negative policy tools (Alford et al., 2006).

While some use of direct incentives (i.e. grants, tax breaks, etc.) may be made to incite particular behaviors (Baldwin et al., 1998), more often regulators actively tailor

[26] A dynamic in which a regulatory agency 'commands' regulatees to behave in a certain manner, and then 'controls' the situation (through the enforcement of penalties for violations) to ensure that its mandates are met (Baldwin et al., 1998). Although command and control approaches have been criticized as being wasteful of firms' resources and for providing incentives for noncompliance, they have been quite successful at protecting environmental quality under a variety of circumstances (Cohen et al., 2005).
[27] Social exchange theory deals with transactions between parties of items they consider to be of value (Alford et al., 2006). This value is often not monetary in nature, but may take the form of aide in a time of need, friendship, etc.

their treatment of regulatees to enhance the likelihood of desired outcomes. Fast responses to reimbursement claims or permit requests, for example, can raise the likelihood of expenditures for covered cleanups or proper construction. Accessibility of agency staff and the reduction of costs associated with compliance are also thought to encourage good behavior on the part of regulated groups. In general, the greater the perceived fairness and transparency (termed the 'functional quality') of a regulatory system, the greater will be peoples' willingness to comply with its mandates, and to bear any sanctions resulting from violations. Finally, 'regulatory relief' (the forgiveness of minor infractions) may be used as an olive branch by regulators to improve relations with those they oversee, thereby establishing a level of rapport that can ease future interactions (Alford et al., 2006).

Although research specific to the field of oil pollution regulation is sparse with regard to enforcement practices, there is evidence to suggest that cooperation, or the lack thereof, can have a major impact on spill response and ultimately, on the effectiveness of the resulting cleanup. John Gallagher (2002), for example, examined the effect of the Department of Justice's use of strict criminal liability for oil spills and found it to be "…demonstrably counterproductive to the protection of the environment from the effect of spills…" and identified this practice as posing a major threat to the effectiveness of the Unified Command Structure utilized under OPA90. These outcomes result, according to the author, because the mere threat of such harsh sanctions acts to diminish responsible parties' willingness to work together with regulators to mitigate a spill's impacts, thereby increasing response times and decreasing their effectiveness.

Consideration of Costs

The adoption of a particular practice is also in part a function of whether the associated consequences are public or private in nature. Public consequences come in the form of breakthroughs or reforms that have historical significance, and the policies that produce them are more likely to be put in place when they are reflective of commonly-held values. Private consequences, conversely, are more narrowly defined as making those who embrace a particular practice better-off. Approaches that produce private benefits are most likely to spread under conditions of closeness, both in terms of spatial distances and social relations (Wejnert, 2002). As is often the case, new strategies for oil pollution regulation have the potential to produce both types of benefits, in the form of improved environmental quality and/or reduced governmental expenditures.

As a rule, the costs associated with implementation are major determinants of adoption. If a policy entails financial uncertainty, a type of direct cost, implementation is made less likely. The presence of indirect costs, such as the assumption of risk, or the potential to incite conflict, can also stymie the advance of new ideas and practices (Ibid.).

Compliance Posture

Another factor which must be considered in determining the appropriateness of a given regulatory strategy is the compliance posture of those whom it affects. Voluntarily compliant regulatees are often motivated, at least to some extent, by intrinsic normative motives that predispose them to obey the law out of principle. At the other end of the behavioral spectrum, some break the law opportunistically, particularly when the likelihood of detection and/or sanction is low. Given that individual actors assume these postures to varying degrees, care must be taken in designing a regulatory strategy, as the strict use of penalties may discourage voluntary conformity, yet appeals based on morals alone will likely result in increased violations (Alford et al., 2006).

To address the dilemma of creating a policy capable of inciting a set of desired behaviors from such differently-oriented groups, agencies may adopt a 'tit for tat' tactic. A theory popularized several decades ago by Robert Axelrod (1981) who used it to describe cooperation as it pertains to evolutionary trends, a tit for tat strategy is one in which a cooperative stance is adopted at the outset, but future postures are designed to mimic those displayed by external parties.

In the case of regulation, therefore, a tit for tat strategy would dictate an emphasis on, among other things, open dialogue, outreach and education during initial interactions with regulatees. For those who prove their reliability, this posture would be maintained; however, for groups that are perceived to act evasively or to take advantage of the situation, traditional disciplinary actions (such as the imposition of penalties) would be taken. If cooperation with the sanction results, the regulate is once again treated in a more trusting manner; if not, penalties and legal actions escalate in severity, in a manner consistent with a traditional command and control scheme (Alford et al., 2006)

Explanations for Lax Enforcement

It has been observed that enforcement actions are taken infrequently in some jurisdictions. This apparent lack of state action may result from the fact that injurious incidents involving petroleum occur infrequently in particular locales[28]. Given the

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[28] According to U.S. Coastguard reporting, for example, Montana and South Dakota had no releases in 2000 (Ando et al., 2004a).

scarceness of regulatory resources, these jurisdictions may (logically) opt to direct them towards more pressing problems (Ando et al., 2004a). Lax enforcement is not necessarily correlated with low risk,[29] however. Rather, it may result from such factors as the relative economic and political importance of the petroleum industry within a given state (Ando et al., 2004a; Firestone, 2003).

The terms "iron triangle" and "industry capture" have been coined to describe policy-making relationships in which maintenance of the public welfare becomes de-prioritized. A triangle typically consists of the legislature, enforcement agencies, and interest groups; and results in regulatory actions that are designed to benefit the interest groups whose insider position within the system allows them access to key law makers and civil servants. When the special interests involved are members of the regulated community, 'capture' can result; a dynamic in which government rescinds its watchdog status, instead using its authority for the benefit of the industry involved (Baldwin et al., 1998; Kingdon, 2003; Sapat, 2004).

There is some evidence to suggest that pressure from interest groups has less effect on the actions of a state's regulators than on its legislators. This is perhaps because the attentions of interest groups are typically focused on influencing the opinions of lawmakers and the public, rather than on altering agency procedures (Sapat, 2004). In instances where government officials must rely on industry for information critical to standard setting or other elements of the regulatory process, however, these insider groups have ample opportunities to pressure regulators directly, such as through the notice and comment period required of many agencies (Baldwin et al., 1998).

[29] Texas, for example, suffered 1055 spills (totaling 161,365 gallons) in 2000, yet has no active regulatory program in place. (Ando et al., 2004a)

The public, whose interests are compromised by an iron triangle or industry capture, may be incapable of mounting an effective opposition. The dispersed nature of the populace, combined with people's limited understanding and interest in matters of regulation make detection unlikely. Even when a questionable dynamic of this type is discovered, there may be little recourse for those who would challenge the status quo, given the identities of those involved and the complex nature of legal and regulatory processes (Ibid.). It is also possible that a more innocuous explanation can be found in instances where enforcement is lax or nonexistent, such as limited regulatory capacity in the form of personnel and funding. (Ando, et al., 2004a; Firestone, 2003)

THE GOALS OF REGULATION:
DETERRENCE AND COST SAVINGS

In addition to factors such as agencies' capacities and regulatees' likelihood of compliance, the desire for spill deterrence and the need to conserve scarce regulatory resources are often major motivating factors in regulatory design and execution, and may also serve as the performance measures against which the efficacy of agencies' actions are judged. The need for cost savings stems from regulators' use of public resources to accomplish their ends (Alford et al., 2006), and can in fact, be facilitated by lessening the number and/or severity of petroleum releases. In addition to reductions in regulatory outlays, deterrence is desirable because ameliorating the negative impacts of oil spills is difficult, primarily due to the fact that nearly every aspect of the regulatory process is characterized by uncertainty (Daley et al., 2005).

Given the challenging conditions faced by regulators, coupled with the need to balance the beneficial outcomes that result from oil use with actions to limit the level of resulting pollution, prevention of releases is identified by many agencies as their primary goal. Much environmental legislation, beginning with the Clean Water Act of 1972, supports this focus. (Castle et al., 1994; Daley et al., 2005; Muoghalu et al., 2001; Weber et al, 2000)

The theory of deterrence is based on the notion that humans are rational actors and will work to attain positive incentives and avoid negative ones (Ehrlich, 1996). It postulates that appropriate penalties, which may be direct, for example through the leveling of fines or the suspension of operating licenses, or indirect as with the generation of image-damaging negative publicity, can induce potential polluters to alter their actions. In this way, the number and/or severity of environmentally injurious events can be reduced. (Cohen, 2005; Weber et al, 2000)

Complete deterrence is rarely attained, partly because the effectiveness of policy "sticks" such as lawsuits and fines depends upon a variety of factors. The severity of the punishment and the resulting negative effects, including those to public image, are important determinants of deterrence. A potential polluter's aversion to punishment, as well as their capacity to avoid committing violations, also figure in their behavior. Regulatees are expected to maximize their own utility; a strategy which could entail continuing to pollute illegally under certain circumstances, specifically when the expenses associated with compliance outweigh the potential costs of polluting, including any associated penalties. When enforcement is difficult, either because infractions cannot be consistently detected, or because the legal and/or administrative structure is cumbersome, lower levels of deterrence can be expected (Cohen, 2005; Ehrlich, 1996).

In some instances, total deterrence of unwanted behaviors through regulatory interventions may not, in fact, be the desired outcome. This is the case when an otherwise beneficial activity would have to be completely abandoned to eliminate all negative impacts (Cohen, 1987; Ehrlich, 1996; Firestone, 2003). Oil pollution arguably fits this description, as the substance is an integral component in so many of our everyday activities, and because spills are still possible, even when appropriate safety measures are in place.

The desired state of affairs, therefore, is to construct a monitoring and enforcement framework that balances the need for environmental protection with those of the regulated community. Deterrence theory posits that officials wishing to reduce the level of undesirable behavior on the part of the regulated community can take one of three actions: they can increase the severity of the penalty, decrease the delay between the offending action and the resulting punishment, or increase the likelihood that the undesirable action will be detected and/or the penalty enforced (Olsen, 1988). With regard to oil-related resource injuries, therefore, it has been postulated that a program with consistent monitoring of potential polluters and enforces high penalties within a short timeframe will be more successful at reducing the number of injurious incidents than will one that takes a more lax approach. (Cohen, 1987; Weber et al, 2000)

Penalty Design

According to the literature, not all states seek natural resource damages when oil is spilled; the imposition of penalties, however, is likely universal, making penalty design a topic of considerable interest. The appropriateness of a given instrument is dictated by the characteristics of the regulators and regulatees, the major sources of pollution, as well as the natural environments most often impacted. The need for deterrence and cost savings also influence the process of penalty selection.

Severity of Punishment

Instruments range in coerciveness from purely voluntary self-regulation, to market-based approaches, to the more traditional command and control strategy, which involve standard setting, reporting, and formal compliance tracking. In specifying penalty structures state agencies have variously elected to use administrative, civil, and/or criminal instruments. The severity of punishment, as well as the difficulty of implementation, varies with the method selected, with civil penalties representing the most forgiving and inexpensive to enact, and criminal penalties the most harsh and costly to apply (Firestone, 2003).

Potential Motivators

Typically the effectiveness of a regulatory body is gauged by the number of cases pursued. This is largely because the number of litigated cases is easily monitored (Ibid.); however, critics have labeled this approach for gauging regulatory effectiveness “bureaucratic bean counting,” in part because it can encourage myopic regulation and induce erroneous penalization (Adler, 1998). Regardless of one’s take on this practice, case-load monitoring promotes punishment of small infractions. Moreover, it apparently encourages a preference for administrative penalties, rather than criminal or civil ones, since these can usually be handled entirely within the agency, and can therefore be imposed more quickly and at relatively lower cost (Firestone, 2003).

In some instances garnering political support may be of primary concern among regulators. This occurs when targets of regulation have considerable political and/or financial clout and can be expected to retaliate against the imposition of sanctions, or when there is significant public interest in a particular issue. If regualtees are politically influential or a major employer, administrative actions are most likely and criminal prosecutions highly unlikely. Conversely, if swift and severe penalization is desired by the community affected by a violation, criminal proceedings are often the enforcement venue of choice (Cohen et al., 2005; Firestone, 2003).

Some states' regulatory strategies may be explained by the "case reality" theory, which posits a polluter's identity influences the type of penalty that is imposed. The size of the firm perpetrating a given offense can affect the way enforcement is carried out due to a set of inherent differences that exist between large and small entities. The number of employees affects the ease with which guilty individuals can be identified. The relative viability and economic importance of the perpetrating firm with in the community, including considerations such as financial standing, technical capacity and length of operation, also vary with size. These financial concerns impact a responsible party's ability to comply with mandated environmental safeguards, to challenge the indictment processes, and to pay fines for violations. (Firestone, 2003)

Finally, smaller-scale firms are also less likely than their larger counterparts to fully understand regulatory guidelines or to believe that they truly apply to their operations. In light of these conditions, case reality theory predicts that administrative and civil enforcement efforts dominate in dealings with large businesses, while criminal prosecution is more likely when offenses are perpetrated by small-scale entities. (Ibid.)

NATURAL RESOURCE DAMAGE ASSESSMENT

Whether acting under federal or state legislation, when oil is spilled, regulators may undertake a natural resource damage assessment. This action is taken to recover losses termed compensable values, which result from changes in the economic welfare of resource users and non-users as the result of a spill-induced injury (Offiara et al., 2001.). These damage assessments determine the (often considerable) costs to be born by responsible parties above and beyond any penalties or other spill-related expenses that they expend directly or are recovered by outside responders and/or regulators[30] (Lee et al., 2002; Offiara et al., 2001). While conducted infrequently[31], NRDA has been the subject of considerable debate; both because its motivations and goals represent a departure from traditional regulatory undertakings, and because of the considerable logistical challenges that must be overcome to conduct it.

While some states conduct NRDA routinely, even for small spills, others never do, except as participants in federally-led cases (Ando et al. 2002 a and b). Given the uniqueness and relative rarity of this regulatory intervention, the following sections are devoted to explaining both the motivations behind it, as well as the methodologies employed and challenges that must be overcome to accomplish it.

Natural Resources: A Primer

When oil enters the environment, injuries to natural resources can be a major consequence. Included among the nation's natural resources are its air, water, wildlife

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[31] NRDA is undertaken for less than 1% of reported spills (Helton et al, 1999).

and biota (NOAA, 1996). These entities do not exist in isolation, but rather as integral components of wetlands, forests, estuaries and other ecosystems. Within the regulatory context, natural resources are considered valuable because of the resource services they provide Services such as food production and waste management, described as "ecological processes that produce, directly or indirectly, goods and services from which humans benefit." (Limburg et al., 1999)

Norberg (1999) depicted natural resource services as falling into three general categories: those that are integral to the internal maintenance and functioning of the system, those related to the regulation of external inputs, and those associated with ecosystem structure and functioning. These services, then, can take an almost infinite number of forms. While some of the resulting benefits are captured for private gain,[32] many are thought to accrue more or less equally to all. For this reason natural resources (as defined in OPA90 and other relevant legislation) cannot be privately owned, but instead are held in trust for the public by designated government entities.[33] (Austin, 1994; Efroymson et al., 2004; Hannah et al. (eds.), 1996; Jones, 1997; Lee et al., 2002; Offiara et al., 2001; Peterson et al., 2003; Renner et al, 1998)

Many natural resources can be described as "common pool" resources, both because achieving successful exclusion of would-be users is difficult, and because as the number of users increases, the overall quality of the resource is diminished. If the

[32] Some argue that the dependence of the market on naturally-derived inputs is so profound as to support the notion that "ecological and economic systems (are) jointly determined;" a view which contradicts the more traditional view which casts natural elements simply as 'factors of production;' lending further support for efforts at environmental protection. (Bollier, 2003; Hannah et al. (eds.), 1996)

[33] A forest, for example, may be a source of profit for timber companies who harvest and sell the trees, but it also functions to sequester the greenhouse gas carbon dioxide; thereby providing a service which benefits everyone.

carrying capacity of the resource[34] is exceeded through overuse, it will cease to function as species become extinct and/or natural cycles are disrupted (Ciriacy-Wantrup et al, 1975; Dietz et al, 2003; Hannah et al. eds., 1996; Hardin,1968). This outcome, in which '(f)reedom in a commons brings ruin to all' (Hardin, 1968 pp. 1244) has memorably been termed the 'tragedy of the commons.'

Unlike market goods, common pool resources require no advertising, but are sought by users; a characteristic that is thought illustrative of their superior value, and cited as evidence of the clear need to maintain their continued functioning. (Bollier, 2003) In order to subvert the tragedy of overuse, which, it has been argued, can only occur in 'open access' systems[35], various management structures have been proposed. Inspired by the writings of economists such as Coase and Demsetz, some argue against governmental management, advocating instead for the privatization of natural resources as a means to ensure their continued viability.[36] Serious objections have been raised about such propositions, however, for reasons of fairness and accessibility (Bollier, 2003; Hannah et al. eds., 1996), and because of problems related to the specification of property rights (Grafton et al., 2000), transaction costs and economies of scale (Cole, 1999).

In some instances, localized or community-based management structures have proven quite sustainable and effective at stemming resource abuse given certain circumstances. The existence of a defined group of users, as well as the ability to monitor use and exact punishments for violations, are among the most important

[34] Defined as the level of use which can be maintained indefinitely (i.e. where a resource's regenerative capacity is greater than, or equal to, the rate of depletion).
[35] This is a dynamic in which oversight is essentially absent and anyone who wishes to use the resource can do so, in whatever manner and to whatever extent they desire.
[36] See for example: DeAlessi, Louis. Property Rights and Privatization. *Proceedings of the Academy of Political Science.* 1987. (36):3. pp. 24-35.; Drakic, Maja. Privatization in Economic Theory. *IBL Working Paper.* 2006. Grafton, Quentin R. and Dale Squires. Private Property and Economic Efficiency: A Study of a Common-Pool Resource. *Journal of Law and Economics.* 2000. (43):2. pp. 679-713.

prerequisites for this type of management. Despite the fact that this approach has enjoyed some level of success within the U.S. context (Kellert et al., 2000), more often the position of regulators and legislators has been that top-down, "command and control" approaches are preferable for managing the nation's many natural assets. (Ciriacy-Wantrup, S. V., 1975; Hannah et al. eds., 1996; Hardin, 1968; Holling et al., 1996; Ostrom, 1999)

Oil Spills: Resource Use or Abuse?

The kind of extractive use of resource services described by Hardin and others is quite familiar; however, oil spills could alternatively be described as impinging upon nature's capacity to act as an 'environmental sink.' This type of resource use does not entail removal, but instead refers to the exploitation of ecosystems' ability to absorb and (up to a certain point) mitigate anthropogenic wastes.[37] (Hannah et al. (eds.), 1996) It is through this lens that environmentally injurious events, such as oil spills, can be understood in the context of the commons.

Absorptive capacity is not infinite and just as populations can become overstressed as a result of excessive harvesting, environmental sinks' carrying capacity can be overwhelmed, leading to systemic degradation (Ibid.). Although some environmental regulations are based on the identification and maintenance of sustainable levels of pollution[38], such a system is arguably unrealistic for oil pollution due to the unpredictability and concentrated effects of releases. Also, given this approach's

[37] Absorption and mitigation, therefore, are considered resource services in this context.
[38] (This logic underlies programs such as the cap and trade system for sulfur dioxide that was set up under the 1990 Clean Air Act Amendments, and the distribution of effluent allowances under the Clean Water Act. (Cohen et al., 2005)

apparent granting of a 'right to pollute,' many object to it on moral grounds (Cohen, 2005; Des Jardins, 2001; Light et al., 2003).

While the use of environmental sinks is one way of conceiving of what happens when oil is spilled, there exists another, perhaps more widely-accepted vantage point. Often spills are treated, not as instances of resource use (or the capturing of services provided by sinks), but in terms of the injuries they cause to the individual natural resources whose functioning (services) they compromise. To illustrate the prevalence of this view, one need only think of what occurred in the aftermath of the grounding of the *Exxon Valdes* in Alaska's Prince William Sound. Clearly, that event was not depicted so much as an instance in which the local ecosystems' ability to absorb oil was used (and arguably, exceeded), but as a horrific tragedy in which thousands of animals were killed and injured, habitats compromised and fishing and other industries damaged. (Heller, 1989; Herz, 1989; Kurtz, 2004; Lee et al, 2002; Offiara et al, 2001; Paine et al, 1996; Schneider, 1989).

Oil Spills as Ecosystem Disrupters

In the context of NRDA, when a diminution in service levels results from a release, a "resource injury" is said to occur; such injuries are symptomatic of compromised ecosystem functioning. In fact, it is through this particular lens that the overlap that exists between the seemingly opposite notions of environmental sinks and of spills as injurious events becomes apparent. Studies have consistently linked ecosystems' resiliancy, or their ability to withstand and recover from perturbations, to their overall health and level of diversity. Introduction of pollutants can act to weaken natural systems, primarily through the elimination or degradation of component parts (Hannah et al., 1996; Cairns, 1980). The exact nature of any individual release can be difficult to predict, however; because organisms' tolerances and trophic cycling are often complex; a condition that underscores the delicacy of the natural balance, and validates the depiction of spills as sustainable at some level, yet at the same time as undeniably damaging events.

Simply put, the more complex an ecosystem is, the better able it will be to recover after an injurious event such as an oil spill. In this context, complexity arises not only from the number and types of species present in an affected area, but from the degree to which their functional capacities vary and overlap. An ecosystem is rendered more resiliant as the number of differences that exist among species in a given ecosystem in terms of food sources, nesting sites, and reproductive needs and timeframes increase. This is because an event which might devestate one or a few elements of a complex system is unlikely to undermine its functioning entirely, an outcome made increasingly likely as the number of components parts decreases (Hannah et al., 1996; Peterson et al., 1998). An image of a bed of nails is the analogy sometimes used to illustrate this concept, because although the removal of a few nails from an area containing many such individual supports might go unnoticed by the user, the loss of the same number from a bed already sparsly populated would likely cause considerable hardship.

Natural environments, particularly complex ones, are thought capable of absorbing some level of perturbation without producing serious harm; however, this does not mean that they remain unchanged. A disturbance in excess of this threshold level initiates a period of functional breakdown (termed the Ω-phase). The system will then begin to regenerate (during what has been called the α-phase) and eventually reach a new functional equilibrium. Rather than "recovering" from a disturbance, ecosystems almost always emerge from this process in a state that is considerably altered from their pre-injury condition both in terms of form and of function (Hannah et al., 1996; Cairns, 1980).

This cycle of disturbance and recovery supports the notion that, far from existing as static entities, ecosystems can reach and maintain a variety of stable functional states as a result of the interplay between their internal characteristics and external stimuli (Gunderson, 2000). Changes in state can be brought about as a result of natural, as well as anthropogenic disturbances, and ecosystems are constantly changing in response to external and internal events, and move through these same phases in the wake of naturally-occurring injuries, such as those caused by hurricanes and fires. However, unlike natural disasters, oil spills can rarely be attributed to an "act of God," and their residual effects can linger for many years, compromising system functioning in a way that non-anthropogenic injuries rarely do (Hannah et al., 1996; Cairns, 1980).

In light of the complicated nature of ecosystem functioning, it should come as little surprise that our knowledge of such matters is limited. Some relationships between constituent parts are apparent, and may be (crudely) represented through food chains or webs, however, many more elude detection or explanation (Cairns, 1980; Editorial, 1999). Our relative ignorance limits our ability to detect and measure the injuries that result from an oil spill and severely curtails attempts to restore systems to their former functioning. (Editorial, 1999; Limburg et al., 1999) Some have even gone so far as to suggest that restoration is in fact impossible, as it disregards the constantly changing nature of ecosystems. (Cairns, 1980)

NRDA is motivated by the recognition that when a spill creates a systemic perturbation it diminishes the resource services provided. As a result, the public, which is the beneficiary of the affected services, has suffered a loss and compensation is necessary to make the public whole[39] from the injury. Since many services do not have market determined prices, economic measures of loss attempt to determine how much money would be required to provide beneficiaries of injured resources with an equivalent level of wellbeing to that enjoyed before a resource injury. Thus, the Hicksian concept of compensation, which defines utility as resulting from both market and non-market goods and services, provides the basis for resource damage valuation. Damage assessment, necessarily involves describing how a natural asset contributed to individual wellbeing, as well as how the injury under investigation acted to diminish that utility. Once these values are determined, individual losses are summed across the affected population to determine total damages (Kopp et al., 1993).

Guiding logic states that responsible parties will not voluntarily bear expenses they can legitimately avoid, meaning that they may well do nothing in the wake of a spill if this proves to be the most cost-effective strategy. Regulatory intervention is therefore deemed necessary, as it is expected to alter potential polluters' behaviors towards prevention, to encourage responsible reporting and response in the event that a release should occur, and to ensure that the public is justly compensated for any loss incurred as the result of a spill. In general, evidence to support the validity of the former two suppositions can be found by examining National Response Center data, which clearly

[39] Accomplished by reinstating the level of welfare enjoyed before the event occurred, plus enough additional welfare to offset losses incurred from the moment of the injurious incident to that of full resource restoration.

indicate a diminution in the number and volume of injurious oil spills in response to more stringent and consistent regulatory oversight and sanctioning (Ramseur, 2008). The nature of the intervention is clearly important with regard to the type of reaction it can be expected to elicit from potentially responsible parties, however, as demonstrated by the findings that the use of strict criminal liability tends to discourage cooperation, thereby impeding cleanup progress (Gallagher, 2002).

The feat of ensuring that the public is compensated for spill-related losses is accomplished by forcing spillers to remedy the injuries they have caused, thereby mitigating effects that would otherwise remain as negative externalities (Ando, et al., 2004a; Ando et al., 2004b; Austin, 1994; Efroymson et al., 2004; Jones, 1997; Lee et al., 2002; Ofiara et al., 2001; Peterson et al., 2003; Renner et al, 1998). Under federal-level regulation, certain entities are called upon to take action in the interest of the public by engaging in Natural Resource Damage Assessment (NRDA). These ‘trustees,’ are most often governmental agencies but can also include Indian tribes and other interested parties, who seek compensation for the diminution in resource services. (Ando et al, 2004; Austin, 1994; Lee et al, 2002; Kopp, 1993; Offiara et al, 2001)

Failure to attain redress from responsible parties would constitute enclosure of publicly held commodities by private interests and is at odds with the “polluter pays principle” known to underlie much of today’s environmental regulation. Uncorrected injuries, therefore, can be described as the false commodification of something which is widely held to be inalienable: the public’s right to benefit from natural resource services. (Bollier, 2003)

While there are many compelling reasons to correct for the injuries caused by oil spills, it is a daunting task, which often falls to state regulators. This is because large incidents may merit federal enforcement under OPA, however, most spills are relatively small and do not warrant the attention of trustee agencies like the EPA or NOAA. For such minor incidents, the decisions of whether and how to regulate, are made by state trustees, and while some jurisdictions have created programs and even passed legislation pertaining to oil spills, others have done relatively little if anything in this regard (Ando et al., 2004b).

RESOURCE VALUE: AN ELUSIVE GOAL

Environmental quality is a public, non-marketed good. Although clearly valuable, many environmental amenities are not bought and sold, hence consumers' preferences are not revealed by the setting of prices through the interaction of supply and demand. For this reason, the marginal benefit associated with each additional unit of these goods, and conversely, the marginal cost of the loss of each unit due to environmental damages, remains unknown (Callan et al., 2004).

The great variation that exists across states' in their approaches to penalizing spillers is at least partially symptomatic of the significant challenges inherent in identifying and valuing spill-induced losses. The nature of resource value, as well as the many difficulties encountered by those who seek to discern it, are the subjects of this section.

Approaches to Regulation and the Valuing of Resource Services

As described above, natural resources are valued in terms of the services they provide. Hence, in response to an injurious oil spill, remunerations must be scaled (through NRDA) to reflect the level of services lost. Specifying damages to offset injuries, however, is often extremely challenging, primarily because it is can be impossible to determine an irrefutable value for lost resource services.

The traditional measure of value used in economics is the price consumers are willing to pay for a good or service. The validity of this approach is based upon the assumption that purchasing decisions are made in order to maximize individual utility within budgetary constraints; in other words that society is made up of individuals whose actions are selfishly motivated. While private market transactions can be adequately described in terms of purely self-serving decision making, a valuation of public goods such as natural resources cannot be so narrowly defined because other (non-selfish) elements may become important (Coker et al. eds., 1992)

Use Value

Use value is described as the benefit derived from physical use or access to an environmental good. In this context, use is often direct, such as the value one derives from visiting a pristine beach or harvesting wild mushrooms. Indirect use value, or the benefits resulting from indirect consumption, is also important. Bird watching is an example of an indirect use because the birds, once observed, are still available for later viewing (Callan et al., 2004).

While some use values may have associated price tags (for example, an admission paid to access the beach), others do not (perhaps picking mushrooms in an open-access woods), complicating attempts to value them. Any number of resource uses may be diminished as a result of an oil spill, and it is only by accurately accounting for such losses, that reliable damage claims can be made (Des Jardins, 2001; Lee, 2002; Offiara et al, 2001).

Non-Use Value

Non-Use value does not refer to any kind of personal benefit derived from resource services, but is the result of the continued existence and functioning of natural these natural amenities (Callan et al., 2004). Unlike use value, the validity and definition of which are widely agreed upon, considerable debate still exists around the subject of non-use value, and a variety of terminology has been proposed to describe its various manifestations.

Some argue that pleasure (and hence, value) can be derived solely from the knowledge that a particular natural feature exists independent of any past, current or anticipated personal benefit. Variously termed ‘existence’ or ‘passive use’ value, it is said to originate from people’s sense of responsibility towards ecosystems and the plants and animals which inhabit them. This feeling, it has been argued, can be experienced even by those who would be “appalled by the prospect of being exposed [to the habitats and animals in question]” (El-Shaarawi et al. (eds), 2002).

Others have equated the term 'nonuse' with nature's intrinsic value: value that arises from resources' inherent worth and exists independently of man's valuation process. Many reject these notions of pure altruism and deep ecology, sometimes on moral grounds, but also because values conceived in this way are all but impossible to quantify for regulatory purposes. Finally, another conception of nonuse values is that they are generated solely from the knowledge that a natural amenity will be available for use by future generations of man. The terms 'preservation' and 'bequest' value have been coined to describe this concept, and refer to the net economic value derived from the knowledge that a natural resource will remain for future generations to use and enjoy. Taking these ideas to the extreme, a small minority have sustained that nonuse values are simply a form of ex-ante use value (Taylor, 2003).

Measuring non-use values has proven very problematic, largely because they are in large part a function of moral and ethical preferences. Despite widespread agreement on their existence, therefore, attempts to measure non-use values have proven controversial and summing across individuals to determine net welfare losses resulting from an injury, a virtual impossibility. (Des Jardins, 2001; Larson 1992 and 1993; Lee, 2002; Offiara et al, 2001; Taylor, 2003)

Value of Ignorance

In addition to the logistical difficulties encountered in trying to determine a value for resource services that are damaged by an oil spill, a more fundamental, and less resolvable question arises. While some of the benefits derived from natural resources are familiar and easily recognizable, our dependence on the majority of such services is not so self-evident.

To provide but one example, the larval stages of many marine species including crustaceans and mollusks tend to congregate in estuarine environments because, among other things, they provide relative safety from predators. When oil enters such areas, these creatures are harmed, producing a variety of effects, ranging from (hard to detect) trophic disruptions, to (the more obvious) eventual escalations in seafood prices due to decreased harvests. It is unlikely, however, that many of the people affected are aware of the causal link between the spill and, for example, the increased price of shrimp; raising the important question of how damages suffered by unknowing recipients of resource services should be calculated. Is ignorance sufficient reason to disregard value? If not, how are resource values to be specified so that appropriate compensation can be gauged?

Value of Time

While information (or the lack thereof) presents one sort of challenge to damage valuations, time presents another. Throughout history, mankind has depended upon the Earth's natural resources for survival; and it is to be expected that this relationship will continue in some form long into the future. (Des Jardins, 2001; Kempton et al, 1995; Light et al, 2003). Our decisions regarding proper levels of resource use (and tolerable levels of abuse), therefore, are critically important in determining the quality of life afforded the unknowable number of people yet unborn (Des Jardins, 2001; Dunford et al., 2004). As a result there is future value for the preservation of natural resources, particularly those that are nonrenewable, or that if injured, cannot be restored to pristine condition.

With regard to oil spills, the passage of time is a critical regulatory consideration. Even when immediate actions such as the removal of visible product and the application of chemical dispersants are taken, the negative effects resulting from an incident can sometimes be detected decades after the spill.[40] Because the natural resources injured by oil spills are considered assets, the time component of any injury must be considered in assessing damages (Kopp et al., 1993). To address this issue, the costs are valuated starting from the moment of injury through the point of complete recovery, discounted to reflect the passage of time, and then summed across periods to attain the net present value.[41] Similar to computations used in cost-benefit analysis; in this instance the total compensation necessary to make the public whole[42] from the incident is identified (Callan et al., 2002; Kopp et al., 1993).

Described as being at once "empirical and ethical," the use of discounting in the NRDA context has been the subject of much disagreement, both in principle and in practice (Sumaila, et al., 2005). Defined as "a procedure that discounts a future value into its present value by accounting for the opportunity cost of money[43]," such calculations involve the application of a discount rate to all future costs and benefits.[44] The end result is that values for costs and benefits realized in the future are reduced,

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[40] The effects of the *Valdez* are felt to this day in the form of, among other things, diminished herring populations in the Sound, as well as residual petroleum distillates on some beaches. (Paine et al., 1996)
[41] Termed 'compensatory value' in this context. (Lee et al, 2002; Offiara et al, 2002)
[42] A notion borrowed from common law, meaning simply to acquire compensation in an amount equal to the loss suffered by the owner of the resource (i.e. the public at large).
[43]Opportunity cost is defined as the highest-valued alternative to any given decision and is based on the idea that, by selecting an alternative, one necessarily foregoes all others.
[44]The discount factor equation (assuming that costs and benefits accrue over more than one time period) is: Present Value = Future Value$[1/(1+\text{Discount Rate})^{\text{Time Period}}]$

relative to those same outcomes if they were to occur in the present (Callan et al., 2002; Kopp et al., 1993). Because of this, the specification of the rate does much to influence the outcome this type of calculation; and a high rate is thought to encourage or legitimate short-sighted behaviors, particularly on the part of private resource users, thereby increasing the likelihood of despoliation (Clark, 1973).

Some feel that this practice is wholly inappropriate given the significant uncertainty regarding our capacity to measure damages and anticipate the behavior of natural systems in the aftermath of an anthropogenic disturbance (Kopp et al., 1993; Sumaila, et al., 2005). Others dispute discounting on ethical grounds; citing our inability to anticipate future generations' need of natural resources as reason to be more, rather than less protective of their functioning; a stance which is clearly at odds with the devaluing of services that have yet to be realized (Des Jardins, 2001).

Even among those in favor of discounting, considerable disagreement exists over the selection of a rate for use in such calculations; especially when impacts will be felt long into the future (called 'intergenerational effects') (Sumaila, et al., 2005, Kopp et al., 1993). The traditional (high) discount rate[45] is said to reflect people's "personal tastes," and is thought to approximate the rate that is applied (consciously or not) to one's own investment choices. It has been suggested that another, much lower rate, may be needed to value societal objectives and goals. This second rate would better reflect people's "social tastes," which are evidenced through their political choices and tend to be more greatly influenced by anticipated future conditions than are the decisions made within their personal frames of reference (Sumaila, et al., 2005).

[45] Usually equal to 3%; this is also the rate advocated by NOAA for use in damage assessments conducted under OPA (NOAA, 1999)

The matter is further complicated by the fact that, unlike the typical cost benefit analysis, NRDAs require discounting be applied to past, as well as future losses and gains. It has been suggested that people value the present most highly, followed in importance by the future and finally the past. These time frames can be subdivided further still, leading to arguments that the near past and future should be considered separately (because they are valued more highly) from more distant times, raising questions as to whether a single rate of any amount can be reliably applied throughout the process.(Kopp et al., 1993)

A Philosophical Aside

Although related only tangentially to the current undertaking, it is worth noting that the valuation conundrum faced by regulators engaged in NRDA epitomizes one of the major points of philosophical contention regarding the rightful relationship between man and the environment. Simply put: *Is nature valuable independent of humans' valuation of it?* Proponents on both sides of the issue remain firmly entrenched in their positions, and it is indeed unlikely given the value-based nature of the debate, that any resolution will be reached on this issue (Des Jardins, 2001; Light et al., 2003).

Within the context of NRDA, however, an anthropocentric vantage point clearly prevails. Evidence of a human-centered bent can be found in its focus on making the *public* whole from the injury, a task accomplished by restoring use and nonuse values, both of which are conceived of in terms of actual or perceived benefits to humans.

Dollars or…?

For all the reasons discussed above, resource services are difficult to identify and measure. Despite these challenges, however, the process of natural resource damage assessment demands that both losses and future functioning be quantified. Dollars are one metric often used to impute value; however, such calculations have been subject to considerable criticism. Some object to this practice on moral grounds, arguing that monetization ignores the fundamental and irreplaceable qualities of the natural world by putting it on par with other commodities that are bought and sold (Bollier, 2003).

Others cite the lack of prices determined for services through the interactions of supply and demand as a logistical hurdle too high to make dollars a viable metric. (Brinson et al, 1996; Cacela et al, 2005; Carson et al, 2001; Dunford et al, 2004; Offiara et al, 2001) Compounding this, even in instances where prices do exist for individual services, these cannot meaningfully be separated from the larger ecosystems of which they are a part, and to which no monetary value has been assigned. (Editorial, 1999)

VALUATION TECHNIQUES

What follows is a discussion of the various techniques that have been created to ascertain value in the context of NRDA. Most, but not all, utilize dollars as their measurement metric. Some are controversial, and their use by trustees may well lead to entrenched legal battles with responsible parties. Many entail spill-specific investigations, and therefore require considerable regulatory resources to apply. For the purpose of this review, these more specialized techniques are grouped together under the heading "case specific." In contrast, "simplified" methodologies are more general in their design, and require little in the way of regulatory outlays. It should come as little surprise, therefore, that a few of the approaches profiled below are gaining in popularity, while others are declining. Despite these differences, each assessment techniques is considered here in turn, as it represents a viable option for regulators tasked with assessing spill-related damages.[46]

Case-Specific Approaches

Although a variety of case-specific approaches have been developed and endorsed by both the EPA and NOAA, they all rely upon the collection and evaluation of (often extensive) data specific to the particular incident under investigation.[47] These non-market valuation techniques have been developed to value lost resource services in the absence of market-determined prices. Included among them are indirect measures (such as travel cost approach, hedonic pricing and household production function) that use ex post measures of welfare to determine values, and direct measures (such as contingent valuation), which illicit ex ante welfare measures based upon anticipated behavior (Kopp et al., 1993).

Travel-cost methods and hedonic pricing are among the case-specific techniques intended to identify the true monetary value of resource services. The former is based upon a calculation of the net difference in resources spent by tourists (in the form of time, money, etc.) to visit an area before and after an injurious incident. Hedonic pricing assumes that environmental amenities, while not directly transacted in markets, account

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[46] While some state laws specify the use of particular methodologies to value resource damages, federal legislation provides trustees the leeway to employ any technique (including one of their own design), so long as it is sound in design and execution (Lee et al., 2002).
[47] Previously collected data, where available, are used to determine the baseline (pre-spill state of the affected ecosystem), which forms the benchmark that subsequent remunerations must attain.

for a component of the cost of items such as homes, that are bought and sold and whose locational attributes affect price. These methods, which are appealing for their ability to quantify lost services, have been criticized as capable of providing only an approximate value, and for their inability to capture non-use values (Austin, 1994; Lee et al, 2002; Offiara et al, 2002; Renner, 1998).

Contingent valuation (CV), a technique that relies on surveys to determine respondents' willingness to pay for particular resource services, is the only economic estimation technique to date thought capable of capturing the non-use values people derive from natural resources. Despite this, applications of the methodology have proven highly controversial for a variety of reasons. Among the criticisms of CV most frequently cited are (1) the lack of incentive for respondents to assign accurate dollar values to resources for which no real price exists and (2) the fact that instrument design is thought to significantly impact findings. (Ibid.)

As described previously, some argue that dollars are not an appropriate metric for resource service valuation and in designing OPA's regulations, NOAA shows a clear preference for direct restoration (Lee et al., 2002). This approach entails the reinstatement of services at levels sufficient to compensate the public for their losses following a spill, either through the acquisition and preservation of equivalent resources, or through the enhancement or creation of ecosystems that provide services of the type injured[48] (Callan et al, 2004; Carson et al, 2001; Jones, 1997; Offiara et al, 2002). Due to the more intuitive nature of this type of damage calculation, observers have noted that penalties assessed using direct restoration are subject to fewer legal challenges. They also are more likely to be upheld by judges in the event of such a challenge, than are

[48] This may occur at the spill site, and/or at additional, unaffected locales.

assessments in which injury amounts are converted to dollar values (Bonnieux, 1993; Jones, 1997; Kontoleon et al, 2002; Thompson, 2002; Wikham, 1999).

Although some advantages are afforded by the use of direct restoration techniques such as habitat equivalency analysis (HEA), there are also drawbacks to these approaches. In the absence of money, another measure must be identified in order to scale restorations. (Dunford et al., 2004; Offiara et al., 2001; Penn et al., 2002; Fonseca et al., 2000) The specification of this metric is often difficult, as it must capture all of the resource services provided by the injured habitat; a virtual impossibility given our limited understanding of ecosystem functioning. (Brinson et al., 1996; Dunford et al., 2004; Peterson et al., 2003) The preference for direct restoration is also based upon the assumption that humans can create ecosystems capable of providing the services injured by a spill. (Fonseca, et al, 2003; Hackney, 2000; Sauer, 1998; Zedler, 1996) This notion, the improbability of which is further compounded the requirement that resource service levels be anticipated at various future dates (for the purpose of discounting), was described by Peterson et al. (2003) as "…a form of ecological hubris of extraordinary dimensions."

The valuation methods just described are case-specific in nature, they are designed and executed in the aftermath of an injurious oil spill and require the collection of data specific to the incident under investigation (Ando et al., 2006; Lee et al, 2002; Offiara et al, 2002). Techniques such as CV and HEA have been heralded for their transparency: regulators do not act arbitrarily but, instead, determine penalties based upon the true level of services lost (Ando et al., 2004a; Ando et al., 2006). Described as the 'Gold Standard,' they may be used in instances where significant environmental damages have occurred, or where legal challenges are likely, and therefore, methodological defensibility crucial (Ando et al., 2006).

Despite the appeal of case specific valuations, the regulators relying on them must typically overcome considerable obstacles in their application. Their high degree of sophistication may necessitate specialized skills not possessed by agency staff members, as well as considerable expenditures of time and money. For these reasons, case-specific valuations may not be feasible for all trustees (Ando et al., 2004a and b; Bergstrom et al., 1999; Sapat, 2004). Once the valuations are made, they represent sunk costs that must be recovered as part of the damage settlement (Hannah et al. (eds.), 1996). Finally, when case-specific methods are used, it may be difficult for potentially responsible parties to anticipate the level of liability in advance of an incident (which can be quite high), although precedents set by settlements reached in other cases may be provide some clue. As predicted by deterrence theory, such uncertainty may confound attempts to discern the appropriate level of precaution, resulting in wasteful resource expenditures by regulatees and a failure to maximize social welfare (Castle et al., 2001; Cole, 1999.).

Simplified Techniques

In place of the case-specific approaches described above, state regulators may opt to use a simplified assessment method, such as a penalty formula or computer model. These techniques, which are known collectively under the heading ‘benefit transfer,’ allow for the computation of damages without the collection of extensive spill-specific data, thereby requiring a more modest outlay of regulatory resources[49] (Ando et al., 2004b; Bergstrom et al., 1999; Downing, 1996; Woodward et al., 2001).

Simplified penalty formulas require the collection of basic spill data (frequently limited to the type of oil spilled, amount of the release, its location and the weather conditions at the time) and a pre-specified mathematical formula is used to calculate a responsible party's liability for a particular spill. States can opt to use a computerized model devised by NOAA[50] or design a unique equation for this purpose as Florida, Washington and other states have done (Ando et al., 2004a and b).

Benefit transfer, a technique commonly employed in cost benefit analyses, is based upon the premise that estimates derived in one assessment (often through case-specific methodologies) can be applied to another, unrelated event. Three types of benefit transfer techniques are available. "Fixed Value Transfer" involves the calculation of total benefits provided by the policy site (the site to be valued), through the compilation of per unit values derived from one or more study sites (i.e. those for which valuation have already been conducted). Conversely, "Expert Judgment" attains this result using unit values reached through an opinion process. Finally, in 'Value Estimator Models,' study site demand functions are used in conjunction with policy site-specific explanatory data to attain both the per unit value and the total number of available units at the location to be valued (Bergstrom et al., 1999; Downing, 1996; Kirchhoff et al., 1997; Woodward et al., 2001).

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[49] Enforcement costs can be recouped from responsible parties as part of the damage settlement; however, the greater they are, the more difficult this process becomes and the greater the appearance of regulatory waste.

[50] Known as 'Type A' assessments, the use of the NOAA model for damage calculation is restricted according to a variety of factors and has only been developed for limited areas of the U.S. (Lee et al, 2002; Offiara et al, 2002)

The data requirements and costs associated with benefit transfer applications are minimal compared to case-specific ones. Whether a single model is built to facilitate all spill valuations, or individual incidents are matched to previous assessments based upon factors such as the affected population or resource type; the use of benefit transfer makes the feat of estimating potential liabilities easier for members of the regulated community. Not surprisingly, the speed and cost savings afforded by simplified assessments are said to explain their continually increasing popularity among regulators (Bergstrom et al., 1999; Opaluch et al., 1992).

While ease of implementation and predictability are thought to be important for imparting deterrence, benefit transfer approaches are not infallible. Regulators employing such simplified techniques to value spill damages must be aware that findings may be biased by a variety of factors. Errors present in the study site valuation, for example, may lead to unreliable transfers, as may differences in the affected populations or in welfare measures.[51] In addition to these general criticisms of benefit transfer, the penalty formulas created and employed by states today have been specifically condemned for their lack of transparency and inability to account for the passage of time[52] (Ando et al., 2004a).

CONCLUSION

As this review of the literature illustrates, there are a great many factors that can influence whether and how states penalize those responsible for oil pollution within their

[51] For a comprehensive discussion of error sources, see: Bergstrom, John C. and Paul De Civita. 1999. *Status of Benefits Transfer in the United States and Canada: A Review.* Canadian Journal of Agricultural Economics. 47(1): 79-87.

[52] None incorporate discounting.

borders. The pursuit of natural resource damages in particular is fraught with obstacles that must be overcome. Based upon the knowledge contained within this chapter, original research was conducted to determine how each state handles this task, to identify common challenges and to identify best practices. The remainder of this text document this research and present its findings.

- Chapter 3 -

Research Methods

Introduction:

This chapter outlines the methodology used throughout this research project. In all, three distinct approaches were relied upon to produce the data analyzed and discussed here. Some information was publicly-available, and was obtained from a variety of sources through the World Wide Web. Most of the information presented throughout this thesis, however, was generated by the researcher, both through the administration of a telephone survey and through a series of on-site case studies. The remaining chapters are used to answer the research questions that motivated this investigation; a feat accomplished through the synthesis and comparison of data gathered from one or more of these sources.

The Survey

Strengths and Limitations:

The current investigation is focused on the real world, day-to-day functioning of oil pollution regulation at the state level. While theory clearly has something to say about the selection and effectiveness of the techniques used to accomplish this end, the most direct and reliable mechanism for learning about what is being done in the field, about what works and what doesn't, and about why this is so, is to ask the regulators themselves. It is with this in mind that a survey was designed and administered to employees of state-level agencies charged with responsibilities related to the regulation of oil pollution.

In presenting and interpreting the data gathered using this instrument, it is important to keep in mind both its strengths and limitations. Among the greatest strengths of the survey is that it is the first of its kind; no prior attempts have been made to speak with representatives from every state to create a comprehensive catalog of approaches to the regulation of oil pollution. Through the administration of this single survey, therefore, macro-level trends can be described that might otherwise go unnoticed or dismissed as state-specific anomalies.

Of particular interest is the context of this research is the identification of challenges and shortcomings common across multiple jurisdictions, as well as of innovative solutions to these issues that have been developed by a few states, but which are potentially amenable to more widespread adoption. What's more, the dissemination of the survey findings, both in the form of this document and subsequent publications, will provide a vehicle for transmitting ideas and perhaps ultimately, establishing new contacts between programs that currently lack such interstate interactions.

Despite their myriad strengths, the survey and its findings are not without limitations, the most significant of which arises from the fact that information gathered from each state was almost always provided by one individual, representing one oil pollution-related program. This is not always the case. In some instances multiple representatives from a single program and/or multiple programs or agencies from a single state, were interviewed in order to create a more holistic and complete description. By and large, however, contacts with every relevant program could not be established, and in these cases, interviewees were asked (whenever applicable) to provide information about their state as a whole.

Given the limited number of respondents, the results reported herein may contain errors due to the limitations of individuals' knowledge. Also, some information, particularly as it pertains to perceptions of programmatic strengths and challenges, is clearly based on the opinion of the survey taker, and cannot be interpreted as an official statement on the part of the program, agency or state they represent.

Another caveat that should be kept in mind throughout the interpretation of the survey findings is the fact that, as is often the case, particularly when the instrument is completely original and not informed by previous and/or closely aligned research, some degree of learning occurred throughout its administration. This was certainly the case with regard to the identification of regulatory innovations, and while it could not have been otherwise, this fact, combined with the limitations of individual respondent's knowledge, undoubtedly impacts upon the attempts to discern predictors of innovativeness that are detailed in the following chapter.

Finally, some of the information reported among the findings was volunteered by participants, rather than being offered in direct response to the questions asked of them. Its inclusion here was deemed desirable, because it allowed for the creation of a more detailed, and in many instances, more complete description of state's regulatory behaviors than would have resulted if reporting had been limited to direct responses only. However, the fact that this information was not attained through consistent questioning, limits the weight that can be placed on any resulting interpretations.

Purpose

As the first of its kind, the survey allowed the researcher to gain a comprehensive understanding of state-level oil pollution regulation where none existed before. Because so little was known about the field at the outset, a number of questions were asked of participants that were of a very fundamental nature. Programmatic funding, the identities of participating agencies, and relationships with the regulated community, were explored in order to satisfy the first research question, namely "How is oil pollution regulated by each of the states?"

The identification of challenges commonly experienced by those involved in state-level oil pollution regulation is the focus of the second research question, and was also addressed using information gathered through the survey instrument. This was accomplished using two strategies. First, respondents were asked directly, "What do you consider to be your state's greatest challenge(s) with regard to oil pollution regulation?," an approach that provided insight into internal perceptions of programmatic needs and weaknesses. Throughout the interview process and subsequent data analysis, additional shortcomings common to the field were identified through examination of issues including the most frequently named spill sources, as well as the availability and quality of incident data. In this way, a set of common challenges, both as perceived by the regulators themselves, and discerned by the researcher based upon programmatic characteristics, were identified.

The survey was also used as a tool to identify innovative regulatory practices that could be amenable to more widespread adoption. Although no question directly focused on the topic of innovation, programs and initiatives of this kind were identified throughout the course of the questionnaire's administration. This approach was deemed most advantageous, because for the purpose of this research, a creative solution was only worth considering if it related directly to the areas of interest. Once common challenges had been detected, therefore, the innovative approaches identified in this way, were examined to see whether any acted to address the issues of concern, and were otherwise amenable to replication by other states.

Several criteria were used to match challenges to potential solutions. The latter had to be unique to the state in which it was carried out, or an exemplary model of an approach implemented in a very few jurisdictions. This was because a goal of this work was to speed the diffusion of innovations, not report on already widespread approaches. The proposed solution had to have been proven effective within its original context, a judgment made based upon program-specific criteria. It also had to be replicable. Extremely costly programs were not considered, therefore, because of the finding (discussed in Chapter 4) that many programs lack sufficient resources to carry out their current duties in a satisfactory fashion. Initiatives reliant upon state-specific characteristics of groups were also omitted, as these factors were thought to reduce the likelihood of widespread adoption. The approaches selected in this way were then profiled in greater depth through case study research, so as to satisfy the final research question.

Survey Design

The survey, which is contained in Appendix A, is divided into five sections and was designed to elicit information about a variety of topics, including: the nature of the each state's oil pollution problem, the type of regulatory approach they have adopted in response, as well as the participants' perceptions of their programs and procedures in terms of its strengths and weaknesses. Questions were written based on the researcher's prior knowledge of the subject matter, which was attained from scholarly and professional literature, and from personal professional experience as a Petroleum Cleanup Site Manager for the Florida Department of Environmental Protection. No additional verification of the protocol or of the clarity or validity of individual inquiries were attained prior to its deployment[53].

Part A, which asks simply "How long have you worked in the field of oil pollution regulation?," functions to ensure that respondents have experience in the field, as new hires were thought less able to provide reliable information on the topics of interest. Part B focuses on the state's "Regulatory Framework," and contains questions on topics including authorizing legislation and funding, the number of state agencies and other entities involved in the regulatory process and the function of each, as well as about the circumstances and year of the program's initiation.

The focus of Part C is on "Extant Conditions." It asks about the state's major sources of oil pollution, the natural resources and resource uses of greatest concern, and whether the regulated community tends to challenge penalties and damage claims. The questions contained in Part D relate to "Enforcement Practices" more generally. In it, participants are asked to explain how penalties and/or damages are calculated; whether they engage in outreach to, or education of, the regulated community; and about data tracking and performance monitoring. In the final section of the instrument, respondents identify what they consider to be the greatest strength of their program, as well as its greatest challenge. To help ensure that an up-to-date and balanced description is attained,

[53] It is common practice to hold focus groups, or distribute a survey protocol to a sample of potential participants for the purpose of verifying question clarity and accuracy. Despite the appeal of this practice, it was not followed due to the logistical and time constraints created by the IRB approval process, and because the researcher did not have pre-existing access to a 'test' group of this kind.

the final question in the survey asks whether a recent report or other document pertaining to the state's regulation of oil pollution is available for examination.

Respondent Identification

Potential survey participants were identified in a variety of ways. The U.S. Environmental Protection Agency (EPA) maintains a webpage[54] that contains links to each of the state-level environmental agencies; this page frequently served as the mechanism for locating regulatory bodies whose missions include oil pollution regulation. Once reaching a particular department's homepage, links to programs focused on oil spills, leaking underground storage tanks, and other related areas were identified, often using the website's search function or relevant links. Once an appropriate program had been identified in this way, contact information for an individual thought qualified to take the survey[55] was located, to which the cover letter (Appendix B) and a copy of the survey protocol were sent.

In several instances, potential respondents were identified using a snowball sampling technique in which current participants were asked to recommend contacts in other states, or when necessary, in other agencies or departments within their own state. These interstate recommendations proved especially useful in instances where names and emails were difficult to identify through web-based resources. In contrast, when regulatory responsibilities were divided among various departments or agencies, and the respondent's knowledge was limited to the functioning of their own program, within-state referrals were used.

[54] Available at: http://www.epa.gov/epahome/state.htm.
[55] As a rule, the most senior person affiliated with a program of interested whose email, phone number and mailing address could be located, was contacted. This strategy was adopted under the assumption that such an individual's knowledge of their program's design and functioning would be the most complete, and because they were thought most capable of making referrals as needed.

<u>Correspondence with Survey Participants</u>

Once a potential respondent was identified, a contact email was sent. In the majority of instances, the phrase "State-Level Oil Pollution Regulation Research," was used as a subject line; however, when the contact had been identified through a referral process, the phrase, "Referral from (referee's name)" was added. The body of the email consisted of the cover letter (Appendix C); again, modified to include the name and departmental affiliation of the person making the referral, as applicable. A copy of the survey protocol was included as an attachment.

Often, the potential survey taker sent a response email within a week of the initial contact. In such instances, a time and date for the interview were agreed upon, or the name of a more appropriate participant provided. If no response was received within two weeks of the first email being sent, a phone call was placed to the subject, both to ensure that the email had been received, and to determine whether and when an interview would take place. When a call reached voice mail or a secretary, a message was left, explaining the purpose of the call and providing the researcher's contact information. If no return call or email was received within a week, the search for a new respondent resumed as described above.

Oftentimes, however, a phone call resulted in the scheduling of an appointment to conduct the interview at a future date, and in a few instances, the respondent agreed to conduct the interview immediately. Once an appointment had been secured, a packet containing a cover letter (Appendix D) two copies of the Informed Consent Form (Appendix E), a copy of the survey protocol and a self-addressed stamped envelope, were mailed to the respondent. A signed copy of the Informed Consent Form was then returned to the researcher.

In total, telephone interviews were conducted with regulators in 42 states. The majority of these surveys were administered over the phone, and usually lasted between 25 and 45 minutes, although some were more than an hour and a half in duration. Hand-written notes were taken throughout the interview; which were later entered into a word document. An electronic copy of the completed interview was emailed to each participant, who was permitted to make any changes, additions or deletions they felt were needed. Although most made minimal or no alterations to the document, some changed wording, corrected minor content errors, and added additional relevant information, not discussed during the interview itself. Whenever applicable, findings based upon these respondent-corrected transcripts are reported here.

Although the vast majority of the survey results were derived through telephone interviews, information pertaining to several states was not gathered in this way. Following the initial contact email, written responses to the survey questions were received from regulators in Arkansas, Delaware, New Hampshire and New York. The information provided by Arkansas and New Hampshire was deemed sufficiently clear and complete to be included here unchanged. Telephone follow-ups were conducted with respondents in Delaware and New York; both to clarify and expand upon their written responses.

In three instances, web-based information was used either as a supplement to, or in lieu of, respondent-generated interview data. Because telephone interviews could not be secured with regulators from several states, attempts were made to locate the necessary information from the relevant departmental and agency websites. In the vast majority of cases, none of the questions contained within the survey could be satisfactorily answered using web-based resources alone. In the case of Washington, however, internet sources were used to supplement the description of that state's approach, which had been gained through a telephone interview with a representative of the Tanks Program. This approach was used specifically to learn about the state's approach to the prevention and remediation of coastal spills; a program of considerable importance in Washington, but one from which no participant could be secured [56].

To ensure that regulators in Washington's Spills Program were given ample opportunity to provide accurate information about their policies and procedures, an electronic copy of the completed document was sent to program head, who was asked to provide any corrections or additions to the description compiled from their website. No response was received; therefore, the information reported is limited to that which is available on the World Wide Web

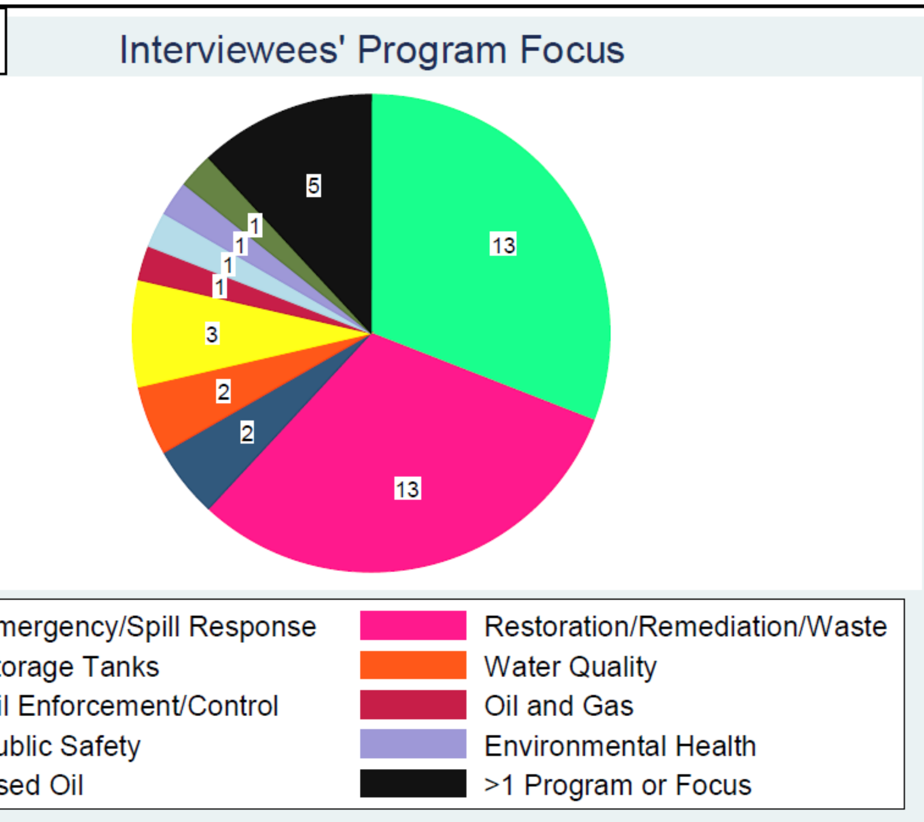
Participating Departments and Programs

As shown in Figures 3.1 and 3.2, respondents from 42 states participated in the survey, representing some 44 agencies and 45 programs. Of these, the largest number (26) was focused on either spill/emergency response or remediation. Three programs; those in Maine, Maryland and Montana; were dedicated to oil enforcement; an additional three to tank-related spills (in Arizona, Minnesota and Washington); while the protection of water quality was the charge of the respondents in Michigan and South Dakota. In

[56] A regulator from Washington's Tanks Program participated in a telephone interview; therefore, much of the information pertaining to this state's approach to oil pollution regulation was acquired in this way. However, information pertaining specifically to the Spills Program was compiled using internet resources, as no telephone interview could be scheduled.

both Illinois and Indiana, survey takers worked in Divisions of Oil and Gas, while in Colorado, Tennessee and Hawaii, the regulators who provided the information presented here were from programs focused on public safety, used oil recycling and environmental health, respectively.

Figure 3.1



In several instances, the state-specific data presented here were derived from multiple sources, or from a single program whose focus includes more than one of the categories outlined here. Multiple separate survey interviews were conducted with regulators from Louisiana, Illinois and Utah. This approach was taken because in each case, the initial respondent indicated that a second program's role should be investigated in order to attain an accurate and comprehensive understanding of their state's approach to oil pollution regulation. In the case of Virginia, Ohio and Minnesota, a single interview was conducted, but the responsibilities of the represented program included more than one of the areas identified here; for example, combining emergency response functions with oversight of storage tanks or remedial activities.

Figure 3.2

State	Agency 1	Program 1	Agency 2	Program 2
Alaska	Department of Environmental Conservation	Prevention and Emergency Response		
Arizona	Department of Environmental Quality	Underground Storage Tanks and Division Support Section		
Arkansas	Department of Environmental Quality	Emergency Response		
California	Department of Fish and Game	Office of Spill Prevention and Response		
Colorado	Department of Labor and Employment	Oil and Public Safety Division		
Connecticut	Department of Environmental Protection	Emergency Response and Spill Prevention		
Delaware	Department of Natural Resources and Environmental Control	Emergency Prevention and Response Branch		
Florida	Department of Environmental Protection	Bureau of Emergency Response		
Georgia	Department of Natural Resources	Emergency Response Program		
Hawaii	Department of Health	Division of Environmental Health		
Idaho	Department of Environmental Quality	Waste Management and Remediation Division		
Illinois	Department of Natural Resources	Oil and Gas Division	Environmental Protection Agency	Office of Emergency Response
Indiana	Department of Natural Resources	Division of Oil and Gas		
Kansas	Department of Health and Environment	Assessment and Restoration Section		
Kentucky	Division of Waste Management	Petroleum Cleanup Section		
Louisiana	Department of Environmental Quality	Clean Waters Project	Louisiana Oil Spill Coordinator's Office	(same)
Maine	Department of Environmental Protection	Oil Enforcement		
Maryland	Department of Environment	Oil Control Program		
Massachusetts	Department of Environmental Protection	Bureau of Waste Site Cleanup		
Michigan	Department of Environmental Quality	Water Bureau		
Minnesota	Pollution Control Agency	Spills/Above Ground Tank Unit		
Missouri	Department of Natural Resources	Environmental Emergency Response		
Montana	Department of Environmental Quality	Enforcement Division		
Nebraska	Department of Environmental Quality	Waste Management Division		
Nevada	Division of Environmental Protection	Superfund/Brownfields/Environmental Response		
New Hampshire	Department of Environmental Services	Oil Remediation and Compliance Bureau		
New Jersey	Department of Environmental Protection	Site Remediation Program		
New Mexico	Environment Department	Remedial Action Program		
New York	Department of Environmental Conservation	Division of Environmental Remediation		
Ohio	Environmental Protection Agency	Division of Emergency and Remedial Response		
Oregon	Department of Environmental Quality	Emergency Response Program		
Pennsylvania	Department of Environmental Protection	Waste Management Program		
Rhode Island	Department of Environmental Management	Office of Emergency Response		
South Carolina	Department of Health and Environmental Control	Emergency Response Section		
South Dakota	Department of Environment and Natural Resources	Groundwater Quality Program		
Tennessee	Department of Environmenta and Conservation	Used Oil Program		
Texas	General land Office	Oil Spill Prevention and Response Division		
Utah	Department of Environmental Quality	Division of Emergency Response and Remediation	Department of Environmental Quality	Used Oil Recycling Program
Vermont	Department of Environmental Conservation	Waste Management Division		
Virginia	Department of Environmental Quality	Office of Spill Response and Remediation		
Washington	Department of Ecology	Underground Storage Tanks Program		
Wisconsin	Department of Natural Resources	Bureau of Remediation and Redevelopment		

<u>Non-Participating States</u>

Although survey data were gathered from the vast majority of states, interviews with eight jurisdictions could not be secured. Despite multiple attempts to contact regulators in Alabama, Iowa, Mississippi, North Carolina, North Dakota, Oklahoma, West Virginia and Wyoming, no willing research participants could be identified. It is interesting to note that in several instances, potential respondents were identified using referrals from regulators in nearby states, yet as was the case with all of the non-participating jurisdictions, no response was ever received to any of the emails or phone calls of inquiry.

Given that no one directly declined to participate in the research, it is unclear why regulators in these states opted not to take the survey. It may be that their lack of interest is indicative of an unwillingness to provide information about their programs to a member of the general public or of the academic community. Alternately, it may be that their non-responsiveness is an indication of an inability to commit the time and effort needed to respond to the survey questions. Some support for the second supposition was provided by the large number of those who did participate in the study who were obliged to reschedule planned interviews, or in other ways made it known that responding to the survey, while interesting and worthwhile, posed a hardship to them because it acted as yet another burden on programmatic resources that were already quite strained.

Given that the research is intended to create a holistic understanding of the duties, challenges and innovations that typify the field of state-level oil pollution regulation, the ideal scenario would be one in which the findings were based upon information provided by representatives of every state. A 100% response rate proved impossible to attain, but given the large proportion of states that are represented in the data, it is likely safe to assume that the trends and findings identified herein, as well as the suggested programmatic designs and policy implications detailed in the concluding chapter, are trustworthy.

Support for the validity of this research is provided by the fact that there are numerous similarities between the eight states for which survey data are not available, and the 42 from which they were successfully collected. Some of the states for which no interviews could be secured have coastlines while others do not, and some have oil import sites, a feature which others lack. In addition, the locations of these states are quite dispersed; a fact which supports the conclusion that no single geographic, economic or ecological region is disproportionately underrepresented.

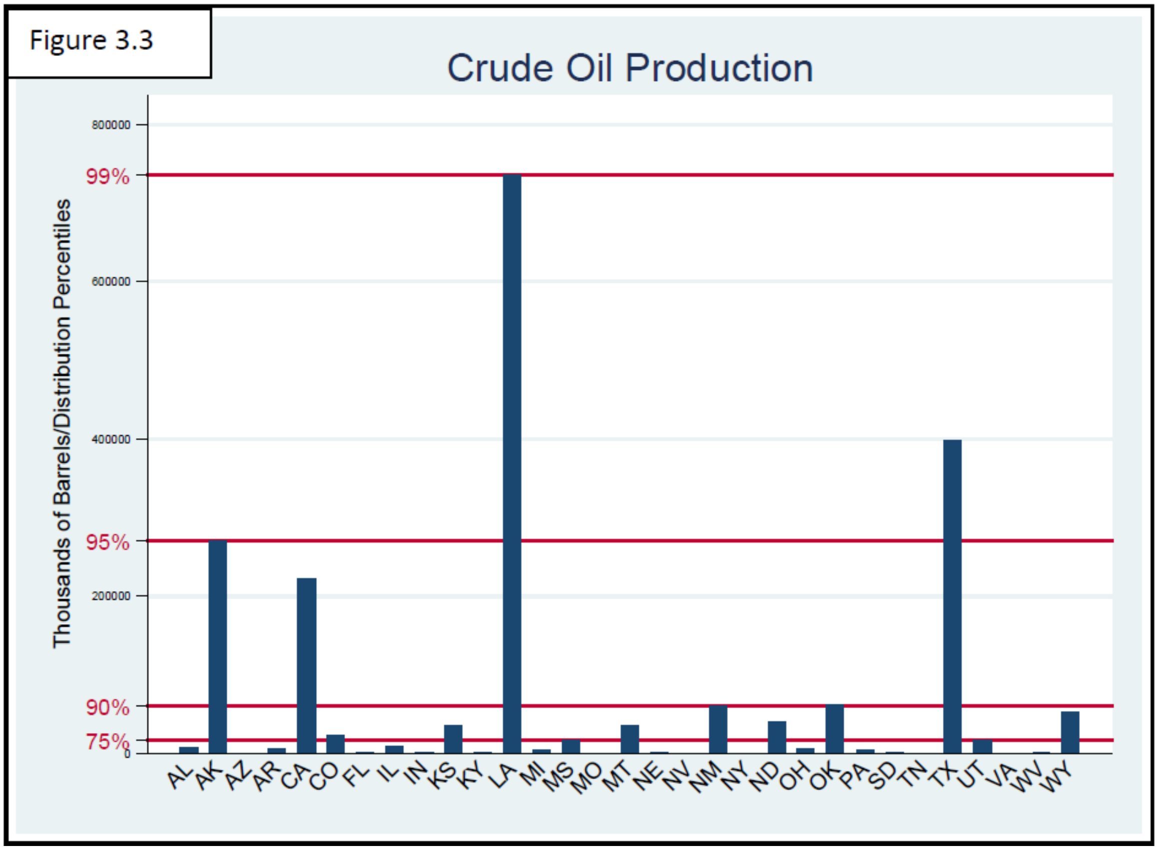
Because economic conditions, as well as the importance of the oil industry within a state may well influence their regulatory posture towards petroleum-related pollution, it is important to note some characteristics that appear common among non-participating states. First, although survey data were gathered from all of the largest producing states, many of which are characterized by prosperous economic conditions, several of those that did not participate also generate relatively large volumes of product (see Figure 3.3), but enjoy more modest economic standings. What's more, three of the non-responding jurisdictions; Alabama, North Carolina and Wyoming; were also named as among the nation's top ten "Pro-Business States" in 2008 by Polina Real Estate, Inc., a group that creates a ranking annually, based upon measures of 29 factors considered indicative of business-friendliness[57]. Given these characteristics, it is possible, that the examination of regulatory behaviors of the few states for which interviews could not be secured, could

[57] For more information about this ranking, see: http://www.pollina.com/publications/probiz~1.htm.

have shed light on additional practices, challenges and innovations not evident in other states. While the potential influence of these additional data is impossible to predict, it is nonetheless worth noting their absence, as their economic characteristics may make them more inclined to engage in "industry-friendly" behaviors.

To some extent, however, the fact that surveys were completed by regulators in Louisiana, Texas and California may counterbalance the impact of omitting the aforementioned jurisdictions. Regardless any balancing out which may have resulted, their inclusion in this study was particularly important for a number of reasons. First, industry-related sources are a major concern in these states; their oil pollution-focused programs tend to be quite large and well-developed, and work in conjunction with federal agencies on a regular basis; and their strong economic standing means that, in general, funding is available for prevention, response and other related functions. All of these factors combine to create a dynamic in which regulation is a priority and innovation is likely to be encouraged, and this study's findings are stronger for including survey data for each of these states.

Figure 3.3



Treatment of Survey Data

The nation-wide survey was conducted, both to answer the first two research questions, and to identify innovative solutions to the challenges commonly experienced throughout the course of oil pollution regulation-related activities. With these goals in mind, therefore, the information provided by respondents was continually reviewed throughout the administration process, in an attempt to identify relevant findings and trends as they became apparent. Particular attention was paid to what appeared to be typical regulatory hurdles, as well as unique programmatic solutions.

When the survey process was deemed complete, all instruments were re-read and relevant findings identified using a multi-tiered coding scheme, which ultimately gave rise to the distinct variables that are analyzed and discussed in Chapter 4. Gross categories, such as “Relationship with the Regulated Community” and “Resource Impacts of Greatest Concern,” often resulted directly from one or more of the questions contained in the survey.

After the general topics of interest had been identified, participants’ responses were examined to determine the full range of response types, and numerical identifiers assigned to each. Individuals’ answers were then coded to create a series of dummy variables, each of which communicated the presence or absence of a particular response type. For instance, if a participant indicated a concern over potential habitat and drinking water injuries resulting from oil spills, this information was coded using a ‘1’ for the variables measuring these resource impacts, and a ‘0’ for indicators of cultural, recreational and other injury types. This approach, which represented participants’ perceptions as simply the presence or absence of certain response types proved the most advantageous, as it allowed for trends to be distinguished, and did not result in a loss of information.

Once the information contained within the surveys had been translated into a series of unique variables, the questions of how regulators approach the problem of oil pollution, as well as which difficulties are most often encountered by people in this field, could be answered. At the outset, it was hoped that the survey data could be used in conjunction with some publicly available information, to allow for the statistical prediction of innovative tendencies. Although the creation of statistical models for this purpose was attempted by the researcher, none produced statistically significant results (See Appendix J). It was also hoped that states’ levels of spill deterrence could be quantified and this information used to verify the effectiveness of various regulatory strategies. Unfortunately, the data required to conduct these analyses were not available from the states themselves and could not be reliably attained from the NRC[58].

The fact that statistical significance proved elusive with regard to innovation is largely due to the considerable variation that exists across observations, stemming from differences in program types and goals, as well as the influence of individual respondents' opinions and knowledge. Given the small sample size, therefore; insufficient commonalities existed within the dataset to allow for the meaningful application of logistical regression analysis, a technique which, at least in theory, had the potential to predict innovators from non-innovators, based upon information about problem types, regulatory characteristics and other factors. Given that advanced statistical modeling proved untenable, the discussion related to how the states regulate oil pollution contained in Chapter 4 is based upon examination of response counts, basic correlations and overall trends.

Identification of Innovative Solutions

Throughout the survey's administration, a spreadsheet of what appeared to be innovative regulatory strategies was maintained. These apparently unique approaches were identified through the course of the interviews, as participants described their states' regulatory behaviors in the areas of interest. Ultimately, this list was compared to what were identified as common regulatory challenges, and appropriate matches identified. The innovative solutions profiled here were selected using a number of criteria, which acted to rule out all but four programs (developed in two states), from consideration for in-depth study.

[58] See Chapter 1 for a discussion of this database's limitation.

In addition to addressing a commonly-identified challenge, the most important characteristic of any potential model solution was that it had to be amenable to replication by other states. Clearly, this condition could only be satisfied by programs that are proven effective, as it would make little sense to propose as a model, an approach that had failed to produce the desired results. In addition, to be a viable option for adoption, any proposed solutions could not be overly dependent upon the existence of circumstances unique to the developing jurisdiction.

It was also hoped, although not required, that the states whose approaches were to be profiled would vary in their basic demographics and problem types. This condition was deemed desirable because after speaking with a number of interviewees, it became clear that many had preconceived notions regarding which states were like theirs; a perception which appeared likely to color regulators' opinions of whether a particular endeavor merited their program's attention. Given this, it was believed that the selection of programs from highly similar jurisdictions would limit the perceived replicability of their approaches, thereby decreasing the overall usefulness of this investigation[59].

Certain logistical considerations, both on the part of potentially-adopting states, and in terms of the conduct of the research itself, also influenced the selection process. Since many respondents identified funding as a major challenge, any approach selected for in-depth study would have to be amenable to implementation with minimal resource outlays. Finally, the creation of an accurate and comprehensive programmatic description required the researcher to visit sites in person and speak at length with those

[59] For instance, it was thought unwise to focus the case study research exclusively in 'big oil,' coastal, highly affluent or very impoverished states; instead, variations in these sorts of characteristics were desired, because potential adopters were thought less likely to dismiss the findings out of hand.

involved. This constraint meant that only programs which were willing and able to facilitate this type of access could be considered for in-depth study.

It is worth noting that a number of states reported engaging in new and different regulatory behaviors; however, most did not meet the criteria set forth for identifying innovative solutions. This outcome largely reflects the fact that the majority of these approaches were created to address problems that are unique to the state in which they were developed, or to a small number of jurisdictions. In other instances, the programs of interest required significant monetary outlays and staff to support. Ultimately, programs in Florida and Wisconsin were found to satisfy the selection criteria[60], and detailed case studies created.

Case Studies:

Once programs had been identified to serve as model solutions for commonly-experienced regulatory problems, the original interviewees were re-contacted to determine whether an on-site visit and in-depth investigation would be feasible. In both instances, the regulators who had participated in the original survey expressed their willingness to allow the researcher to access the offices, personnel and internal documents necessary to create case studies of their programs, and offered their assistance in contacting additional participants and making other scheduling arrangements.

In all instances, records of interviews were created using a digital voice recorder supplemented with hand written notes. This repetitive approach facilitated quick and

[60] Wisconsin's data management systems were selected of in-depth study, despite the fact that they require considerable resources to develop and maintain. Despite the high costs associated with their implementation, inclusion of the BRRTS and SERTS systems was deemed desirable due to the finding that most state programs lack consistent and complete data collection and management schemes.

easy access to the general concepts, while still making possible the extraction of specific details as needed. When writing up the case studies, the notes served as an outline of each of the conversations and allowed for related concepts to be identified across interviews. The audio recordings, in contrast, were consulted both for clarification and in instances where a direct quotes was deemed the most effective way of communicating a particular concept. For a full list of individuals who were interviewed in Florida and Wisconsin, see Figure 3.4.

In Florida, Mr. Phil Wieczynski, Chief of the Department of Environmental Protection's (DEP's) Bureau of Emergency Response, acted as the primary contact for the study of Florida's approach to natural resource damage assessment (NRDA). At his suggestion, arrangements were made to visit the DEP's offices in Tallahassee and Tampa, as well as the Florida Fish and Wildlife Research Institute in St. Petersburg, Florida. The research, which was conducted over the course of four separate days during June 2008, consisted of multiple interviews with agency staff involved in emergency response and NRDA operations, as well as in response and GIS planning and development. The researcher also toured a number of restoration sites located in the Tampa/St. Petersburg area, to see first-hand how damage settlements had been used by resource trustees to restore use and non-use values lost due to oil pollution. Leslie Craig of the National Oceanic and Atmospheric Administration (NOAA) Restoration Center was also interviewed, although ultimately, the information she provided did not contribute to the creation of the case study.

State	Organization	Name	Title
Florida	Department of Environmental Protection	Phil Wieczynski	Bureau Chief; Bureau of Emergency Response
		Chris Rossbach	Emergency Response Manager
		Domenic LetoBarone	Emergency Response Specialist and Regional NRDA Coordinator
		Richard Neves	Environmental Specialist
	Fish and Wildlife Research Institute	George Henderson	Director
		Richard Knudsen	Assistant Research Scientist
	NOAA	Leslie Craig	Restoration Specialist
Wisconsin	Department of Natural Resources	Marck Giesfeldt	Bureau Director, Bureau of Response and Remediation
		Steve Sisbach	Section Chief; Enforcement, Investigations and Emergency Management
		Adrienne Sullivan	Call Center Manager, Duty Officer
		Wendall Wojner	LUST Coordinator, Hydrogeologist
		Ted Amman	Hydrogeologist
		Pat McCutcheon	Hydrogeologist Supervisor
		Bob Strous	Natural Resources Program Manager
		Marie Stewart	Waste Management Specialist
		Roxanne Chronert	State Spills Coordinator
		Janet Sausen	Automation Team Leader
		Joe Renville	Attorney
	Keystone	James Buell	President/BRR's Contracted Programmer
	University of Wisconsin Extension	Kevin Erb	Nutrient and Pest Management Specialist
	Department of Health and Family Services	Henry Nehls-Lowe	Senior Environmental Health Scientist
	National Guard Civil Support Team	Scott Hawks	Command and Segeant Major
	Wisconsin State Lab of Hygiene	Ron Arneson	Laboratory Coordinator
		Dave Degenhardt	DNR Liason

Figure 3.4

Although not represented in the original survey, Florida's Used Oil Recycling Program (FOURP) was also deemed a promising model, as internet research indicated that it had successfully addressed some of the obstacles (namely data collection and monitoring) that were identified throughout the survey, and did so with a minimal expenditure of regulatory resources. Mr. Richard Neves, one of the program's two staff members and one of its designers, was therefore contacted, and soon agreed to an in-person interview.

Wisconsin's computerized spill tracking system SERTS, and its manure applicators training program, came to light while conducting the initial survey with the Roxanne Chronert, the State Spills Coordinator. Having played an instrumental role in the creation of both initiatives, Ms. Chronert acted as a liaison, arranging a series of interviews with individuals involved in the programs.

The researcher spent a week in Madison, during the course of which, a number of individuals were interviewed from the Department of Natural Resources' Bureau of Remediation and Redevelopment (BRR) Interviews were also conducted with representatives of other agencies and institutions, whose missions include supporting the BRR's operations. One of the two case studies contained here is focused on Wisconsin's data management systems, and was primarily based upon information gathered through conversations with the state's contracted programmer, and members of the BRR's tanks, enforcement, and emergency management programs. The profile of the Manure Applicators' Training Program, in contrast, was created using information provided by Roxanne Chronert and by Kevin Erb of the University of Wisconsin Extension. Mr. Erb worked to develop the initiative and still remains heavily involved in its administration. Representatives of several other institutions, namely the National Guard's Civil Support Team, the State Lab (run by the University of Wisconsin), as well as the State Health Department, were also consulted, although ultimately the information they provided was not utilized in creating the case studies.

Supplemental Public Data

In attempting to describe the approaches to oil pollution regulation adopted by each of the states, as well as the extant conditions theorized to influence regulatory strategies and behaviors, the information acquired by speaking directly with state regulators proved insufficient. Therefore, publicly-available data were acquired from a number of sources, and used to supplement those derived from the survey and in-person case study interviews.

Reports published by federal agencies such as the Energy Information Administration, and by groups including the American Petroleum Institute and the Environmental Council of the States, provided many of the variables included in the analyses detailed in Chapter 4. For a complete list of sources, please see Appendix F. When data were not accessible in published format, potential sources were asked for information directly. The number of LEED buildings[61] present in each state was used as an indicator of relative innovativeness; these counts were obtained directly in the form of an Excel spreadsheet from the U.S. Green Building Council.

In other instances, the desired data could not be attained through public sources or direct request, and were therefore omitted from the discussion and analyses. The miles of crude oil pipeline present in each state, for instance, was of interest as this mode of transport can lead to significant spills, and was named by several survey respondents as a source of major concern. GIS data depicting the exact locations of all pipelines within the U.S. can be purchased at the prohibitively high cost of $4,400 from Rextag Strategies (see http://www.rextagstrategies.com/giscrude.php), a private company. The Pipeline and Hazardous Materials Safety Administration, the federal agency tasked with maintaining this data, however, refused to provide a per state total mileage count, as the researcher lacked the proper security clearance.

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[61] The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is a third-party certification program that acts as a benchmark for the design, construction and operation of green buildings. It measures the 'sustainability' of a structure by considering five main factors: site development, water savings, energy efficiency, materials selection and indoor environmental quality. By meeting pre-specified building criteria, structures can attain a "Certified," "Silver," "Gold" or "Platinum" rating; a designation intended to reflect how 'environmentally-friendly' they are. The construction of green buildings differs from that of conventional ones in a number of ways; they are generally more costly to build and make use of standards and approaches that are deliberately intended to promote sustainability; because LEED is arguably the most widely-utilized rating system for such structures, the prevalence of participating structures in a state was considered an indication of its environmental innovativeness. For more information about the LEED system, see: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222.

Conclusion

The following chapters are based on information gathered from a nationwide survey, a series of in-person interviews and a number of publicly-accessible sources. These data are combined and analyzed to determine how states regulate oil pollution within their borders, to discern the most often encountered challenges, and to identify innovative solutions that have been developed by individual states to that might be amenable to more widespread adoption.

- Chapter 4 -

State-Level Oil Pollution Regulation: Description and Analysis

Introduction

Focused on responding to the first two research questions, this chapter relates findings regarding how individual states regulate oil pollution, and what difficulties are commonly encountered in the course of these endeavors. Information gathered from the surveys and case studies is combined with publicly-available data to describe activities, facilitate the examination of trends, and identify a series of challenges typically experienced in the course of implementing state oil pollution regulation programs.

The initial section of this chapter describes regulatory programs' initiations. The memories and perceptions of agency staff are used to create a comprehensive description of both when and why the many types of regulatory interventions aimed at addressing oil pollution-related concerns were undertaken by each of the states. Regulation is largely reactionary, and capacities as well as issues of concern change over time. Given that the focus of this research is on describing current practices and challenges such that viable solutions can be identified, the remainder of the chapter relates to conditions as they exist today.

With regard to polluting sources, for example, respondents were asked to identify which potential spill-generators were of greatest concern to their agencies and departments. Their responses are reported here and compared with actual hazard, using measures of the prevalence of each source type within individual states.

In terms of actual regulatory designs, a number of topics are discussed, including the number of agencies with authority over oil pollution and the typical divisions of labor that exist between them. Programmatic funding sources are also described, as are participants' perceptions of their adequacy with regard to covering the costs of cleanups, staffing and other basic functions. Survey takers' accounts of the roles played by external parties; such as local responders, regulators in other states and federal agencies, members of the general public and environmental and industry organizations; are also detailed here. Finally, regulators' relationships and treatment of regulatees is examined in depth.

Through the course of these descriptions and analyses, a series of challenges and shortcomings common across states are identified. Poor data collection practices, for example, are found to be quite common, as is an inability (or unwillingness) to seek natural resource damages, despite widespread concern over lost use and non-use values resulting from spill events. Enhancing spill prevention appears to be another major stumbling block, a finding which is not surprising that state regulators must often contend with many dispersed spillers and spill types. Having explored regulatory challenges here, the following two chapters contain a series of case studies, each of which profiles an innovative solution to one of these shortcomings. The studies describe programs that have been successfully implemented by regulators in Florida and Wisconsin, and can be used as models by other states interested in replicating their efforts.

This work is designed to focus on the forest, rather than the trees. While the result of this effort cannot be described as 'comprehensive,' in that not all of the characteristics of every (or perhaps *any*) state's approach are captured, it does facilitate the description of common regulatory behaviors, and makes possible the drawing of credible conclusions regarding what works and what does not with regard to oil pollution regulation.

The findings reported here are based primarily on qualitative analyses. They do not rely upon mathematical modeling to determine the effectiveness of regulatory interventions; they do not include a statistically-based classification scheme for grouping states' approaches to this type of regulation. Although research products of this type are not undesirable, they proved impossible to generate for a number of reasons.

The availability of spill data was a major limiting factor. There is no comprehensive national database where all releases are recorded; and, as discussed at length throughout this chapter, considerable disparities exist between state and federal accounts of polluting incidents. Also, data tracking at the state level is frequently inconsistent or non-existent, a fact which is discussed in greater depth in later pages. The extreme variation in the types and designs of state programs proved another major obstacle to efforts at standardized reporting. Similarly, the fact that survey data were often gathered through an interview with a single individual, representing but one of the (typically) many programs dedicated to oil pollution regulation within their state, was another limiting factor.

Despite these conditions, the findings presented here are of considerable importance, and should not be dismissed because of data limitations. The interviews offer insight into a dimension of regulation which has not yet garnered much academic attention. By all accounts, we have been successful in devising solutions to some of the largest spill sources, a feat that has been accomplished through what could be described as ‘federally-centered’ regulatory efforts, although the states certainly played an important role in the undertaking. For smaller-scale threats, however, those over which primary responsibility falls to the states, much work remains to be done.

This thesis acts to describe states’ strategies, highlight the difficulties they face, and identify and describe innovative solutions to these challenges that have already been devised and implemented by one or more of these ‘laboratories of democracy.’ It is hoped that the ideas presented here will facilitate a more accurate and holistic understanding of the nature of the oil pollution problem as it exists in this country today. It is also the intention of this work, to provide those states struggling to address one or more of the most common regulatory hurdles, with viable model solutions that can be adopted to address their concerns.

Part I: Program Initiation

As detailed in the literature review, any number of factors may prompt the creation of a regulatory program. One of the aims of the survey was to determine which, if any of these proposed motivators had led to the development of programs and initiatives designed to address oil pollution. The data presented in this section were generated using participants’ responses to the survey questions: “In what year did your state initiate this program?,” and “What prompted the creation of the program?”

When asked why their particular program had been initiated, a significant proportion of the survey respondents were able to identify the precise motivations, specifically naming large focusing events and regulatory trends initiated at the federal level, as providing the impetus. Others cited the perception of a general need for enhanced government interventions to protect health and environmental welfare responses, which when considered in conjunction with reported program start dates, also provide evidence of the importance of national mood on individual states' behaviors.

A total of 20 survey participants noted that the actions of federal regulators, or the passage of a federal law, were wholly or partly responsible for motivating the creation of their program (see Figure 4.1). For some, such as Arizona and Colorado, it was the desire to assume primacy over a federal program that was the impetus. For South Carolina and others, it was a general recognition of a trend in the federal arena of environmental protection that motivated state-level regulatory efforts.

Fourteen states named a specific focusing event as the single driving force. Of these, Maryland, Massachusetts, Minnesota, Rhode Island, South Dakota, Utah and

Wisconsin were motivated to create their current regulatory programs by local events. Two spills, one in Baltimore Harbor, the other in Chesapeake Bay, prompted Maryland to initiate a program to address such releases. Similarly, simultaneous spills totaling one million and 3.7 million gallons each, occurred in Minnesota in the mid-1960s; these events prompted the creation of the state's Pollution Control Agency and of the Emergency Response Program which still exists today. South Dakota's regulations, in contrast, were put in place after a release from a facility in Sioux Falls prompted the evacuation of a nearby school.

The *Exxon Valdez* spill, however, was the only event named specifically by regulators whose state was not directly affected by the release[62]. In addition to Alaska, respondents representing six states (California, Florida, Louisiana, Oregon, Texas and Washington) reported that the infamous spill provided the motivation for the laws and programs in place today. The fact that the effects of this incident reverberated across jurisdictions, many of which are quite spatially distant from the shores of Prince William Sound, is evidence of *Valdez*'s role as a bellwether; as by all accounts, it pointed out the inherent weaknesses in the regulatory and response capacities in place at the time.

It is difficult to separate the effects of the spill into purely state- or entirely federal-initiated actions, because it set into motion a multitude of regulatory revisions and innovations whose development and influence co-occurred. What is clear is that all involved treated the incident as a wake up call to be heeded with the utmost seriousness. In a Senate subcommittee hearing immediately following the spill, Transportation Secretary

[62] Some of these identified local focusing events, in combination with the *Valdez*, as providing the motivation for their program's creation.

Samuel K. Skinner commented that "(o)n a scale of one to ten, (Aleyska's[63] spill response plan) was a zero," despite the fact that it had been approved by federal and state regulators alike. At the same hearing, Senator John H. Chafee (R-RI) chastised all involved, stating; "From all accounts, the cleanup crews initially responding to this spill acted more like the Keystone Kops than the well-trained oil spill response team described in the industry's contingency plan" (Editorial, 1989).

The general sentiment in the wake of the largest oil spill in U.S. history was that "(a)rrogance, misplaced trust, a lack of oversight and user-friendly regulation" had "set the stage…[for the] tragedy" (Editorial, 1989). Although Exxon was popularly portrayed as the villain, state regulators recognized their role in what ensued. A long-time employee of the state's Department of Environmental Conservation who was involved with the response effort, they described the aftermath of the spill in this way when interviewed by the researcher.

> "*Exxon Valdez* was probably the worst…way you could manage a spill response…it was such a mess. (I)t was like was like America and Jihad; we (the State of Alaska and Aleyska) were the worst of enemies... It was a very argumentative process, there was finger pointing, there was no collaborative effort on it. It was hard for the State and it was hard for industry, too."

Alaskan legislators responded by passing House Bill 261 (DEC-SPAR.a, 2006), which led to the creation of a new spill response office that would be capable of responding to the next big release. Six other states acted similarly, by passing legislation and/or creating programs designed to ensure that a *Valdez*-style incident would never occur within their borders. Of these, Oregon, California and Washington are in relatively close proximity to the spill site and provided some of the response equipment used in the

[63] Aleyska is the industry consortium that operates out of the Port of Valdez, of which Exxon is a member.

aftermath of the spill. Today, all three are active members, together with Alaska[64], in the Pacific Coast - British Columbia Oil Spill Taskforce; a group created in 1989, in recognition of "…their common concerns regarding oil spill risks and the need for cooperation across shared borders.[65]"

The remaining three states that identified the *Valdez* as a regulatory catalyst are far from Alaska, but have in common with it a number of risk factors, and would face similar environmental and economic impacts. California, for example, has a total of seven oil import sites and seaports (more than any other state), Florida and Washington each have four such locales and Texas has six. Also, excluding Oregon, all are oil-producing states. More oil is produced in the state of Texas than in any other jurisdiction; and in terms of offshore oil production, California is second only to Alaska, and Louisiana ranks third. In terms of potential impacts, all have large areas of coastline characterized by sensitive ecosystem types and all have economies, segments of which are reliant upon access to a healthy marine environment[66]. According to respondents, this combination of factors prompted regulatory responses because of wide-scale recognition that what had befallen Alaska could someday occur on their shores if the proper precautions were not put in place.

During the course of an interview, George Henderson, Director of Florida's Fish and Wildlife Research Institute, echoed sentiments expressed by a number of interviewees when he described his state's reaction.

> The *Exxon Valdez* woke everybody up and we realized 'Wow, this really can happen.' The perception of Exxon more or less trying to obstruct progress, rather than jumping in with both feet to work with the people

[64] Hawaii and British Columbia are also members of the Taskforce although not among the founding members.
[65] See: http://www.oilspilltaskforce.org/
[66] For example, Florida had more registered recreational marine vessels in 2006 than any other state and California came in second in this ranking (973,758 and 963,658 vessels respectively).

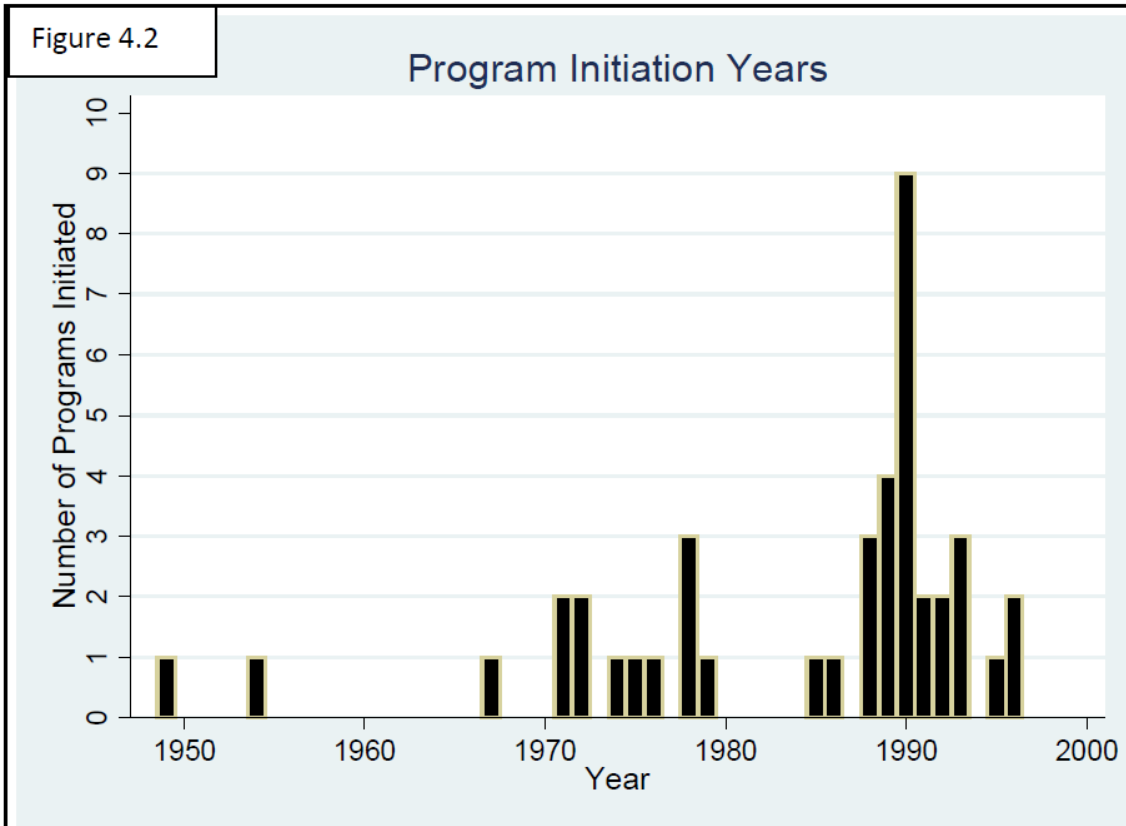
> was, whether it's true or not, a strong perception among the casual public, including legislatures. At that time, the state had a Commission that it established, and it looked at all aspects from pilot licenses to oil spill damages, and it came up with the concept of creating (the Emergency Response Department) which didn't really exist before that.

Although many respondents identified just one or two motivating factors, it is not always easy to recall the specific stimulus for a program's creation. This is particularly the case for efforts begun years ago because, as multiple interviews made clear, institutional memories are often lost as long-time employees retire or seek employment elsewhere. Evidence of this is found in the responses of the twelve states that cited the general perception of need for a regulatory program of the kind, or who were unable to name a specific motivation. Similarly, four jurisdictions felt that a combination of federal actions and one or more focusing events, had provided the momentum for their state's actions.

In light of the many reasons why states have opted to create programs to regulate oil pollution, it should come as little surprise that the years in which they began are quite varied. When the temporal frequency distribution is created (see Figure 4.2), in fact, it spans nearly half a century; although particular periods produced markedly greater numbers of such efforts than did others.

Arkansas, Minnesota and Michigan reported the earliest dates of program initiation (1949, 1954 and 1967 respectively). These three were the only jurisdictions to cite a year prior to the 1970s, the decade widely recognized as the beginning of the environmental movement in the United States. In contrast, Kentucky and Rhode Island identified their programs as the most recently created (both originated in 1996). By far, the largest number of respondents, nine in all, named 1990 as the year in which their states began regulating oil pollution using their current approach. A distant second in terms of program starts was 1989, with four states identifying this as the year in which their programs began. These findings corroborate respondents' reports that that the *Exxon Valdez* spill, and resulting federal regulatory initiative, did much to influence states' behaviors.

Figure 4.2



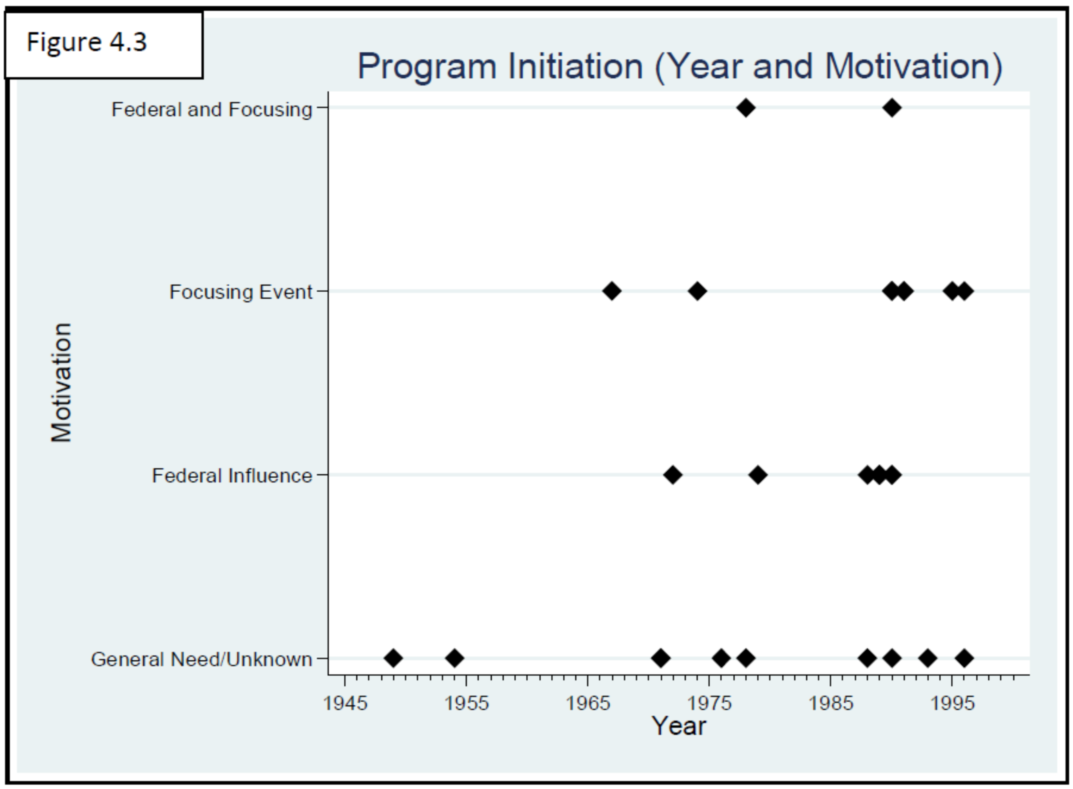
Interpretation of these data must be done cautiously as, perhaps more than with other indicators extracted from the survey responses, their values are dependent upon the particular program in which the respondent is employed and their personal interpretation of the question's meaning[67]. Further complicating matters, on several occasions, more

[67] Arkansas, for example, identified the creation of its Pollution Control and Ecology Commission in 1949 as marking the beginning of its program. Changes have undoubtedly occurred to their regulatory approach since that time, and had a different individual provided the survey responses, they might have indicated a more recent date, perhaps reflecting the start of a particular, oil-focused program.

than one date was provided, reflecting the fact that significant changes in programmatic designs and/or goals had taken place after its initiation; in such instances, the earliest date provided for the current program was recorded[68].

Despite the limited nature of the interpretations possible based upon these data, several findings are worth noting. First, two of the three earliest dates are reported by states whose regulatory motivations are either unknown or described as a general perception of need. It is also interesting, though hardly surprising given the occurrence of the *Valdez* incident and the enactment of the federal Oil Pollution Act of 1990, that all but one state that named 1989 or 1990 as the year their program began, identified a

Figure 4.3



federal influence[69], a focusing event, or both as important motivating factors. Clearly, this latter conclusion supports the notion that occurrence of this one spill, and the

[68] A single date is recorded for DE, ID, IN, MA, MS, NE, NV, NM, OR, PA, SD, UT, and VT, although more than one was provided by the respondents.

resulting passage of OPA90, were the single most important historical events with regard to determining the shape and focus of oil pollution regulation in the United States (see Figure 4.3).

Legal Foundations

Regulatory authority is typically based in legislation; however, the number and nature of the laws and orders under which individual states seek to prevent and mitigate the effects of oil pollution vary considerably. In some states, laws specifically focused on this problem exist, and their passage often coincides with the creation of the programs in place today. Georgia's Oil or Hazardous Spills or Releases Act (O.C.G.A. 12-14-1 et. Seq.), Louisiana's Oil Spill Prevention and Response Act of 1991 (Louisiana Revised Statute 30:2451), and Massachusetts' Oil Spill Prevention and Response (Chapter 21E) and State Oil Spill Acts (Chapter 21M), are examples of such laws.

Authority over oil pollution is also often attained, not with the passage of a new law, but through extensions and alterations to existing legislation. An example of this practice can be found in Maine. Title 38 of the Maine Revised Statutes, initially passed in 1969, provides the basis for the state's entire regulatory program. The law has been revised over the years to encompass emerging issues; major alterations related to oil were made, for instance, after the passage of the federal Clean Water Act and Oil Pollution Act of 1990 (OPA90).

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[69] Responses were coded as indicating the presence of a 'federal influence' in instances where the participant's answer indicated that their program had begun in response to the passage of federal legislation or because a federal program had been created (whether for the purpose of assuming primacy, or to avoid federal cooption of an area considered within the state regulators' domain).

In a number of instances, states rely wholly or in part upon the authority granted to them under federal legislation or through the assumption of primacy over federally-created programs, to facilitate the regulation of oil pollution. As is the case in several other states, the Louisiana Department of Environmental Quality considers all oil spills to be unauthorized releases with the potential to threaten drinking water, and uses its authority under the EPA-delegated National Pollution Discharge Elimination System (NPDES) program to address them. Colorado's Department of Labor and Employment has a similar reliance upon federal initiatives, assuming primacy over the EPA's Leaking Underground Storage Tanks program in order to control releases from such sources.

Whether specific to oil pollution, or revised versions of existing laws, it is not at all uncommon for states to rely upon multiple pieces of legislation to provide the needed regulatory authority. When this approach is used, applicability typically depends on the source, type or location of the polluting substance or event; however, these delineations are not always so clear cut. Washington state, for example, has at least seven laws under which it regulates oil pollution. The state's Underground Storage Tank Law (Chapter 90-76) provides authority for its tanks program; however, federal law is also used. Marine and inland spills are handled under a variety of laws. To name but a few, RCW 88.40, RCW 90.56, and RCW 88.46, relate to the transport of petroleum products and financial responsibility, oil and hazardous substance spill prevention and response, and vessel oil spill prevention and response, respectively.

Changing Need and Changing Regulation:

Since oil pollution regulation is undertaken in response to extant conditions, it is not surprising that changes in those conditions precipitate alterations in program design.

Examples of this trend can be found by examining the behaviors of individual states; however, there is evidence that large-scale transformations have taken place, particularly as described in the preceding section, since the *Valdez* spill and the passage of OPA90, which acted to fundamentally alter the regulatory landscape.

At the level of the individual state, adjustments in programmatic focus are ongoing. In the case of Wisconsin, the legislature's decision to make funding available for the cleanup of tank releases led to the creation of a large program dedicated to that task, a program which served as a model for the design of the EPA's LUST program. Today, as older tanks are largely phased out and funding is less readily available, program staff looks towards the future with the knowledge that fundamental changes are inevitable, but the shape those changes will take remains as yet unknown.

Another example of programmatic redesign can be found in Alaska. Still smarting from the *Valdez,* legislators authorized a program whose focus was solely on preparedness for large events. "The thing about it is that we don't have that many great big spills,' explained John Bauer, longtime employee of the state's Department of Environmental Conservation, 'the Exxon was a big catastrophic spill, we haven't really had one since then. It's kind of like the Maytag repair man – you keep waiting for another big one. [I]t doesn't happen in 10 years, is it going to happen in 20?" Recognizing the need to respond to the 2000 or so smaller spills that are reported around the state each year, the legislature passed a law in 1995, creating the Prevention and Emergency Response Program (PERP), which Bauer describes as designed to "…look at not only the big catastrophic spills, but also the smaller spills; kind of our 'meat and potatoes' spills that we have everyday."

Recognition of the need to concentrate efforts on small spills is common among state regulators; as is the perception that the number and severity of industry-generated releases has decreased considerably since the passage of OPA90, a sentiment most recently articulated at the national level in a Congressional Reporting Service Report focused on coastal spills (Ramseur, 2008). Although this outcome appears to be a testament to the effectiveness of regulation and to changed attitudes on the part of industry, it in no way indicates that the problem of oil pollution has been resolved. On the contrary, discussions with state regulators clearly indicate that while the volumes released are typically smaller, oil pollution is still a major concern. These trends have been described by research participants in terms of changed attitudes and behaviors among members of industry, and of capacity on the part of federal and state agencies

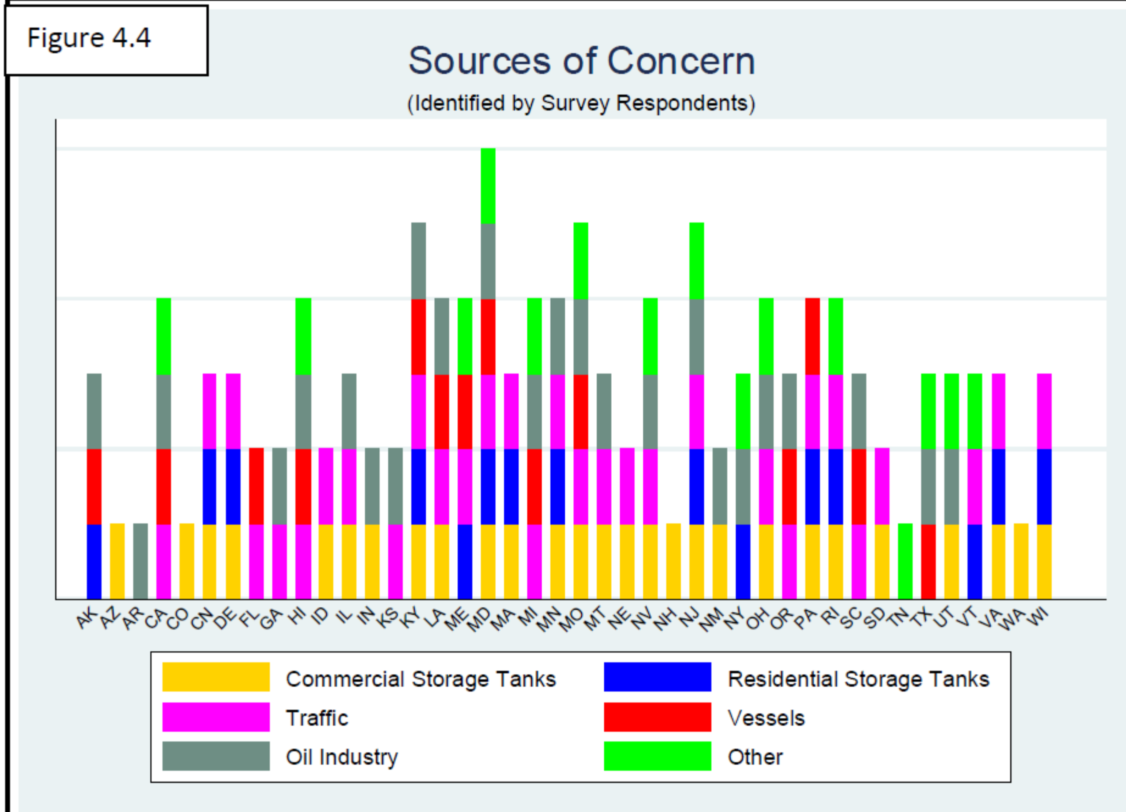
Part II: Oil Pollution Today

Polluting Sources and Incident Data:

Through the course of the survey, a number of specific sources were described by respondents as the most pervasive generators of oil pollution within their states at the present time (See Figure 4.4). Somewhat surprisingly, motor vehicle traffic was the most frequently identified pollution-generator. Named by respondents in 30 states; of particular concern are releases originating from large trucks, whose saddle tanks or connector lines may be damaged during accidents or as a result of contact with flying road debris, either of which can result in the release of large quantities of diesel fuel.

A number of more traditional sources were also identified. A close second to traffic, 29 survey takers felt that under and above ground storage tanks, such as those found at commercial installations (primarily gasoline stations) and residences, were among their states' greatest polluters. Also, industry activities involving the extraction, processing, transport and use of large volumes of crude oil or refined product were named by 24 jurisdictions, many of which qualified this response noting that these sources pose a significant threat, but rarely generate damaging spills. A number of participants (14 in all) also identified watercraft (particularly recreational vessels); while 15 named various other sources, such as electrical transformers, railroads and illegal dumpers as of considerable concern.

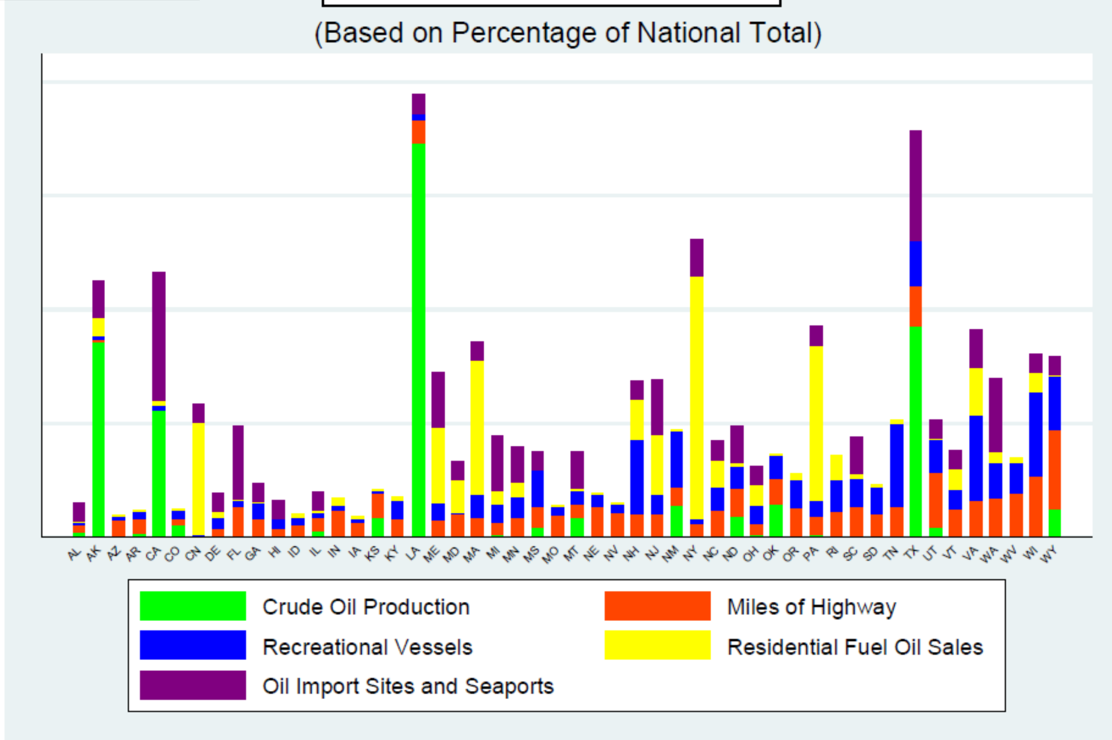
Figure 4.4



Perceptions aside, the actual prevalence of these spill-generators varies between states, and although some are clearly at greater risk from the sources they felt posed the greatest threat, others appear to have an average or even minimal likelihood of experiencing these types of incidents, relative to other jurisdictions. Three distinct approaches are included here to represent states' hazard profiles. Figure 4.5, presents what can best be described as absolute measures of relative hazard; as each bar is made up of the summed percentages of the national totals for each polluting source found within individual states. In contrast, Figures 4.6 and 4.7, make use of location and population functions to depict risk while adjusting each state's total to reflect how either its physical extent or number of residents compare to the country as a whole[70].

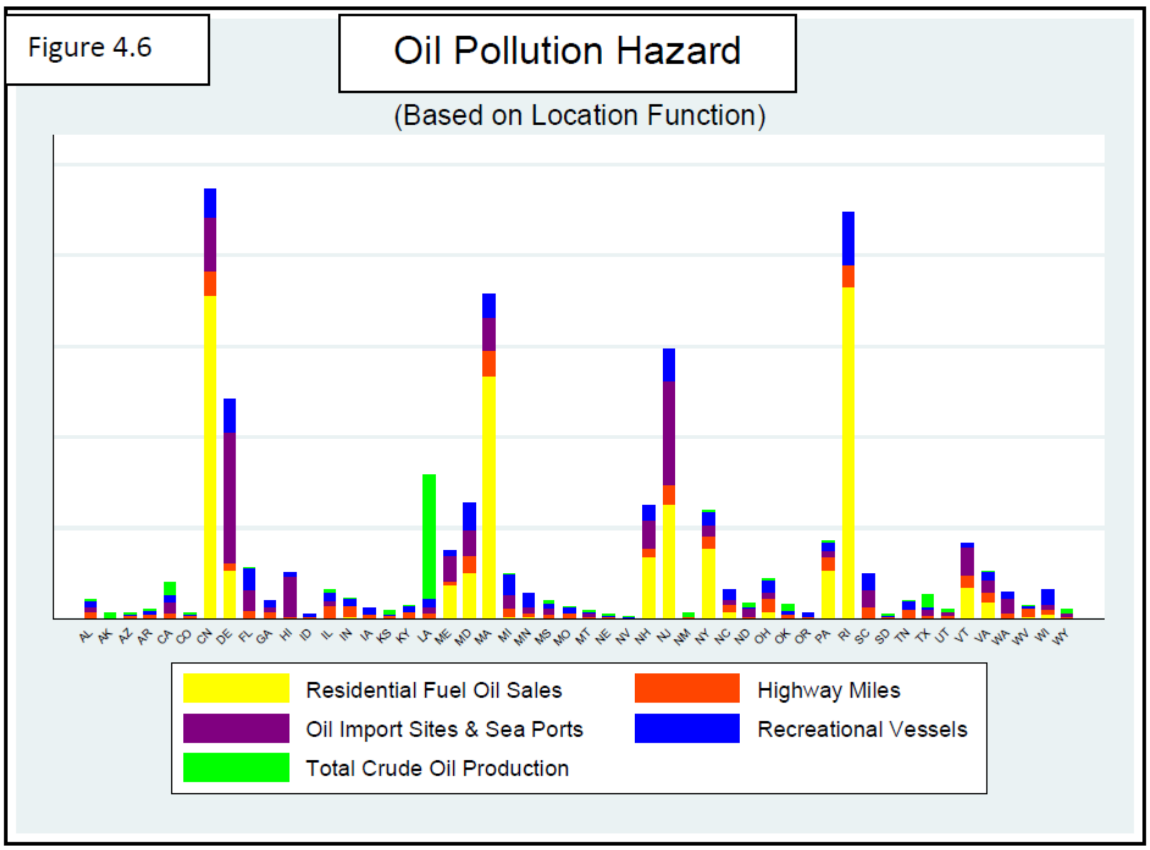
Figure 4.5

Oil Pollution Hazard



[70] To calculate the location quotient, the state-specific value of the variable of interest was divided by its area (in square miles) this amount was then divided by the national total for that variable divided by the total land area of the U.S. To determine the population function, the same estimate was calculated substituting population statistics for land areas.

Each analysis makes use of the same publicly-available data[71], but creates a different risk profile, to facilitate the examination of this topic from a variety of perspectives. Total crude oil production, and number of oil import and sea port sites, are used to measure the level of industry presence in each state, likewise, a count of highway miles serves as a proxy for both spill-generating traffic accidents and gasoline stations. The prevalence of home heating oil is depicted using sales data for 2006 and the number of registered recreational vessels present in each state for the same year gives some indication of the potential for boating-related releases.

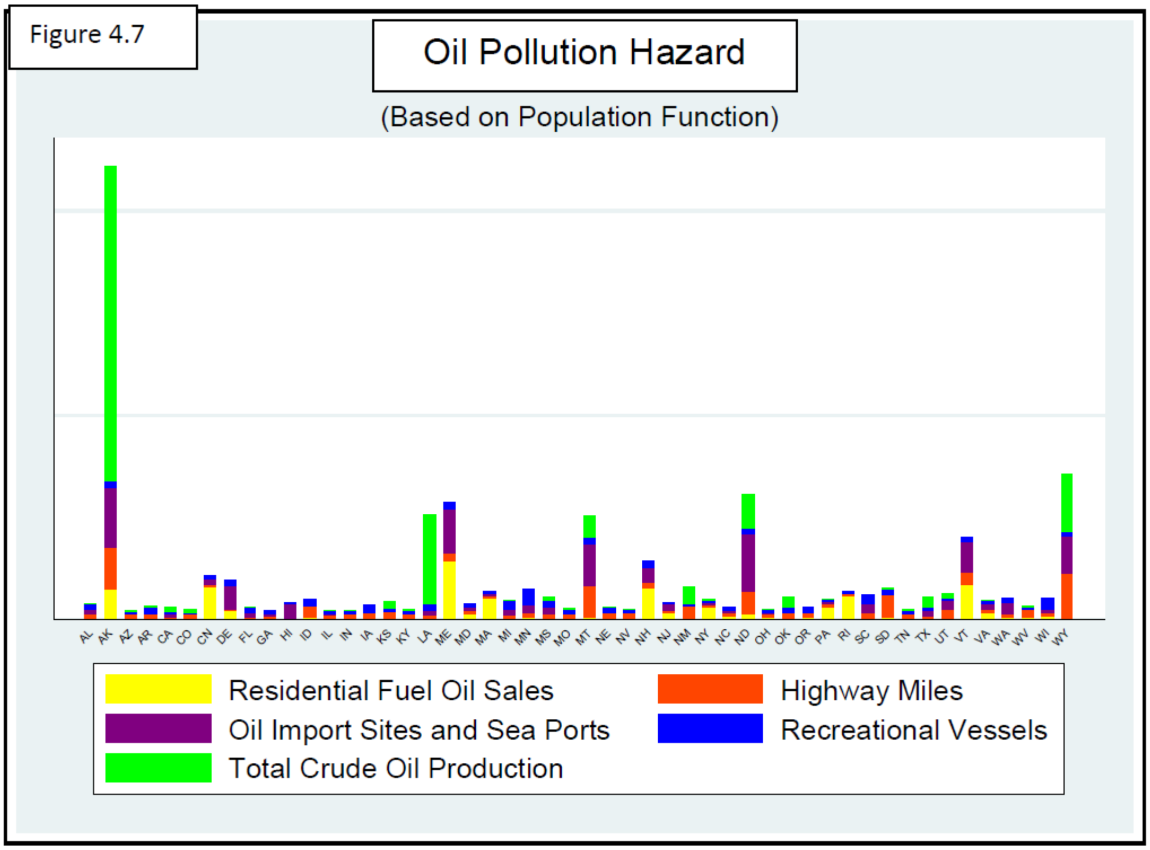


Although the variables relied upon here are the best measures of the respondent-identified sources of concern that could be created using available data, it is important to

[71] For a complete list of data sources, please see Appendix F.

note that the statistically-detectable relationships between them and the survey-takers perceptions are generally limited. Two independent variables; the volume of residential fuel oil sold, and the number of registered recreational vessels; proved significant in their ability to predict whether these source types were identified as of concern. Respondents' probability of naming residential fuel tank spills doubled with each additional 38,000 gallons sold in their state annually; an amount well below the calculated standard deviation of the distribution (233,808 gallons). A somewhat weaker, but still meaningful, relationship was found to exist between the number of vessels and participants'

Figure 4.7



perceptions. An increase of approximately 354,000 recreational watercraft, was found to double the odds that this source would be mentioned, however, given that this is well above the standard deviation of the data (~250,000), responses were clearly less sensitive to changes in this indicator[72].

The interpretation made possible when calculations are based upon absolute percentages is perhaps the most familiar. Four of the five states whose hazard levels appear greatest are also the nation's largest producers of crude (Alaska, California, Louisiana and Texas). A significant proportion of their final hazard ratings is composed of the measure of "Crude Oil Production," and all four named the oil industry as among their greatest polluting sources. New York, the state whose hazard level appears fifth highest in the nation, generates no oil, but also named industry as one of its most prevalent spillers. In this instance, however, the state's high hazard ranking is primarily due to the large proportion of the population that uses kerosene and #2 oil to heat their homes. Recognizing this fact, regulators from New York also named residential storage tanks as a major spill source. Pennsylvania, Connecticut, Massachusetts and Maine are also at considerable risk due to their similar use of home heating oil, and all but Connecticut identified releases from residential tanks as an area of considerable concern.

When the data are adjusted to reflect states' sizes, however, the individual hazard profiles change considerably. Seemingly in little danger when absolute percentages are considered, Connecticut now appears at greatest risk, followed closely by Rhode Island and Massachusetts. All three are characterized by a considerable reliance on home heating oil, which was one of the major spill sources identified by respondents from these

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[72] These findings resulted from multiplying logistic regression coefficients by 100, an approach which yields the percentage change in the odds given a unit change in the independent variable. For in-depth discussion of this technique, see: Roncek, Dennis and Marc Swatt. 2006. For Those Who Like Odds: A Direct Interpretation of the Logit Coefficient for Continuous Variables. Social Science Quarterly. 87(3): 731-738.

states. They are also among the smallest in the nation, ranking 48th, 50th and 38th respectively, a condition which also impacts the calculation of this measure.

New Jersey and Delaware are also shown to be quite prone to oil pollution, and although residential fuel oil is one component of this determination, the presence of oil import and sea port sites,[73] is also partly responsible. This finding bears some resemblance to regulators' perceptions. The New Jersey DEP, for example, is well aware of the polluting potential of the many storage tanks and industrial activities within the state, but is equally concerned about illegal dumping and traffic accidents. Delaware, in contrast, is more focused in its efforts, concentrating primarily on traffic and tank releases. It is also interesting to note that when state size is taken into account, Louisiana's risk of oil pollution is still among the top six in the nation, whereas the much larger Alaska, Texas and California appear on par with non-producing jurisdictions such as Minnesota.

When risk is determined taking population size into account, perhaps the most dramatic results are produced. A sparsely- populated state where large volumes of oil are generated, Alaska's ranking in this instance is more than 11 times the mean value for the population as a whole. Not merely a mathematical anomaly, regulators in Alaska confirmed that the state's vast size and sparse population, coupled with its often severe weather conditions and large oil industry presence, can severely limit their ability to respond to releases in a timely manner. Unable to reach a remote spill site during inclement weather, employees of the PERP may have to wait weeks or even months to respond to remote releases, a condition which limits their ability to mitigate and assess natural resource damages.

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[73] New Jersey has three such sites and Delaware has one.

The total calculated for Wyoming, the state at second highest risk when population is considered, is approximately one third that of its northern counterpart, but still higher than any of the other 'big oil' states whose risk ranking dominated in the initial examination. In the case of Wyoming, its high ranking reflects the presence of considerable miles of highway, in addition to its rather modest levels of crude oil production. North Dakota, Maine and Montana are also among the jurisdictions at greatest per capita risk of polluting events, having in common the presence of locales through which large volumes of oil are imported. As with the area-based measure, Louisiana again ranks sixth in the nation in terms of its relative risk of experiencing deleterious oil pollution, making it the only state to consistently attain a high ranking, regardless the methodology employed for calculating risk.

From the above discussion, several conclusions can be drawn. Clearly, relative risk of oil pollution varies across states, and is quite sensitive to the type of calculation used. Also, the relationship between regulators' perceptions and measures of actual risk can differ, sometimes considerably, as evidenced by the very low correlations calculated between the survey responses and the various measures employed here. Rather than indicating that these measures are in some way flawed, however, this observed lack of correspondence may reflect the influence of respondents' limited knowledge or personal experience. It may also be that particular sources, although present in a given state, are well managed and therefore, are not perceived as particularly threatening by regulators there; or in contrast, that a relatively uncommon activity causes a disproportionate amount of pollution.

What should be taken away from this discussion, therefore, is the general conclusion that oil pollution originates from a large number of common activities, making it a ubiquitous problem, rather than one confined to states such as Alaska and Texas, which are typically associated with spills originating from the oil industry. In fact, the major oil-producing states appear to be at relatively low risk when absolute percentages are not used as a measure; a finding which is worth noting, particularly given the general consensus among federal and state agencies that the incidence of large, industry-generated spills have declined considerably of late.

Louisiana appears at odds with this conclusion, however, as its risk rating remains relatively high, regardless the methodology employed. To be sure, this finding is partly due to the much greater production level of Louisiana as compared to other jurisdictions (about twice that of any other state), but the presence of several other factors compounds this risk. Employees of both the Louisiana Environmental Protection Agency and the Louisiana Oil Spill Coordinator's Office (LOSCO), the two state-level agencies with primary authority over oil pollution, confirmed the seriousness of the problem.

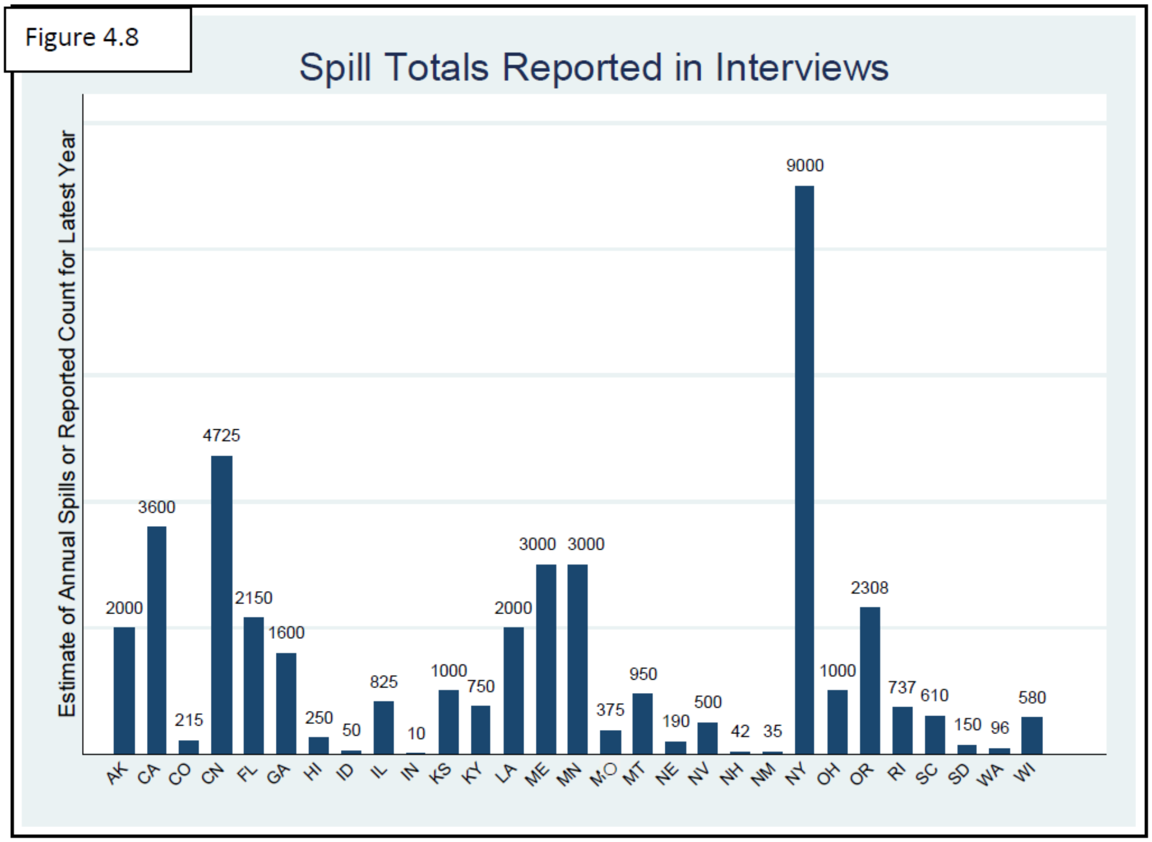
Massive volumes extracted both on and offshore, as well as imported from abroad through the only U.S. port capable of accommodated deeptankers arriving directly from the Middle East (EIAa, 2008). Making matters worse, releases are made much more likely due to a combination of natural and manmade conditions. As both interviewees were quick to point out, the oil industry has been present in Louisiana for over 100 years, meaning that much of the infrastructure in use today is outdated and working beyond its intended lifespan. Aggravating this situation is the fact that the ongoing process of land subsidence in coastal areas has put much of the metal pipelines and machinery in contact with corrosive salt water, and in some instances, effectively made offshore wells out of installations that were originally constructed in sheltered bay areas. The state is also prone to hurricanes; and a single large storm can cause a multitude of simultaneous releases, as demonstrated, for instance, when Hurricane Katrina devastated a large portion of the state in 2004. Clearly, Louisiana has special characteristics that put it at a greatly increased risk for oil pollution from industry-related sources, making it the state at perhaps the greatest risk of this type of environmental degradation.

Many survey takers, even those representing non-producing states, named contingents of the oil industry as among their potential spillers. This response, however, usually reflected their awareness of the potential for releases from ports, pipelines, and other industry sources, rather than the actual severity of the problem experienced. By far the most frequently cited type of polluter was small-scale end users, such as truck drivers and homeowners, for whom oil transport and consumption are not a primary focus, but occur in conjunction with other activities. This finding is significant, in that it appears to support the conclusion drawn by the Congressional Reporting Service and others, that the incidence of large industry-generated releases has decreased significantly since the passage of OPA90.

State-Specific Spill Totals:

The conclusion that the nature of the oil pollution problem experienced throughout the United States has changed of late does not imply that the problem has been resolved. On the contrary, the survey data suggest that many states still experience a large number of potentially injurious releases. When asked how many oil spills were reported in their states annually, 29 survey takers were able to provide a count; these respondent-generated annual spill totals are presented in Figure 4.8. Although clearly illustrative of the fact that oil pollution is still a major concern among state regulators, interpretation of this information must be tempered by the fact that its accuracy is somewhat suspect because many figures represent participants' estimates, rather than verified counts.

Figure 4.8



Although not precise, these numbers support the conclusion that the publicly-accessible and often-cited National Response Center (NRC) data do not portray the whole of the nation's oil pollution problem. The omission of a considerable number of releases from the federal database is not the result of poor data management; however, it is in fact, an unavoidable artifact of the system's design. The NRC is tasked with data collection under a specific set of federal laws, the applicability of which is extremely limited for small, use-related releases. Oil spills originating from traffic accidents, illegal dumping, residential heating oil tanks and other small use-related activities, therefore, fall largely within the regulatory purview of the states alone.

Data sharing practices also act to limit the types of incidents recorded in the federal database. Although faxed alerts are sent to state emergency responders whenever any incident is reported directly to the NRC's hotline or website, there is no reciprocal mechanism in place to ensure that the states share their spill reports with their federal counterparts in a similar fashion. The Center generates a record corresponding to every release reported to them regardless their legal authority over it, however, it is seldom made aware of spills from tanks, trucks and other small sources, as these matters are typically handled within the state reporting and response systems. Emergency responders in Wisconsin and Florida confirmed this scenario, and explained that the decision as to whether the NRC should be notified of a release is made on a case-by-case basis. If state regulatory and response resources are sufficient, federal agencies are seldom contacted.

To demonstrate the degree to which states' own counts vary from those available through the NRC data portal, Figure 4.9 depicts the percentage difference between respondent-provided spill totals and those recorded for each state by this federal source[74]. While the NRC's spill totals are higher for Hawaii, Indiana, Louisiana and Washington, for the remainder of the states they are lower, often considerably so. In the case of Connecticut, Maine and Montana, the state-reported quantities are more than 20 times higher than those reflected in the federal data set, while Minnesota's total is more than 30 times that reported by the NRC. From information gathered through the course of the

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[74] NRC data reflect the total number of incidents reported in 2006 involving petroleum. This year was selected because it is the most recent for which information is publicly-accessible, and because the numbers reported by many states are annual estimates, rather than counts representing specific years.

survey, it is possible to conclude data management and standardization are among the areas in greatest need of attention. Despite that fact that oil pollution continues to pose a major environmental threat, the only widely-available database (provided by the NRC) bears little resemblance to records kept by individual states. Compounding this, many states currently rely upon poorly designed reporting and tracking systems.

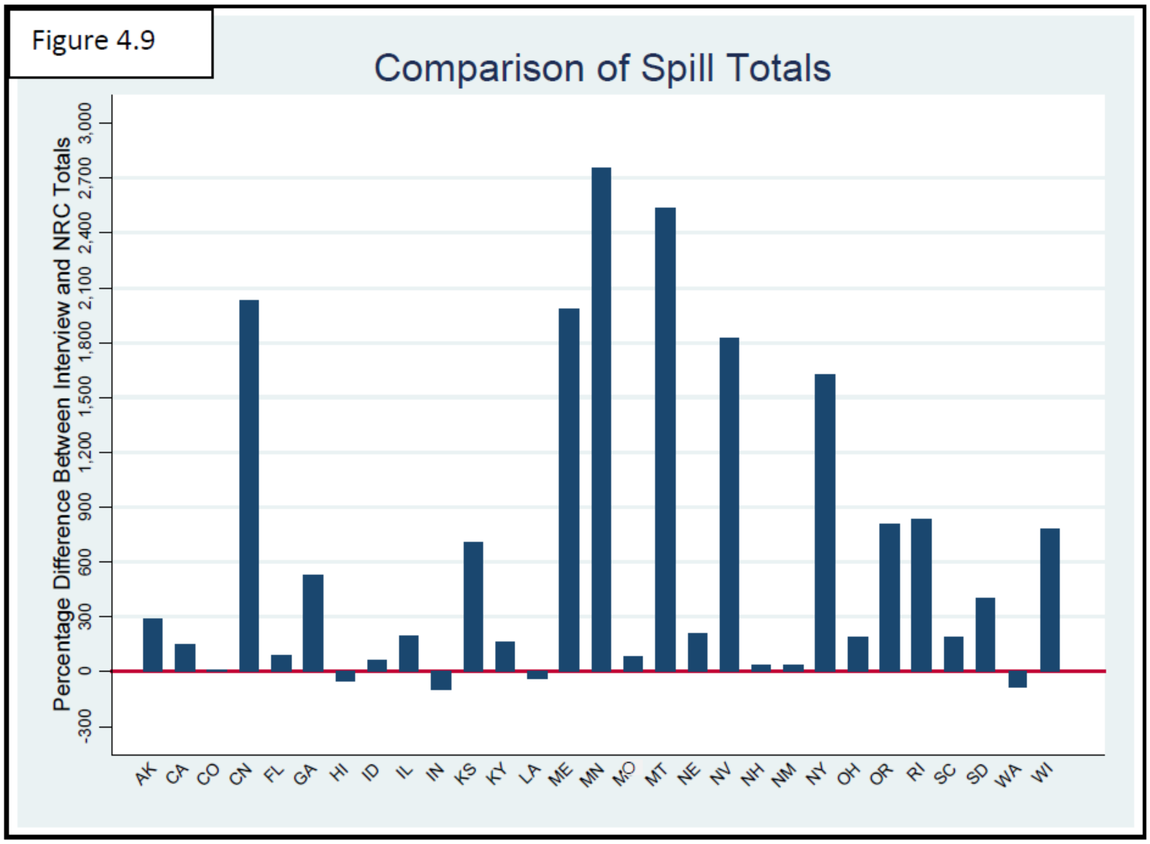


Figure 4.9

Some jurisdictions, such as Wisconsin and Alaska, were found to utilize consistent spill reporting and case monitoring, and to make this information accessible to the public through user-friendly web-based portals. Many participants, however, reported concerns over the quality or availability of their state's spills data, noting that they are outdated, dispersed across multiple agencies or levels of government, or can only be accessed by physically scanning paper records. Some respondents even indicated that spill statistics are not tracked in any formal way by their programs.

Even among programs found to actively monitor spills data, discrepancies in reporting techniques and difficulties in accessing actual case data, meant that multi-state comparisons were impossible to conduct. Differences in reporting requirements are particularly pronounced, with some states requiring that an oil spill of any amount in any locale be reported, while others use a minimum volume of one or more barrels (42 gallons) and specific location-related criteria (such as contact with a surface water body) as the triggers for regulatory involvement.

For all of these reasons, a combination of respondents' perceptions and publicly-available source-related data have been used here as evidence of the types of oil pollution most often experienced in each of the states. While not sufficient to facilitate a comprehensive analysis, these data are presented here because they illustrate the considerable oil pollution-related case load faced by many states, and support the conclusion that locational and population-related considerations should be taken into account when considering risk. New York, for example, receives more petroleum spill reports annually than any other state (about 9,000), many of which arise from industrial activities and home heating oil tanks. Connecticut, the state shown to be at highest risk when land area is considered, handles about 4,725 incidents of this kind annually.

Beyond frustrating efforts at conducting a nationwide analysis of spill trends, states' poor data management likely has negative impacts on the programs themselves, as accurate records are central to performance monitoring, budgeting and other essential functions. The experience of Tennessee's Used Oil Program provides a dramatic illustration of the crippling impact that poor data management practices can impart on a regulatory effort.

Created through the passage of the Tennessee Used Oil Act of 1993, the Program engages in a variety of outreach and assistance efforts, including the generation and broadcast of television and radio commercials to raise consumer awareness about proper oil disposal and the provision of funding for the construction of used oil recycling centers. The Program has been, by all accounts, an impressive success; however, data to support this supposition are not available, simply because the Act does not specify how they should be collected. Regulators currently use data collected by Auto Zone auto parts stores across the state to get a sense of large scale trends, such as changes in volumes collected and geographic differences in collection rates. Solid Waste Regions (which consist of one or more counties) also provide annual reports to the Program; however, the information pertaining to used oil collection is not considered reliable, as some do not report quantities that are burned for heat generation. State regulators are currently meeting with representatives of the Regions to educate them about data collection and reporting needs; however, given the current dynamic, it is hardly surprising that the Law's lack of clarity in this regard is considered a major challenge.

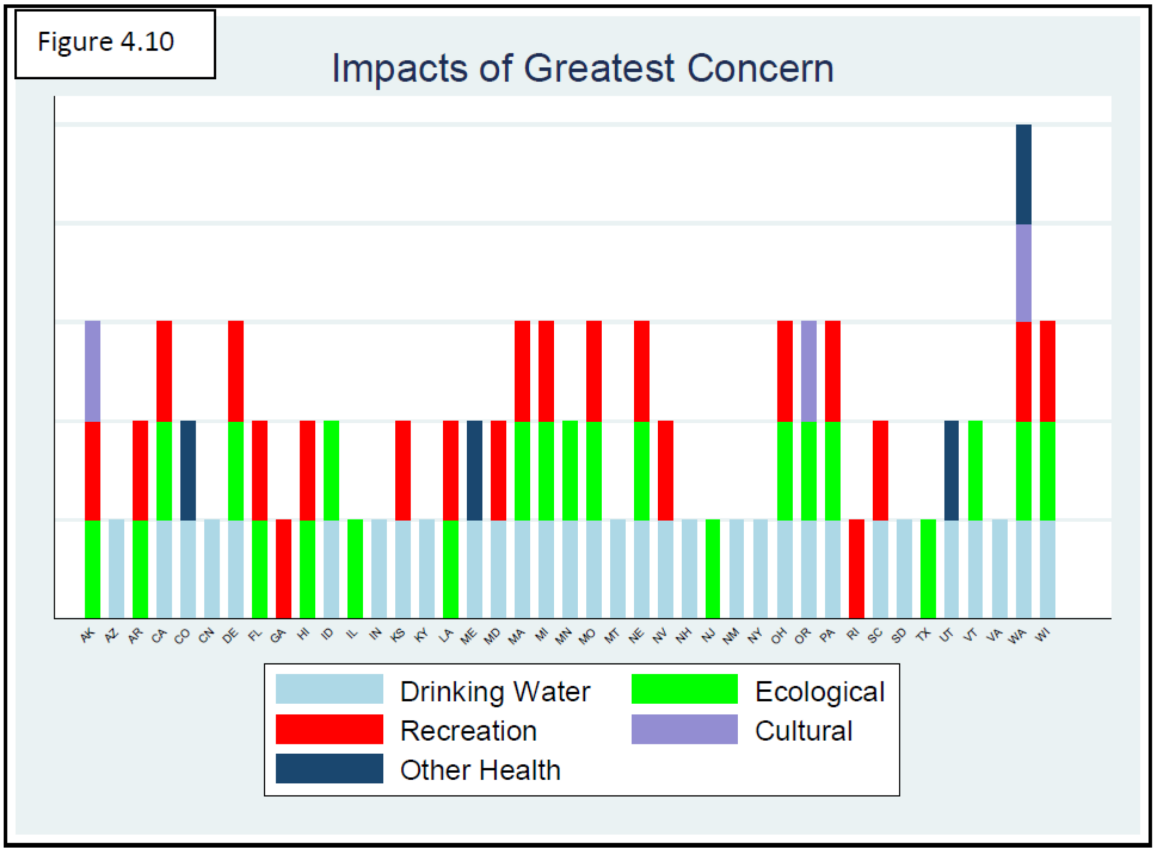
Impacts of Greatest Concern:[75]

As the previous section makes clear, small-scale use-related releases represent the bulk of state regulators' caseloads. At the individual level, the environmental impacts of a leaking tank or ruptured fuel line may be insignificant, but when hundreds or even thousands of such incidents take place in every state each year, the total impacts are considerable. Given the different ecosystems and polluting sources present in each state,

[75] Although an interview was conducted with regulators from Tennessee, no impacts of concern were identified, therefore, this state is omitted from the discussion contained in this section.

it is worth exploring which impacts are considered to be of greatest concern by each jurisdiction.

Figure 4.10



Drinking water degradation is clearly the most prevalent concern among regulators of oil pollution. As depicted in Figure 4.10, fully 32 of the states interviewed felt that pollution of drinking water through exposure to petroleum was one of the outcomes to be avoided at all costs. Of these, 10 named this impact as the only one on which their programs focus. This sentiment was expressed regardless whether the state's population relied upon surface or groundwater sources, or a combination of the two, but was clearly identified with certain types of spill-generating behaviors. In New Mexico, for example, regulators report that about 90% of the state attains its water from subterranean sources. For this reason, oil extraction and transport activities located in river valleys are of particular concern there, because the surface water can act to convey contamination to the groundwater below.

Maine share's New Mexico's concern for groundwater pollution, but leaking residential underground storage tanks are the primary culprits. This is because, not only do the majority of Maine residents drink from private wells, most heat their residences with fuel oil, meaning that individual homeowners may inadvertently poison themselves and their neighbors as a result of poorly maintained tanks. The severity of this problem is quite pronounced despite regulators' efforts at public outreach and education, as about one tank release is reported to the state's Department of Environmental Protection each day during the winter months; an order of magnitude more than that of Maine's second most frequent spill source.

In addition to drinking water contamination, four respondents identified other human health impacts stemming from petroleum vapors as among their programs' primary focuses. Colorado's Department of Labor and Employment, for instance, has been faced with the issue of vapor exposure when underground utility lines have acted as vectors to deliver petroleum fumes originating from an area of underground contamination to distant locales, putting workers in particular at increased risk of exposure. Maine, Utah and Washington have had problems with more localized exposure, as when basements of homes and buildings fill with oil fumes originating from leaking tanks or over-pressurized lines.

State regulators are also well aware of the various use and non-use values that can be diminished through exposure to oil pollution. Fully 22 respondents identified various types of ecological damages as among their major concerns. As with many coastal areas, the state's River and Bay are among Delaware's most fragile natural ecosystems. If a release should occur in the spring, regulators would be faced with the oiling of nesting piping plovers, horseshoe crabs and migratory birds, many of which stop over in these areas on their way to summer in the Arctic. At other times of the year, fish species would likely endure the most harm, including an endangered shark known to spawn in the lower bay. Texas regulators, in contrast worry about impacts to sea grass beds and coastal marshes. Landlocked states such as Nebraska and Ohio also identified petroleum-related ecological degradation as a potential negative impact, specifically the possibility that their ecologically-sensitive lakes and rivers could be adversely affected by a nearby spill.

In addition, some 20 participants expressed concern over damages to recreational areas and facilities. Hawaii's Division of Environmental Health is well aware of that state's economic dependence on the tourist trade, and worries about an oil spill's potential to degrade beaches, recreational fishing opportunities and other related activities. Similarly, boat ramp closings and impacts to sport fishing were named by the respondent from South Carolina. In Nevada, spills affecting Lake Tahoe would certainly impact the quality and/or availability of the many recreational opportunities offered there.

Finally, injuries to cultural or heritage resources were named by regulators from Alaska, Oregon and Washington. All are home to considerable Eskimo and other native populations, and all are members of the Pacific States/British Columbia Oil Spill Task Force, both of which likely contribute to this focus. In Alaska, for example, potential spill sites are prioritized using a scheme ranging from "Areas of Major Concern" to "Areas of Lesser Concern," as part of the state's attempt to pre-identify resources that could be impacted by an oil spill. Among the locales receiving the highest priority are cultural resources and archaeological sites, such as National Register-eligible village and burial sites, while sites adjacent to shorelines are identified as of “Moderate Concern.”

Despite the fact that a number of states are home to Native American groups and their heritage sites, no other respondent expressed concern over degradation of cultural resources. This seemingly odd finding is likely explained by the fact that by law, tribal nations are on par with the states with regard to environmental and other types of regulation. Although some survey takers reported more or less amicable relationships with these groups, many opt not to work with state governments in any way, choosing to remain autonomous in their operations, and when appropriate, to deal directly with federal agencies.

These survey data support a variety of conclusions regarding the oil pollution-generated impacts of greatest concern to state regulators, conclusions whose significance will become more apparent as the discussion turns to the pursuit of natural resource damages. The vast majority of individuals interviewed identified their states’ focus as primarily on drinking water impacts, although the nature and identity of spill sources varied considerably across jurisdictions. Certainly, given our dependence on clean water and the many ways in which it can become contaminated with petroleum products, this concern is a valid one. Also quite frequently mentioned were habitat effects, such as species losses and injuries to sensitive ecosystems, as well as the degradation of recreational resources. It is interesting to note that in virtually all cases, respondents focused their attention on water, either directly, as in the case of drinking water supplies, or indirectly, as when expressing concern over degradation of shoreline or surface water-based ecology and tourism. Heritage and cultural impacts were mentioned to a much lesser degree, but nonetheless, do appear to be among the items about which regulators are concerned.

Part III: Programmatic Funding

The availability and sources of funding do much to determine programmatic capacity and goals, and therefore, are treated as a separate section within this chapter. According to survey respondents from across the nation, departments dedicated to oil pollution regulation typically rely on one or more of just four revenue-generating mechanisms (see Figure 4.11): (1) dedicated sources, (2) annual budgetary appropriations, (3) federal grants and (4) penalties. Most programs depend upon two or three sources of revenue (18 and 17, respectively), while seven identified three funding types and one, Illinois, reported using all four.[76]

The viability of these supports, and the uses to which they can be put, vary considerably across states and time periods. Although some sources appear preferable to others, it seems that, as is often the case, the devil is in the details. After speaking with regulators directly, the conclusion that the particulars of design and administration make the difference between funding being viewed as a strength or as a weakness, is unavoidable.

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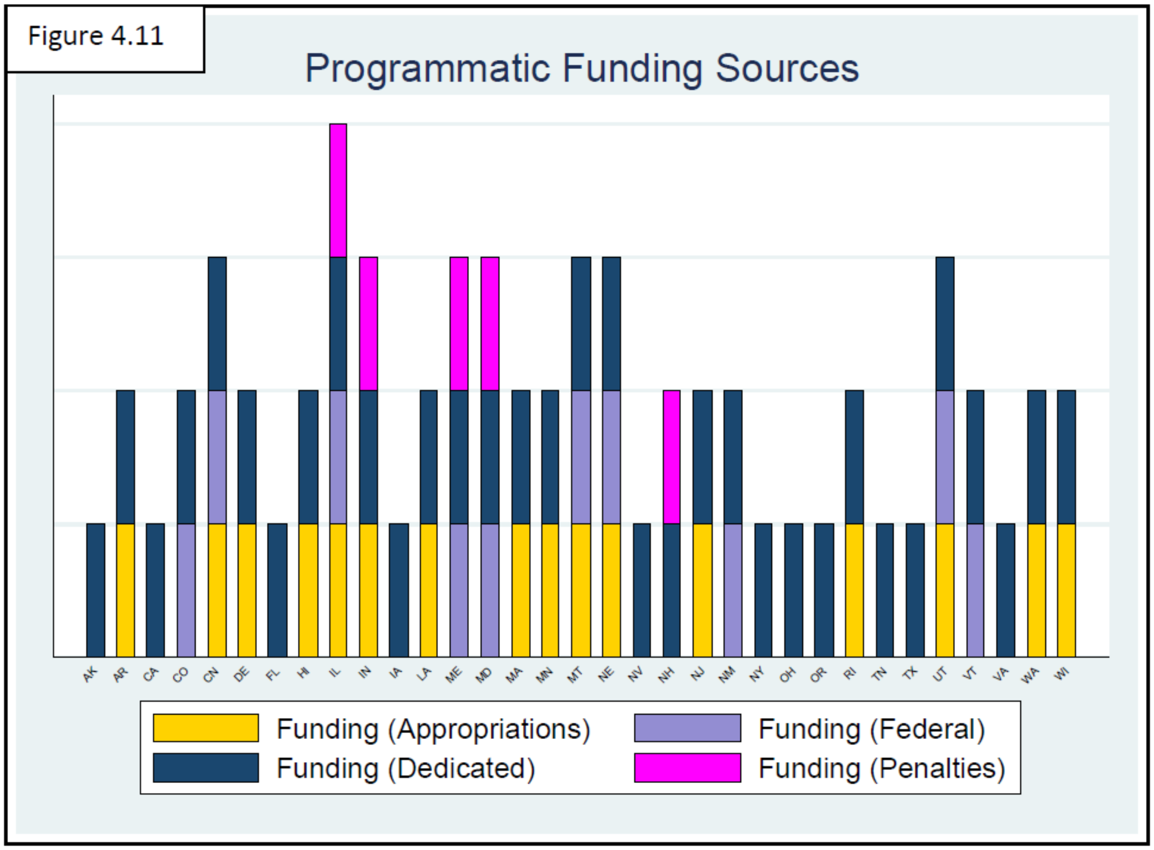
[76] Interviews were conducted with both the Illinois Department of Natural Resources and the Environmental Protection Agency. The former uses annual well fees paid by operators (dedicated), general fund appropriations and an annual grant from the EPA for its Underground Injection Control Program; the latter utilizes general fund appropriations and penalities.

Figure 4.11



The availability of a dedicated funding source is arguably the best possible scenario for the operation of a regulatory program. If properly designed and consistently administered, the presence of such a source means a consistent flow of programmatic funding. The majority of programs, 33 in all, benefit from some sort of dedicated funding. Of these, 11 rely entirely on such sources to pay all programmatic expenses.

The origins of these moneys, as well as the activities for which they can be dispersed, appear to depend largely on the particular characteristics of the individual state and of the regulated community. Many, such as California, Florida and Maryland, charge a fee or tax on oil imports. This approach, which typically provides revenue sufficient to cover state-led cleanups and other programmatic expenses, could be adopted by any jurisdiction, but appears more common in those where large quantities of oil (refined or otherwise) cross over state borders on a regular basis. Even a minimal tax or fee of this kind can produce substantial revenue, as illustrated by California's Oil Spill Response Trust Fund. The Fund was created using a 25 cent per barrel import fee, which was discontinued in 1990 when the balance of the Fund reached $50 million; this benchmark was met after just two and a half months of collection.

Other states have chosen to focus specifically on releases originating from storage tanks, and may impose tank registration fees or other, typically annual costs, on tank owners. Funds generated in this way are usually used to cleanup contamination originating from commercial tanks, but may be dispersed for remediation of releases originating from residential storage of petroleum. Some choose instead to channel this revenue into accounts dedicated to assisting responsible parties in meeting federal financial responsibility requirements, or make the money accessible to help offset the costs of cleanups for non-covered entities. Others adopt a hybrid of these approaches. The $5-$7 million generated annually through Nevada's ¼ cent per gallon fee on gasoline sales, for example, is combined with a $100 annual tank registration fee, and used to maintain its Leaking Underground Storage Tank Insurance Fund.

While dedicated funding is often limited to specific programmatic functions, the Used Oil Programs present in Utah and Tennessee cover all of their expenses using fees charged on the sale of motor oil to consumers. While four cents per quart may seem a paltry sum, the fee provides Utah regulators with sufficient funding to pay staff salaries, engage in considerable public outreach and education efforts, provide grants for the construction of used oil collection centers and pay the operators of these facilities 17 cents for each gallon of oil they take in.

Per gallon taxes leveled on gasoline and diesel sales are one of the most common mechanisms for generating funds for cleanup and programmatic operations. Sixty percent of states level one or more taxes on sales of gasoline, and less often, diesel. The average tax is slightly more than 1.16 cents per gallon; however, actual amounts charged vary from a high of 2.9 cents per gallon in Delaware, to just 0.003 cents per gallon in Illinois (see Figure 4.12).

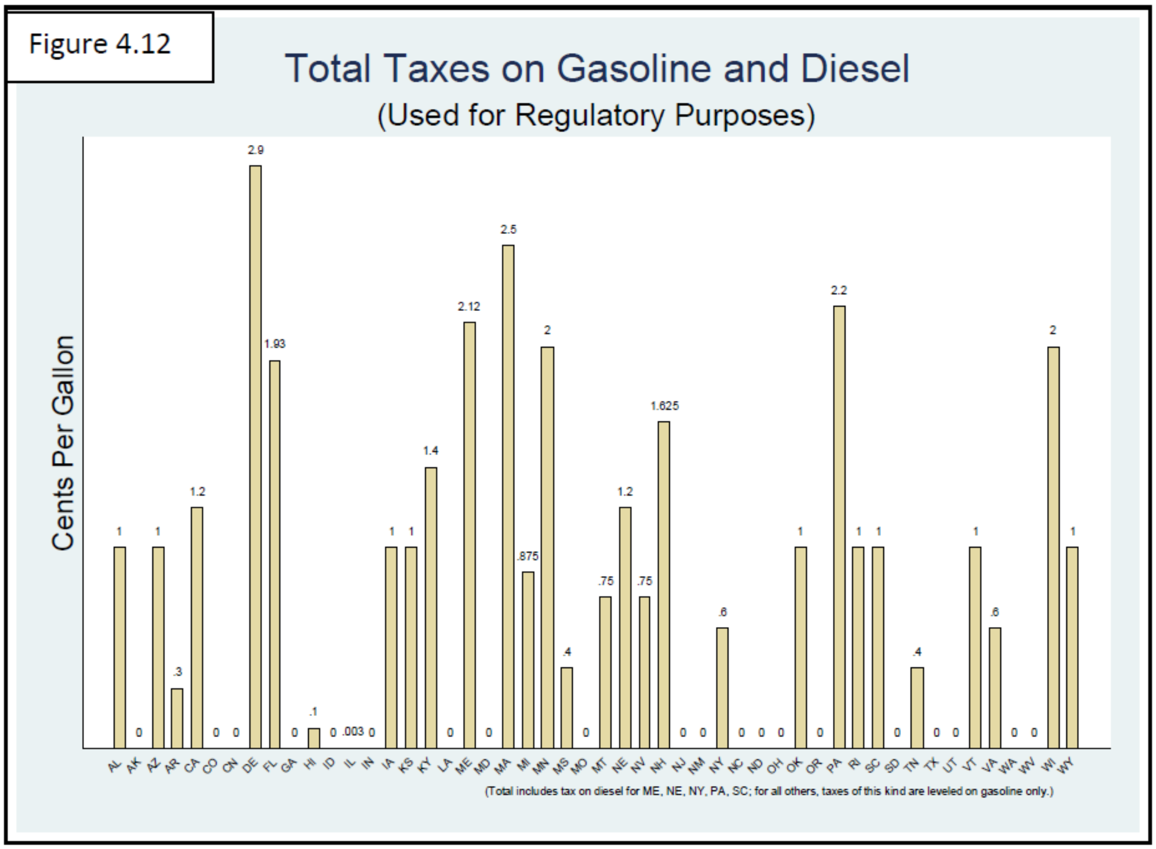


Figure 4.12

The proceeds generated through these taxes are typically earmarked for activities such as spill response and remediation assistance. Of the one cent per gallon charged on gasoline purchases in Nevada, for instance, one quarter of the amount collected (some $5-7 million per year) is used to create the state's Petroleum Fund. The Fund, which is administered by a unique Fund Board, is accessed to pay for corrective actions for

LUSTs that are currently enrolled in Nevada's Tank Insurance Program. Participation in the program requires eligible tank owners to pay a $100 annual fee, and provides up to $1 million dollars coverage for onsite cleanup costs, and double that amount for offsite expenses.

In addition to taxes and fees on crude and finished petroleum products, similar charges on hazardous waste generation and/or disposal, are also used to fund oil pollution programs. In Vermont, a tax of this kind is used to by the Department of Environmental Conservation to run its program. The tax rate is specified on a sliding scale, and is determined according to the end state of the waste materials, with those destined for recycling accruing the lowest dues. Likewise, regulators in both Ohio and Oregon use tipping fees on hazardous waste deposited at state-owned landfills to supply some of their revenue.

On the opposite end of the funding spectrum with regard to predictability are budgetary appropriations. Subject to cuts during lean economic times, 26 of the states for which information about funding could be attained list their state's general fund as among the sources of their programs' budgets. Of these, those in Georgia, Kansas, Louisiana, Michigan, Missouri, Pennsylvania and South Carolina are wholly dependent upon this source of revenue.

Federal grants were named as a funding source by 13 of the programs that participated in the survey. None rely entirely on these disbursements to pay for their operations; however, every state has benefited from such assistance at one time or another and many receive regular disbursements of federal money for the purpose of regulating oil pollution. A variety of different federal sources may be accessed, the availability and quantity of which varies considerably across jurisdictions according to need and the assumption of primacy for various federal regulatory programs.

As illustrated in Figure 4.13, disbursements from the Oil Spill Liability Trust Fund (OSTLF), created with the passage of OPA90, have been received by every state. This money can be used to offset costs incurred by state regulators in the course of response and restoration activities that cannot be recovered from responsible parties. States can also seek compensation from the fund for damages to natural resources resulting from oil spills.

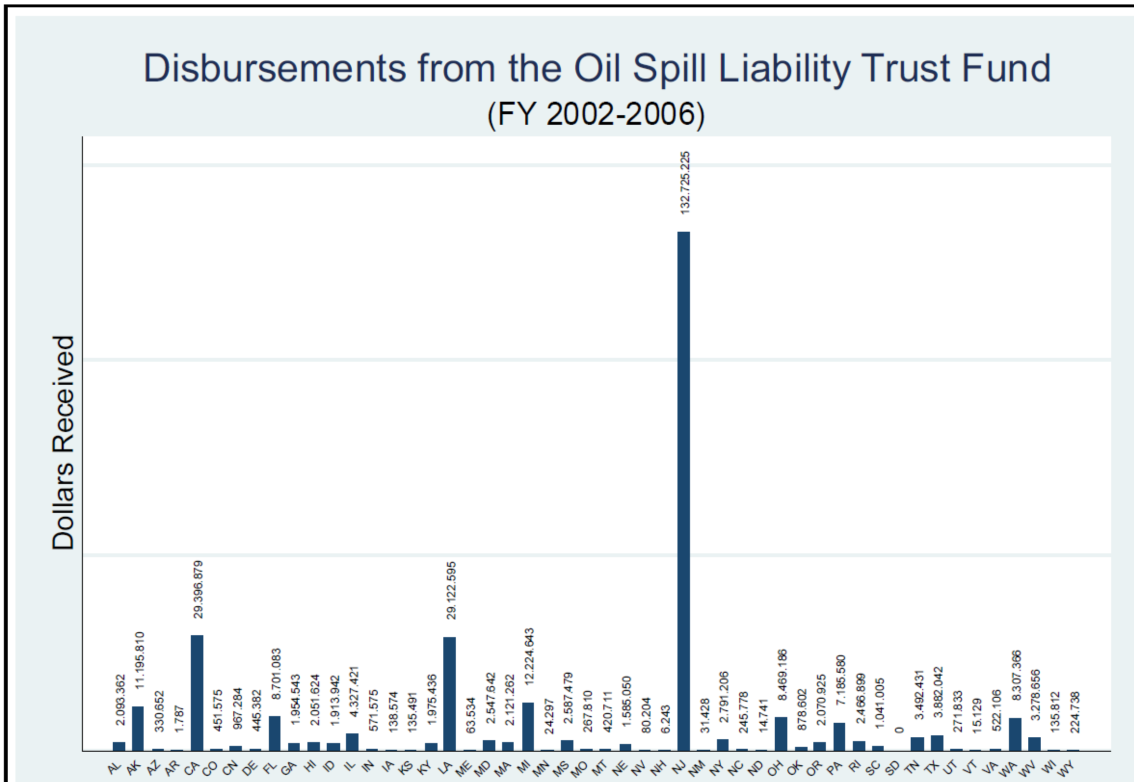


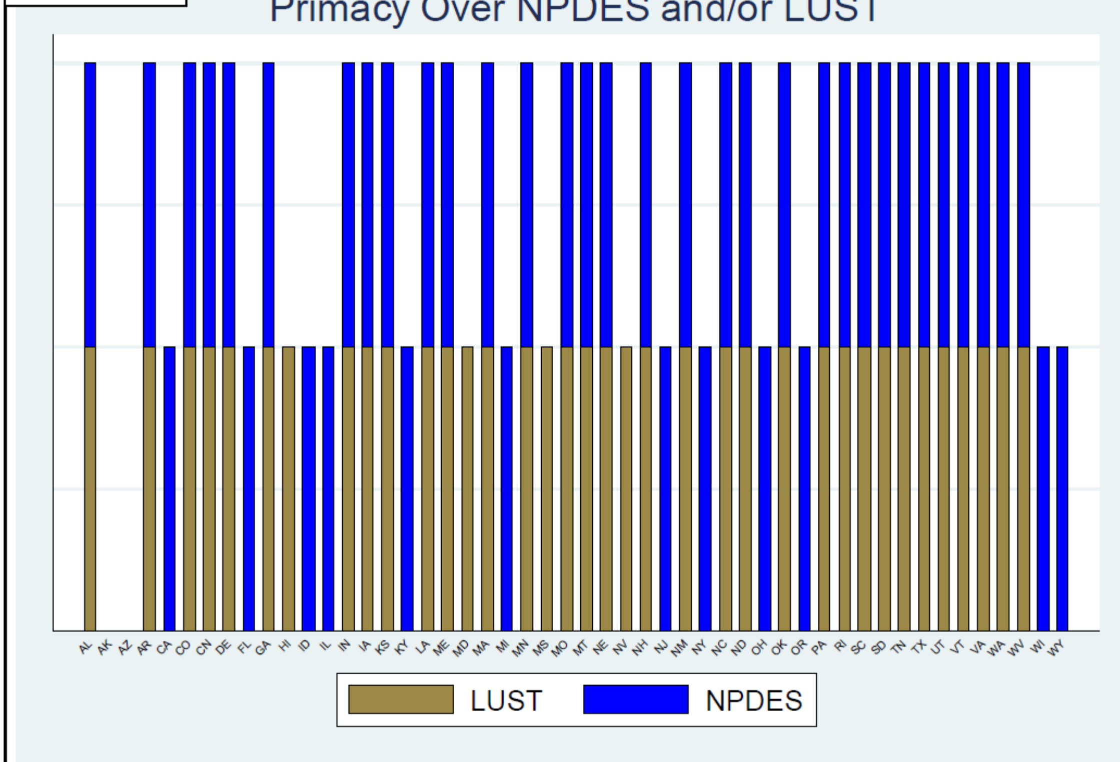
Figure 4.13

Amounts disbursed from the Fund to individual states vary considerably, however; and likely reflect not only the severity of their respective oil spill problems, but the number and amount of claims filed. Between 2002 and 2006, for example, the average per-state award was just under $6 million; however, the standard deviation for disbursements over this period was over $19 million. New Jersey, for example, was the recipient of far more money (nearly $133 million) from the OSTLF than any other state, taking in more than 4.5 times as much from this source as California, the next largest beneficiary. Conversely, South Dakota received no funding during this time period, while Arkansas and New Hampshire were provided with less than $2,000 and just over $6,000 of OSTLF money respectively.

The assumption of primacy over particular aspects of federal regulatory programs can also provide funding to the states. Two of the federally-sponsored programs over which states may assume control that were named by interviewees were the National Pollution Discharge Elimination System (NPDES), created by the Clean Water Act, and the Leaking Underground Storage Tank program, which was created by an Act of the same name. Currently, 32 states have assumed responsibility for both programs; while federal regulators retain complete responsibility in only two jurisdictions (Alaska and Arizona) (see Figure 4.14).

The majority of states (36 in all) have approved programs for leaking tanks, a designation which brings with it grant moneys, along with reporting and benchmark cleanup requirements. Of the interviewees affiliated with tank-focused programs, many identified either the initiation of the federal program, or the nature of its requirements, as the impetus for their state's focus on tank-related releases. Some of these identified the EPA's financial responsibility requirement as an important driver, while others noted the program's benchmark cleanup requirements as a hindrance due to stringent state-level cleanup standards. Those that expressed the latter concern, explained that federallyimposed funding benchmarks set according to the number of remediations accomplished annually, put at a disadvantage the states in which cleanup standards are more stringent, relative to those that allow case closure on sites where more pollutants remain in situ.

Figure 4.14



Similarly, 42 states have delegated authority for NPDES permits. Unlike the LUST program, the focus of this program is not specific to oil pollution; however, it was identified by several survey participants as one of the venues through which their states act regulate these contaminating sources. In Louisiana, for example, oil spills are treated as unauthorized releases, and therefore, warrant enforcement under the authority of this program. The Louisiana Department of Environmental Quality, which works in conjunction with the LOSCO and several other regulatory bodies, receives much of its programmatic funding through fees arising from NPDES permits.

Revenues can also be generated through the enforcement of penalties for violations. Of the jurisdictions for which data were attained through interviews, Illinois, Indiana, Maine, Maryland and New Hampshire identified moneys collected in this way among their sources of programmatic funding. This practice has been hypothesized by Firestone (2001) to incite more frequent, and perhaps unwarranted penalization, as regulators are in a sense 'rewarded' for such actions with larger budgets.

As evidenced by many survey takers responses when asked whether they used penalties as a funding mechanism these strategic enforcement behaviors are largely denounced, and sometimes actively avoided. In Wisconsin, for example, legislators took the unusual step of mandating that the money recovered from responsible parties for expenses incurred through state-led spill response activities be deposited into the general fund, rather than allowing it to be returned directly to the program's coffers, apparently to circumvent any possibility of incentivized penalization.

The data collected using the survey instrument do not appear to sustain the notion that the use of penalties to cover programmatic expenses encourages overzealous enforcement, however. Support for this conclusion is evidenced by the extremely low correlations (ranging from -0.16 to -0.05) that exist between the measures of cooperation and penalty enforcement (discussed in depth below) and the indicator of whether funding is derived through penalties. Other factors, therefore, appear to be of greater importance in determining regulatory practices and behaviors, and the fact that all of the departmentsthat reported spending the dollars they generate through fines have additional revenue streams, likely limits their incentive to over-enforce.

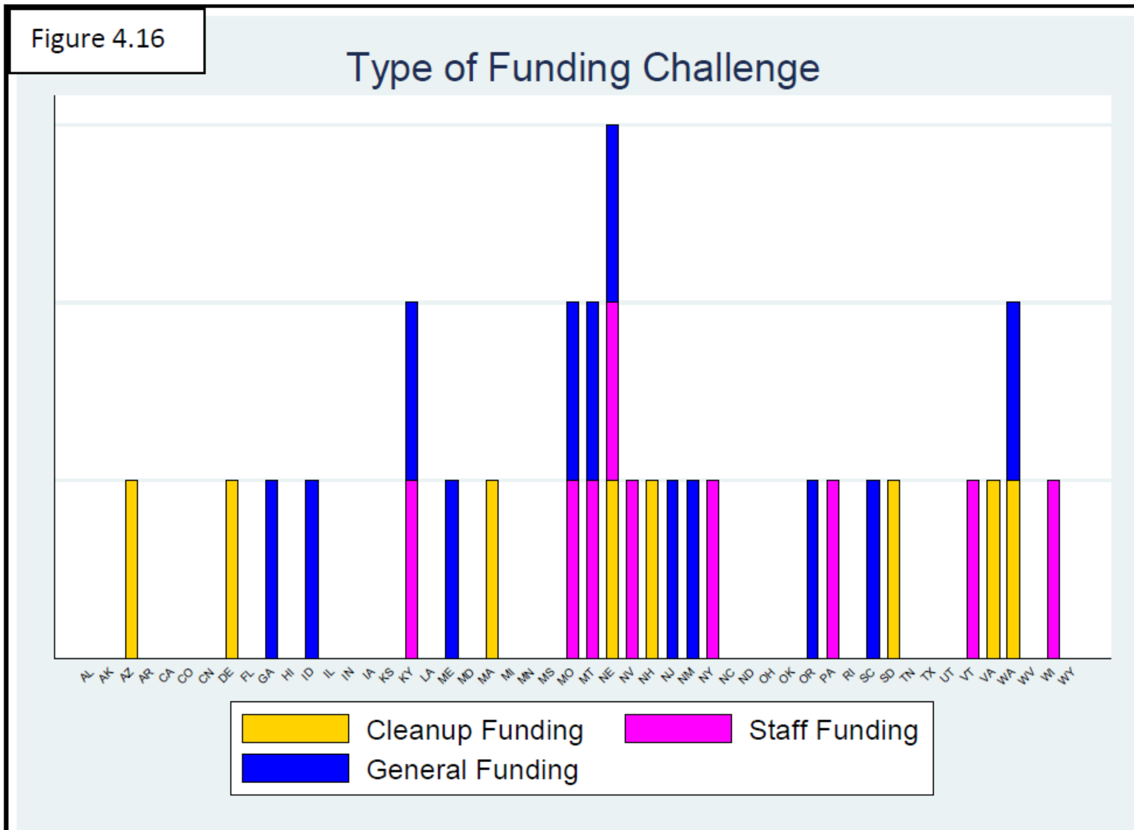
Funding is perhaps the most basic element of program operation, yet the mechanisms utilized by state regulators are far from uniform. This finding begs the question of whether any particular source is superior to the rest. This study is limited in its ability to answer this query; however, some evidence, albeit circumstantial, can be found in the responses of survey takers when asked to name their programs greatest strengths and challenges. Far from identifying a single source type as superior, the data point toward the less exciting, but not surprising conclusion, that the details of program design and administration dictate whether any type of funding mechanism will be sufficient to meet regulators' needs.

Of the interviewees, those from 23 states identified the acquisition and/or maintenance of adequate programmatic funding as one of the largest obstacles they face, while 11 individuals named these as among their greatest assets (see Figure 4.15). Evidence that finances can be a double-edged sword, responses provided by participants from Nevada, Vermont and Washington, indicated that financial support is at once a boon and a bane for their departments.

Figure 4.15

The comments of those who named funding as a strength, typically referred to the general availability of resources to carry out their regulatory duties, rather than to the availability of money to pay for any single activity. As illustrated in Figure 4.16, respondents who felt that financial limitations were a major hindrance, however, were often more specific in their descriptions of which programmatic elements are most affected. While 11 respondents named a general lack of funding as an issue of concern, eight were more specific, citing the availability of money to pay for cleanups as a major stumbling block. An additional eight participants related the fact that budgetary limitations kept them from retaining sufficient departmental staff. The response provided by the Nebraska Department of Environmental Quality, which echoes sentiments expressed by many other jurisdictions, is illustrative of how crippling a lack of funding can be. Not only are resources insufficient to respond to releases not covered by the State Fund, a considerable backlog of tank releases exists, due to insufficient money and personnel.

Figure 4.16



No single mechanism, or combination of mechanisms, appears strongly predictive of participants' perceptions of funding sufficiency; some general trends, however, can be identified. As shown in Figure 4.17, perceptions of financial difficulties were reported in conjunction with all but one[77] arrangement of source types currently in use by the programs interviewed. Those that are completely dependent upon general funds do appear to be at a disadvantage, as fully two thirds of respondents in this position said that securing sufficient funding was difficult for their respective departments. This finding is

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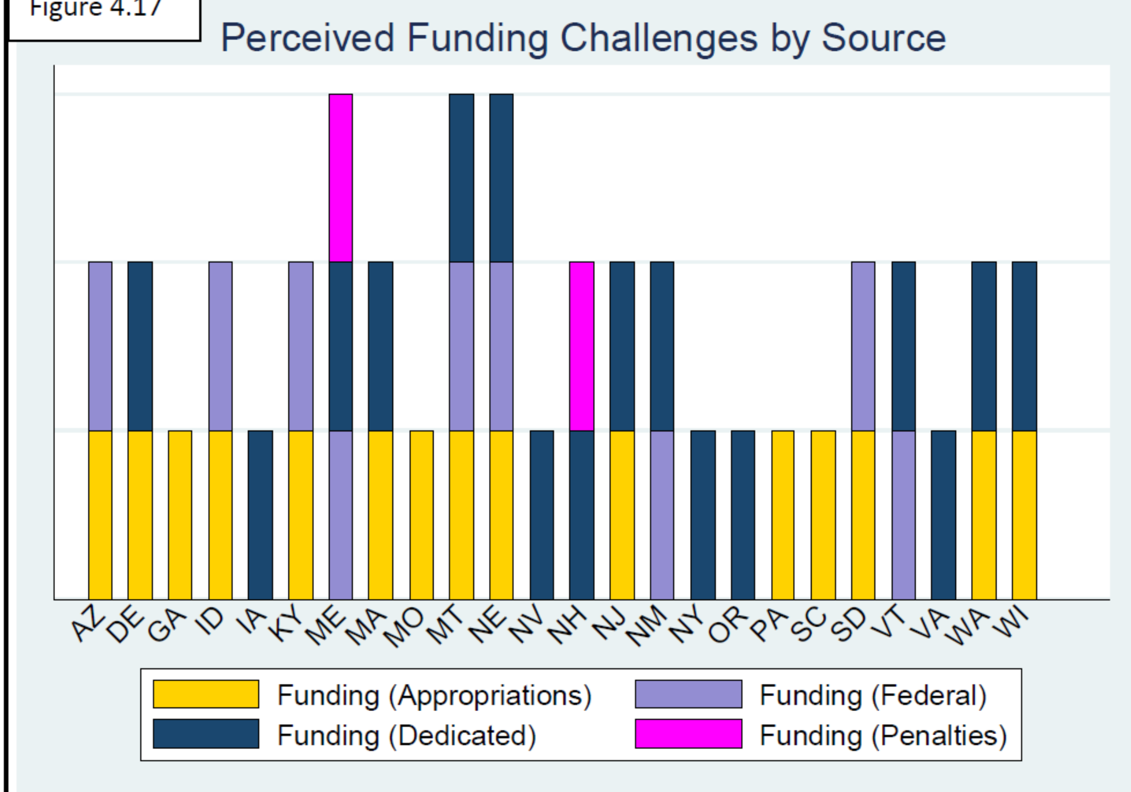
[77] Regulators from Illinois, the only state reporting reliance on all four sources, did not identify funding as a concern.

not surprising, given that this funding type is affected by changes in budgetary priorities, which can render programs that are perceived as low priorities (such as those dedicated to oil pollution regulation[78]) subject to cutbacks. Also, of the programs that make use of federal grants, the considerable majority (nine of thirteen), felt that funding was a problem. This sentiment appears to derive, at least partly, from perceptions that money (and personnel) have been diverted away from spill prevention and response in the wake of the September 11th terrorist attacks and as a result of the subsequent reorganization of the EPA's emergency management program.

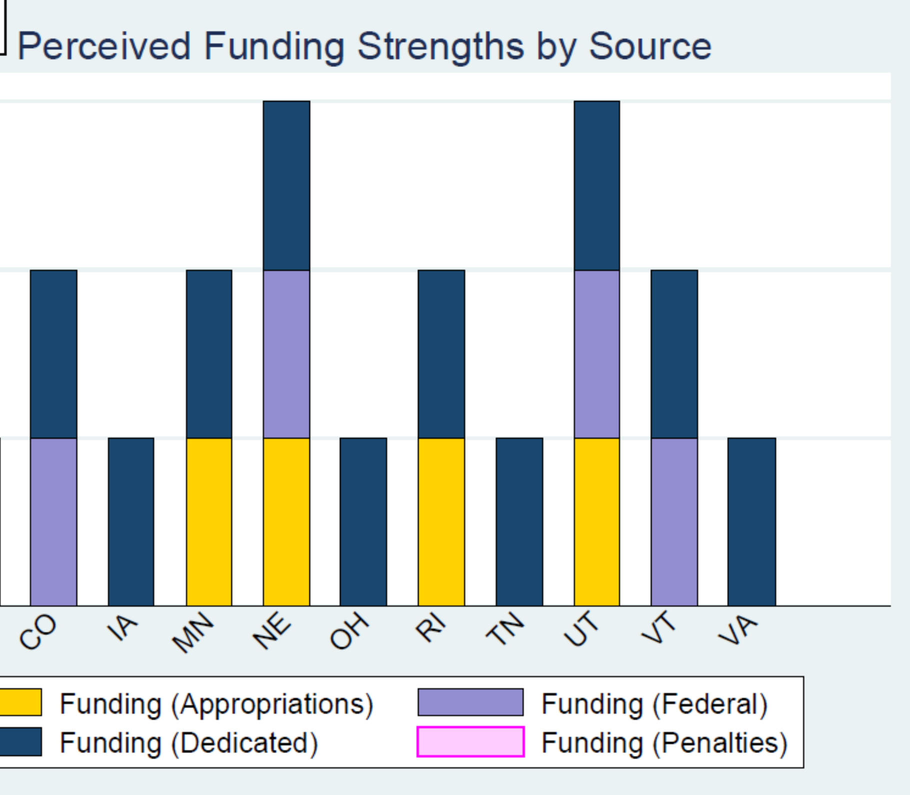
Figure 4.17



[78] The notion that oil pollution regulation falls relatively low on the list of legislative and regulatory priorities was expressed during a number of the interviews. The validity of this notion was consistently refuted, however, both directly by respondents, and as evidenced by the spill and other data contained in this report and elsewhere.

When considering the revenue sources used by programs that reported funding as among their strengths (see Figure 4.18), however, it is worth noting that every one of them has access to a dedicated funding source, and for half, this constitutes their sole budgetary support. In contrast, of the 25 states that use general fund appropriations for their oil pollution programs, only four named funding as a strength; and none of these are wholly dependent upon appropriations, as all have a dedicated source, which two supplement with federal dollars. In addition, none of the jurisdictions that rely on penalties to pay programmatic expenses identified funding as a strength; a finding that further supports the conclusion that this mechanism does not promote strategic enforcement, but which fails to create a cogent argument for its implementation.

Figure 4.18



The survey data appear to support the notion that dedicated funding is the preferable mechanism for oil pollution regulation. Its availability does not appear to guarantee solvency, however, a finding which begs further explanation. Of the programs that depend wholly or in part on such a source, 11 identified funding as strength. In contrast, however, 15 of the respondents whose programs benefit from some sort of dedicated funding felt that the resources available were insufficient.

Survey takers' responses likely reflect both their personal perceptions[79] and actual programmatic demands, therefore; it is difficult to identify overarching explanatory themes within the data. Despite this limitation, it appears that the creation of a dedicated source is always welcomed, but that the test of time is needed to determine whether it will prove sufficient. In particular, it seems that issues stemming from increasing need and/or stagnant monetary streams are problematic.

For many states, demand for funding simply outpaces supply. Oregon regulators, for example, have three funds at their disposal: the marine Spill Prevention Fund[80], the Hazardous Substance Remedial Action Fund[81], and the Highway Spill Fund. Despite this, the availability of resources; particularly those needed to respond to large and/or multiple simultaneous releases; was named as their single greatest challenge. New Hampshire's situation is similar. The vast majority of its programmatic support comes from a 1.5 cent fee leveled on petroleum imports; yet unlike in California, where similar fees produce abundant revenues, the amount generated in this way falls short of the state's demands. New Hampshire's Cleanup Financial Assurance Program, which

[79] Which may reflect past experiences within their current program or knowledge of other regulatory operations within their state or other jurisdictions.
[80] Maintained using fees on cargo, tankers, barges and facilities.
[81] Created using tipping fees collected at a state-run hazardous waste landfill.

provides most of the Money for handling long-term contamination issues, is under-funded. To date, efforts to increase the fees to satisfy this need have been stalled, a condition that has resulted in many projects being put on hold.

In some instances, it appears that the availability of regulatory dollars act to redirect a program's focus, sometimes to the point of exhausting available resources. The likelihood of this outcome seems particularly high if money is accessible by responsible parties. While not alone, Virginia's experience in particular is illustrative of this trend. The Virginia Underground Petroleum Storage Tank Fund is non-lapsing and created using a fee on the sale of petroleum products from bulk terminals. As is often the case, the amount of the fee varies depending upon the balance of the fund; however, it is never less than 1/10 cent, nor more than 3/10 cent per gallon. The Fund is used to cover cleanup costs in excess of a responsible party's state-required financial responsibility level, up to that dictated under federal law; to pay for residential tank remediations; and for state-led cleanups.

It would seem, therefore, that Virginia regulators are in an enviable position in terms of their ability to pay for remedial operations; and in fact, regulators from that state acknowledge that the creation of the Fund has enabled them to engage in 'quick and efficient site cleanups.' Certain behaviors on the part of the regulated community; specifically the transfer of oil facilities away from major entities, to smaller, less financially-capable ones, and the use of limited liability corporations by individual gas stations; have put considerable strain on the Storage Tank Fund, however. These actions mean that state money is accessed to pay for cleanups that might otherwise be covered by the responsible party, or a private insurance company.

Clearly, no single funding source is foolproof. The survey data suggest, however, that dedicated funding is likely the best revenue-generating mechanism available to state-level oil pollution regulation programs. General fund allocations, at least when used as a stand-alone source, appear to be the least desirable.

Part IV: States' Regulatory Designs

Authority and Divisions of Labor:

Unlike this study, states seldom view the subject of oil pollution in a holistic, substance-based manner, by considering all sources, impacts and potential interventions simultaneously. Rather, the majority of states have divided responsibility for this type of regulation between a number of agencies, and all have acted to delegate authority between multiple, differently-focused programs within those agencies. In general, Departments of Environmental Protection (or the equivalent), Fire Marshals, and when appropriate, industry-focused agencies such as Divisions of Oil and Gas, are the most often involved; however, the involvement of Departments of Health and of Commerce is not at all uncommon.

As shown in Figure 4.19, this sharing of authority is the norm at the state level, with only six interviewees reporting that a single organization has total responsibility in this regard. The largest number of jurisdictions, some 34 in all, have designated between two and four separate agencies to assume some type of authority over oil pollution regulation. Three states go further still, using five, and as many as eight departments to manage these issues.

There is great variation across states in terms of who does what, but in general, the division of labor is reflective of the agencies' primary missions, and sometimes, of the political and/or economic climates of the state. Typically, environmentally-focused departments carry out what might be described as the non-emergency, core functions, such as overseeing the cleanup of leaking tanks and legacy contamination. They may also handle emergency response operations, as does the Connecticut Department of Environmental Protection, or may share these responsibilities with other state-level agencies. Delaware's Department of Natural Resources and Environmental Control, for instance, has responsibility for all remediation and restoration, and penalizes offenders, but also works in collaboration with the state's Emergency Management Agency in responding to newly reported releases.

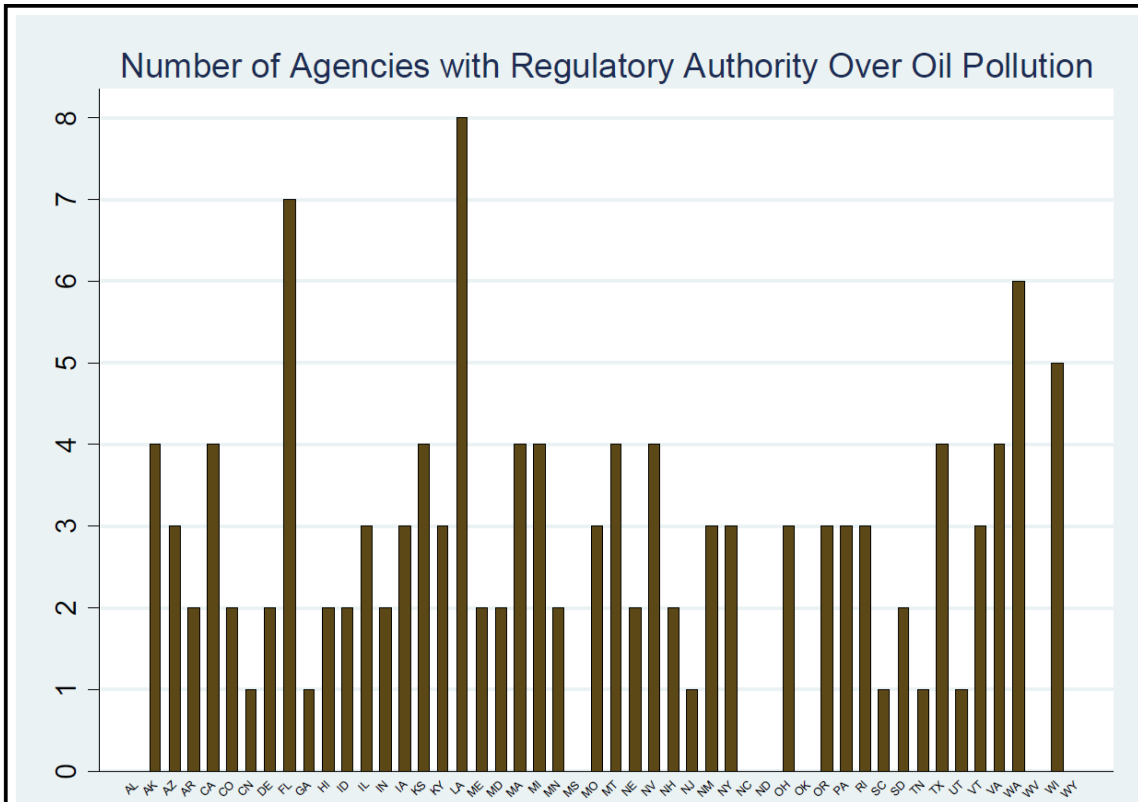


Figure 4.19

The location of a release may also determine which regulatory body must respond. In Arkansas, the main concern is industry-generated spills, and authority is split between the Department of Environmental Quality and the Oil and Gas Commission. The former handles incidents that occur at oilfield saltwater disposal and drilling fluid treatment facilities, and at reserve pits, while the latter regulates releases from oil wells and pipelines. Colorado's State Health Department, in contrast, is charged with the oversight of all non-tank spills, which fall under the regulatory purview of the Department of Labor and Employment.

Sometimes divisions of authority between departments come about out of political or economic necessity. The former scenario describes Wisconsin's Tanks Program, which was once housed completely within the state's Department of Natural Resources. After receiving complaints that cleanup standards were too stringent and progress towards site closure too slow, legislators chose to split the caseload, giving a portion to the state's Department of Commerce, which was viewed as more business friendly and less heavy handed than its environmentally-focused counterpart.

In Washington, however, the decision to delegate a portion of the state's oversight of residential home heating oil tanks to the Pollution Liability Insurance Agency (PLIA), rather than the Underground Storage Tank Section of the Department of Ecology, was motivated by economic, rather than political concerns. In an attempt to maintain their customer base, private heating oil distributors opted to create industry-funded insurance for residential tank owners, serving a similar function to the commercial tank owners' financial assurance requirements. As the PLIA was already tasked with oversight of commercial tanks, it was given responsibility for the newly-developed residential tanks insurance program as well.

Finally, in a number of states, departments that do not normally have regulatory authority over oil pollution can assume certain responsibilities under specific, predetermined circumstances. This is the case in both Florida and Louisiana, where the agency totals are the highest in the nation. In Louisiana, certain state regulatory bodies have been designated as resource trustees for the purpose of natural resource damage claims, do not become involved in any non-NRDA cases. Conversely, Florida has in place a State Environmental Response Team (SERT) which includes all state agencies, and can be called into action in the event of a catastrophic release. Routine oil pollution regulation, however, is handled within two state agencies (the Florida Departments of Environmental Protection and of Fish and Wildlife).

In addition to allocating authority among state-level regulatory bodies, it typically further subdivided among multiple departments within each agency. For example, in Connecticut, six distinct groups share responsibility for responding to various types of petroleum contamination within the Department of Environmental Protection. Storage tank releases are managed by one team of approximately 10 people, an additional 10 handle tank-related enforcement actions, and another 20 oversee reimbursements from the state's UST Petroleum Cleanup Fund. For new releases, emergency response functions are carried out by a team of 15 individuals; and for long term cleanups, 10 people handle site assessment (which involves sampling contamination levels and delineating plumes, mapping and other functions) and another 40 have remediation oversight responsibilities.

Given the divisions of labor that exist within agencies, it is not unusual, for responsibility over a single incident to be shared by more than one division or office. Spill response and initial cleanup may be handled by one group, but cases where contamination cannot be completely mitigated within a short timeframe are referred to another, as is the case in Connecticut, Alaska, Florida, Wisconsin and others. The considerable number of divisions of authority, both between and within regulatory agencies, makes the need for comprehensive and reliable data management tools all the more acute.

Financial Carrots and Sticks:

Part of the reason why funding is such a central issue with regard to oil pollution regulation is the fact that the costs associated with cleaning up even a small release can quickly escalate into the hundreds of thousands or even millions of dollars. Without exception, therefore, states hold true to the 'polluter pays' principle, meaning that those found responsible for a release are liable for any costs associated with response, remediation and other related activities. Despite the obvious appeal of this notion, there are a variety of circumstances under which spillers cannot be induced to finance a much-needed remediation. Recognizing that protecting human and environmental health must not rely upon the financial standing or cooperativeness of a third party, many states have implemented mechanisms to provide monetary assistance to and/or require financial assurance of, potentially responsible parties.

In many instances, a spill is detected, but the responsible party cannot be identified, meaning that there is no one upon whom to assign blame, as well as the bill for response and cleanup costs. Texas regulators, for example, reported that the majority of the petroleum releases detected within their state are known as "mystery spills," because the guilty party is unknown. In other cases, the spiller has been identified, but is unable to pay for associated cleanup costs. This is particularly the case for use-generated releases, such as those originating from home heating oil tanks.

In instances where no guilty party can be found, or once found, is proved incapable of paying for the costs of response and remediation, public resources, in the form of regulatory agencies' budgetary outlays, response equipment, and personnel time, are relied upon to mitigate the threat. Recognizing the need for a mechanism to internalize such externalities, various state and federal laws and regulations require owners and operators of facilities, tanks and vessels capable of generating a harmful release of oil to demonstrate their ability pay for the costs associated with a spill. The level of 'financial responsibility[82]' required varies according to the type and degree of risk associated with a particular activity; and can be demonstrated through insurance coverage or bonding.

In addition to, or in lieu of, requiring financial responsibility of potential spillers, for a variety of reasons, many states have recognized the need to institutionalize a mechanism for providing monetary assistance for cleanups, even in instances where a responsible party can be identified. While some offer such support only to predetermined classes of spillers, such as home owners that are under no legal obligation to carry spill insurance, others cover costs for releases generated by entities to which financial responsibility requirements do apply. Of the states for which data were available, fully

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[82] Financial responsibility is required, for example, under the EPA's Leaking Underground Storage Tank (LUST) Program and a variety of state laws.

1/3 (16 states[83]) provide spillers with some sort of financial aide to cover cleanup and response costs.

Partners in Regulation:

Oil pollution programs have continual contact with a number of other groups, in addition to interactions within and between state-level agencies. The nature of these relationships, however, varies across organizations and circumstances. A spill program may, for instance, operate in relative isolation under normal conditions; however, a release can trigger the involvement of any number of other parties. Often called to participate, either through the formalized structure of the Unified Command System[84], or on an as-needed basis, are local first responders; other agencies within the same or neighboring states and at the federal level; environmental interest groups; industries; individuals directly affected by the release; and interested members of the general public.

In virtually every state, emergency response functions are shared with multiple groups. Local entities, primarily police, firefighters and health departments, are often the first on scene when a release is reported. Advantageous in that they possess the training and supplies necessary to stop an ongoing spill and/or prevent the spread of oil contamination, these community-based responders are typically able to reach a scene more quickly than are state employees. In addition to relying upon these traditional first responders, some states, such as Alaska and Wisconsin, have preexisting agreements with private contractors that maintain equipment and specially-trained personnel, and can be called on to respond to a release that is either too dangerous or too remote for state and

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[83] AL, CO, CN, IA, ME, MD, MO, NE, NV, NH, NM, SD, UT, VA, WA, WI

[84] A predetermined chain of command required under the Oil Pollution Act, which allows duties and authorities to be agreed upon in advance of a release, so as to facilitate a speedy and effective response.

local emergency response personnel. Access to both local first responders and contractors not only means faster response times, it frees states' scarce regulatory resources for other uses, and avoids the duplication of efforts across governmental levels.

Local governments may also assume a more prominent position in the regulation of oil pollution, sometimes taking on a recordkeeping role, or in other instances, possessing responsibilities on par with those held at the level of the state agencies involved. Nevada, for example, is made up of 17 counties, 15 of which are considered "rural." In these jurisdictions, state agencies handle all aspects of oil pollution regulation; however, in the urbanized counties of Washo and Clark (home to Reno and Las Vegas, respectively), authority over spills has been delegated by the state to the health departments, which handle initial spill response and cleanup activities.[85] Wisconsin takes this approach a step further, even allowing local governments to assume the role of lead trustee for natural resource cases.[86]

The regulatory hierarchy extends above, as well as below, the state level, as a number of federal-level agencies have authority over various kinds of oil pollution. Whether through oversight of delegated authorities, such as those under the NPDES and LUST programs, or direct authority to act as resource trustees, relations with these entities, especially the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, and the Coast Guard, are of fundamental importance to state programs.

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[85] The state Division of Environmental Protection maintains a case file for all releases handled by these counties.

[86] Wisconsin is a 'home rule state,' therefore, county governments have the right to assume the role of lead trustee for damage cases pertaining to spills within their boundaries. This right has never been exercised, however.

It is not surprising, therefore, that references to these groups and to the federal laws and regulations they carry out, were made frequently by interviewees. Representatives of New Jersey, Florida, and other coastal states, for example, noted how the Coast Guard's use of two year rotations means that expertise in spill response is difficult to maintain. This is the case because experienced officers are continually replaced by novices. Other jurisdictions, including Alaska, expressed concern that the diversion of federal resources in the wake of the September 11th terrorist attacks has resulted in a diminished interest in spill response, an outcome also attributed by interviewees to the considerable length of time which has passed since the last truly catastrophic spill in the U.S.

Given the complex hierarchical interactions that exist across governmental levels, it is not surprising that interviewees named relationships with other regulators among their strengths. Six respondents, those from Alaska, Delaware, Georgia, Hawaii, New Jersey and Wisconsin, identified their programs' relations with regulators from other state agencies and/or levels of government, as among their greatest assets. The Georgia Environmental Protection Agency, for example, values highly the support it gets from local first responders. The New Jersey Department of Environmental Protection, in contrast, cites its strong working relationship with federal regulators (particularly the Coastguard), as well as with other state agencies, as a major strength.

Relations are not always beneficial, however; as evidenced by the responses provided by Rhode Island and Vermont, which identified their dealings with other regulators as a challenge. Both states noted that changes in federal policies in the post-9/11 period have put strain on their programs through both increased case loads and decreased funding. New Jersey shared these sentiments, despite the value it placed on relations with federal entities. Vermont also noted that increasing demands from their state legislature were of concern, as did Florida, where emergency responders identified the relatively recent addition of oversight responsibilities for environmental forensics, as necessitating the diversion of resources and reordering of programmatic priorities, in this case away from restorations associated with NRDA.

The role of interest groups in oil pollution regulation appears to vary considerably between states, and even within a single jurisdiction, according to the circumstances of a given decision, incident or activity. A number of states reported an ongoing relationship with members of the oil industry. Some, such as Colorado's Department of Labor and Employment, participate in industry-sponsored functions, including those hosted by the Petroleum Marketers Association and Colorado Petroleum Association, where they offer workshops, make presentations, and maintain booths at trade shows. Others, like Florida, invite industry representatives to participate actively in elements of standard-setting and program design, welcoming involvement well beyond the typical notice and comment period included in the rulemaking process.

Environmental interest groups and members of the public play a different role, typically becoming involved in instances where a large, highly-injurious release occurs. California's Office of Spill Prevention and Response, for instance, endured a barrage of public inquiries after the South Korea-bound container ship Cosco Buson struck one of the pilings supporting San Francisco's Bay Bridge in November 2007, releasing 58,000 gallons of bunker fuel into the water and impacting some 15 miles of shoreline (Weeshoff, 2008). Concerned citizens first called the state's Oiled Wildlife Care

Network to learn about volunteer opportunities, but upon finding the lines busy, many contacted elected officials directly to express their concern. Under immense public pressure, some officials began promoting the notion of allowing untrained members of the public to assist in the cleanup efforts. Regulators objected to this approach due to the considerable health risks posed by exposure to the heavy fuel oil, but have since implemented a program which would allow for thousands of citizens to receive immediate training, qualifying them to participate in the response effort should another such incident occur.

New Mexico and Missouri were the only states to report interactions with any of the large environmental groups such as the Audubon Society or Sierra Club, and even these states indicated that their involvement had been of limited duration, and focused on a particular rulemaking event or resource. This finding seems to support Firestone's supposition that such large interest groups would be unlikely to target regulators directly.

Some survey takers did indicate that more localized organizations have an ongoing role in the regulatory process, often providing specialized knowledge and expertise or physical support, in the event of a spill. The Chesapeake Wildlife Group, located in Maryland, relies on volunteers and assists employees of the Department of Environmental Protection in cleaning any animals oiled as the result of an offshore release. Montana's Flathead Lake Basin Commission and Whitefish Lake Institute, act similarly, assisting state regulators when spills impact the particular bodies of water with which they are affiliated. In Florida, local organizations whose members have intimate knowledge of the nearby beaches, have been dispatched in the aftermath of a spill to geo-locate sea turtle nests using hand-held GPS units.

<u>Relationships with the Regulated Community</u>

One of the most striking findings of the survey was the degree to which regulators value their relationship with members of the regulated community and how this orientation affects their enforcement practices. Far from embracing the 'command and control' strategy espoused in the early years of the environmental movement, states' approach to oil pollution regulation can best be described as built upon a spirit of cooperation. Today, it appears that the 'tit-for-tat' or escalated style of enforcement; rather than the application of inflexible, standardized sanctions; is the norm. Participants' responses clearly echoed the supposition advanced by Gallagher (2002); namely, that the use of harsh sanctions acts to impede cleanups, ultimately yielding lower levels of environmental quality and welfare than can be had when more convivial relations prevail.

Evidence of the importance placed on their relationship with the regulated community can be found in the responses of survey takers when asked to name their state's greatest strength(s) and challenge(s) with regard to oil pollution regulation. Twelve of the respondents identified this as a major strength of their program, while an additional five described their dealings with potential spillers as posing a considerable challenge.

Of those who felt that their relationship with the regulated community was a programmatic strength, the response capabilities and expertise possessed by members of this group were often considered to be of the utmost importance. In Hawaii, for instance, teamwork and partnerships with industry are considered a major asset by spill regulators, where such entities can be counted upon to respond, even in the event of a release for which they have no culpability. Similarly, Maryland regulators rely upon the specialized knowledge possessed by members of the regulated community to enhance their own operations.

For jurisdictions that named relations with regulatees as among their greatest challenges, it was ignorance of requirements and limited capacity to respond to releases, which were of greatest concern. In California, for instance, regulatory requirements have essentially been designed to ensure that foreign transporters maintain the proper response capabilities; a responsibility they would otherwise neglect. Arkansas regulators, in contrast, must deal with small 'mom and pop' operations, whose "old-fashioned attitudes" can be detrimental to environmental protection efforts.

The vast majority of states interviewed, 31 in all, identified a variety of ways in which they seek to actively cultivate a relationship with regulatees through efforts focused on outreach and education. The nature of such efforts is dictated by the identities of the polluting sources, and of the potential impacts, that characterize each jurisdiction.

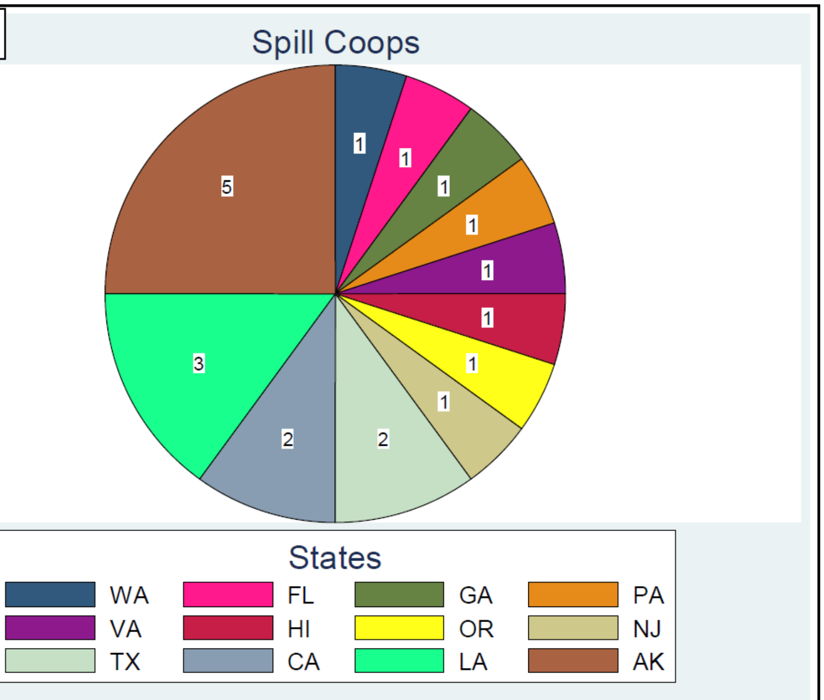
For some states, outreach efforts are primarily aimed at raising awareness. Colorado regulators, for example, maintain a booth at industry tradeshows, conduct state-wide seminars and work with state and local government entities that possess tanks to educate them about proper use and maintenance. A similar approach is used in Kansas, where a 'spill package' containing educational materials is mailed out to members of the regulated community on request, and programmatic staff continually participates in environmentally-focused conferences.

Others have opted to focus considerable resources on ensuring that necessary response capabilities are in place should a major release occur. In Alaska, for instance, efforts aimed at educating residential tank owners occur in tandem with the conduct of large-scale spill simulation exercises, such as the annual North Slope Mutual Aid (MAD) and Prince William Sound Drills. The California Office of Spill Prevention and Response is similarly focused on the use of spill drills to ensure preparedness; so much so that seven new positions are being created to allow it to meet its mandated responsibility.[87]

[87] Each exercise typically requires the participation of 30-40 staff members.

In locales such as these; where large coastal spills are possible due to geographic characteristics and the presence of high volume oil extraction, processing and/or transportation operations; organizations commonly called ‘spill coops’ can be found. These organization may be created and administered through the cooperative efforts of industry leaders (such as Exxon Mobil, Conoco Phillips and others), or run by

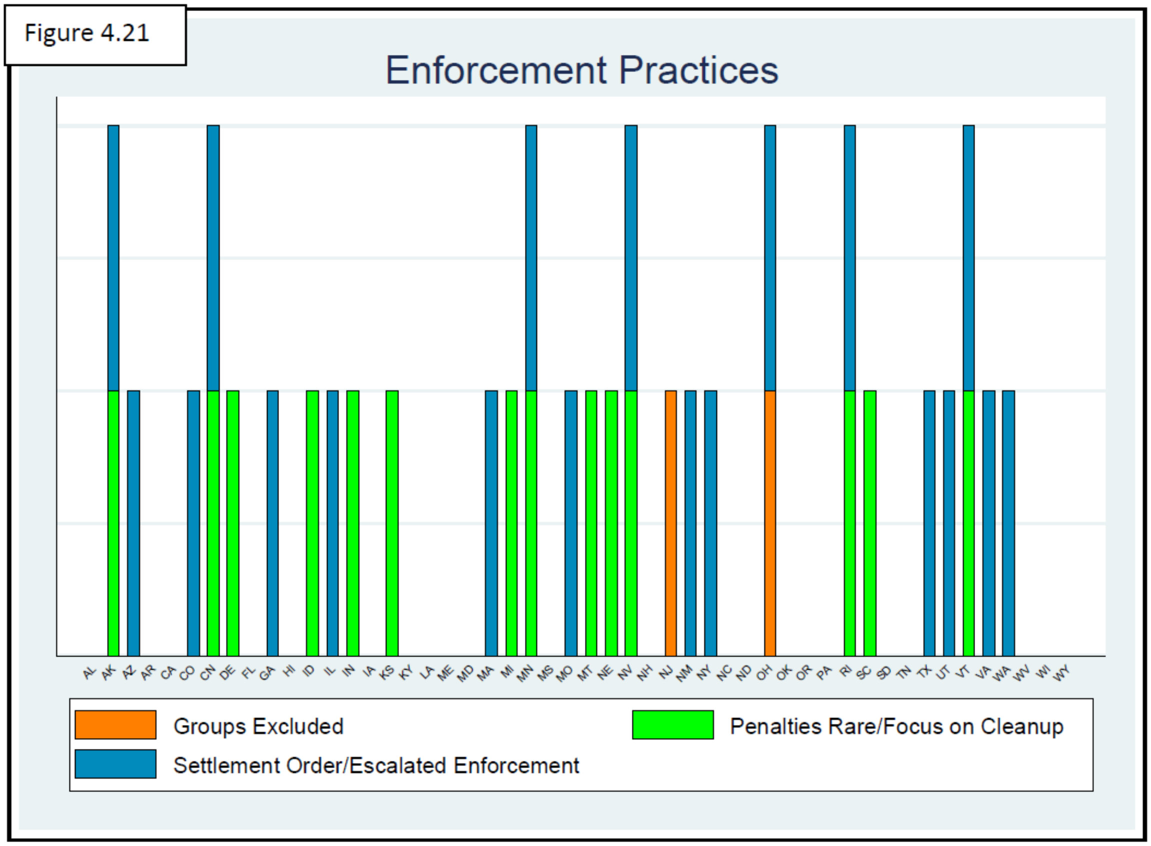
Figure 4.20



independent firms, who then contract out their services. These coops exist to fulfill federal and state mandates that require entities that handle or store large quantities of oil to main response capabilities adequate to mitigate a release should one occur. In addition to ensuring that a worst case scenario can be adequately handled by responsible parties, coops represent yet another point of interaction between regulators and regulatees, as they frequently participate in, or as is the case with MAD, orchestrate spill drills.

As depicted in Figure 4.20, the largest number of coops (5) are located in Alaska; a fact which is hardly surprising given the considerable industry presence in the state and its geographic, economic and ecological characteristics.[88] Conversations with employees of the state's Prevention and Emergency Response Program made clear the importance of these entities in ensuring that another *Valdez*-style event will never occur there. Louisiana ranks second in number of coops, hosting three such groups; while California and Texas each have two.

Figure 4.21



In light of the importance placed on relations with the regulated community by the states, it is perhaps not surprising that the enforcement mechanisms invoked in the event of a release are typically flexible, often explicitly incorporating negotiation (see

[88] Alaska is second only to Texas in total oil production. Yet at just 1.2 people per square mile (estimated as of July, 2007), it is the least densely populated of any state. What population is there, is largely concentrated in just a few areas, leaving many regions of the state essentially uninhabited. Rough and inaccessible terrain, combined with often severe weather conditions, raise the likelihood of oil spills, yet decrease responders ability reach releases quickly and take necessary steps to mitigate their effects. Alaska is particularly sensitive to oil-related pollution, as it is home to many fragile habitat types, sensitive species, sites of cultural importance, and industries, such as fishing, all of which can be severely damaged through the introduction of oil.

Figure 4.21). Of the states for which interview data were attained, the enforcement practices described by 22 showed evidence of a cooperative approach.[89] Respondents from New Jersey and Ohio named specific classes of responsible parties[90] for which enforcement actions are less likely to be pursued, or are typically less severe than those used with other offenders. Fourteen states indicated that penalties are rarely used or that they prefer to concentrate their energy and resources on cleanup, rather than punishment. These sentiments were often accompanied by statements emphasizing their program's focus on cooperation and/or maintaining a strong working relationship with members of the regulated community.

Oftentimes, as described by Alford et al. (2006), the structure of the enforcement process itself provides the foundation for establishing a cooperative relationship with offenders. Nineteen programs identified their strategy as one based on "escalated enforcement;" an approach which is often manifest in their use of consent or administrative orders as the preferred mechanism. In describing the processes they employ, the tit-for-tat strategy is clearly in evidence; as when, for instance, warning letters are followed up with fines if unheeded, but serve as the terminal enforcement phase if the conditions they articulate are satisfied.

Nevada's enforcement strategy, which rarely merits formal challenges by responsible parties, provides an excellent illustration of this approach. In that jurisdiction, a release which impacts or threatens to impact the waters of the state is

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[89] The indicators described in this section were not derived in response to a question focused explicitly on cooperation/compromise with responsible parties. Instead, respondents' answers to questions focused on whether enforcement actions were typically challenged, as well as on the nature and type of penalty calculations, provided the data discussed herein. This fact must be kept in mind when interpreting the data, as participants may have responded differently had they been asked explicitly to comment on this topic.
[90] Non-profit organizations.

always considered to be a violation; however, the decision as to whether penalties will be enforced is based on the circumstances surrounding the event. Cooperativeness on the part of the spiller is sought, and cleanup is emphasized, rather than penalization. In instances where a penalty is deemed appropriate, such as when the release was the result of egregious behavior on the part of the responsible party, an administrative settlement order is used, which specifies the amount owed. The party is then permitted the opportunity to show cause and/or explain any extenuating circumstances leading to the event, and a panel of four upper-managers can re-evaluate the penalty amount based on a variety of factors (including environmental impact, threat to health, volume and culpability).

As in other states, negotiation and continual interactions with the responsible parties are the norm in Nevada. However, in an unusual twist, spillers are provided the additional option of conducting a supplemental environmental project (valued at 1.25 times the settlement amount) in order to satisfy their spill-related liability. Projects of this kind are undertaken by about half of the parties against whom penalties are leveled. They are designed and conducted by the responsible parties; however, programmatic staff remains involved in an oversight capacity[91].

Natural Resource Damage Assessment:

One of the more interesting conclusions to come from the survey is the finding that relatively few states routinely conduct natural resource damage assessments (NRDAs) for oil spills, independent of federally-led efforts. This is particularly

[91] Although this is a unique approach which provides for resource restoration, and therefore, may be in some ways comparable to NRDA, it was not possible to gather more in-depth information about this initiative.

surprising given the considerable number of regulators who identified pollution-generated injuries to ecological, recreational and cultural resources, as of considerable concern to their programs. Not designed as a punitive action, NRDA is intended specifically to recoup losses from such impacts, in order to 'make the public whole' in the aftermath of a release.

Of those surveyed, only 17 reported that their states have ever collected resource damages in cases other than those overseen by federal regulatory bodies such as the EPA and NOAA. Although clearly representative of a trend in states' regulatory habits, there is no clear legal explanation for this finding, as all states have the authority to conduct NRDAs. The Oil Pollution Act of 1990, the Clean Water Act, and a number of other federal laws can be invoked by state regulators for the purpose of seeking resource damages. What's more, specific legislation authorizing this activity has been put in place by 27 state legislatures. Some, such as California's Lempert-Keene-Seastrand Oil Spill Prevention and Response Act and Texas' Oil Spill Prevention and Response Act, are quite explicit in their direction as to how assessments should be carried out and values derived. Others merely serve to authorize the pursuit of damages, such as the addition in 1997, of a single phrase to Maine's Revised Statute Title 38.

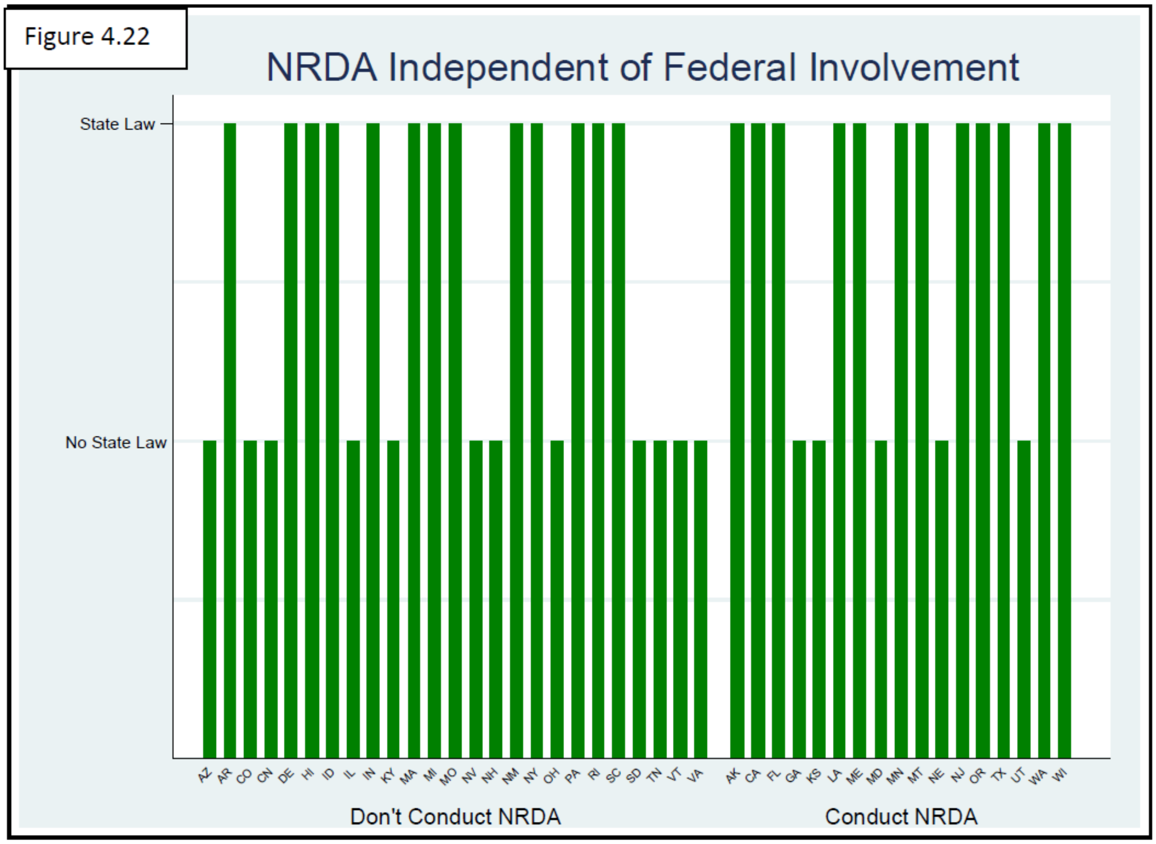
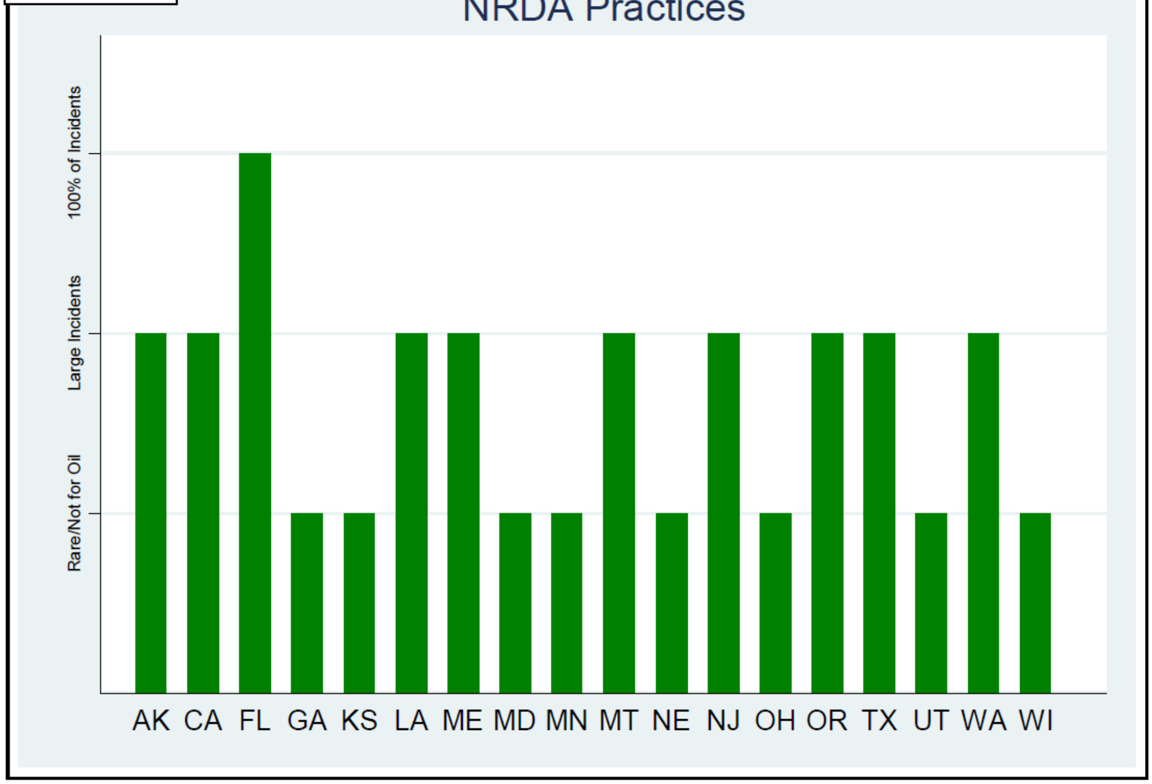


Figure 4.22

As Figure 4.22 illustrates, states in which a law has been passed specifically authorizing NRDA are more likely to seek damages of this kind than those lacking such a law. Although the correlation coefficient between the two measures is relatively low (0.3616), approximately 70% of states that reported conducting assessments are in possession of unique authorizing legislation, while only about 39% of those without such a law have acted similarly.

Figure 4.23



There does appear to be a positive relationship between passage of a state law authorizing NRDA and regulators' likelihood of actually seeking damages for resource injuries, however, even among states found to engage in this practice, considerable variation exists in terms of the circumstances under which damages are sought and the techniques used to value resource injuries (see Figure 4.23). Six of the 17 states that reported having ever conducted a damage assessment indicated that none had been undertaken for oil pollution-related injuries or that this type of compensation is rarely ever sought. Utah, for example has conducted a single NRDA focused on pollution originating from a copper mine and Kansas reported using habitat equivalency analysis to assess injuries, but neither have ever received compensation for a petroleum release, despite the latter's report that about 1,000 such incidents occur within their state annually.

Similarly, Georgia regulators seldom calculate damages resulting from lost resource services, and do not seek compensation for lost ecosystem functioning, as it is expected to recover naturally over time. Nebraska, in contrast, occasionally conducts an abbreviated type of NRDA, using pre-determined per animal values for releases to surface water bodies that result in fish kills. Maryland has a similar set of species values, but the respondent from that state noted that the extensive fieldwork and manpower needed to investigate the extent of the injuries are too great to warrant frequent application. Ohio and Wisconsin regulators felt similarly, indicating that the NRDA process was quite cumbersome and therefore, rarely applied.

Despite the relative rarity of NRDA at the state level, some jurisdictions do seek damages routinely. Several states noted that natural resource damage assessments are conducted fairly frequently, particularly for large or highly injurious spills. Alaska, California, Montana, and New Jersey are all reported following this pattern, and New Jersey has implemented a formulaic assessment methodology to value groundwater injuries, which a number of other states have expressed an interest in replicating.

Only two states, Florida and Washington, were found to seek damages for all oil spills. Both, however, have acted to spatially delimit the types of incidents for which compensation is always sought; in the case of Florida, NRDA is conducted only for marine spills, while Washington concentrates its efforts on those in excess of 25 gallons that impact surface waters. Although the logic behind this approach could not be determined for Washington; Florida's concentration on marine incidents appears to be largely an artifact of the division of regulatory authority that existed at the time the authorizing legislation was passed. The agency tasked with devising the state's formulaic assessment methodology had jurisdiction only over coastal resources, while another was tasked with oversight of inland areas, and although authority was later consolidated within the Department of Environmental Protection; there has been no move to extend the NRDA practice to encompass the whole of the state. Like California and others, Florida and Washington also conduct NRDAs for significant releases, even if they do not impact marine or surface waters.

The only state to indicate an increasing focus on NRDA was Minnesota. To date, regulators there have only conducted two assessments, but considers these initial efforts to be 'test cases,' and are using them to determine how best to go about the process of valuing injuries. Both habitat equivalency analysis and more traditional economic analyses were used for these assessments.

The overriding conclusion, therefore, is that most states never conduct natural resource damages when not serving as a trustee in a federal-led case, and even among those that do engage in this regulatory practice, many perceive the process to be a difficult one, and seldom engage in it. When respondents from states in which NRDA is not done were asked why this was the case, many noted that the amount of time and resources required for this purpose were simply too great. Virginia, for example, cited a lack of manpower as the likely explanation for this omission, while the participant from New Hampshire indicated that the Department's Commissioner and Assistant Commissioner are actively opposed to such undertakings. The perception that seeking damages will likely lead to legal embroilments with responsible parties also appears to be common among regulators, and is at least partly responsible for the current state of affairs.

Other Innovations:

As described in Chapter 3 (Methods), a series of criteria were used to select a number of innovative solutions, for case study research. Although not chosen for more in-depth investigation here, either due to their limited applicability or for logistical reasons, a number of states were found to have among their regulatory repertoires, programs and initiatives that are unique and serve to address challenges that each experienced in the past. This section provides an overview of many of these exceptional approaches, as they could provide the fodder for future research, or be of interest to particular jurisdictions experiencing similar difficulties.

Alaska was one state found to have many innovative initiatives in place, however, they are intended to address concerns that are largely unique to this state, stemming from its vast, sparsely-populated area, sensitive coastal environment areas and significant oil industry presence. State regulators, for example, have designated "Potential Places of Refuge;" coastal areas that afford protection to leaking or disabled vessels, allowing necessary repairs to be made, or response equipment and personnel to be summoned, while minimizing the likelihood that oil will enter sensitive ecosystems (DSPP, 2008). They also administer a program of "Community Spill Responders," wherein citizens are provided the necessary training to act as local first responders, thereby limiting the damages resulting from releases before representatives of the Department of Environmental Conservation and other professional responders can arrive on scene. The state’s response capabilities are further supplemented through the placement of inland ‘equipment containers’ and ‘nearshore equipment packages’ in areas at particular risk (PERP, 2008).

California is widely recognized as an environmental leader, and was found to have one of the most highly funded and comprehensive approaches to oil pollution nationwide. One of the more exceptional programs in place in this state, however, is its “Oiled Wildlife Care Network,” which was created through a legislative mandate in 1990. Unique in the world, the Network consists of some 26 facilities located at various points along the state’s coastline, and provides rescue and rehabilitation services for oiled seabirds and mammals (OWCN, 2002). While volunteer labor is relied on heavily, interest on the Agency’s Oil Spill Prevention and Administration Fund is used to pay operating expenses. The veterinarians employed by the Network are globally-recognized specialists and are frequently called upon to assist in response efforts across the nation and the world. In the aftermath of the *Cosco Buson* spill, it is this organization has taken on the responsibility for training members of the public in spill response procedures.

As the previous discussion made clear, Louisiana is at particular risk of experiencing deleterious oil pollution, a fact which is widely recognized by regulators in that state, prompting them to develop a number of innovative interventions. One of the more proactive undertakings is the state’s “Abandoned Barge” and “Abandoned Facilities” Programs, in which employees of the Louisiana Oil Spill Coordinator’s Office actively work to identify, investigate, and when necessary, remediate, aging vessels, wells and other potential spill sources (LOSCO, 2008).

Louisiana regulators were also mandated to create an environmental baseline inventory, so as to provide the Coordinator with "technical data regarding the coastal waters before, during and after an unauthorized discharge of oil;" information which is an essential aid in the conduct of natural resource damage assessment and in oil pollution regulation more generally. This undertaking, which has necessitated considerable amounts of laboratory testing, and the cooperation of multiple state, local, federal and private partners, has been managed using the Louisiana Oil Spill Geographic Information System at a cost of some $20 million (Gisclair et al., 2008).

Coastal states have spill response-related concerns that are wholly unlike those of their landlocked counterparts; many have unique and innovative interventions intended to address them. Louisiana and Texas, for instance, have developed and deployed a system of buoys equipped with remote sensing equipment, capable of monitoring and transmitting information related to the location and movement of a marine spill. Regulators in Hawaii have at their disposal an air-deployable dispersant system; one of only seven such systems in use worldwide. A number of states, including Florida and Texas, administer "Clean Marinas Programs" (or the equivalent), which typically provide safety and response training to marina owners and operators but, as is the case in Texas, may go so far as to provide participating locales with specially-crafted sorbents and other materials to prevent harmful releases from entering the waters of the state.

Finally, two states have devised innovative solutions which act to address, among other issues, the problem of programmatic funding. Massachusetts has embraced a system of Hazardous Waste Site Cleanup Professionals, commonly referred to as "Licensed Site Professionals" (LSPs). This network of state-approved and licensed private environmental professionals assumes the duties associated with overseeing the progression of cases from discovery of contamination, through to the point of closure. The program remains under the close supervision of regulators, as it is administered by a state-run board, and all participants must undergo training and pass periodic examinations (MassDEP, 2008). By assuming the role of day to day case management, however, the presence of LSPs has been instrumental in alleviating the strain on scarce regulatory resources, and since the program's initiation, the major backlog which had developed when duties of this kind were handled exclusively by staff of the state's Department of Environmental Protection has been eliminated.

The final innovation of note was developed in Washington State. The "Heating Oil Pollution Liability Insurance Program" is funded through a fee paid by distributors of home heating oil on a per gallon basis. The Program, which was proposed by members of the industry who feared the eventual collapse of their market as more and more residents switched to alternate heat sources, is administered by the state's Pollution Liability Insurance Agency, and is provided at no cost to owners of active tanks. Not only does the plan cover a considerable portion of cleanup costs resulting from an accidental release (up to $60,000), it provides some moneys (up to $1500 for property restoration) and helps offset the costs for tank upgrades and replacements (WPLIA, 2008).

Conclusion

A variety of important conclusions come from this work, however, several stand out as noteworthy because of their relationship to the theories proposed in the extant literature, and because they relate to challenges commonly experienced in the course of states' efforts to regulate oil pollution.

Perhaps the most fundamental of these findings is the fact oil pollution still poses a major threat to environmental quality and human health and welfare. This finding may come as a surprise to those who have focused on trends in industry-generated spill frequencies and severities as reported using the National Response Center data in which a precipitous decline is observable, especially since the passage of OPA90. According to interviewees, the observed reduction in catastrophic releases from such sources as tankships and facilities, is due in large part to increased sophistication and awareness on the part of regulators at both the federal and state levels. Industry has responded in kind; dedicating considerable resources to spill prevention, as well as to ensuring that adequate response capabilities are in place. By all accounts, these outcomes have arisen in response to the heightened awareness and more comprehensive legal framework which was put in place in the post-*Valdez* era.

Despite these gains, however, state regulators are still faced with a multitude of small scale, use-related releases. Addressing such concerns is particularly problematic because responsible parties tend to be truck drivers, home owners and other groups for whom the use or transport of oil is not a major focus. Also, although far from catastrophic individually, the relatively small spills of the type that originate from traffic accidents or leaky heating oil tanks, cause considerable environmental degradation when considered across at the state or national level.

The importance of these conclusions is undeniable, yet they must be described as preliminary, simply because there is no reliable or comprehensive source of oil pollution data. Many states were found to engage in poor data collection and management practices; and for those that do have comprehensive tracking systems, large discrepancies existed between state- and federal-reported spills figures.

The survey data also support the conclusion that the occurrence of a focusing event, or the creation of a new federal law or program, are the only clearly-identifiable motivations for undertaking an initiative of the kind studied here. Examination of programs' start years support this conclusion, as the majority coincide with the passage of NEPA, CERCLA and other major federal initiatives or a state-specific environmentally-injurious event such as a major spill or highly-publicized accident. By far the largest correlation, however, is evident between the occurrence of the *Exxon Valdez* and subsequent passage of OPA90 and individual states' initiatives.

Much previous discussion has focused on the nature of the relationship that exists between regulators and regulatees, and on how it translates into sanctioning behaviors. The results of the survey clearly support the conclusion that, rather than embracing the traditional command and control approach, the vast majority of states seek a cooperative relationship with those they regulate. This stance is manifest in their enforcement practices, which tend favor the use of negotiated settlements rather than more traditional command and control-style penalization, and in respondents' statements expounding the notion of an explicit focus on cleanup rather than punishment. It also appears that need and capacity, rather than the economic importance of the oil industry, are the primary determinants of states' regulatory behaviors; a conclusion which, while certainly interesting, should be treated with caution as the nature of this relationship is likely confounded by the influence of federal legislation.

Finally, despite expressing widespread concern about the diminution of use and non-use resource values that can result from an oil spill, relatively few respondents reported that their states have ever sought natural resource damages independent of their federal counterparts. Even among states that have engaged in this type of regulatory effort, many have done so infrequently, or have never sought damages in conjunction with a petroleum release. It appears that the considerable resources and expertise, as well as the general perception of NRDAs as legally risky, are to blame for this state of affairs.

A number of states were found to engage in innovative regulatory behaviors; however, given that the need to address small-scale, use-related oil spills; to improve data management techniques; and to design an easier, more legally-sound approach to NRDA is so pronounced, the following two chapters contain a series of case studies of programs identified throughout the course of the survey, as uniquely suited to addressing these issues. In all, four separate approaches are described, two of which have been implemented in Florida, and two in Wisconsin. The programs detailed here are proven successful and represent practical models for states in seeking viable solutions for any of these challenges.

- Chapter 5 -

Florida's Innovations in Prevention and Enforcement

An Introduction to the Case Studies

Florida was one of two states chosen for in-depth study, because regulators there were found to have developed innovative approaches to address commonly-experienced oil-pollution related concerns. It is perhaps not surprising that Florida would be proactive in this regard, as it is generally considered one of the more 'environmentally-friendly' states. In 2006, for example, Florida spent over $1.2 billion to fund its environmental programs and initiatives, ranking third in the nation in this regard. This expenditure is all the more impressive when one considers that the state ranked 19th in per capita income in the same year (U.S. Census, 2008). The fact that the state is also home to some 480 LEED[92] certified buildings, more than all but two other jurisdictions, provides further evidence of its commitment to innovation and sustainability.

A variety of risk factors make oil pollution a very real concern in Florida, partly because the oil industry has a considerable presence within the state. Although there are no refineries operating there, the state ranks third in the nation with regard to the number of oil import sites. Four seaports are dispersed along the coast, located in Jacksonville, Port Everglade, Tampa and Port Canaveral[93]. This dynamic facilitates the importation of crude from abroad, but also means that many of the state's fragile marine and near shore

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[92] LEED is a certification program that recognizes environmentally-friendly construction. For more information, visit: www.leed.org
[93] For a map depicting the locations of oil import sites and oil-powered electricity generating facilities, see Appendix H.

environments are within close spatial proximity of large-scale potential spill sources. Two major pipelines, the Genesis and the Sunniland, traverse the state, carrying crude oil to a variety of end users (including the state's 20 petroleum-fired power plants) and transporters, and constitute another possible source of oil pollution (EIAf, 2008). According to Phil Wieczynski, Emergency Response Chief at the Florida Department of Environmental Protection (DEP), oil importation is considered "a significant threat" to environmental quality, but is not currently the source of a large number of incidents.

In addition to industry-related risk factors, Florida is also plagued by a number of use-related sources of oil pollution. Ranking second only to California, in 2006, fully 5.1% of the oil consumption nationwide occurred in this southern state (EIAf, 2008). Very densely populated[94], there are about 340 residents per square mile (U.S. Census, 2008). Drivers utilize some 1,472 miles of highway, more than the length present in 43 of its 49 counterparts (USDOT, 2007), a figure that is indicative of the substantial threat posed by traffic accidents and leaking commercial underground storage tanks[95]. Florida also hosts a higher number of registered recreational vessels than any other state (NMMA, 2006), whose bilge water and fueling practices can lead to the release of oil into the marine environment. Given these figures, it is hardly surprising that truck accidents and marine vessels represent the two largest spill sources in inland and coastal areas of the state respectively, according to Wieczynski.

Selecting the Case Studies

[94] Florida ranks 7th with regard to population density nationwide.
[95] These are primarily found at gasoline stations.

The majority of states surveyed identified small, non-industry-generated releases as among the most problematic, yet many lacked a viable strategy or the needed resources to address them. Given these findings, and the fact that the record high oil prices that characterized the summer of 2008, and are likely to return in the future undoubtedly boosted the market for recycled product, Florida's Used Oil Recycling Program was selected for inclusion in this study. The Program not only acts to address a major source of oil pollution present in every state, it does so in a low cost, yet very effective manner, characteristics which make it amenable for use as a model for potential adoption by other states.

Survey responses also highlighted the fact that the vast majority of states do not seek natural resource damages for oil spills independent of federal involvement. This is true despite reports from many participants, that the lost use and non-use values resulting from these releases are of considerable concern. Many cited the high costs, long time frames and considerable expertise required to conduct traditional (case-specific) assessments as prohibitive given their limited budgets and personnel. Others noted that seeking resource damages was perceived as a legally-risky endeavor[96], and therefore, rarely undertaken. In contrast, Florida regulators seek damages for every spill to coastal areas of the state through the application of a benefit transfer-style calculation that makes use of both a pre-specified damage formula and a supporting GIS. This combination of formulaic and spatial methodologies allows for timely, inexpensive assessments, which by all accounts, are legally robust and accurate. Florida's approach to Natural Resource Damage Assessment (NRDA) is the second initiative discussed in this chapter.

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[96] Many survey takers indicated that concerns over potential legal challenges kept their states from actively seeking resource damages.

Case Study I: Florida's Used Oil Recycling Program[97]

Used Oil Recovery and Recycling: An Introduction

One of the major conclusions arising from this research is that the majority of the oil pollution with which state regulators must contend originates not from large-scale industrial operations, but from smaller, more widely-dispersed end-users, for whom the transport and consumption of oil are tangential to other activities. Releases of used lubricating oil are a perfect example of this trend. They originate as a result of the activities of do-it-yourself (DIY) auto mechanics, the pumping of bilge water from boats' hulls, the regular maintenance of all types of machinery, and a number of other sources. Used oil, therefore, is often the product of activities undertaken infrequently by potential spillers, who themselves tend to be small in scale and spatially-dispersed; characteristics which make monitoring for releases a difficult feat. Regulatory efforts are further complicated by the fact that such small entities are also more likely than their larger counterparts to have low awareness of environmental protection initiatives and their role as waste generators (Firestone, 2001).

Despite the difficulties associated with designing effective regulatory interventions to prevent the improper disposal of used oil, there are a number of compelling reasons to do so. More environmentally-damaging than new product, used oil contains far greater quantities of heavy metals and other toxicants. It is also typically more viscous, and therefore, harder to remove from beaches, feathers, and other natural

[97] All graphics contained within this section are taken from Florida's Used Oil Recycling Program's 2007 Annual Report.

features with which it might come in contact if disposed of improperly. If allowed to enter the environment, the amount of used oil generated by a single automotive oil change (approximately one gallon) can contaminate up to one million gallons of water; the same volume consumed by 50 people, over the course of one year (USEPA, 2008).

Given the considerable environmental harm that can arise from used oil, there is certainly cause to ensure that it is properly handled. More than a waste product, however it can perhaps better be described as a resource to be captured and reused, particularly in light of recent and projected future oil prices. Although a barrel of crude (42 gallons) is needed to generate just 2.5 quarts of new motor oil, an equivalent amount can be created through the re-refining of the used oil resulting from a single oil change. Reconditioning is another way of reusing oil. Unlike re-refining, reconditioning does not remove all impurities, but by passing the liquid through a series of filters it is rendered suitable for a variety of industrial processes. Today, the vast majority recovered is combusted to provide the heat needed to rotate turbines, fire cement kilns, and power other industrial operations. In some instances, specially-designed heaters provide warmth in large spaces such as garages and open work areas by burning used oil (Earth911, 2008).

Given all this, it is not surprising that regulatory interest has been fixed on the topic of used oil recycling for some time. In 1992, the U.S. Environmental Protection Agency initiated its Used Oil Management Program[98] that among other things, provides guidance for the creation of used oil collection sites and promotional materials related to its “You Dump It, You Drink It” campaign. The Program also reviews and approves state-level initiatives dedicated to used oil collection and recycling. A number of states,

[98] Under the authority granted by 40 CFR Parts 260, 261, 266, 271 and 279.

including: Arkansas, California, Florida, Ohio, Texas and Utah, have put such programs in place. Among these many efforts, however, Florida's continues to serve as model worldwide. The stellar reputation of Florida's Used Oil Recycling Program (FUORP), has led regulators from across the U.S. and from such diverse locales as Italy, Bahrain, and Nigeria to seek the advice of Richard Neves, an Environmental Specialist at the Department of Environmental Protection and the Program's Coordinator.

Recognizing the need to protect the state's fragile ecosystem from releases of used oil through improper disposal, Florida initiated the FUORP to target generators of this substance, as well as the organizations involved in its collection, transportation and reuse or recycling. In order to ensure that improper disposal and handling practices are avoided, the state uses public education and outreach, combined with consistent monitoring and hefty liability requirements. Successful in attaining high collection rates, the Program is characterized by excellent data management, and has been designed to operate on a very modest budget and staff; all characteristics which make its approach amenable to more widespread adoption.

<u>Program Initiation</u>

An innovator in the field of used oil recycling, Florida began its work on the subject in 1984, even before the federal EPA's regulations had been promulgated. Neves described the initial effort as "minimal,' noting 'They were just trying to get some numbers; basically, to find out what was going on, because nobody had any clue." What caused the state to take such an early interest in used oil? The Coordinator recounted an event that is widely held to be the motivation, although no official documentation exists to confirm it.

> There was a used oil transporter who had a load, and at two o'clock in the morning he drove through…an orange grove and opened the valve on the back of his tank and dumped all the oil. Well, there was a highway patrolman parked under one of the trees on the side of the road catching a nap (and) he sprayed the highway patrolman as he went by, and (the patrolman) pulled him over. It made the newspapers and everybody went, 'Why is this happening? Why aren't we doing anything?' So that's what started stuff back in '84.

Still, the Used Oil Recycling Act (the Act; sections 403.75 – 403.769) would not be passed, nor funding provided, until a number of years later (FDEP, 2007). Clearly, something else must have occurred to motivate these actions, that 'something' was the *Exxon Valdez.*[99] Neves continued:

> Then the *Exxon Valdez* (happened) and the legislature said 'Well, we need to get a little more serious about this. This is an issue.' So they set up the program; put it in the statutes…and when they did that, they provided money right up front: $2.5 million. A million of it went to infrastructure (for) grants to local governments to set up recycling stations, primarily for do-it-yourselfers…the other one and a half million went to public and formal education.

Legal Foundations

The Act, the implementation of which is spelled out in the Department's Used Oil Management Rule (Chapter 62-710, Florida Administrative Code)[100], prohibits improper disposal or management of used oil and establishes a program for the creation and maintenance of a network of collection centers across the state. It describes the

[99] The legislation was passed in 1988 as part of the Solid Waste Management Act, however, major revisions effecting used oil recycling were initiated 1993, after the Alaskan spill had occurred.
[100] The language of the Act was amended to adopt federal used oil management standards (Chapter 40, Part 279 of the Code of Federal Regulations).

registration and reporting requirements with which used oil handlers must comply and the legal certification mandatory for all transporters. The DEP is also required under the law to educate the public regarding proper collection and recycling practices. (FDEP, 2007).

In Florida, used oil is not normally treated as a hazardous waste; a characteristic of the legislation credited with making the FOURP a major success because it facilitates the creation of a flexible regulatory approach that is well suited to dealing with small, use-related generators. If mishandled, however, this classification changes and the stiffer penalties associated with RCRA are enforced. Mr. Neves described this regulatory dynamic, and how it is used by Florida regulators to create a major incentive for responsible parties to assume a cooperative stance with regard to spill response and remediation.

> The way that used oil is regulated at the federal level, it's really under RCRA, but the first two presumptions move it out of RCRA: (1) if it's destined to be recycled and (2) if it's not been mixed with hazardous substances. Florida statute says that as soon as it's mismanaged (i.e. spilled), we can look at it as hazardous waste. So, if you're in a cleanup situation and you're a bad player, we're going to look at it as hazardous, because the fines (are) $500 per occurrence for a used oil violation, but if it's hazardous waste, it's $10,000 if it's (non-hazardous) waste and $50,000 if it's hazardous. We'll go to the more stringent (fine), because it's out of the exemption and it's considered a solid waste…

In light of the considerable environmental injuries that can result from an oil spill, the discretion to assess higher penalties by invoking RCRA was deemed an insufficient protection. Accordingly, all individuals who "transport used oil over public highways in shipments of greater than 55 gallons at one time" (F.A.C. 62-710.201) are required to become certified[101]. The certification process involves attending a training course and

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[101] Those carrying less than 55 gallons at a time must be registered with the state but are not required to fulfill the requirements of certification.

maintaining liability insurance. The amount of protection required was set at $100,000; however, in 2005 the Used Oil Recycling Act was amended to increase that minimum to $1 million. Mr. Neves, explained his motivation for increasing the insurance requirements for used oil transporters:

> Looking at the cost of cleanup, I thought 'This is ridiculous. We're not fulfilling our mission; it says 'Protect the Environment.' If something happens, we're going to look pretty stupid, so I want to raise (the minimum insurance requirement) to $1 million'…which is in line with what we require for hazardous waste (haulers)

As described in the Program's 2007 Annual Report, the Used Oil Recycling Act included regulatory carrots, as well as sticks, putting in place incentives for oil reuse. State and local government purchases of recycled or re-refined oil benefit from a five percent price preference, a measure likely intended to help ensure a market for the substance given the low price of virgin product at the time. Businesses willing to accept used oil from members of the public are also eligible for specific limited liability exemptions[102]; perhaps in reaction to the liability-related fallout which characterized the federal Superfund Program[103].

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[102] Limited liability exemptions are described in Florida Statutes Chapter 403, Section 403.760 as follows: No person may recover from the owner or operator of a used oil collection center any costs of response actions, as defined in s. 376.301, resulting from a release of either used oil or a hazardous substance or use the authority of ss. 376.307, 376.3071, and 403.724 against the owner or operator of a used oil collection center if such used oil is:
(a) Not mixed with any hazardous substance by the owner or operator of the used oil collection center;
(b) Not knowingly accepted with any hazardous substances contained therein;
(c) Transported from the used oil collection center by a certified transporter pursuant to s. 403.767;
(d) Stored in a used oil collection center that is in compliance with this section; and
(e) In compliance with s. 114(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended.
This subsection applies only to that portion of the public used oil collection center used for the collection of used oil and does not apply if the owner or operator is grossly negligent in the operation of the public used oil collection center. Nothing in this section shall affect or modify in any way the obligations or liability of any person under any other provisions of state or federal law, including common law, for injury or damage resulting from a release of used oil or hazardous substances. For the purpose of this section, the owner or operator of a used oil collection center may presume that a quantity of no more than 5 gallons of used oil

Measures of Success

The effectiveness of the program in accomplishing its mission of ensuring environmental protection through the proper collection, handling and reuse of used oil has been dramatic. Pursuant to Section 403.754 of Chapter 403 of Florida statutes, all persons or entities registered in conjunction with used oil collection, transport, transfer, rerefining, marketing or consumption, are required to submit annual records detailing the sources, volumes, and destinations of all product handled, as well as the dates upon which such activities took place. Because data collection is statutorily defined in this way, FOURP has been able to monitor its progress, and keep abreast of state-wide trends. In all, collection rates have risen substantially over the life of the initiative, equaling approximately 119 million gallons in 2005, leading Florida's program to be ranked at or near number one in a variety of reports focused on used oil recycling efforts[104]. Of that amount, about half was recycled (see Figure 5.1)[105].

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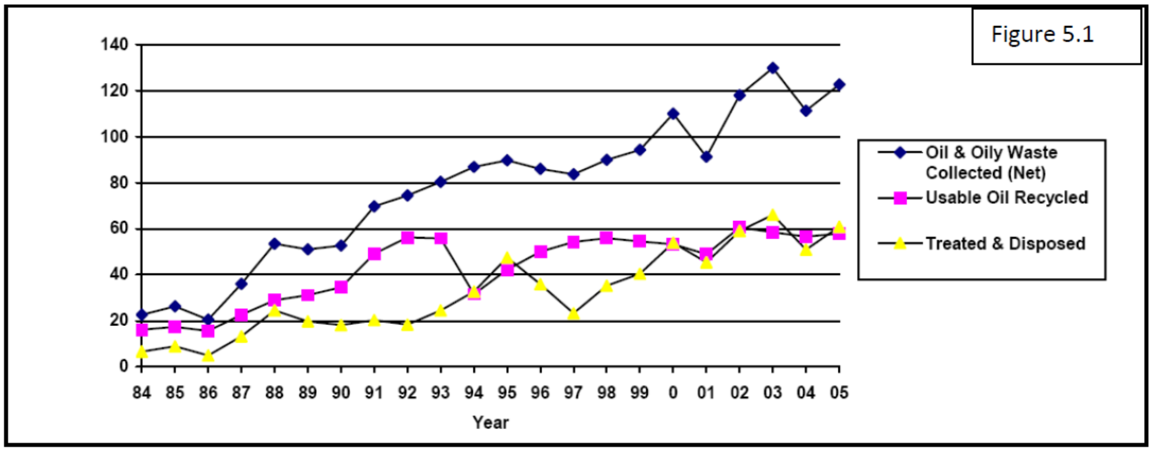
accepted from any member of the public is not mixed with a hazardous substance, provided that such owner or operator acts in good faith.

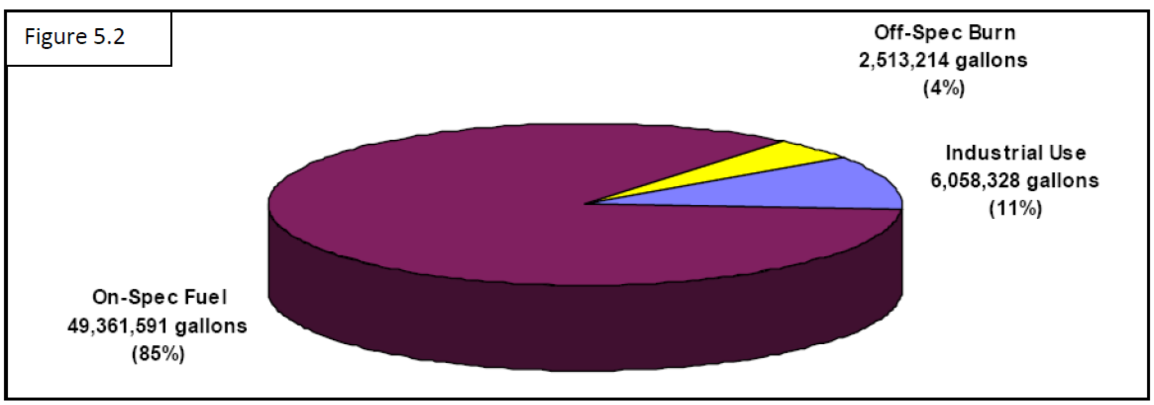
[103] Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, the authorizing legislation used to create the EPA's Superfund Program) liability for the costs of remediating contaminated properties is strict, joint several and retroactive. Because of these conditions, anyone found to have contributed to onsite contamination, even municipalities who had contracted for household waste disposal at landfills later determined to be severely polluted with unrelated substances, could, and often were, sued to recover part or all of the cleanup costs. What's more, once found liable, any party could independently seek out additional responsible parties to recover these expenses. The result of this dynamic was a 'web' of law suits, which claimed considerable regulatory and private resources, and often ensnared parties with no culpability for the onsite contamination (Thomas, 2001).

[104] Reports published by the Evergreen Oil Company in 1995, the American Petroleum Institute in 1996 and the state of California (forthcoming).

[105] When examining the numbers discussed in this section, it is worth noting that a variety of factors, including changes to the authorizing legislation, pricing of virgin product, the increased number of solid waste permits possessed by Used Oil Processing facilities, and the occurrence of several devastating hurricanes around the state, all impact the numbers reported, although the nature of their influence is not entirely clear and varies from year to year. In addition, some discrepancies arise due to differences in the techniques used to measure loads of oil by the used oil industry; transporters use dipsticks to estimate



The largest single source of recovered product is automotive, accounting for about 44% of the total volume in 2005 (see Figure 5.2)[106]. This category includes oil collected from DIYers, professional garages and 'quick lube' facilities. Industrial processes contributed over 29 million of the gallons collected in that year, originating from bulk petroleum facilities and other installations. The remaining 61 million gallons were designated 'mixed' oil, generated largely by commercial sources, and consisted of combinations of more than one type of product.

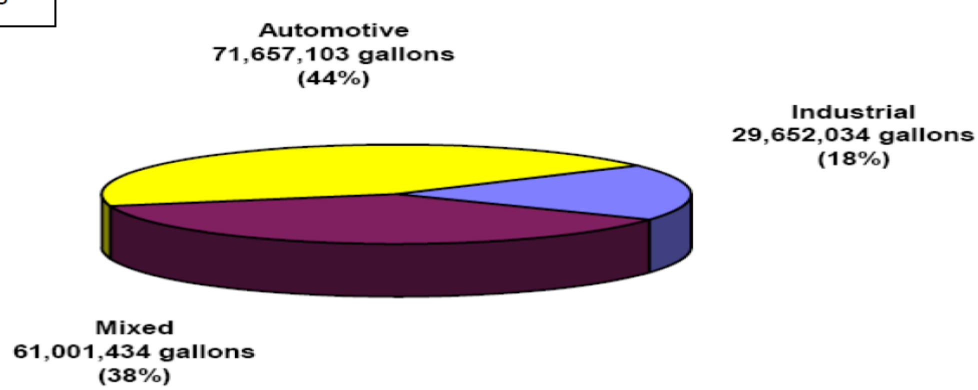


volume, for instance, while processors use weight, a more accurate metric. The differences in volumes reported by these two groups is often between 6 and 12%.

[106] When added together, the volumes reported in this figure equal approximately 44 million gallons more than the total amount collected in 2005, this reflects the occurrence of some double reporting when oil is transferred from one facility to another, rather than directly to an end-user. In such instances, both facilities may account for the same volume of oil among their annual reports. Efforts are underway to eliminate this kind of inaccuracy.

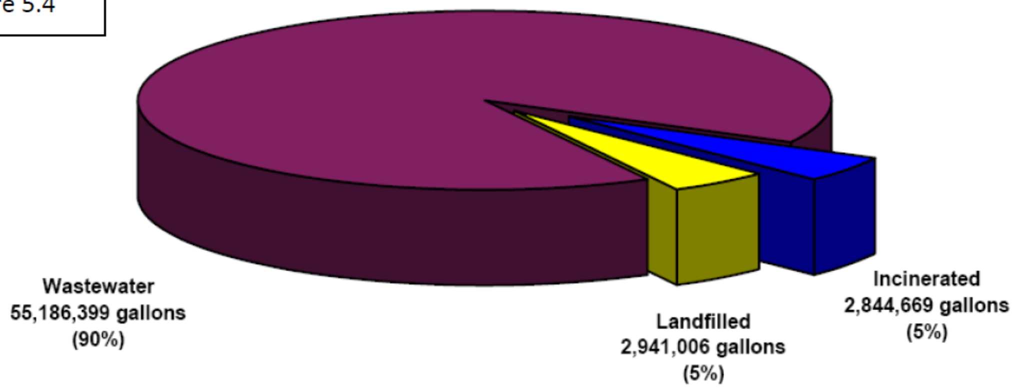
Of the approximately 60 million gallons that were recycled, the vast majority, over 49 million, was burnt as 'on-spec' fuel. The utilization of used oil in this way offers cost savings without users incurring any additional regulatory burden, as it is legally considered equivalent to new oil of the same grade. Off-spec burning accounted for about 4% of the remaining volume, while the rest was used for industrial processes (see Figure 5.3). In Florida, the industrial activity which claims by far the largest proportion of used oil is phosphate benefication, a process whereby particles of phosphate are isolated through the addition of oil to mining products, an action that causes these lower-density particles to float, easing their collection.

Figure 5.3



About half of the total volume collected was treated as 'oily wastes' and disposed of, rather than recycled. The vast majority consisted of condensation water and sediment; substances which, whether oil is collected in drums or by vacuum truck, typically constitute a significant portion of each load. Not surprisingly, therefore, most (90%) of these wastes were handled as industrial wastewater, while land filling and incineration were used to handle of the remaining 6 million gallons (see Figure 5.4).

Figure 5.4



The disposal of used oil filters is another issue with which regulators must contend, although under the Used Oil Recycling Act, the FUORP has authority over the oil contained in spent filters, but not the filters themselves. To help ensure that used filters would be recovered, rather than simply discarded, however, Florida passed a law 1995, prohibiting the disposal of oil filters into land fills, a practice which not only removes a potentially valuable recyclable from the waste stream, but could threaten groundwater through exposure to petroleum-contaminated leachate. Per the state's requirements, filters can either be hot drained[107] and sent for recycling, or burnt in their entirety at Waste-to-Energy facilities, and the steel recovered for reuse (FDEP, 1997). Currently, one facility in South Florida, the United States Foundry in Miami-Dade County, recycles almost all of the filters recovered through the program, creating a variety of grey steel products such as manhole covers (FDEP, 2007).

The collection of accurate data about used oil filters has proven challenging for a number of reasons. Among these are the large number of collection techniques employed by reporting sources and the fact that FOURP staff have been unable to attain statistics

[107] 'Hot draining' is a technique for removing oil trapped inside a discarded filter in which the filter is inverted and heated for a period of time, reducing the oil's viscosity and facilitating its removal.

for new filter sales in the state because this information is considered proprietary by the businesses involved. Despite these obstacles, in 2005 alone, the recovery of nearly 11,000 tons of steel and 392,000 gallons of oil were recorded through documented filter draining and recycling. While these numbers represent a significant reduction in the potential for environmental harm arising from the improper disposal, filter-related issues remain a concern.

The handling of filters that have been collected from DIYers is somewhat problematic. The fact that only a single significant "filter end user" exists in the state means that events or decisions that affect the U.S. Foundry's capacity or willingness to accept these wastes can have a substantial impact on the recycling effort state-wide. The significant impacts to South Florida caused by Hurricane Andrew, for instance, led the Foundry to stop accepting filters for a period of time, causing massive quantities to accumulate at collection centers as there was nowhere willing to accept them. Once the facility's operations resumed the situation was resolved, however, the incident raised awareness among all involved about the system's overall fragility. Neves is also aware of a few transporters in the northern portion of the state who skirt the costs associated with recycling in Florida by transporting their loads into Georgia for landfill disposal.

Programmatic Characteristics

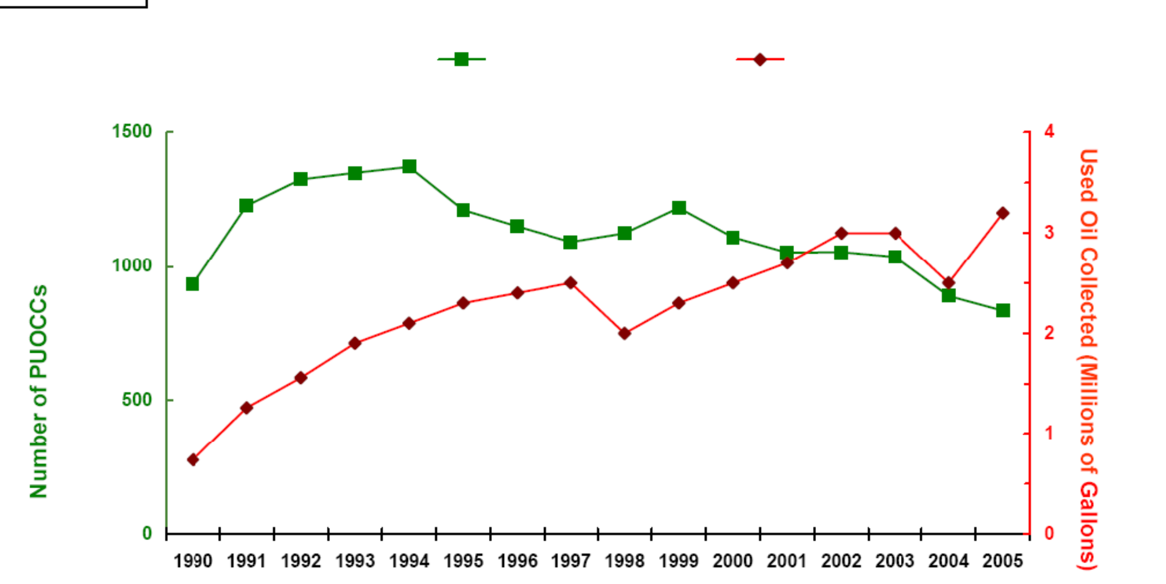
Authorizing legislation sets the stage for regulatory intervention by identifying necessary actions and desired outcomes. The methods selected to fulfill these obligations, and therefore the ultimate success or failure of the resulting program, however, are largely at the discretion of the regulators themselves. This section provides an overview of the characteristics and practices that have helped make Florida's Used Oil Recycling Program's so effective.

By all accounts, the FUORP has been highly successful in carrying out the tasks set forth in the Used Oil Recycling Act, an accomplishment which is particularly noteworthy, given the extremely limited regulatory resources available to back its efforts. The program does not have a dedicated source of funding; instead appropriations are relied upon from the state's general trust fund for water quality. The salaries of the program's two staff members (Mr. Neves and an administrative assistant) are paid from this source, and additional external support is occasionally obtained, in the form of grants for specific projects.

Clearly, the budgetary constraints on Florida's program place very real limitations on what can and cannot be undertaken. In Utah, for example, where a fee of four cents per quart of new oil sold is used to fund their program, regulators provide considerable financial assistance for the construction of used oil collection centers. Unlike Utah and California's continual revenue stream, in Florida a $1 million legislative allocation was made at the program's inception, to be used to provide grants to local governments for collection site creation. Other entities were not eligible to receive these moneys, however, and support for this activity has not been made available since.

Programmatic data clearly illustrate that the number of Public Used Oil Collection Sites in Florida has declined in recent years (from a high of approximately 1,300 in 1994, to just 834 in 2005; See Figure 5.5). Staff attribute this trend, not to decreasing demand, but to counties' recent move away from remote, un-monitored sites to the establishment of single, centralized locations that can be more easily monitored; a move that appears largely to have been undertaken to allow for more thorough monitoring, as illegal dumping practices were common at remote locations. Support for this supposition is found in the continually-increasing collection rates reported for the state as a whole despite the decrease in collection sites (FDEP, 2007).

Figure 5.5



Describing how his program has managed to do so much with so little, Neves contrasted the FUORP with its counterpart in California, a group with which he has maintained a continual working relationship. Like Utah, California's program is funded through a four cent per quart used oil recycling fee.

> I went out to Sacramento once; they contacted me because they were real impressed with (Florida's) program… So I went out to UC Davis and showed them our numbers, and they showed me around. The whole floor was used oil, and each county had (an office). My jaw dropped, and I said 'How do you all do it?' (They answered), 'We have a budget of $22 million a year... Really, the only reason we called you out here is (that) we want to know how you get all of those good numbers, but you all don't have any money.' I said, 'It goes back to the legislature; we started it off right with a good foundation.'

Public outreach and education were central elements of the "good foundation" to which Mr. Neves referred, and continue to be one of the FOURP's focuses. A survey conducted around the time of the program's initiation highlighted the need to raise awareness among DIYers about the importance of proper disposal of used oil. Many such individuals reported pouring the substance down the drain, or ridding themselves of it in other environmentally-damaging ways. "Somebody dumping a gallon of oil is no big deal, but if you're talking 15 million people in a state, and 20-30% of them change their own oil, those little things add up.," explained Neves.

Given the pressing need for increased awareness about the proper handling of used oil, the remainder of the initial legislative appropriation (some $1.5 million) was used to fund a public outreach initiative. The campaign included television and radio spots intended to curb irresponsible handling and improper disposal of oil among the state's many professional and amateur auto mechanics. Marinas were also targeted, as spills during gasoline pumping and releases of oily bilge water were identified as major sources of contamination.

Since this first effort, the state has continued to work to raise public awareness whenever funding can be secured. In 2001, for example, Florida's legislature appropriated moneys that were used to create and air some 58 radio commercials to promote used oil collection centers. Similarly, educational materials are always available upon request for distribution at local events such as county fairs. The state also maintains a toll free number to provide callers with information about used oil collection center locations by zip code, and a complementary website is run in cooperation with the company Earth 911.

Florida does not limit its outreach efforts to used oil generators, however; considerable energy is expended on educating children and young adults about the issues surrounding oil pollution and recycling. A portion of the initial funding earmarked for education was used to create a variety of lesson plans, a game and a video designed for use in a classroom setting. Neves, a former educator, worked together with a number of groups, including teachers, industry, and environmental groups, to create the "DIY 800 Curriculum Kit," which was distributed to every secondary and post-secondary institution in the state. Recognizing the need to create a product which could easily be incorporated into teachers' lesson plans, the activities were designed specifically to meet Florida's educational standards, and each is marked with a code to indicate the requirement it satisfies. Intended for a number of age groups, the activities are also designed to be relevant in a variety of subject areas, including science, math and auto shop.

Educational materials are supplemented with a variety of less traditional tools. One such addition is an apparatus consisting of two vials of oil, one new, one used, which can be flipped on end to visually demonstrate the latter's increased viscosity and darkened appearance. This demonstration is intended to illustrate used oil's potential to cause even greater environmental harm than virgin product. The program even went so far as to design a board game in which players move car-shaped pieces along a track by demonstrating their knowledge of issues surrounding used oil recycling. The game itself was designed by the makers of Trivial Pursuit, and resembles its commercial counterparts with regard to design and sophistication. It is intended for use in schools, and the board itself is the size of four standard student desks pushed together; it is magnetized (as are the playing pieces) and has a row of grommets on one side to allow it to be hung on a wall to facilitate full class play.

Clearly a comprehensive and well designed curriculum, DIY 800 is still in use today, some 18 years after its creation. When asked why the state had chosen to spend such a large portion (three fifths) of the initial funding on education, Neves commented:

> I'm a firm believer that education is how you change the future, and I think the state of Florida agrees with that… Once upon a time, if you went into a school and asked a kid, 'What can I do with this tin can?,' he would have said, 'The trash can is over there.' If you go to a campus now and say 'What can I do with this?' they say, 'The recycling bin is over there.' That, to me, is demonstrative of a change in attitude which will change the future.

In addition to public outreach, FUORP has continually made an effort to work cooperatively with multiple groups that have varying interests in used oil. The oil industry for example, has played an integral part in its design and initiatives since the program's inception. Mr. Neves recalled how the formation of an industry association marked the beginning of this relationship.

> Back when the used oil regulations first came around, an association appeared, and they called themselves 'The United Association of Used Oil Services.' Their members were the handlers in the state of Florida; mostly transporters and processors. When we went into rulemaking, when I issued my annual report, (and for other used oil-related concerns), I could just pick up the phone and call the Association and tell them 'I'm looking for some information, could you pole your members and have them get in touch with me?' We had a really good relationship with industry.

The cooperation that exists between regulators and regulatees has not always been viewed favorably. The Natural Resource Defense Council, for instance, mounted a legal challenge against the federal EPA and the Florida DEP alleging that used oil recycling was 'sham recycling' because the substance is typically burned for heat generation. Despite the ensuing criticisms of the state's relationship with industry, Neves explained how Florida's rapport with the Association acted to enhance regulators' understanding of the complex issues involved in used oil recycling, rather than encouraging lax enforcement.

> We got accused of being in bed with industry, but I'm not a petroleum engineer, and when I've got a question about a used oil processing facility, a certain portion (of the process), or a certain material…I'm going to go to an expert. I'm not going to go back to organic chemistry, and start going through the petrochemical section, and try and educate myself when I can call (a professional) up who does this everyday…

The relationship with the Association also proved invaluable to regulators as they attempted to write rules that would satisfy their legislative mandate, and still function in the real world. Biannual meetings provided a forum where members could meet with DEP employees to air grievances, ask questions and raise concerns. "Everything was off the record…' Neves explained, 'They could ask anything under the sun and we would give them an interpretation. They could be honest with us and we weren't going to…put them in jail." In return, FOURP employees could solicit advice regarding how to structure initiatives to achieve the desired results. Neves described one such exchange related to concerns over used oil that had been contaminated with hazardous substances.

> Industry came to us and said, 'I turned down this load of oil because it's hot, but I go back there next week and it's gone. Somebody picked it up. We don't want to rat out our customers, but if you put (that the discovery of contaminated oil must be reported to the DEP) in your rule, (we would

> be justified in reporting it).' I said 'OK,' so we put it in the rule that if you turn down a load of oil, you have to report it to the department.[108] (This is an e xample of how) i ndustry a nd the D epartment w orked together an d found solutions to those little, problematic situations.

The Association disbanded in 1999 due to lack of funds and because, as Neves put it, "…the used oil universe and the regulatory universe had settled down, so there wasn't necessarily a reason to meet twice a year…" Today, however, there is some talk of its reinstatement, as many of those involved recognized the unique value of the working relationship it facilitated between regulators and the regulated community. Mr. Neves, a self-professed "former Greenpeace tree-hugger," explained his feelings about the value of cooperation and ongoing dialogue; "I've come to realize that things get done when you find that middle ground and compromise. If you go to one side or the other, it doesn't do anybody any good." This sentiment appears quite common among regulators from across the country, as evidenced by the large proportion of survey participants who identified their programs as adopting a cooperative stance with regard to the regulated community.

At times, the FOURP has taken targeted steps to assist the regulated community in meeting its requirements. The labeling of used oil storage tanks had been identified as an issue of concern because, in the absence of a standardized system, tank owners had created labels individually, leading to considerable variation in appearance and location. In 2006, EPA compliance assistance funds were used to design and distribute stencils for use on all storage tanks. The funds were also allocated to provide training for oil

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[108] This language was later repealed due to concerns over the reporting timeframe. Essentially, haulers were concerned that they would lose customers for reporting illegal activities and wished to wait a period of time after discovering contamination before notifying the state. Although this approach was acceptable under the language of the rule, the state's enforcement officers began issuing penalties associated with reporting delays, causing the Association to request that the rule be amended to remove the notification requirement. Handlers now make use of an anonymous tip line to report contaminated oil

transporter drivers after the legislature amended the Act in 2005, requiring that members of this group acquire certification.

Driver training was initially offered free of charge by the DEP throughout the state. In addition to a host of regularly scheduled meetings, two additional sessions were held, one in Georgia and the other at a company's training event in Tampa, at the specific request of members of the regulated community (FDEP, 2007). All told, some 200 individuals were instructed on issues ranging from pre-acceptance halogen testing,[109] to spill release response actions (FDEP, 2006). Today, transporters have the option of designing their own training program according to DEP standards, or purchasing a course package that has been pre-approved by the Department. Given the success of the state-led initiative, Neves is currently seeking external funding to repeat the effort undertaken in 2006.

Industry is not the only contingent that the FOURP has worked to involve in the regulatory process. The design of DIY 800 curriculum, for example, brought oil companies and associations together with environmental groups and educators. Although tensions ran high at times, the end result was likely better than any single group could have created alone. The effort was orchestrated by Neves, who described it in this way:

> When we put (DIY 800) together, we worked with…the Nature Conservancy, the League of Environmental Educators, the Florida Association of Science Teachers and Biology Teachers, Shell, Exxon, the American Petroleum Institute, the Florida Association of Petroleum Marketers, (and others)… We had some really volatile, tedious, contentious meetings. You had the environmentalists on one side of the table and industry on the other side of the table trying to hammer out that middle road as to 'How do we want to educate people?'

[109] Screening to ensure that a load of oil has not been contaminated with hazardous substances.

In addition to looking within the state for assistance and inspiration, the FUORP also turns to the experiences of other innovative states for guidance. Neves continually monitors other jurisdictions' initiatives, and contacts the regulators involved to learn how their experiences can help inform Florida's efforts.

> We watch what California does and then we pass our rule and correct for the mistakes they made. They're always out there on the cutting edge, and we like to be out there on the cutting edge too, but there's that pendulum (effect). You put your ruling way out here (motions to far right), and then you realize, 'Well, that's a little impractical.,' so you back off of it a little bit. We watched California and Texas go wacky on a couple of things. (W)hen we revised our rule, I was in touch with the people who wrote the rules in those states, (I asked) 'What kinds of problems are you having?'

Clearly, external inputs have been instrumental for the FOURP, but one of its most important initiatives, data collection and evaluation, have been largely an internally-driven effort. Stemming from a legislative mandate that annual reports be compiled describing the program's accomplishments in-depth, the FOURP's excellent treatment of oil collection and other data has proven an invaluable tool for the regulators themselves and for others interested in the program's design and operation. Although raw data are not accessible on the program's website, analyses of collection and recycling rates, as well as a variety of other metrics, are available in easy-to-interpret graphical displays, accompanied by comprehensive narratives. Keeping such close tabs on these indicators allows program staff to monitor the impacts of various outreach efforts, and otherwise monitor their progress.

Data collection and reporting efforts have not always been unproblematic, however. Neves has been responsible since the program's inception for the compilation of information from all reporting sources, as well as for conducting the analyses contained within the program's annual report. He described some of the difficulties he encountered early on, noting:

> (I)t was so new, and people didn't really know what they were looking at, or what they were looking for. (In) the first annual report, or the first couple that I did, when I balanced the numbers I came up with (approximately) a 30% margin of error… So I started looking at where the problems were; we had a lot of duplicate reporting…. What I still do to this day is go through each of (the renewal applications for collection centers) and check all of their math, because that's where a significant portion of the margin of error occurs.

Recognizing that some of the blame for the inaccuracies lay with the state itself, he worked to simplify the reporting process accordingly. The impacts of these efforts in terms of enhanced reporting accuracy have been dramatic.

> (The reporting forms) were very complicated. They had 17 different types of handling scenarios, end users, types of oil, (etc.). I thought, 'This is ridiculous! It's micro-managing and we're losing the big picture for all the minutia that doesn't have any consequence.' I redid all the forms when we went through the rulemaking process… and right now…it's less than 1% margin of error… I feel real comfortable in the numbers that we have.

Although Florida's data collection and analysis are exemplary, the amount of time and energy dedicated to these tasks are significant, and constitute a considerable drain on the program's limited resources. Recognizing this fact, the statute was recently revised to remove the requirement that performance indicators be reported to the legislature directly, a group which rarely had the time or inclination to examine the reports submitted to them. This change does not mean that Neves intends to discontinue his data tracking efforts; on the contrary, he is actively working to streamline the process to ensure greater speed and even higher accuracy. One of the mechanisms he would like to institute to help realize these goals is to allow for web-based electronic reporting.

> I want them to be able to do their annual report online and punch their numbers in, so that when 'a' doesn't match 'b' it will reject it. (That way) I won't have to sit here and do the math on my calculator… At that point, it will pretty much run itself, except for pulling the numbers and issuing the (annual) report.

Conclusion

Preventing oil pollution is a common regulatory goal. As evidenced by the survey data, however, smaller, less-predictable releases, often originating from sources (such as DIYers) for whom the handling and use of oil is not of primary importance, are among the most commonly faced by state regulators. Used Oil Recycling Programs are likely the single best avenue for ensuring that the waste oil generated from activities such as servicing cars or industrial machinery does not become an environmental hazard[110]. Although several states have initiated such programs, Florida's stands out as an exemplary model. Its efforts have resulted in the collection and reuse of millions of gallons of used oil and tons of filters annually, all at a fraction of the cost of many other programs.

Florida's approach to used oil recycling is based upon a sound legislative foundation, however, amendments to the authorizing law and subsequent rules have been made in response to newly-identified needs and priorities. The potential for environmental degradation stemming from used oil is lessened through a variety of mechanisms, including regulators' option to treat mishandled oil as a toxic waste, as well as the statutory requirement that all transporters be certified and carry a $1 million in financial assurance. Regulatory 'carrots' are also offered to encourage compliance and

[110] Unfortunately, no data exist to support this supposition; however, it does make intuitive sense given the improper disposal habits documented among DIY mechanics in Florida during the FOURP's initial survey effort.

participation, such as the pricing discount offered for state and local government purchases of used oil, as well as the limited liability provided to collection centers.

Among the keys to the FOURP's success has been its willingness to look beyond the confines of the Department for guidance and knowledge. Throughout its history, the program has actively sought input from members of the regulated community, environmental organizations, educators, and other regulators; a practice that has made its initiatives amenable to real world conditions and has undoubtedly contributed greatly to its overall effectiveness.

Public outreach and education have also been hallmarks of the program since the beginning. Increased awareness among DIYers and students alike has been accomplished through targeted service announcements and the creation and distribution of a sophisticated curricular package for use at all levels of the public education system.

As with any effort, there are some areas in which Florida's Used Oil Recycling Program could be improved. One of the most obvious is the need for a dedicated, or at least a more substantial funding source. Were more money available, the program could continue with initiatives, such as transporter training and public outreach campaigns, without relying upon periodic appropriations or the availability of external funding. Also, although data collection and treatment are among the program's greatest strengths, these processes could be streamlined and made more readily accessible. Finally, authority could be extended to include empty oil bottles[111] and used filters, such that one program had oversight over all sources of oil pollution arising from DIY activities.

[111] The Program has no authority to regulate the disposal of new oil bottles once emptied, the majority of which are land filled or incinerated at waste-to-energy facilities. Disposal of oil bottles is of particular concern because the average user leaves 1.28 ounces of oil in each container they throw away, the accumulation of which in garbage trucks and at other points along the waste stream, can cause spills as

Despite these few shortcomings, Florida's Used Oil Recycling Program is an example of a dynamic and effective regulatory intervention and could serve as a model for other jurisdictions interested in preventing pollution arising from DIYers, industry and other generators of used oil. In the words of Richard Neves, "I know that it's recognized, nationally and internationally, as a good program. I think it's one of the best." For a complete description of the programmatic elements to replicate and amend, see Table 5.1.

(Table 5.1)

Element	Replicate	Amend
Data Tracking and Analysis	• Require consistent reporting from all parties involved in the storage, transport and reuse/disposal of used oil • Design reporting forms to be simple to fill out, yet capture all data needed to monitor program performance and track trends • Compile and analyze all data annually; track trends to monitor program performance, judge effectiveness of individual initiatives and identify problem areas; identify sources of reporting error and take steps to correct them	• Create an automated system for data reporting, possibly using a web-based platform, to minimize the time and effort required to check data for errors. • Make database publicly-accessible, preferably through a web-based interface
Education and Outreach	• Conduct a survey of likely generators of used oil (i.e. DIYers, auto mechanics, marinas, etc.) to determine their level of awareness about issues surrounding used oil such that outreach materials can be targeted to address any identified shortcomings • Create public service announcements to raise awareness about the proper handling and disposal of used oil through a variety of media (tv, radio, newspapers, etc.) • Maintain a telephone hotline and website where members of the public can find the locations of used oil collection centers nearby.	• Utilize a regular schedule for airing television, radio and newspaper announcements to ensure continued awareness of used oil-related issues • Provide materials designed for classroom use in digital format for easy access by potential users

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contents come under pressure and resealed bottles burst, releasing their contents on the ground or in other inappropriate areas. Similarly, the accumulation of new motor oil within landfills represents not only a potential environmental hazard, but the waste of a valuable resource.

	• Work with educators to design a formalized curriculum that can be used in classrooms at all grade levels, and satisfies state-mandated educational requirements.	
Authorizing Legislation and Rules/Regulations	• Involve industry and other interested parties in the rule writing process to facilitate information sharing and the creation of 'workable' regulations • Require sufficient environmental protections, including secondary containment and standardized labeling of storage tanks and high liability limitations for transporters • Under normal conditions, do not treat used oil as a hazardous waste, but reserve the right to do so if environmental injuries result from mishandling • Offer incentives for used oil use, such as preferential pricing for state and local purchases	• Give program direct authority to regulate the recycling/disposal of empty oil bottles and used oil filters • Provide program with a dedicated funding source, preferably one tied directly to the sale of lubricating oil, such as the four cent per quart fee charged on all sales of new motor oil in California and Utah. • Design incentives for used oil use such that they are phased out as market demand stabilizes. • Provide financial support for the construction and/or maintenance of used oil collection facilities.
Other	• Create a forum where members of the regulated community can discuss concerns and offer suggestions without fear of penalization • Maintain contact with other states engaged in similar efforts to share ideas and learn from past mistakes.	

Case Study II: Formulaic Natural Resource Damage Calculations

Introduction

Despite widespread concern over the use and non-use impacts resulting from oil spills, relatively few states consistently conduct natural resource damages assessment (NRDA) in the aftermath of a release. Designed to attain compensation for impacts such as lost habitat services and recreational values, NRDA is not a punitive response but rather, is intended to "make the public whole" from these losses.

It appears that much of the reluctance on the part of states to seek such damages stems from the perception that they are time-consuming and expensive to pursue, and may result in lengthy battles with responsible parties over the terms of settlement. These characteristics that make the process a hard sell for regulators, who typically have at their disposal very limited budgets and staff, and as attested to throughout the survey, prefer to maintain a cooperative relationship with the regulated community. Also, given that many releases are small in volume, the resulting injuries, and therefore, the potentially-recoverable damages, are typically minor. The common perception appears to be that effort expended on acquiring such small sums is time and energy wasted, as well as legal risk assumed unnecessarily, as restoration activities tend to be quite costly to undertake.

As described in Chapter 4, several states do conduct NRDA frequently. Some, such as California and Louisiana, have chosen to follow the federal example, relying upon expensive and complicated spill-specific assessments. It appears that their circumstances with regard to need and availability of regulatory resources, are such that such undertakings of this type are worthwhile. Others, like New Jersey and Washington have devised abbreviated formulas for assessing damages, although the applicability of the former is restricted to groundwater injuries, and the latter is applied only at the discretion of the a multi-agency Natural Resource Trustee Committee.

Florida has devised a methodology, however, which is based on a simple, yet elegant mechanism for determining losses, and allows regulators there to recover damages for every release to coastal waters. The approach has at its heart, a simplified assessment formula, which can be used in conjunction with a highly-specialized GIS. Once recovered, damages are deposited into the Coastal Liability Trust Fund, where they amass until sufficient to carryout one or more worthwhile restoration projects. Pooling funds in this way frees the state from conducting one-off restorations, and ensures that even the smallest of claims can be effectively utilized.[112]

Conceptual and Historical Foundations

The design of the assessment methodology is justified by the principle of "liquidated damages;" a notion borrowed from contract law. Well-suited to the concept of natural resource injuries, liquidated damages are typically used in instances where damages resulting from a breach of contract are considered intangible, remote or difficult to demonstrate, but are nonetheless recognized as real. In Florida's case, the 'contract' in question is implied, and exists between the state, acting as the designated resource trustee, and coastal resource users, which include shippers, operators of recreational watercraft, and any other potential spill source (Plante et al., 1993). The notion of liquidated damages is particularly useful in the regulatory context because it is expected to infer a deterrence effect. In the absence of easily-identified damages, parties are discouraged from breaching the contract by agreeing to a set of pre-specified consequences such as those spelled out in Florida's NRDA formula (Eggleston, 1997).

Recognizing the need to minimize the legal and regulatory efforts expended to recover compensation for resource injuries, the Florida legislature relied upon the logic of liquidated damages in crafting its damage assessment formula. The language contained in the authorizing legislation (Chapter 92-113, Laws of Florida) supports this conclusion.

> The Legislature recognizes the difficulty historically encountered in calculating the value of damaged natural resources. The value of certain

[112] Similar funds are maintained by Alaska, California, Oregon, Texas and Washington; Louisiana is currently considering establishing one.

> qualities of the state's natural resources is not readily quantifiable, yet the resources and their qualities have an intrinsic value to the residents of the state and any damage to natural resources and their qualities should not be dismissed as non-recoverable merely because of the difficulty in quantifying their value. In order to avoid unnecessary speculation and expenditure of limited resources to determine these values, the Legislature hereby establishes a schedule for compensation for damage to the state's natural resources and the quality of said resources.

In state-led cases[113], responsibility for assessing natural resource damages using the formula falls to the Bureau of Emergency Response (BER), a division of the Florida Department of Environmental Protection (DEP), whose employees are trained to act as first responders and approach every spill with the intention of both mitigating its effects as well as assessing any resulting injuries. Their efforts are supported by Florida's Fish and Wildlife Research Institute (FWRI), an agency charged with, among other things, creating and maintaining the GIS portion of NRDA methodology and providing BER employees with annual training in its use.

This kind of formulaic approach to damage assessment is relatively rare despite the obvious appeal of having at one's disposal a fast and inexpensive technique for calculating damages. The minimal amount of academic scrutiny that has been focused on techniques of this variety has been less than favorable, finding that their inability to account for the passage of time through the use of discounting is a major and consistent weakness, and criticizing the apparent arbitrariness of the dollar amounts assigned to various resource types (Ando et al, 2004a). When asked during the interview process why they do not make use of such an abbreviated methodology, respondents in a number of states cited the possibility of legal challenges as a major concern. Given all this, one is

[113] For federal-led investigation, Florida's formula would not be used; a case-specific assessment would be conducted according to federal legislation.

left to wonder why Florida chose to rely so heavily on this methodology, as well as whether and how they have been able to address these concerns.

Chris Rossbach and George Henderson, who today work as the Director of Florida's Fish and Wildlife Research Institute and an Emergency Response Manager at the Department of Environmental Protection respectively, were both present for the passage of the authorizing legislation and the formula's design. They recalled the importance of focusing events and historical precedent in setting the stage for their state's actions. Rossbach stressed the influence of a release into Florida waters in getting the authorizing legislation passed, recalling:

> There was a pretty big spill up in Jacksonville a few years before…and there was a lot of oil on the beaches and a lot of wildlife injured…and there was no mechanism for forcing the spiller to compensate Florida for those damages. So Senator George Kirkpatrick…took this on as a crusade. I remember him very clearly saying 'It will never happen again that somebody doesn't pay us for the damage they did.' So (statute 376.121) was written…

As with many types of oil pollution regulation, the occurrence of the *Exxon Valdez* was important in motivating Florida to make rapid regulatory decisions, and ultimately, to embrace the current formula-based assessment methodology. Henderson described how historical precedent with regard to regulatory practices, together with the occurrence of that infamous spill, set the stage for the state's actions.

> There had been, on the books in the state of Florida, species value lists that were used for pollution (since the 1970s). A formulaic thinking was already accepted within the broad rules of the state, so when they introduced this formula, and everybody was mad at the oil companies at the same time, there wasn't really a whole lot of debate.

<u>The Formula</u>

The formula can be used to calculate damages resulting from releases of a large number of substances, the vast majority of which are oils. The list of pollutants to which it can be applied is contained in an internal guidance document, jokingly called 'NRDA for Dummies' and is spelled out in an inter-departmental memo dated April 10, 1992 (Appendix G). Injuries resulting from releases of a large number of substances can be discerned using the equation; the typical culprits, such as fuel, motor, and crude oils, are of course included, as well as some more unconventional substances, such as peppermint essential oil and asphalt.

The memo also enumerates which substances are not defined as pollutants by the statute. Sulfuric, phosphoric and other acids are among the compounds specifically omitted, as are liquefied petroleum gases and ethanol. Rossbach described the omission of ethanol in particular as of considerable concern, because although Florida has not witnessed any major releases of this substance to date, a substantial volume of it enters the state through its marine ports. Given ethanol's increasing popularity as a fuel and fuel additive, import rates will likely continue to grow, thereby increasing the likelihood of a resource-injuring release.

For those pollutants covered by the formula, the NRDA calculation is based upon the volume and type of oil spilled, the location of the incident, and the habitats and species impacted (see Figure 5.7). Recognizing the considerable variability in the types and severities of injuries that can result from individual spills, Department of Natural Resources[114] staff used a nominal group technique to create a relative ranking of impact values. Among the factors considered in the ranking process were receptors' sensitivity

[114] One of the two agencies which were later combined to form the DEP.

to injury and potential for natural recovery, typical costs of restoration and the types and degrees of habitat utilization[115].

In determining damages, a base rate of $1.00 per gallon is applied, irrespective of any observed impacts. The volume released is then multiplied by a location factor, which is used to identify whether a spill occurred in nearshore, inshore or off-shore waters. Examination of the rational behind this locational variable provides an excellent example of how the values contained in the formula were devised to reflect the relative severity of a release[116].

“Inshore,” for instance, is defined as consisting of state waters up to one mile from the shoreline. This area is typically the most ecologically-productive and least able to dilute or otherwise attenuate oil pollution through mixing and/or dispersal. Spills in this area are deemed the most severe, therefore, and are subject to the highest multiplier (eight). “Nearshore” refers to the region between one and three miles from land, an area that typically hosts migratory species, and within which spilled oil may be dispersed to a somewhat greater degree than in the inshore regions. Reflecting the fact that resource injuries will likely be less severe as a result of spills into nearshore waters, the formula specifies that the calculation be multiplied by a factor of five. Finally, ‘offshore’ is the area characterized by the greatest ocean depths, and currents facilitate the dispersal and mitigation of oil pollution. For these reasons, offshore spills are thought to produce the least injuries, and this designation yields the lowest valuations[117] (Plante et al., 1993).

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[115] Ecological, but not human uses, were considered in this process.
[116] Distinctions between the regions reflect standardized distances recognized throughout Florida and Federal legislation.
[117] Offshore is essentially the base value for the formula as the associated multiplier is one.

To complete the first portion of the damage calculation, the pollutant-specific base rate is multiplied by the volume released, location factor, and finally, an indicator of whether the spill occurred within a Special Management Area (SMA). Similar to the location factor, SMA status describes whether an incident impacted areas thought to provide particularly valuable services. Areas such as state and national parks and protected marine areas are given SMA status, and result in a doubling of the assessment total, because of the unique habitats and living resources found there.

The "additive dollar amount for impacted habitat," which calculates the dollar values of injuries to various habitat types using a per unit (linear or square foot) charge, multiplied by the area affected, is also multiplied by SMA status, and this total is added to the value derived in the preceding calculation. The total arrived at in these two steps is then multiplied by a factor representing the pollutant characteristics. This value is found by multiplying predetermined pollutant-specific amounts[118] by the percentage of the spill volume constituted by each substance.

[118] Eight for heavy oils (i.e. bunker/residual fuels), four for mid-weight oils (waste, crude and lubricating oils, tars and asphalt), and one for lighter oils (such as heating oil and jet fuel).

As with the location factor, the values ascribed to various pollutant characteristics were intended to reflect their individual propensities to injure the ecosystems with which they come in contact. Exposure, which is determined according to the degradability and dispersability of a substance, is one determinant of the level of harm it can impose. The post-contact effects are also considered, resulting from toxicity and mechanical injury.

Figure 5.7

Florida Department of Environmental Protection Damage Assessment Formula

$$[(B \times V \times L \times SMA) + (A \times SMA)] \times PC + ETS + AC = \text{Damages}$$

Where:
B = Base Rate
V = Volume
L = Location Factor
SMA = Special Management Area
A = Additive Dollar Amount for Impacted Habitat
PC = Type of Pollutant/Characteristic
ETS = Endangered/Threatened Species
AC = Administrative Costs

Among the effects of greatest concern are smothering, immobilization, direct mortality and changes in food chain and web structures. The formula, therefore, includes higher values for releases of heavier oils, because they are known to produce more damage through exposure and the related effects, relative to their lighter counterparts (Plante et al., 1993). The total derived in the preceding steps is then augmented through the addition of charges for impacts to endangered and threatened species, totaling some $10,000 and $5,000, per organism respectively. Any administrative costs incurred by the department, are also included, such as those incurred while responding to the release and conducting the assessment. These charges are calculated per person on an hourly basis.

The minimum assessment is $50.00; the amount owed for any release of diesel or gasoline totaling less than 25 gallons. Domenic Letobarone, Emergency Response Specialist and Regional NRDA Coordinator, explained that this volume was selected as a cutoff, because it was the amount held by the standard size automobile gas tank at the time the legislation was passed. As originally written, the applicability of the formula was clearly defined: for releases less than 30,000 gallons, the formula was to be used, for those in excess of that amount, an individual assessment was required. A recent amendment did away with these restrictions, however, giving responsible parties the freedom to decide whether to use the formula, or conduct a case-specific NRDA, for any size spill.

FMSAS

First developed by ESRI[119] at a cost of some $250,000 dollars, the Florida Marine Spill Analysis System (FMSAS), is the GIS component of state's damage assessment methodology. FMSAS consists of twelve data layers, the substance of which was originally based upon Environmental Sensitivity Index (ESI) [120] data, but which is continually revised by Florida regulators as more recent or accurate data become

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[119] A private company and producer of ArcGIS and related programs. For more information, see: http://www.esri.com/company/index.html.

[120] ESI maps are produced by the Hazardous Materials Response Division of the Office of Response and Restoration. According to the ESI Metadata Clearinghouse website "The ESI data were collected, mapped, and digitized to provide environmental data for oil spill planning and response. The Clean Water Act with amendments by the Oil Pollution Act of 1990 requires response plans for immediate and effective protection of sensitive resources." (Available at: http://mercury.ornl.gov/metadata/nbii/html/nos/esi_data.html

available. The system includes a series of specialized tools designed to assist the Bureau of Emergency Response throughout the NRDA process. Richard Knudsen, Assistant Research Scientist and GIS specialist at the Florida Fish and Wildlife Conservation Commission, who has been involved with the system's development and implementation since 2001, demonstrated its operation. "The heart of it,' explained Knudsen, 'is…the Florida Marine Spill Analysis System (FMSAS), which in essence is a large, highly-detailed geographic information system. We have built a series of specialized tools to assist the Bureau of Emergency Response in their NRDA actions." he continued, noting that "(FMSAS) is…what spurred the U.S. Coast Guard to buy into the concept of the…GIS-based Area Contingency Plan[121]."

Once a spill is reported, the first step is to locate it within the GIS. This can be accomplished, using either latitude and longitude coordinates, or place names. The system's Gazetteer facilitates the second type of operation, a tool which Knudsen described as "robust," due to its impressive search capabilities. The Gazetteer "allows (regulators) to quickly search any point in any data layer," he explained, a task facilitated by the U.S. Geological Survey's Geographic Names Information System. Knudsen went on to describe how the BER might use the tool after receiving notification of a release through the State Warning Point[122].

> If we get information about a spill, and all the reporting organization has to tell us is 'It's two miles south of Lighthouse Point.,' we can first locate Lighthouse Point…and then zoom to a fixed radius around that location. From there, we can locate any other point by a bearing and a distance, which is very often how we're given information. Very rarely are we given an exact latitude and longitude.

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[121] Area contingency plans (ACPs) are required under federal legislation. ACPs are compiled for sensitive areas and/or those most likely to experience an oil spill and contain details about the deployment of response equipment and the unified command structure.
[122] Florida's emergency reporting hotline.

When asked how FMSAS relates to NRDA calculations, Knudsen explained that "the Complex Event Analysis Tool really is the core of the numerical NRDA." To use the GIS, spill data must be input into the model, either by drawing a polygon delimiting the extent of the impacts, or by entering over-flight readings. For large releases, GPS is used to delineate the areas impacted. Additional, spill-specific data, such as trajectory modeling, can also be entered to more accurately reflect the conditions on the water's surface and shore areas. Knudsen went on to describe how the system uses this information to assess resource damages.

> There's a lot of different ways that I can pull that information in, but the basic function is that you have a polygon…and once I have that information in there, I can run a 'Resource at Risk Analysis,' and what that is going to do is it's going to take that polygon and use it like a cookie cutter to drill down through all the GIS data layers that I have loaded in. For linear features (it will indicate) exactly how many feet, meters, miles, etc., have been affected by that polygon, and for polygon features, it's going to tell me the area affected. In Florida, those numbers are the numbers that are plugged into the formula to generate the damage assessment.

Timely response is central to limiting the negative impacts of an oil spill, and in addition to supporting NRDA, the Complex Event Analysis Tool allows FMSAS users to quickly notify field personnel of the presence of critical resources that could be affected by a release. 'On the Fly Resource at Risk Reports' can be generated using the same 'cookie cutter' approach. Just like for NRDA calculations, these Reports contain information about the types and quantities of species that could be impacted by a spill. Maps depicting this information can be distributed to responders on-scene, allowing them to tailor their actions to minimize injuries.

Although the FMSAS and the formula appear suited to 'arm chair' application, spill impacts are typically verified through on-scene investigation, especially for large or particularly injurious releases. Local knowledge is frequently relied upon to validate and make adjustments to the data related to habitat and species locations and abundances. "Around the Port Everglades Area, there's a group that actually goes out and GPS locates the turtle nesting beaches and the turtle nests themselves." explained Knudsen, providing an example of how local knowledge is used to enhance the accuracy of FMSAS. He continued, "They can either provide us that data (in digital format), or they can sit here…and say, 'Well, we know that they're here, here, here and here' (motioning, pointing to specific locations). We can actually drop those points on the map, and then have a map to hand out (to responders) to say 'Stay away from these areas.'"

Emergency responders are also instrumental in ensuring that the formula and FMSAS are correctly applied. 'We always want to ground truth it; we always want to be out there to see the impacts to oyster reefs, mangroves, salt marshes, and things like that." said Letobarone when asked how closely he would rely on the GIS in assessing impacts. "There's very seldom 100% coverage." added Rossbach, who went on to explain how more minimal contamination levels are handled within the formula. "You take the total linear feet and then apply your coverage percentage. So, if it's 100 feet and it looks like it's about 50% (coverage), you would call it 50 feet (and proceed with the calculation)."

<u>The Florida Coastal Protection Trust Fund</u>

Once damages are calculated and submitted to the responsible party for payment, the recovered funds are deposited into the Florida Coastal Protection Trust Fund, a pool of money which is also stocked using other, non-NRDA generated dollars. The first three statutorily-defined uses of the Fund are directly related to restoration, and clearly demonstrate a preference for projects designed to reinstate the functioning of the resources impacted by the damage-generating spill. The remaining seven authorized uses of Fund moneys are more diverse, however. The Fund can be accessed, for example, to develop and update the "Sensitivity of Coastal Environments and Wildlife to Spilled Oil in Florida" atlas, to expand or enhance the state's pollution prevention and control education program, or to fund alternative projects selected by the Board of Trustees of the Internal Improvement Trust Fund. Clearly, this relatively flexible use of damages represents a departure from the federal approach, where dollars must be dedicated entirely to pre-specified restoration projects.

Restoration Projects

Despite the numerous uses to which the Fund can be put, Florida regulators have conducted a large number of restorations, some 27 of which were paid for using Trust Fund moneys generated through applications of the formula. Fund moneys were used, for example, to conduct a large-scale study of the fate and effects of oil in the marine environment, the creation of an artificial reef using oyster shells, and a number of other undertakings. They were also distributed to the non-profit group Save Our Seabirds, to design and produce informational signs related to fishing and the safe handling of wild birds (such as the one pictured in Photo 1) that have been placed throughout the state in public fishing areas.

Photo 1

When asked why Florida has not accessed its Trust Fund to pay for restorations since the 27 projects conducted in FY 2000-2001, a number of explanations were provided. Some interviewees noted that because of the way the Fund is designed, a legislative appropriation would be necessary to access the money. A request for such a disbursement has not been made in recent times, both because the balance of the fund has remained below $1 million (an unofficial benchmark used by Weisinski), and because, as described previously, the allowable uses of the moneys are quite broad. In light of this lack of specificity, there is considerable hesitation about calling attention to the money in the Trust Fund, as this action could conceivably bring about its diversion to pay for something other than restorations.

The significant time and energy required to complete restoration projects have also kept Florida from seeking another dispersal from the Trust Fund. Phil Weisinski related how increased demands on DER make finding the regulatory resources to commit to restorations difficult.

> It's very time-consuming to…develop (and) process projects, (and) our Bureau has had a lot of other missions that have come on since September 11th. We end up doing a lot more than we did in 1999-2000; (then) we were focusing more on the spill response and the coastal side. We've also had an increase in our missions…(to include) supporting criminal environmental investigations. I don't have the resources now to dedicate to (resource restoration).

The Coastal Protection Trust Fund is not the only source of moneys the state can draw on for restoration purposes. Florida has also successfully submitted a claim to the Oil Spill Liability Trust Fund to receive compensation for a series of 21 historical spills that caused resource injuries throughout the state, but for which no remunerations had been secured from responsible parties. As with the Tampa Bay settlement, moneys were distributed among affected areas. Manatee County, for example, received $300,000, which was used for invasive species removal and the planting of native vegetation in Robinson Preserve. The Preserve opened to the public in July 2008, and represents a major triumph for environmental advocates, as the nearly 400 acres was originally slated for the construction of a golf course, but has, through extensive restoration efforts, been returned to a functional mangrove and marsh habitat (see Photos 2 and 3).

Photo 2

Photo 3

In addition to restorations conducted solely by state trustees, many projects have been completed as part of federal-led cases, including the large number of restorations funded through the settlement of the Tampa Bay spill, which occurred in 1993. Each of the municipalities impacted by the spill were apportioned some of the restoration dollars to conduct projects approved by the state and their co-trustee, the National Oceanographic and Atmospheric Administration (NOAA). Fort Desoto Park, which served as the launch site for the response effort, received a boardwalk and dune restoration funded with the settlement moneys (see Photo 4). Treasure Island, the only

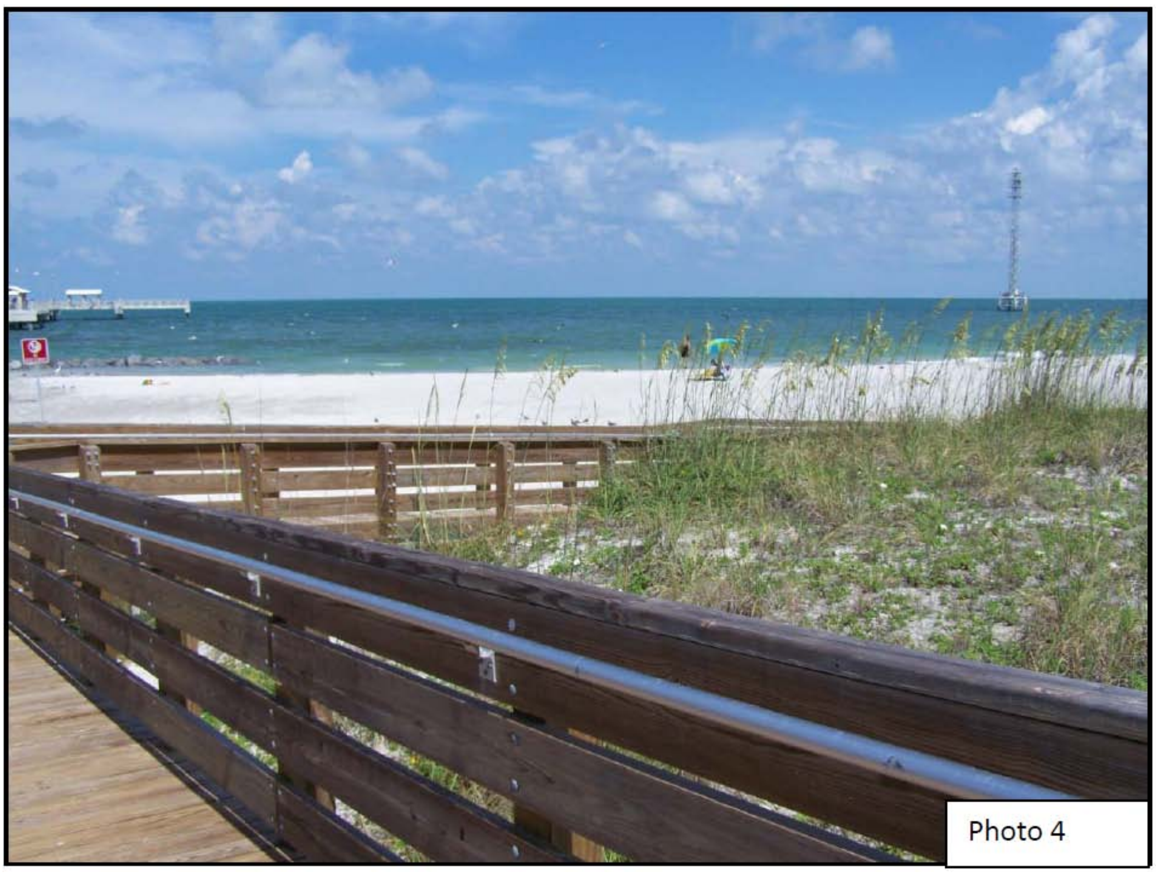
Photo 4

restoration still to be completed, also benefited from a dune restoration and boardwalk construction; as well as receiving funds to construct a sophisticated entrance area for the park. The focal element of the project was a pavilion which provides visitors with shaded seating and a view of the beach, and an adjacent nature trail is equipped with informational signage describing the park's habitats and species. The signs themselves are embellished with colorful illustrations, designed by a local artist (See Photos 5 and 6).

Photo 5

Photo 6

Weaknesses of Florida's Approach to NRDA

Despite all of its strengths, Florida's approach to NRDA is not a regulatory panacea. The formula's applicability to coastal, but not inland spills means that there is no automatic mechanism for generating damage assessments for the multitude of releases that occur in the land area east of Highways 19 and 41 and west of U.S. 1 (the landmarks chosen to delimit coastal from interior state lands[123]). By all accounts, NRDA is rarely conducted for inland releases.

[123] These roads also mark the extent of Coast Guard jurisdiction.

The methodology's ability to calculate values for ecological, but not human use and non-use losses, means that only a portion of potential damages are recovered for any given spill. Phil Weisinski, who was not with the DEP at the time of the formula's design, speculated that this omission may have been intentional, as provisions in other laws provide some mechanism for the recovery of compensation for impacts such as beach closures.

The formula is also not designed to take into account the cleanup technology used. A factor which George Henderson explained, represents an important difference between the federal and state approaches.

> If you were doing a natural resource damage assessment and restoration plan according to the NOAA models, the restoration planning could and would be different, if you had somebody stomping through and wiping down the mangroves and creating muddy paths and changing the hydrology in the area. Or in a salt marsh; if you go in there and burn the salt marsh it's one thing, but if you go in there and try to flush the oil out it's something else; you can potentially be dealing with different kinds of damage to the resources. But the way the formula's set up, it says: X number of gallons of oil, X number of linear feet of mangrove or salt marsh…times the type of oil, and you're done…it's irrespective of what kinds of cleanup technologies were employed. That's one of the real criticisms, because in the real world, it definitely does make a difference.

Another limitation stems from the fact that the values contained in the formula are codified in law. While this affords regulators a good deal of security, in that amounts are not up for debate, the values are forever static, as no provision was included in the law to allow for adjustments in response to changing remediation technologies or inflation. Legislative action would be required to allow for corrections of this kind, and the general sentiment appears to be that it is best not to bring the topic up for consideration, as it could prove to be the equivalent of “opening Pandora’s box,” and might result in a weakening or discontinuation of the methodology.

Also, somewhat surprisingly, documentation of the origins of the resource values contained within the formula are not maintained by Department. Injuries to a square foot of coral reef, for example, are worth $10.00, while the oiling of the same area of beach will cost the responsible party just 50 cents. The interviewees explained that the dollar values are not arbitrary, but were derived using quantitative estimates and actual restoration costs. The value assigned to beach injuries, for example, represents the cost incurred by the Army Corps of Engineers to conduct a beach nutrification at the time the statute was passed according to George Henderson.

Supporting the claim that resource values were based on defensible calculations, an article published in the proceedings of the 1993 Oil Conference (Plante et al. 1993) contains a detailed description of the steps used to derive the $1.00 per square foot value ascribed to mangrove forests. Among the measures taken into account were the cost per mangrove seedling and the additional acreage that must be planted to compensate for the relatively higher productivity of established forests as compared to newly created ones. Despite these indications that the resource values are based upon actual replacement costs, however, complete documentation of the methodology used to specify the amounts included in the formula is not available; a fact which makes it impossible to verify the accuracy or legitimacy of the methodology used to derive them.

The damage amounts associated with impacts to threatened and endangered species, totaling $5,000 and $10,000 per animal, were described by all involved as the closest thing to an “arbitrary” value included in the formula. Recognizing that these values were not based on actual replacement costs, the Florida Legislature included in the language of the law, the phrase, "These amounts are not intended to reflect the actual value of said endangered or threatened species, but are included for the purposes of this section.," within the language of the authorizing legislation. To date, no species of either designation has been harmed by an oil spill for which the formula has been used; therefore, it is not yet known whether the state-assigned values would be challenged by responsible parties seeking lower amounts, or environmental groups arguing for higher dollar values.

George Henderson explained the difficulty inherent in identifying an appropriate dollar value for such plants and animals, and how the issue has been addressed within the formula.

> With the threatened and endangered species, it's actually very difficult (to determine a value) from the federal lexicon, because one of the things that you're not allowed to do is value (them) in monetary terms. (T)he state doesn't have that prohibition; they did assign numbers for threatened and numbers for endangered species as a monetary value for the impact to that species. That number, it is safe to say, is rather arbitrary because it's difficult to come up with good restoration plans for these animals. It's one of the reasons they're threatened and endangered in the first place; because the management actions generally aren't working very well. The numbers (in the formula) are aimed to be high enough to have some meaning toward helping to restore them. You have to remember that the formula is not a fine; it's not in any way a punitive assessment. It is designed to come up with a value number that will help you restore the resources back to a state similar to that which was impacted.

Another controversial element of the formula is that it calculates damages for oil releases to the water column, whether or not actual resource injuries are observed. The justification for the use of a base rate of $1.00 per gallon spilled was explained by Henderson as a value derived from an extrapolation of the total value of Florida's fisheries in1989. The practice of collecting damages irrespective of observed impacts is intended to account for damages that occur as a result of the pollutant entering the marine environment, but which do not produce visible oiling; a practice which Ando et al objected to in their 2001 evaluation. Chris Rossbach noted that academics are not the only ones who raise questions about this aspect of the assessment, citing a responsible party's recent allegation that under the current system "…they don't get credit for doing a good cleanup. They're saying that because it went into the water and it was removed immediately, they shouldn't have to pay a NRDA for it." A notion he dismissed, explaining "They do get credit for doing a good cleanup by eliminating shoreline impacts."

Finally, there is no mechanism for sharing data between users of FMSAS, meaning that if one regulator documents a spill within the system, others cannot have automatic access to the information. This appears to be an artifact of the division of authority between the DEP and FWRI, however, plans to move towards a partially-web-based interface in the future may make this type of communication between users more feasible. Today the system does allow for the saving of all spill parameters within a single file, a function which makes possible the distribution of information about important spills, however, it is not an automatic component of the system.

Strengths of Florida's Approach to NRDA

Despite these apparent weaknesses, there is considerable evidence that Florida's formula and supporting GIS continue to serve regulators quite well. Perhaps most importantly, at least from an academic standpoint, the valuations produced using the methodology appear to be similar in magnitude to those calculated using other approaches, a major consideration in evaluating the quality of any such benefit transfer technique. Evidence of this convergent validity was found when the state submitted a claim for reimbursement from the OSTLF. Some of the incidents for which compensation was requested were "mystery spills," in that no responsible party could be identified; in other cases, the spillers were known, but had successfully demonstrated that the release was due to an act of God, a condition which negates responsibility for resource damages. Because Florida could not justify each of the values contained in its formula, regulators were required to recalculate damage amounts using traditional, site-specific techniques in order to submit the claim.

Phil Wiesinski oversaw the submission and was in charge of re-evaluating spill damages; he explained how the valuations produced by Florida's formula compared to those generated using more complicated and time consuming approaches.

> We tried running some comparisons, for example of our state claims for the 21 spills, where we actually had to go through the assessment and development of a restoration plan, and come up with a suite of projects.
>
> I (also) went back and estimated how much those spills would have generated from the formula. In some cases (the formula's valuation) was a little higher or lower than the amount (calculated using site specific methodologies), but overall it was a little higher. That was 11 years after the statute was passed[124], and (the formula) was still fairly conservative in terms of the damages.

The formula's long history of successful application provides further proof of its value as a regulatory tool. Florida has been relying on the methodology since 1991, and by all accounts has been highly successful in its application. The approach has only undergone a single revision during that time period and no successful legal challenges have been mounted against its assessments. When asked why law suits of the type which

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[124] The claims were filed in 2001.

famously plagued many damage assessments conducted under federal laws[125] have not been a problem for Florida, Chris Rossbach cited the statute's inclusion of rebuttable presumption as at least partially responsible. The state's cooperative relationship with industry is also a likely explanation, according to Phil Wiesinski.

> I think that the…reason that it hasn't been challenged is that industry had a hand in developing it. They realized that 'the state's going to do something' and they figured that they had better be plugged in. My predecessor and the agency leadership, said 'let's get them involved,' and that was a good call. If the state had…said 'here's what it is,' they would have been fighting every step of the way. (Under the cooperative approach used) they were running ideas by their associations. They knew they had to do something, and I think they came up with a pretty good model that after 18 years is still in place…and still pretty realistic in terms of dollar figures.

Conclusion

While clearly not perfect, Florida's approach to NRDA allows regulators to quickly and consistently value the injuries caused by coastal oil spills. It has stood the test of time and appears to generate damage totals on par with those derived using more complicated, case specific methodologies. By combining a mathematical formula and a fully-queriable GIS, resources at risk can be quickly identified and protected by first responders, who can then manipulate the calculations to ensure that actual impacts are recorded, and reflected in damage assessments. It is therefore suggested Florida's approach serve as a model for other states considering making NRDA a more frequent

[125] For more information, see: Austin, Susan A. "Recent Development: The National Oceanic and Atmospheric Administration's Proposed Rules for Natural Resource Damage Assessments Under the Oil Pollution Control Act." The Harvard Environmental Law Review 18.2 (1994): 549-62. and Jones, Carol Adaire. "The use of Non-Market Valuation Techniques in the Courtroom: Recent Affirmative Precedents in Natural Resource Damage Assessments." Water Resources Update. Carbondale, Ill., Autumn 1997.

component of their regulatory response to oil spills and other environmentally-damaging incidents.

Among the elements to be replicated are the formula's codification in law and the inclusion of language specifying rebuttable presumption within the text of the legislation. These elements have made Florida's methodology a legally defensible one; and although the static nature of the associated damage amounts is an unfortunate artifact of the law's language, this outcome could be prevented, simply by specifying the methodology to be employed so as to account for inflation and the changing costs associated with newly-developed cleanup technologies. Obviously, the amounts specified in future formulae should be based upon realistic calculations of restoration and service costs and values, and the justifications for these amounts well documented.

The use of a complementary GIS is also a considerable advantage, as it provides those tasked with carrying out assessments and responding to reported releases with a spatial representation of the event, as well as advanced warning concerning the types and locations of potentially-impacted resources. It would certainly be more advantageous if users in the field had the ability alter the GIS's contents in response to changing information and site conditions (as is possible in Wisconsin's SERTS system), but the effectiveness of the response effort is undoubtedly enhanced by the immediate availability of site maps. In addition, the accuracy and consistency with which resource damages are assessed is likely enhanced under Florida's approach in which first responders carry out this function, relative to the more normal state of affairs, where assessments are carried out separately from the immediate task of protecting health and welfare.

Finally, in terms of the formula's scope, future efforts should be designed so as to be more comprehensive, both in terms of spatial extent and the types of resource services taken into account. An artifact of a historical division of authority, Florida's formula only applies to the state's coastal areas. Any newly-created methodology should be designed to determine damages for all areas within a state's borders; similarly, human use and non-use values should be calculated, in addition to the types of purely ecological impacts accounted for by the current technique.

Table 5.2 acts to summarize the description and critical analysis presented here. It presents a description of Florida's system, broken down to reflect particular elements that should be replicated, or amended, by other states interested in adopting a system similar to the one described here.

(Table 5.2)

Element	Replicate	Amend
General	• Make damage assessment 'automatic' when a spill is reported • Assign NRDA responsibilities to first responders	• Conduct NRDA for all areas statewide • Design approach such that valuations are acceptable for federal reimbursements
Formula	• Invite regulated community to participate in design • Specify values according to real costs of remediation or replacement • Specify damages for release, independent of identified effects • Codify in law with inclusion of rebuttable presumption • Create complementary GIS using ESI data	• Automatically adjust values for inflation • Include values for lost use and non-use values • Adjust for cleanup/restoration technologies used • Document methodology for devising values • Determine defensible values for threatened and endangered species
GIS	• Include Gazateer • Allow for data entry/amendments through 'ground truthing' • Allow for instant identification of resources at risk • Make accessible on-scene using air cards • Provide regular training for users	• Link directly to formula and digitized Area Contingency Plans • Create networking capability such that data entered by one user are instantly accessible by all • Maintain layers depicting on-going and historic restorations and previous spills
Fund	• Deposit all damages into a single account • Target disbursements to areas impacted by spills	• Allow direct access by program; do not require legislative appropriations • Limit use of fund moneys to restoration • Identify definitive projects beforehand and disburse funds once needed amount is reached[126] • Utilize an interest-bearing account

[126] This approach is used in California.

- Chapter 6 -

Wisconsin's Innovations in Prevention and Case Management

An Introduction to the Case Studies

Wisconsin is unlike Florida in a number of ways. With far less coastline (none of which is marine) and quite different ecosystems, a lower-degree of development and a less pervasive industry presence than its southern counterpart, it is faced with different types of oil pollution risk factors. Despite these distinctions, the two states have in common a commitment to environmental protection evidenced in the behaviors of both their governments and citizens. The presence of these characteristics likely helps explain why Wisconsin regulators have devised promising solutions to challenges commonly experienced in the course of oil pollution regulation-related activities, despite what might be perceived as less pressing need and fewer available resources.

Wisconsin's total population is about 5.5 million; just below 2% of the national total, but with only 103 people per square mile, its population density is well below the national average(U.S. Census, 2008) [127]. Agriculture is a major industry throughout the state, which is home to some 76,000 individual farms (NASS, 2008a & b). Totaling just over 5 million, Wisconsin's population of cows, sheep, hogs and other livestock rivals the size of its human populace (NASS, 2008c). Not as wealthy as Florida, the state's per

[127] The national average for 2006 was estimated at about 150 people per square mile.

capita income, measured at just less than $34,500 in 2006, is below the reported national average for that year[128] (US Census, 2008).

Despite its rural character and relatively modest financial standing, Wisconsin prides itself on its commitment to environmental protection. State government, for example spent some $230 million to fund environmental programs, an amount greater than that expended for this purpose by 36 other jurisdictions. In line with their government's stance, residents also appear to be quite environmentally-conscious. Fully 4.9% of the nation's alternative fueled vehicles are registered in Wisconsin (EIAg, 2008), which is also home to 160 LEED certified buildings. While this figure is one third the number of such environmentally-friendly buildings present in Florida, the two have virtually identical per capita ratios.

The state's environmental initiatives and tendency towards innovation in the field have not gone unnoticed. In the course of its "Innovation and Sustainability in the States" series, for example, the Environmental Council of the States recognized nine distinct initiatives undertaken by Wisconsin, the second highest number identified in any state (ECOS, 2006). Also, in a 2007 Forbes ranking of "America's Greenest States"[129], Wisconsin attained a score of 35.7, which is better than that of 34 other jurisdictions, including Florida, which ranked 20th (Wingfield et al., 2007).

Despite sharing a commitment to environmental protection, the types of oil pollution experienced in Wisconsin are quite different than those found in Florida. Importantly, the potential sources of large, industry-generated releases are fewer, there is only one oil import site, located in the far northern portion of the state on Lake

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[128] $35,286.76

[129] The study assigned numeric indicators to measures in four separate categories: carbon footprint, air quality, water quality, hazardous waste management, policy initiatives and energy consumption.

Superior[130], and a single crude-transporting pipeline, the 'Lakehead.' One oil refinery is located adjacent to the Superior port, which produces only about 0.2% of the national total of finished product. Relying much more heavily on coal and natural gas, Wisconsin has one-fifth the number of petroleum-fired power plants present in Florida (EIAg, 2008).

The sources of smaller, use-related oil pollution in Wisconsin are also different than those experienced in Florida, due in large part to its more rural character and vastly different climate. Wisconsin has relatively few roads and gas stations; when considered as a whole, the state's highway miles (742) (USDOT, 2007) and gasoline distributors (approximately 3,900) total about half the amounts found in Florida (EIAg, 2008).

Although not on par with Florida in terms of development or oil industry activities, Wisconsin is not without considerable use-related spill sources. One type of oil pollution that is far more prevalent in the northern state, is spills originating from home heating oil tanks. Despite its relatively small population, Wisconsin ranks 17th on the national scale with regard to heating oil consumption (EIA, 2006). This widespread use of kerosene and #2 oil means that in addition to concerns over commercial tank releases, residential leaks are a major focus for regulators there. Recreational vessels, in contrast, are one class of polluter that the two states have in common. With approximately 640,000 registered throughout the state in 2006, Wisconsin is home to more watercraft than all but four other jurisdictions (NMMA, 2007); although clearly the risk posed by these craft is much different, and arguably less than in Florida, due to Wisconsin's significantly smaller coastline.

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[130] To view a map depicting the locations of oil import sites, please see Appendix I.

Selecting the Case Studies

One of the most common spill types experienced by virtually every state was those originating from the saddle tanks of large trucks; however, at the survey's completion, no state was found to have developed a program to address this problem. For this reason, the decision was made to create a case study of the only approach judged to provide a viable model for such an intervention, despite the fact that the program itself is not intended to address oil pollution-related concerns.

Wisconsin's Professional Nutrient Applicator's Certification Program was deemed an acceptable proxy for a number of reasons. Most importantly, although targeted at a specific component of the trucking industry, the training provided to drivers through the course of the Program has a proven track record for reducing the frequency of accidents through increased driver awareness and education, as well as more frequent and comprehensive mechanical checkups. This finding supports the notion that through the design and implementation of a program based on the fundamental elements of this model, truck-generated diesel spills as a whole could be reduced.

The other innovation profiled here is the set of data management systems used by the state's Bureau of Remediation and Redevelopment (BRR); with a particular focus on the newly-deployed spills tracking system. The Bureau's approach, which relies upon two interconnected databases and two web-based, publicly-accessible portals, facilitates data tracking and sharing, reduces regulatory redundancies and speeds case closure.

A few of the states surveyed self-identified data collection and/or treatment as major programmatic challenges; a much larger number, however, were determined to have inconsistent or nonexistent practices in these areas. Together, these findings were taken as an indication of a major shortcoming common to many oil pollution-related programs, supporting the selection of Wisconsin's sophisticated and highly functional data management systems for more in-depth study.

As in the preceding chapter, each case study includes a table describing the elements of the approach that are amenable to adoption directly, as well as those that should be altered to increase their usefulness and/or efficacy. In the case of the Certification Program, suggested alterations take the form of hypothesized design and implementation steps, as the original endeavor has a somewhat different focus than its proposed use. With regard to the second case study, suggested implementation steps are provided for the spills tracking system alone, as this is viewed as a more worthwhile and realistic initiative for most states to replicate than is the BRR's larger, multi-tiered data management approach.

Case Study III: Wisconsin's Professional Nutrient Applicator's Certification Program

Introduction

Traffic accidents, specifically those involving trucks, were named as one of the most common sources of oil pollution by the majority of states interviewed[131]. Oil tankers are not the concern, however; rather, it is tractor trailers carrying their fuel in saddle tanks that are the most problematic for state regulators. Many described typical spill-generating events as those in which a truck jackknifes, a collision ruptures a saddle tank, or road debris punctures the line connecting a vehicle's tanks, releasing the fuel into nearby culverts, sewers and surface water bodies.

Accidents involving large trucks[132] occur frequently. In 2006, the most recent year for which data are available, some 368,000 police-reported crashes occurred involving vehicles of this kind. The vast majority of these incidents (78%) did not lead to any injuries or fatalities, but did cause property damages, including those originating from the release of diesel fuel (ADFMCSA, 2008).

Given that every state is traversed by truck traffic, and that accidents involving these vehicles are common (on average, more than 1,000 occur each day nationwide), it is not surprising that these sources of oil pollution should be one of the most frequently cited. Despite the clear need for regulatory intervention, however, no approach designed specifically to mitigate this threat was identified in the course of the interviews. The reason for this is, most likely, the fact that the trucking industry does not fall within the

[131] Some 36 in all.
[132] Defined by the U.S. Department of Transportation as a truck with a gross weight rating of more than 10,00 pounds.

regulatory purview of individual states; rather, it is the federal Department of Transportation which retains authority over this kind of intra-state commerce.

Although no state was found to have developed an approach designed specifically to address truck-generated diesel spills, one jurisdiction does have a program which could serve as a model for the creation of such an intervention. The state is Wisconsin, and the program in question is the Professional Nutrient Applicator's Certification Program (PNACP). The Program consists of three separate levels, and provides truck drivers with training in a variety of areas, ranging from safe driving practices and accident avoidance, to emergency spill response. "For-hire manure haulers" the category of truckers to whom the program caters, is one whose prevalence is largely limited to areas with large farming and livestock industries; however, the principles and techniques employed throughout the PNACP are sound, and the results in terms of improvements in safety and cost savings are impressive.

Provided here is an overview of the PNACP. Some historical background and program-specific details are not directly relatable to the field of oil pollution regulation, but by and large, the approaches employed throughout the program are amenable to adoption for this purpose. In this instance, the role of state regulators has been somewhat tangential to the program's design and implementation; however, there is no reason why a state agency could not assume a role similar to that played by the University of Wisconsin Extension. Given that the problem is national in scale, a multi-state taskforce might represent the most promising approach to implementing a program similar to the one described here.

Motivations

The application of manure to enrich farm fields is a common practice in Wisconsin. But as regulators there were quick to point out, mishandling or severe weather conditions can lead to surface water contamination that may threaten drinking water intakes and cause fish kills or other environmental impacts. The State's Department of Natural Resources and the University of Wisconsin Extension work cooperatively with farmers and manure applicators to reduce the likelihood of such incidents through a variety of initiatives; one of the most successful of which has been the PNACP.

Kevin Erb, a Nutrient and Pest Management Specialist at the UW Extension, was among the program's designers and is still involved with its implementation. He explained how the certification program evolved out of a larger effort to address manure pollution in the state.

> The goal was to find ways to help farmers better manage manure fertilizer to increase profitability and protect the environment… We realized fairly early on that it's critical…that we work with the people that are actually doing the application, and in the early 90s, about 15% of the manure being applied in the state was being done by for-hire manure applicators. We began doing a set of annual meetings for that industry here in the Northeast part of the state.

Those early meetings included some instruction on safe handling practices; an effort which was soon replicated by individual counties throughout the state. This dynamic led to complaints from applicators with operations spanning multiple jurisdictions, who reported to Erb, "They're repeating the exact same things to us at each (county-level meeting); if we don't show up we're painted as people who don't care about the environment." The solution to this dynamic was to create a single regionalized training program for use throughout the state.

In the course of the first few meetings, it became clear that in addition to regulators' desire to address safety and environmental protection-related issues, a forum was needed in which to consider concerns arising from within the application industry itself. Erb described the state of the industry at the time as composed of "small independent businesses and fierce competitors'" and went on to relate the events which took place during the initial education sessions.

> Something very interesting happened; we had very strong, vocal contingents of the manure hauling industry that came forward and said, 'It's good that we're working together towards education here, but if we don't come together as an industry, we're going to get screwed.' They were looking at what had happened to the industry in Missouri, where in order to apply manure…individuals need between 30 and 40 hours of training, which when you run a seasonal business is prohibitive in a lot of cases. They were looking at Iowa, where the state was charging a mandatory fee for every employee to become certified and go through education. There was a problem there in that if you hired somebody at nine in the morning and they quit at ten o'clock, you still had to pay that fee to the state. Iowa had a requirement of three hours of mandatory training; Minnesota had training that was five hours.
>
> So industry said, 'If we don't get our act together here, at some point there could be draconian regulations that come down on us in Wisconsin. So, the industry asked us…to help them put together a state-wide organization (and) from that was born the…Professional Nutrient Applicators Association of Wisconsin, or PNAAW.

Immediately after its creation, the Association became the industry's representative in a variety of capacities; taking an active role in the writing of any regulations that might affect its membership and focusing on the long-standing problem of securing sufficient insurance. "The standard pollution liability insurance that's available to a business,' explained Erb, 'is going to provide what we call 'accidental

accidental' coverage.," affording protection only in instances where a third party vehicle is responsible for a release, and even then, coverage is limited to only about $2,000. Clearly, a more satisfactory solution was needed for what Mr. Erb described as the "unforeseen environmental hazards" of manure application.

Identifying affordable and sufficient insurance proved problematic, with initial estimates ranging from an annual premium of 8,000 for $100,000 coverage to $2,000 for ten times that amount of protection. The PNAAW and UW Extension worked together to devise a solution, ultimately hosting a field day where underwriters could tour a farm, inspect application equipment, and otherwise become acquainted with the industry. It became immediately apparent that a lack of familiarity on the part of the insurance industry about manure application, and farming more generally, was at least partly responsible for the dearth of coverage options. Erb explained the somewhat comical behavior of the insurance agents at the field day, and how an increased understanding ultimately benefited all involved:

> (S)ome of these underwriters understood a little bit about farming and they came out in jeans and a t-shirt. We had some that showed up in four inch heals (and were) trying to walk around manure equipment, which was very interesting. We had one that showed up in a gas mask suit because they didn't understand the industry and what was being hauled.
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> Once we educated those underwriters about what was going on, and the safety precautions that were being taken, and the actual risk, that dramatically opened the door. (W)e had, at one point, three or four companies doing pollution liability insurance, and about a dozen that were doing general business insurance with expanded coverage for those 'accidental accidental' releases for the industry.

Shortly after these new insurance options had been created for the industry, five severe manure-generated polluting incidents occurred within a two week period. Melting snow caused large quantities of the substance to enter surface water bodies, and as Erb put it "(W)e had dead fish floating everywhere." Exacerbated by warm March weather, the events made clear the disastrous results that can occur if manure is mishandled, and galvanized the call for some sort of standardized, comprehensive applicator training program. The Professional Nutrient Applicators' Certification Program, developed through the collaborative efforts of the UW Extension, PNAAW, and private insurance companies, would ultimately be developed.

The Certification Process

Not wanting to create the kind of undue burden typical of the approaches taken by Iowa, Missouri and others, Wisconsin set out to create a training program that would accomplish the goals of educating haulers about safety issues and industry best practices, without requiring lengthy classroom instruction or the payment of high fees. "We looked at the training and certification programs in other states…' explained Erb, 'and created a program in cooperation with the industry and Extension in Illinois and Michigan. We basically picked and chose what we thought was the best (technique), and then worked with the insurance industry to create some market-based incentives to get people to move forward."

The result of this effort was a three-tiered "train the trainer model." Rather than making attendance of Association-led courses by each applicator a certification requirement for each applicator, instructors work with business owners and safety supervisors in annual sessions. After attending a session, which is typically two and a half to three hours in length, these representatives are then responsible for providing training, and administering an examination, to every one of their company's employees whose responsibilities include hauling and applying manure. In this way, training can be provided to all involved at minimal cost, and within a more flexible timeframe.

Level 1 training focuses on emergency response functions. While not intended to replace traditional response agencies such as local fire departments and hazmat teams, applicators who receive this type of instruction leave with an understanding of what needs to happen in the immediate aftermath of an accident in order to minimize environmental impacts. Precautions as simple as turning off a valve and alerting authorities if an overflow is detected may not come naturally to individuals faced with an emergency situation and it is exactly these sort of common sense precautions about which Level 1 training is designed to raise awareness.

Exams are administered to verify participants' understanding of the materials covered, yet one of the main keys to the training program's effectiveness is the fact that success is not judged according to the percentage of correct answers provided. Dr. Erb explained the logic behind this approach and how it has ultimately proved quite beneficial.

> The interesting thing about this industry is that you have people with 20 years experience, but they only have a high school or lower education. They're incredibly proficient and they do an incredibly good job, but the last time they took a test was 25 years ago. So, for a lot of these folks, the idea of doing an exam…paralyzes them because they're afraid of the consequences of that.
>
> With the Level 1 (training)…there is no such thing as a failing grade on the exam, but if an individual gets something wrong on the exam, the safety supervisor has to explain to them what the correct answer was, and make sure that they understand (it). That has dramatically helped, because when you give an exam and you don't have that requirement, people shrug their shoulders (and say), 'Well, he got 23 out of 25 correct; that's good enough.' But if the questions they missed were critical from an

> environmental perspective, there's a problem that might go undetected until there's an accident. By requiring the safety supervisor…to go over the correct answers and be sure that everybody understands them, we can ensure that everybody is getting the correct information. That's one of the things that the insurance industry…really likes about us.

One of the unexpected benefits of trainers' refusal to overlook mistakes has been an enormous amount of thought-provoking debate among members of the application industry. Kevin Erb expressed how this scenario plays out.

> Most companies will train their folks as a group, and then go through all of the answers as a group. When they do that, you would be amazed at the level of discussion that occurs. That discussion, in a lot of cases, leads to rethinking company policy.
>
> (The haulers) have never had a chance before to sit down and discuss in detail, a lot of these issues, because there's not the opportunity. Here they're given the opportunity, in an environment where they're encouraged to ask questions. It's giving them the ability to have that discussion.

Although described as a "completely accidental" component of the training program, such discourses can sometimes reveal fundamental, safety-compromising misunderstandings common among drivers. "One of the questions early on in the test,' explained Erb to illustrate this fact, '(asks) 'If you're driving a tractor and tank down a road, is it safer to turn right into a field, or is it safer to turn left?'" Many test takers mistakenly believed that a left turn was the better choice; however, studies show that more accidents occur during right turns, largely due to the actions of other drivers, who may become impatient with a truck's slow progress and try to pass it mid-turn, causing an accident. While certainly a fundamental element of a truck drivers' skill set, this question sparked heated debate, but ultimately a large number of attendees left the session with a better, safer understanding of their trade, thanks to the Level 1 training. All told, of the

Association's members, between 70% and 80% have taken all of their employees through this stage of the program, an accomplishment which brings with it a 10% reduction in insurance premiums for the company as a whole.

After completing the first tier of training, companies may proceed to the second, which consists of six to eight hours of instruction over a two year period. Of this, a one hour biannual regulatory refresher, in which trainees are made aware of the latest legal requirements for their industry, is the only mandatory component. Participants may then opt to attend any of the training sessions offered by the Association or the three participating states (Wisconsin, Illinois and Michigan), to fulfill their commitment.

Not predicated on the completion of Level 2 training, the third level of the certification program focuses on driver and equipment safety. Designed through the active participation of the insurance industry, this component of the program represents a compromise that ultimately worked for the benefit of all involved. "We began looking at this with the insurance industry,' explained Erb, 'and saying 'What's it going to take to get some additional discounts (on premiums)?' and they initially came back and said, 'Achieve ISO 1401 status.'"

After careful consideration, this preexisting total quality management system was judged to be inappropriate for adoption by manure applicators, primarily because of the high costs associated with the mandatory ISO audits. As Erb explained, the companies involved ranged in size from "a couple of guys with a truck," to somewhat more sophisticated operations, having up to 20 vehicles. Given the relatively small size and limited resources available to individual hauling operations, therefore, the cost of the evaluation required to maintain ISO status, estimated at between $900 and $3,000 each year, would have been prohibitive for many.

Searching for an affordable alternative, the Association opted to use an Environmental Management System (EMS); an approach described by Erb as "a step below the ISO process." Similar to the more costly option, the EMS requires, among other things, a once daily inspection of vehicles to ensure that they are in safe operating condition and a well-documented plan detailing how drivers will react in the event of a release. "The firm is putting together…their roadmap for safety,' explained Erb, 'and that includes a spill response plan. They have all the employees review and sign off on it." While an annual audit is still required, savings are realized because inspections are performed by the insurer, rather than the International Standards Organization.

Pursuing Level 3 training through the creation an EMS is less expensive than maintaining ISO status, but it is still a costly and time-consuming undertaking. Dr. Erb made clear, however, that the economic benefits far outweigh any associated costs.

> Depending on how they do their EMS and the audit, and what policy and procedure the farmer is putting in place, the insurance companies will knock half off of the pollution liability insurance (premium), plus 10 to 40% off of every other kind of insurance for the business, except workman's comp and health. So, you have $10,000 to $20,000 a year in insurance premium savings by going through this EMS process.

To be sure, incentives exist for companies to go through this process, but manure applicators are not the only beneficiaries of the arrangement. Insurance companies have reported an 80% reduction in 'reportable incidents' among policyholders with a valid EMS in place. That's "…everything from a truck colliding with a car at an intersection, to a guy hitting his thumb with a hammer," Erb explained, adding how measures such as daily vehicle safety checks can dramatically raise awareness because "(b)y fixing the little problems, and making employees more aware of the little aspects of the business, (safety) dramatically improves. The insurance industry is very happy with it."

<u>Keys to Success</u>

The results produced by the PNACP are impressive, however, in order to use the program as a model to address truck-related oil spills, an understanding of the attitudinal and historical factors that contributed to its success is critical. One such factor has been a shift within the manure hauling community, away from adversarial relationships, towards more cooperative and constructive dealings. The change was clearly championed by a few key individuals within the industry, who worked with the UW Extension to create the Association and design the certification program; however, this willingness to work and learn together represents a marked departure from previous inter-industry relations. Dr. Erb recalled how much things have changed since the late 1990s.

> In 1999, if one of these manure applicators had seen one of their competitors drowning in a pile of manure next to the road, maybe they would have waved as they drove by, maybe not. It was very severe, very cutthroat competition. By the time we, in 2001-2002, began looking at this idea of putting together the training and certification program, we had gotten the industry to the point where they were willing to work together towards the greater good, which was a major step forward.
>
> We are now to the point where individual companies are sharing equipment, sharing resources, and here's the interesting thing: they're sharing jobs. If they get called in to a facility, and they don't feel that they can handle it given the weather conditions, or whatever, they'll call one of their former competitors, and say, 'Would you be interested in 1/3 or ½ of this job?' and they'll work together on it.

Haulers are not the only ones whose flexibility has been instrumental in the program's design and implementation. The Wisconsin Department of Natural Resources has also gone beyond what might be considered 'typical' regulatory boundaries to facilitate the process and create an atmosphere in which cooperation and innovation could flourish. An important example of this attitude on the part of regulators was their willingness to stage a 'mock' manure spill of some 500 gallons. The exercise, which was conducted under controlled conditions, was used to demonstrate proper response and containment activities to the 60 or so haulers who had assembled to witness it from throughout Wisconsin and neighboring states.

This first exercise[133], was a defining moment, according to Erb, because it demonstrated to the industry that the state was not simply waiting to penalize mistakes, and that if properly handled, a release could be kept from becoming a catastrophe. "The whole process of getting this industry to report spills and to respond properly to spills, (required) building trust within the industry first." Apparently the gesture was well received, as industry members "…are not afraid anymore to call the regulatory agents and report a spill.' said Mr. Erb, who continued, 'I don't think in 1999 or 2000, you had a single manure spill reported by the actual trucking firm or applicator… Now, it's almost constant. There's a source of pride for the applicator; if something happens, they call before a neighbor or somebody else does."

When asked what he considered to be the keys to his program's success, Erb named three. The first, was the existence of forward-thinking individuals within the hauling industry; the second, flexibility and creativity on the part of state regulators. The third and final factor was having an individual to act as the 'point man' of the program,

[133] Simulated spills are now created on a fairly regular basis for educational purposes.

working to coordinate the effort as a whole, and reach out to insurance companies to create the market-based incentives; clearly this was Erb himself.

Conclusion and Recommendations

While not directly applicable to the prevention of oil pollution, Wisconsin's Professional Nutrient Applicator's Certification Program is described here because it makes use of an approach which is proven to increase driver safety and reduce accidents, and offers externally-generated financial incentives for industry participation. These characteristics make it a promising model for the creation of a training program directed at the large truck industry as a whole. Through increased driver awareness, routine vehicle maintenance and the creation of basic spill and emergency response plans, the goal of reducing the number and severity of diesel spills originating from ruptured saddle tanks and flow lines might well be realized.

Some areas of the training program should be replicated unaltered. Among these are the use of a "train the trainer" approach, which provides companies with the flexibility to educate their drivers at the times and places that are most convenient, yet ensures that an equivalent curriculum is used by all participants. A refusal to accept incorrect answers on exams, opting instead to educate drivers as to the right responses, is critical in that it ensures that all trainees come away from the session with the knowledge needed to operate their trucks safely, and to respond to any emergencies that might arise. The use of 'in-class discussion,' while not a planned part of Wisconsin's curriculum, should be included in any training intended to reduce diesel spills, as it provides drivers with a unique forum to talk about their trade and gain new insights.

It is also important that sufficiently-appealing incentives are put in place to ensure companies' participation in the program. In the case of the PNACP, financial inducements came in the form of reduced insurance premiums. When asked whether he felt that an arrangement of this kind might be extended to the trucking industry more generally, Mr. Neves indicated that it was a distinct possibility, noting that the insurance industry was quite enthusiastic about the program due to the substantial reduction (an average of 80%) in the claimable incidents reported by graduates of Level 3 training.

Given the targeted nature of the PNACP, it comes as no surprise that not all of the Program's components can be used unaltered as part of an intervention of the type needed to reduce truck-generated diesel spills. Haulers are given the option of three separate levels of instruction, yet this sort of graduated approach might not benefit the proposed program. A single module could perhaps be designed to encompass the materials covered in Levels 1 and 2 of the Wisconsin model, as regulatory requirements and emergency response-related topics are both central to a driver's education, and are in some ways complimentary. Under such a scenario, the design and implementation of an EMS or, given that larger companies would likely be involved, the attainment of ISO status, would constitute the second level of the training program. Otherwise, a single module could be created to encompass all of these elements, thereby ensuring that no one receives only a portion of the training, as is possible with the PNACP.

Apart from an absence of manure, the largest difference between the PNACP and a program to reduce diesel spills, is the fact that the latter would likely enjoy much greater success if it were implemented at the national, or at least, at a multi-state level. By its very nature, trucking is an intra-state business, meaning that the wider the availability and awareness of such a training program, the more likely it would be to produce the desired results. Similar to the part played by the DNR, state regulators should be encouraged to provide instruction in emergency response procedures and relevant regulatory requirements. However, given the role of federal law, regulators from the Departments of Transportation and Commerce, as well as other agencies, should become similarly involved in the effort.

Clearly, buy-in among members of the trucking and insurance industries has been central to the success of Wisconsin's program, and should be of similar importance with regard to the proposed intervention. An existing or newly-formed association would likely represent industry interests and act as a liaison between regulators and participants. In the case of manure applicators, such an industry group did indeed come about; similarly, an organization of this kind formed in response to the Florida's creation of a Used Oil Recycling Program (see Chapter 5). Industry participation through such a venue should be welcomed, as it provides an otherwise dispersed collective of companies with a unified voice, and facilitates the dissemination of ideas and solicitation of input.

Finally, a neutral third party would be needed to fill a role similar to that occupied by the University of Wisconsin Extension. In light of the national scale of the intended intervention, any group proposed for this purpose would either need to have access to a network of facilities across the country, or be willing to travel in order to provide training at locales provided by the trucking companies themselves. Given these criteria, perhaps the responsibilities of creating and administering the curriculum, as well as working with insurance industry representatives, could best be carried out by a network of universities or nonprofits. Of course, if national coverage proves impossible to achieve at the outset, a more limited program could be implemented and later expanded, as capacity and demand increase. It may even be possible one day for this group to assume the auditing function currently carried out by the insurance companies and the ISO.

Funding is another concern to be dealt with in designing the training program suggested here. Initial support could be sought from any number of sources, including private foundations and federal grant moneys. Once established, however, fees charged to industry participants should be structured so as to cover ongoing operating expenses.

There are obvious obstacles to creating a training program of the kind proposed here, yet the potential benefits in terms of environmental protection and increased vehicular safety are immense. Table 6.1 presents the elements of the PNACP that could be replicated directly, as well as suggested amendments, designed to facilitate the creation of a program targeted at lowering the number and severity of oil spills from trucks' saddle tanks.

(Table 6.1)

Element	Replicate	Amend
Training Framework	• Utilize a 'train the trainer' model, in which supervisors receive instruction directly from the organizing institution, and conduct training seminars with drivers in whatever manner is preferred by the individual companies.	• Provide training in a more condensed format; either cover emergency response and regulatory topics in one module and the creation of an EMS or attainment of ISO status in another, or include all elements in a single training package.
Participants and Roles of Each	• Include the trucking industry, probably through their representatives in one or more association, in the program's design and implementation. • Encourage an external group, such as a network of universities or a non-profit, to orchestrate the design and implementation of the program. • Encourage state regulators to support training efforts by providing information about applicable regulations and demonstrating proper emergency response activities.	• Invite all sectors of the trucking industry to participate in the program's creation and implementation. • Facilitate provision of training to all interested companies, either by identifying an outside group with an existing nationwide presence, or by designing the curriculum to be administered at company-provided locations. • Encourage federal regulators to assume a role similar to that of the states.
Specific Training-Related Elements	• Cover topics related to regulations, emergency response, safe driving practices and vehicle maintenance. • Do not pre-specify passing and failing grades on training-related exams. Instead, ensure that all participants leave with an understanding of the correct answers to each question. • Provide opportunities for trainees to engage in 'in-class discussion.'	• Allow participating companies to select between creating an EMS and attaining ISO status.
Money Matters	• Charge fees to industry participants to cover the cost of training and programmatic operating expenses. • Work with insurance industry to create financial incentives for participation	• Seek initial support from a private foundation or in the form of a federal grant.

Case Study IV: SERTS: A Spills Data Management System

Introduction

Advances in technology, ranging from the incredible processing speeds and storage capacities of modern computers, to the vastly enhanced communication capabilities made possible by cellular telephones and the World Wide Web, have revolutionized modern life. These same tools hold great promise for enhancing the speed and accuracy with which regulators conduct their duties, and make possible the sharing of vast amounts of information with members of the general public, the regulated community and other government agencies and programs.

Levels of technological sophistication vary considerably across states. Many have yet to fully embrace computerization or to use it in a way that facilitates the collection, sharing and analysis of program-specific data; the large number of interviewees who were unable to provide an accurate count of oil pollution incidents within their states is evidence of this fact. Other states, however, have acted as early adopters of these technologies, as demonstrated by their sophisticated websites, which often contain detailed GIS interfaces and queriable incident databases.

Wisconsin is clearly at the technological forefront in the field of environmental protection. The state's Bureau of Remediation and Redevelopment (BRR)[134] is responsible for the regulation and remediation of all types of oil contamination, and operates using a set of interconnected digital systems, which together make possible the instantaneous sharing of information between individuals, programs, agencies and the

[134] The BRR is located within the Department of Natural Resources (DNR).

general public. This widespread use of technology provides benefits on a variety of levels, streamlining the regulatory process, maximizing personnel and budgetary resources, and allowing the DNR to fulfill its obligation to inform the general public about its actions.

All told, BRR uses three main platforms for data collection and sharing: the Bureau of Remediation and Redevelopment Tracking System (BRRTS), the Spills and Emergency Response Tracking System (SERTS) and the RR Sites Map. The former is the oldest. Originally launched in the early 1990s, the Department is now using version 12 of the BRRTS platform. The RR Sites Map has also been in use for some time, although efforts to improve the quality and type of data available through this GIS interface are constantly underway. Finally, launched during the summer of 2007, SERTS is the newest component of the Bureau's digital toolbox.

Used to track spills throughout the state, SERTS makes use of the latest in communications technology, seamlessly connecting the state's emergency hotline to responders in the field, supervisors at Departmental headquarters, and interested members of the general public. The benefits in terms of time and resource savings afforded by this most recent innovation have been dramatic, making it a perfect model for states interested in improving the accuracy of their spills data tracking, and maximizing response and enforcement assets. The preliminary portion of the case study is focused on describing BRR's automation history and practices, including their use of BRRTS and BRRTS on the Web, however, the majority is dedicated to describing SERTS' development, capabilities and results.

Automation: Background and Motivations for SERTS

Automation has been a priority within the DNR since the initial development of BRRTS which occurred between 1994 and 1995. BRRTS is a centralized database where all programs within the Bureau, and some in other Departmental divisions, jointly track actions on sites throughout the state. "About 130 users statewide use (BRRTS),…this is the main application that our RR staff uses to manage information about every activity," explained James Buell, the President of Keystone Consultants and resident computer programmer for the BRR since the beginning of its automation initiative. Buell went on to say that the system is also utilized by some of the regional EPA staff, providing a unique, direct link between state and federal regulators with regard to data collection and sharing.

Within BRRTS, data generated by the various programs is linked at the site level, using common identifiers, such as location or company name. A particular locale, for example, may have a leaking underground storage tank onsite and have experienced a one time, unrelated above ground release; however, rather than the information existing in separate 'regulatory silos,' both sources are tracked within BRRTS by the programs responsible for delineating and remediating each type of contamination. Action codes, of which BRRTS is equipped with hundreds, are the mechanism by which various programs track their progress at each site; making it possible to differentiate, for example, the ongoing status of the tank cleanup from the closed status of a one time release, both of which are located on the same property. The system contains far more than just codes, however, as it is designed to store a variety of site-specific information, ranging from laboratory results, to digital photos, and correspondences.

Data can be queried within the BRRTS system across a multitude of fields, allowing Departmental staff to quickly search and compile site-specific, or system wide information. After demonstrating the program's search capability by pulling records of all the oil spills reported within the South Central region of Wisconsin in the past year, Buell began naming the various ways that BRRTS users can access information.

> They can search on any of the criteria (contained in the database), in fact, you can search on people, their specific roles, (or) geodata. (Users) can run queries if they're familiar with SQR; they can search for multiple action codes. (For example), if I wanted to find a LUST[135] that contained an action, or didn't contain an action within a particular date range (I could).

A large portion of the database is also made available through an online interface called 'BRRTS on the Web.' The portal allows interested external parties to access a wealth of data, while keeping confidential or other sensitive materials out of the public purview. The basic search function[136] allows users to retrieve site data according to activity name and type, address, status and a variety of other common identifiers. The advanced search[137], in contrast, relies on more detailed criteria, such as substance, activity comments[138] and petroleum risk[139]. New actions entered into the internal version of BRRTS by BRR staff are uploaded to the web nightly, to ensure that the most current information is available on the internet.

An integral part of the effort to make Departmental data freely accessible is the RR Sites Map. This web-based GIS can be accessed by following links from the BRRTS

[135] Leaking Underground Storage Tank.
[136] Available at: http://botw.dnr.state.wi.us/botw/SetUpBasicSearchForm.do
[137] Available at: http://botw.dnr.state.wi.us/botw/SetUpAdvSearchForm.do
[138] Allows users to search within written comments for particular phrases.
[139] A score which measures the risk of a petroleum release from USTs and ASTs.

on the Web, or directly through a link on the program's website[140]. RR Sites Map provides users with access to a large amount of environmental quality data, including spatially-located information related to the investigation and remediation of contaminated soil and groundwater and the whereabouts of superfund sites. The site also serves as one of the main vehicles through which private parties interested in redeveloping properties can learn about any available incentives, as it provides location-specific information about liability exemptions, grants and many other tools designed to encourage the reuse of brownfields and petroleum brownfields.[141]

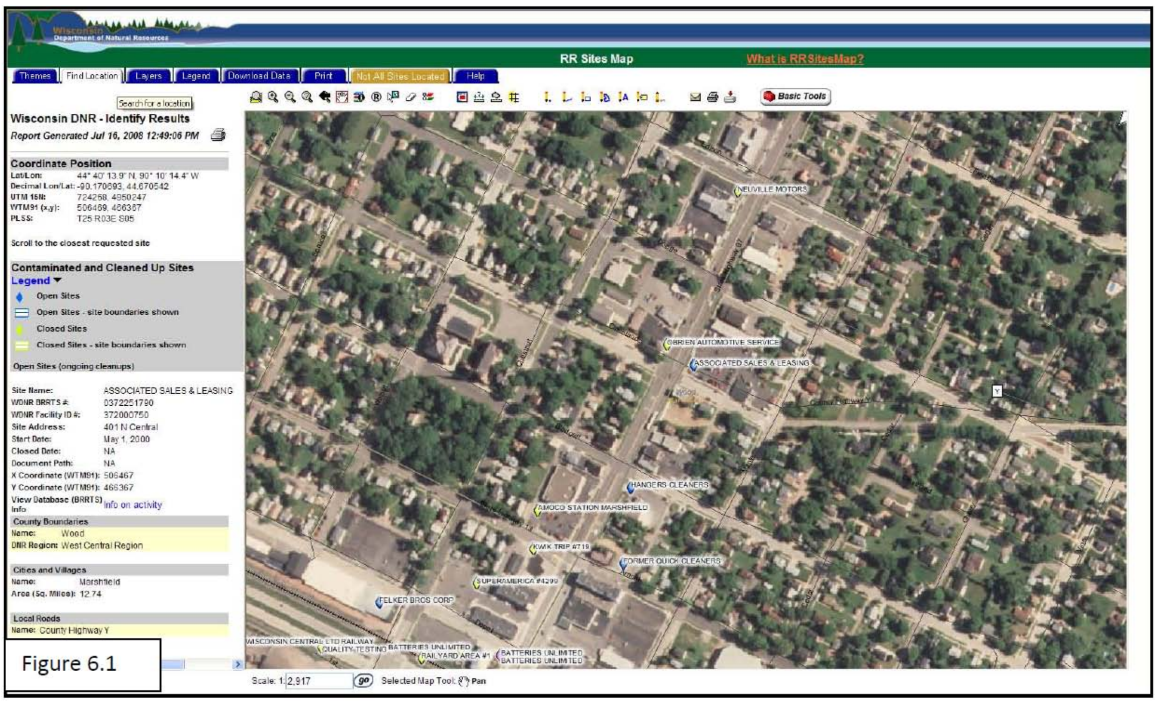


Figure 6.1

The GIS provides users with access to a variety of spatial data, in addition to contamination-related information. The Map includes a number of traditional data layers, such as municipal boundaries, roads, land use/land cover and digital orthophotography collected during a relatively recent (2005) flyover, all of which can be turned on and off

140 Available at: http://dnrmaps.wisconsin.gov/imf/imf.jsp?site=brrts2
141 See: "Welcome to RR Sites Map," available at: http://dnr.wi.gov/org/aw/rr/gis/index.htm.

by the viewer. A variety of search options are provided, and users have the ability to print or download any map generated (See Figure 6.1). Program-specific data, including enforcement actions and cleanup status, are continually updated, and digital documents, such as correspondences between program staff and private contractors or site-specific photos can be accessed from within BRRTS once a locale of interest has been identified on the map.

This combination of internal and web-accessible databases is central to the functioning of DNR's Remediation and Redevelopment program. They serve as a dynamic repository for all site-related data for use by program staff, and a portal for members of the public to access a wealth of information about ongoing or approved cleanups throughout the state. Hydrogeologist Supervisor Pat McCutcheon described a major portion of his duties as consisting of responding to emails and telephone calls originating from landowners, potential buyers and other parties interested in checking cleanup status or undertaking redevelopment projects. He explained how the system allows him to respond to questions from concerned external parties.

> It's instant knowledge… When people call me, the first thing I do is I open the internal version of BRRTS and I find their site. If it's a closed site, or it's listed on the registry, I can go to RR Sites Map and find more information. I have everything in front of me; the biggest benefit is right there.
>
> (I)t's enough information that I can tell them what's going on at a property that I've never talked to any of my staff about. When I'm done, I always say 'OK, now write down this link,' and I give them BRRTS on the Web and I give them RR Sites Map, so that they can go and do it themselves the next time.

The move towards automation within the BRR, which is now more than a decade in the making, has been the result of consistent decision making on the part of a single group of individuals, the Automation Management Team, which is tasked with the strategic deployment of regulatory resources for this purpose. When asked why this trend has been so pronounced, McCutcheon, a former Team leader, answered without hesitation, 'The Management Team has made automation one of our top priorities because that's how we're communicating with the public these days in terms of getting our data out there."

Mr. McCutcheon's comment underscores another characteristic, in addition to its early adoption of technology, which sets Wisconsin regulators apart from many of the others who participated in the initial survey: a desire to make virtually all environmentally-relevant information publicly accessible. When asked about data sharing of this kind, many respondents expressed considerable hesitation. Some identified the large number of historical incidents as prohibitive of such efforts. Wendell Wojner, a hydrogeologist by training and the DNR's LUST Coordinator, could certainly sympathize with this concern, having gone through the process of digitizing historical sites data for his program.

> We haven't always had the capability of computers, so most of our stuff was just (in the form of) written notes. We had to go through that in order to establish a baseline for the Leaking Underground Storage Tank Program, and during the early portions of the program, we had to track and log (everything). It was a huge effort, (and) we're still doing it to a certain extent on something called the 'Waste Registry Sites;' trying to determine whether those sites merit (inclusion) on a list, or (whether) we can just archive that information.

Other survey takers resisted the notion of more complete and timely data sharing, not so much because of the effort involved in compiling the information, but because of the potential repercussions of its dissemination. Liability concerns stemming from inaccuracies were sometimes mentioned, a notion backed by the observation that callers often provide inaccurate information when reporting a release, giving rise to the notion that by passing this on, state programs could enter dangerous legal territory. A concern shared by Wisconsin regulators, the BRR has chosen to handle this issue by withholding certain types of information from public release, specifically those which are deemed confidential or have not yet been verified.

The final reason why states indicated their unwillingness to share data about contaminated sites and enforcement actions was that such information might unduly discourage private investment in affected areas. "That's why we work so hard to make (the data) accurate,' McCutcheon noted, and went on to explain why his state is so committed to letting the public know everything about all locations where environmental contamination might exist.

> In Wisconsin, if I contaminated a property and you bought it from me, you're partially liable. (The state) will try and go after me, but you know what? If I'm dead, or I'm gone, or I'm indigent, you're responsible for that. So, the flipside of letting people know is not letting them know; having them buy a piece of property and find the contamination (after the fact).

He continued, discussing how this type of information sharing is integral to his state's redevelopment initiative; a regulatory focus which it supports by making a variety of incentives, including grants and liability exemptions, available to parties willing to remediate and reuse contaminated sites. Picking up the train of thought, Wojner went on to explain why failing to provide easy access to this type of information could actually hinder redevelopment efforts, rather than encourage them.

> In today's society, there is environmental awareness (on the part of) banks, lending institutions, (and) redevelopment corporations, so prior to a

> property purchase, there is, almost always, a Phase I report being done. Part of that Phase I (includes) going to review the records, and if they don't see something, if the records are hidden, they're going to go back and look at old phone directories and things like that, and they're going to see that the potential is there.
>
> (So), why not have the information right here and now and be up front about it? Get it out there in a database…and then take advantage of some of these (government-sponsored) redevelopment opportunities, and it will definitely help your redevelopment program down the line.

Committed to the use of its electronic platforms to provide information to the public, Wisconsin has recently taken the very unique step of discontinuing the use of deed restrictions as a means of communicating to future owners about any land use controls placed on a site. Instead, for any property where contamination (much of which is petroleum-based) remains insitu after a cleanup has been deemed complete, a closure letter is issued, which includes an affidavit communicating the procedures that must be followed to prevent exposure, effectively replacing deed restrictions. All such parcels are tracked within the DNR's electronic Soil and Groundwater Sites Registry, and potential buyers are made aware of the existence of any affidavits when they query a property through BRRTS on the Web or the RR Sites Mart.

Wisconsin's movement to this web-based mode for disseminating information about environmental controls has been quite a departure from the actions of other states, particularly given the increasing popularity of the "Uniform National Covenants Act." Described by Mark Giesfeldt, the Remediation and Redevelopment Bureau Director as, "very detailed and very cumbersome," the Act contains explicit instructions for the creation of land use controls, and is designed to serve as a model for nationwide adoption. In deciding whether to use the Act, Wisconsin asked its Brownfields Study

Group to examine the document. Their verdict: “Great concept but not implementable.” explained Giesfeldt, to whom the Group advised, “(Let’s) take the concept of having enforceable, publicly-accessible land use controls, and develop a system that meets the concept, but is much more streamlined,’ and that’s what we did.”

Not surprisingly, Wisconsin’s decision to eliminate traditional deed restrictions has been controversial. “The national organization has come twice to the state through the legislature to try to get the legislation overturned because we did not adopt (the Act) verbatim.” said the Bureau Director, describing the reaction of the developers of the Unified Environmental Covenants Act to Wisconsin’s version of their concept.[142] “We were criticized across the country for (switching to affidavits), and people still question it,’ said McCutcheon, ‘(but) I think it’s the right move.”

What was it about traditional deed restrictions that Wisconsin found so unworkable? Pat McCutcheon explained.

> We no longer have faith in titles. We do inspections of (sites) where we have said that you need caps to protect groundwater, or to protect from direct contact (with contamination)…we’re going back and inspecting anything five years or older, and in a lot of (instances), people never knew that there was a deed restriction; they never knew that they needed to maintain a cap.
>
> That’s the problem with title insurance; they aren’t going to catch an environmental liability on the property unless you buy the specific insurance that (covers this)… If there’s an environmental liability, some firms will tell you, others won’t, because it’s not within the purview of what you pay for… The average person doesn’t know that.

[142] The Unified Environmental Covenants Act was developed by the National Conference of Commissioners on Unified State Laws in 2003 and has since been adopted by 16 states. For more information, see: http://www.environmentalcovenants.org/ueca/DesktopDefault.aspx?tabindex=1&tabid=92.

Recognizing the uniqueness of the decision to use the internet as the forum for communicating about this important issue, the DNR has engaged in considerable outreach efforts to raise awareness among members of the general public about this issue, and encourage them to visit the Department's website before purchasing property. It is still too early to determine the impacts of the policy, which came into effect in 2006, but the general sentiment among most members of the DNR staff appears to be that the change was for the best. Even within the program, however, a few individuals are still skeptical of the policy, such as Joe Renville, an attorney with Remediation and Redevelopment, who commented, "We used to do deed restrictions, which I think we still should be doing… If the title abstract companies weren't finding these, they weren't doing their jobs properly."

Clearly, Wisconsin has a long history of relying on technological supports to facilitate its goal of environmental protection. The BRRTS database forms a fundamental link across programs within the DNR, and to the general public through BRRTS on the Web and the RR sites map. Through the continual evolution of these systems, BRR is able to accommodate new initiatives, such as the use of affidavits to signal contamination-related land use restrictions. The most recent addition to its digital toolbox, SERTS, however, represents what might be deemed 'the next generation' in computerized regulatory systems. Combining remote communications with sophisticated data sharing capabilities, SERTS allows Wisconsin regulators to address a need that is common across all states: the need to disseminate, track, amend and analyze spill data quickly and efficiently.

Far from a static enterprise, the use of technology to support regulatory processes requires constant amendments and system redesigns as new requirements are identified and capabilities advance. ‘When we started building our tracking system, (for example), we started very basic.’ said Pat McCutcheon, explaining how the Automation Management Team had guided the development of the DNR’s many digital systems, ‘Everyone said ‘We don’t need to build a Cadillac,’ but we turned that little Corvair into a Cadillac over the years because the needs changed.” He continued, frankly describing how priorities are identified, “There is no magic, it’s whatever bubbles up to the top; whatever people convince us is needed. We really don’t have any predisposed priorities. SERTS is a good example; this is really Rox’s baby.”

The Need for SERTS

The ‘Rox’ McCutcheon mentioned is Roxanne Chronert, State Spills Coordinator and the driving force behind the development of SERTS. “My two main motivators’ said Chronert, describing why she had pushed for the creation of the system, ‘…(were the need for) a more efficient electronic system; one that could be integrated by all the different parties that utilize it, (and) public information, essentially their right to know (about environmental contamination)”

Inefficiencies in the old system warranted the Bureau’s investment in the new automated approach; but before delving into the specifics of these flaws, a bit of background about the regulation of spills in Wisconsin is warranted. According to state law[143], “all discharges of hazardous substances, that adversely impact, or threaten to adversely impact, public health, welfare or the environment must be immediately

[143] The “Spills Law,” 292.11 Wisconsin Statutes.

reported to the Wisconsin DNR (Wisconsin Spill Reporting Requirements: Condensed Version, 2007)." As in many states, included under the heading of "hazardous substances" is virtually every sort of material, because as multiple survey participants noted, anything, even milk can be hazardous under the right conditions. De minimis exemptions to the reporting requirement have not been specified, except under very special circumstances, meaning that every release, whether it is five ounces or 5,000 gallons, whether it originates from an overturned tanker truck or a rusty UST, is treated as a 'spill' in Wisconsin[144].

The DNR maintains a hotline where spills can be reported, setting in motion the state's response mechanism. "During normal business hours, those spills are handled by the call center…' explained Steve Sisbach, Section Chief of Environmental Enforcement and Emergency Management, '(at other times) we have a person on call that is the Duty Officer, who is a DNR employee and they carry a cell phone and a pager with them. The Duty Officer's responsibility is, in essence, to mobilize the DNR staff."

Whether during normal business hours or not, the staff dedicated to spill regulation consists of five regional spills coordinators located throughout Wisconsin, as well as a state spills coordinator, all of whom specialize in technical response issues before, during and after a release, and are tasked with case oversight responsibilities. Response activities, in contrast, are primarily handled by one or more of the over 185 Conservation Wardens and Duty Officers statewide, who work together with local police and fire departments to contain and mitigate the effects of potentially harmful releases.

[144] If cleanup cannot be achieved within a short period of time, cases are referred to the appropriate program (i.e. LUST, etc.) for continued actions.

These efforts, in turn, are overseen by the state emergency response coordinator (WDNR, 2007).

Speaking about how Wisconsin's approach to spill response and management relies upon the combined efforts of many differently-positioned individuals, Mr. Sisbach explained that "DNR is a very unique agency in the country in that we're still a combined natural resource and environmental protection agency… The advantage of that is that we have all of the disciplines together." This arrangement allows for the deployment of resources where they are most needed, he explained, referring, for example, to the increasing role in spill response played by the state's Conservation Wardens, who were formerly focused primarily on issues related to recreation. "They've always had some role in environmental enforcement, and they're one of our first responders to hazardous substance spills…' He continued, describing why this group is so well suited to emergency response, 'They're the most ground-level DNR staff; they're tied in with local police and fire departments."

Wisconsin's approach to spill response and regulation necessarily requires the combined efforts of multiple individuals in a variety of locations. Information about a release is typically relayed from the call center in Madison, to local wardens and the relevant regional spills coordinator. In some instances this chain of notification is interrupted when a caller contacts someone other than a call center operator, perhaps a Warden, policeman or even a spill coordinator directly. In other cases, particularly when releases occur at odd hours, contact cannot be established with one individual by the call center operator, and a second or even third are notified, leading to a cascade of responses as each becomes aware of the situation and act, sometimes completely independently, on that information. In the past, this dynamic frequently led to considerable duplication of efforts and mismanagement of regulatory resources. Ms. Chronert, described the type of confusion that could ensue under the old system.

> Before we had SERTS, the hot line would take a call, and maybe the Sheriff's Department or 911 would call a Warden, and Spills Coordinators would get a call, so we would have three of four people starting to respond to (the spill)… People would show up in the field and there would be two or three other DNR authorities already there.

Explaining how the old notification system functioned, James Buell made clear why it resulted in the generation of multiple spill reports for virtually every incident, the contents of which were almost impossible to reconcile into a single, comprehensive account.

> Previously, the dissemination of information was done via a Word document; a template that was filled out and emailed to the Wardens. The problem with that is they're often already in the field. Multiple versions of that same incident report would get started (and) there was no way to merge them. There was no way to track it very well.
>
> A very big backlog of finalized reports started to build up, because they then had to get entered into our main tracking system (BRRTS). There was no electronic way to do that, so it had to all be re-keyed. It was a very inefficient system.

More than just a source of frustration, the mass of paperwork that typically resulted from a spill, hindered regulators' ability to carry out their duties effectively. Spill coordinators found it difficult to monitor the progress of their cases towards closure, as information was dispersed across files and locales. Another consequence of the historical approach was that any report that had not been entered into BRRTS, of which there were many, could not be uploaded to the web and made accessible to the public; an undesirable condition for a state in which disclosure is such a high priority.

Given the problems with the original approach, Ms. Chronert felt strongly that among the desired qualities of the new system should be a reduction in data redundancies and an enhanced ability to track case-specific data from the time the initial report is received, until the file is closed. Regarding the latter concern, her comments echoed misgivings voiced by some other states when asked about making their data publicly-accessible, yet rather than allowing reality to undermine the process of data sharing, she recognized the need to build certain safeguards into SERTS to protect the DNR from potential legal embroilments.

> When the initial spill call comes in, a lot of times the information is inaccurate, so I wanted a way that we could track how our information changed over time…
>
> Since some of our calls come into the hotline as confidential, there is some reason to maintain that initial information; (for example), if we get into an enforcement case in front of a judge, we need to be able to say 'Yes, I completed the spill form with that information.'

The SERTS System: Design and Capabilities

Having gotten the blessing of the Management Team, Roxanne Chronert and the other spills coordinators, worked together with James Buell, to design a system that would address all of the shortcomings of the previous approach. The result of this effort was the creation of a new data management system designed specifically to address the needs associated with spill reporting and regulation activities. While only in use since 2007, SERTS combines remote, real time communication capabilities with the proven framework utilized by BRRTS, to allow for the more efficient and effective use of staff and funding resources, and to enhance the dissemination of spill-related information to external parties.

One of the major concerns arising from the old system was the inefficient method used to track spills through the various stages from reporting, to response and ultimately, to closure[145]. SERTS replaces the use of Word documents for this purpose, with a set of linked, digitized forms. The first is filled out by the call center worker who takes the initial report and contains fields in which to enter a variety of basic information about the release, such as the location, cause and the time the event occurred. Some data are keyed in directly, while others, such as the type of polluting substance, are entered via dropdown menus to improve efficiency and accuracy. The system uses a simple algorithm to locate releases within the various regions of the state according to the address information, and once the report is completed, it is emailed to all of the appropriate responders, whose addresses are populated automatically by the system. Additional groups or individuals may be notified about a release at the dispatcher's discretion, as they are given the ability to specifying other recipients as appropriate.

Having worked a number of years with the old Word-based system, Adrian Sullivan, the call center Manager and a State Duty Officer, appreciates many of the features of the SERTS form, as they increase the speed and accuracy with which reports can be relayed to responders. "If you miss something (in filling out the form), that's what's really nice about this new system. It will say 'You forgot to fill in this (field)' and won't send it out; but you can still override it, (if you don't have the information)." Continuing to describe the features she finds most helpful, Sullivan said, "We try to get as much information as we can (on a spill), and there's lots of space on this form, which I love." She did admit, however, to continuing to rely on a paper, rather than electronic

[145] A diagram detailing the movements of a case record from the time of the initial report through case closure is included as Figure 6.2. This illustration was included as part of a PowerPoint presentation made by Mr. Buell to the Automation Management Team when SERTS was first proposed.

version of the form, while on the phone with a caller; a habit which many dispatchers still practice because they find it more comfortable than keying in information directly, but which supervisors worry may lead to a backlog similar to that which existed under the old system.

Once a report is issued by the call center, an electronic copy is received simultaneously by the relevant Wardens, spills coordinators, and when needed, a Duty Officer. These individuals all carry laptops equipped with broadband wireless cards[146], giving them the autonomy to travel throughout the state, many areas of which are somewhat remote, while remaining in constant contact with the call center and with each other. Notification might also be set to Wisconsin Emergency Response at this time, which may in turn alert the National Response Center, depending upon the circumstances of the release.

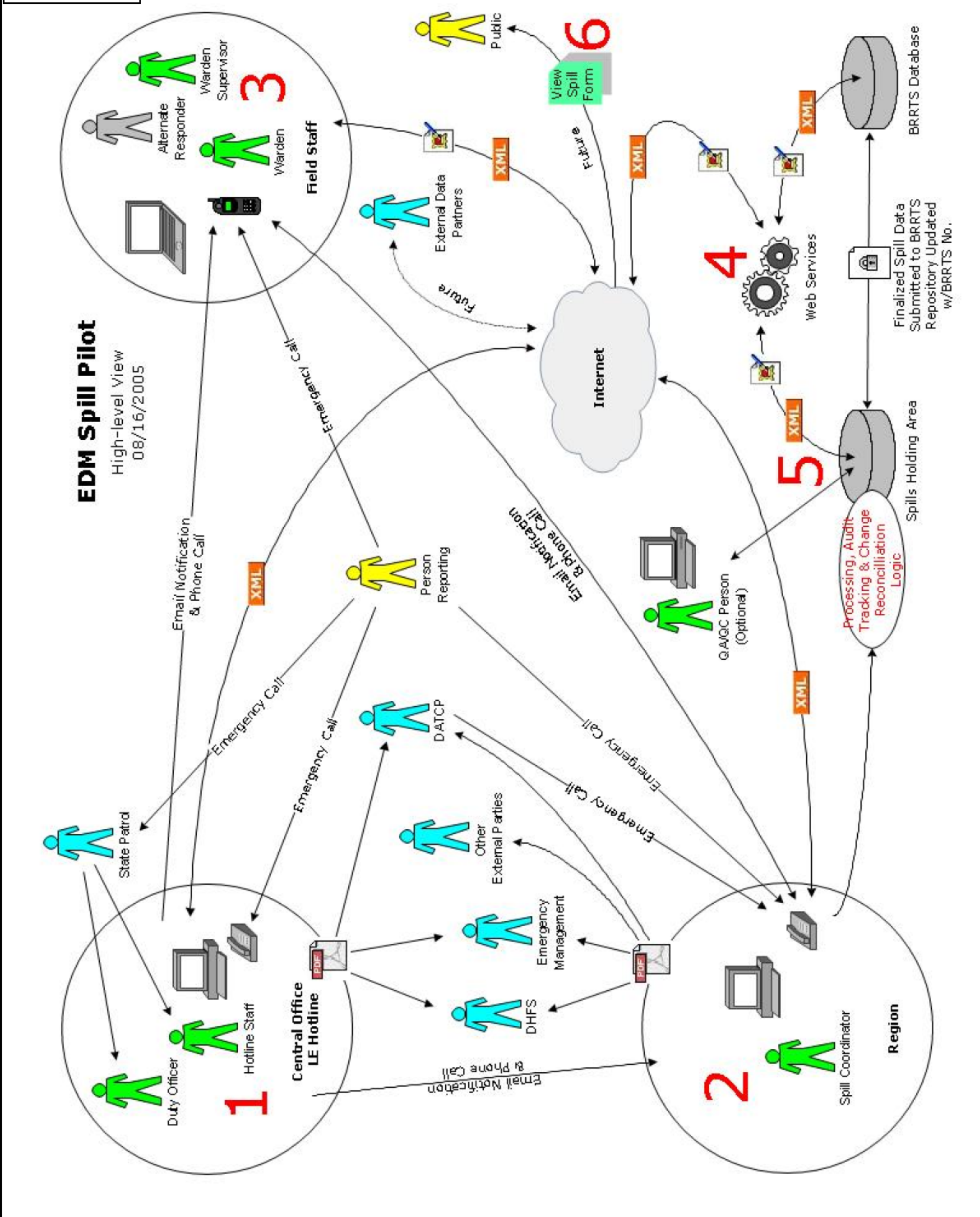
Upon receipt of a spill notification, and in instances where a caller circumvents the hotline and contacts field personnel directly, these individuals initiate a new, more detailed electronic account of the incident. This document remains linked to the original call center-generated report (when one exists) through a common numeric identifier that is assigned to each event at the time the initial report is filed. Although the original record remains intact, relevant data are automatically populated into the second record, saving responders time and ensuring consistency. Similar to the abbreviated web form, as soon as data are entered into this more comprehensive document, they become available through SERTS to all system users, any one of whom can in turn, add or alter its contents as new or more accurate information about the event is gained. Pulling a file from the repository at random, Mr. Buell described its evolution.

[146] Also called “air cards.”

This spill that the hotline just entered through the web form, now shows up in the Southeast Spill Coordinator's repository, or the Warden's or whomever in that region is going to deal with that spill. We got the notification through the web form at 2:10, it then was uploaded to the system to the spill tracking application.

The (responder) can then modify it directly. Let's say they call the person who reported the incident;...immediately they can update information related to that spill that the hotline supplied. (Here) the quantity spilled is unlisted and the municipality is listed as 'unknown,'…perhaps they found that out, and they can modify anything about the report at that time.

Figure 6.2


EDM Spill Pilot
High-level View
08/16/2005
1
Duty Officer
Hotline Staff
Central Office
LE Hotline
2
Spill Coordinator
Region
3
Alternate Responder
Warden
Warden Supervisor
Field Staff
4
Web Services
5
Spills Holding Area
Processing, Audit Tracking & Change Reconcilliation Logic
6
View Spill Form
Public
Future
BRRTS Database
Finalized Spill Data Submitted to BRRTS Repository Updated w/BRRTS No.
Internet
External Data Partners
Person Reporting
QA/QC Person (Optional)
State Patrol
DATCP
Other External Parties
Emergency Management
DHFS
Email Notification & Phone Call
Emergency Call
XML
PDF

During the design phase of SERTS, the people who would ultimately be using the system were consulted often to determine which features they would like it to provide. Roxanne Chronert and others were very clear about the need to address the redundancies and other inefficiencies of the old approach. Wardens and other first responders, however, were more concerned about the logistics of using the new system in the field. Ultimately, all were issued laptops with air cards, giving them the ability to access the internet, and therefore, the database, from anywhere.

Despite the convenience afforded by remote access, much remained to resolved regarding the structuring of the user interface. “One of the key things we heard from some of the law enforcement staff was that, number one, it had to be easy, because some of them are old and they don’t like computers, and two, it had to be easy in the sense that they could just point and click.” said Chronert. In response to these concerns, SERTS was designed to require minimal typing, providing users with a series of drop-down menus through which to enter much of the needed information.

Once begun, all active case files are stored within the “Open Spills Repository” portion of the database, a common area accessible by all DNR personnel, but not currently available to the public at large. Through this system of automatic data sharing, every Warden, spill coordinator and any other party that could potentially be involved in the response or regulatory efforts, is granted access to all of the information related to a case through a single shared file. This approach virtually eliminates the possibility of duplicate efforts and multiple reports.

What’s more, the use of the unique, case-specific identifier is coupled with SERTS’ purposefully repetitive data tracking mechanisms, to ensure that multiple reports are not generated for the same incident. This approach provides regulators with the necessary 'paper trail,' albeit in electronic format, to monitor all changes made to spill-specific information. Mr. Buell explained how changes to the electronic record are tracked to prevent data loss and maintain accountability for actions on the case.

> They were very interested in audit tracking, especially in the case where there could be a liability issue should the hot line have entered the information wrong, or someone reported it to them wrong, and it was a serious spill.
>
> They wanted a tracking mechanism, so there are a couple of things. There's an archive log of what goes on behind the scenes; every change is archived, so you could go back…and see previous versions (of the case files). …(E)very time a change is made, it makes a separate record.
>
> (A)lso, and this looks ugly because it's in XML format so it can be converted into any other format, every main section (of the form) tracks the user, when it was last updated (and) when it was created. So, let's say that the location changes, you can see who changed it, when it was changed, and then you can also see the previous version.

When a case is ready to be closed, the Spills Coordinator goes into the spills repository and pulls the relevant records (typically, the one generated by the hotline and the more detailed account kept by responders), and either deletes any superfluous documents, or combines them to create a single file. If a merge is performed, SERTS highlights any discrepancies between the records being combined, prompting the user to choose which data to display within the fields of the new form. Once a case has been closed, the record is automatically uploaded to BRRTS and made available to the public through the interconnected web-based applications.

In addition to creating a streamlined mechanism for handling spill reports, SERTS is also designed to assist with larger departmental management tasks. The open spills repository, for example, acts as a centralized location where the regional supervisors and the State Spills Coordinator can monitor the caseloads, and rates of case closure, of the various regions throughout Wisconsin. This function, combined with the ability to quickly search for specific indicators within the BRRTS database, make performance monitoring for the purpose of legislative reporting a simple task. Using its newly-created data management capabilities, the spills program has recently released an annual report containing quite detailed information about the types and frequencies of polluting events within Wisconsin, two charts from which are presented here as Figures 6.2 and 6.3.

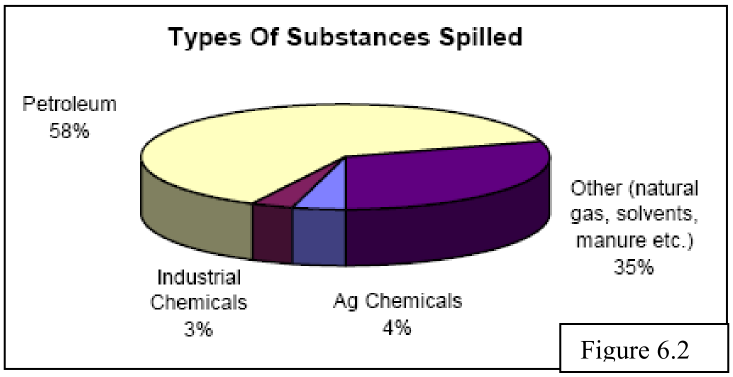


Figure 6.2

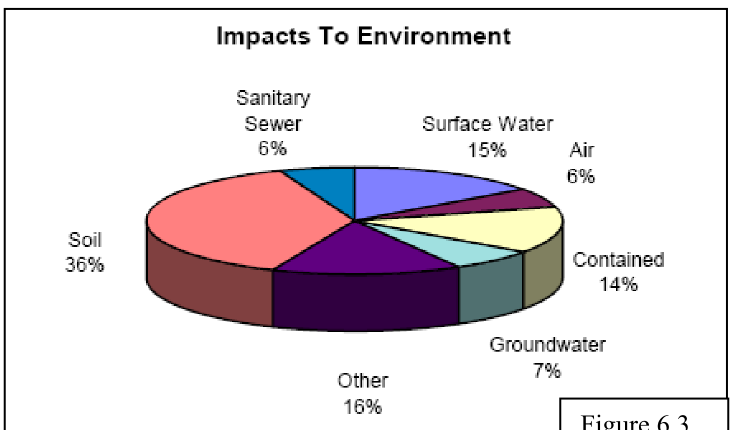


Figure 6.3

SERTS also comes complete with what Mr. Buell has dubbed a "pestering system," that acts to monitor the status of all open cases, and ensure that progress is made within acceptable time periods[147]. If, for example, no new information is entered about a particular spill for an unacceptably long period, the Warden in charge of the case will receive an automatically-generated email reminder from the system. If this step does not produce the desired response, that individual's supervisor will receive a similar email, notifying them of the deficiency. This process moves along the chain of command until the issue is resolved,

[147] Typically, actions are required to be taken within a 30 or 60 day time period.

and prevents cases from 'languishing on someone's desk' for long periods of time. Noting that "…in some regions this isn't working very well, because there are pretty large backlogs (of open spills).' Mr. Buell joked, 'Maybe we'll have to try something more punitive, like calls to their home phones."

Users' and Designers' Evaluations of SERTS

Within the DNR, the reaction to SERTS has been overwhelmingly positive since its deployment a year ago; however, as with any new data management system, certain elements require revisions, while others have yet to be fully implemented. On the subject of public disclosure, for example, Ms. Chronert identified an as yet unfinished component of SERTS, which will be completed with the release of a set of forthcoming updates. "(In the past), we were only entering spills data into that database when a case was closed, so I didn't feel like we were doing the public any justice by not allowing them to see the open, on-going cases that we were working on."

Explaining the many steps taken to manage an open case under the old, Word document-based approach, Chronert continued, "Sometimes these (cases) could be out there for months still open on their desks, and no one except that spill coordinator knew that they were out there." Expressing frustration that even using SERTS "…the public still cannot see open spills,' the Regional Spills Coordinator explained that this omission will be addressed when BRRTS on the web is redeployed in the coming months, and 'members of the public will be able to see open spills that are located in the spills repository."

Ms. Chronert also expressed some concern over certain elements of SERTS' design. The requirement that specific spill quantities be entered, rather than allowing users to select volume ranges from drop down menus, has been an issue that she and the developer revisited several times. The topic was recently re-examined when another program within the DNR approached BRR to explore the possibility of adopting SERTS, or a SERTS-like system to address their own data management needs. She also questions whether the system as a whole would be different, and perhaps better, if Wisconsin had just begun the process of automation, rather than continually building off a platform initiated in the 1990s. "We started to develop this system so long ago, that in some ways I wonder whether technology would have been different today."

The doubt as to whether a vastly improved system would be possible if Wisconsin were starting its automation initiative today is made more salient by the fact that, even during the relatively brief period needed to develop SERTS, technological advances rendered a fairly significant portion of it superfluous. Although all field personnel currently have remote access to the database through wireless internet connections, this was not always the case. Because it was anticipated that first responders would need to enter data while in the field and unable to access the larger system, a considerable amount of time and resources were dedicated to creating autonomous applications for use in individual computers, which would automatically upload information to the shared database upon reconnecting to the network. "We spent so much time designing SERTS so that it could be a stand alone application on a responder's computer,' lamented Ms. Chronert, 'and creating a local repository, so that when you do a spill form on your computer it goes onto the hard drive (instead of uploading to the main database.) That's not even needed in today's world, because all of our responders have gone to an air card." The system's designer, James Buell, expressed similar sentiments, remarking, "Even a year ago, it was rare; there were only a couple of Warden Supervisors, that I was aware of, that had the broadband wireless cards." He continued, describing how this technological shift affected the system's design, "It changed, even within a year, the way we had designed the system to be able to work offline. We spent a lot of time (on that), and we probably would have taken a different route if we had known that they would have that capability. Things evolve."

The continually-changing nature of technology means that some degree of obsolescence is inevitable; thankfully however, much of this evolution is planned by Buell and the BRR staff. As Pat McCutcheon explained, there has been some discussion of creating a centralized forum for data exchange between DNR Divisions.

> There was an effort…to create a divisional hub. It would be a facility hub within the Air and Waste Division, so it would be Air Management, Waste and Materials Management, and the Remediation Program. Those three programs would have one set of common data tables that would be used. So when (there were) common facilities,…and you went in and changed something, like a CEO's name or a company's mailing address, you changed it once (because) the datasets are all linked.
>
> (T)here's a switchboard aspect of it, where in fact, the public can go in and change certain aspects of their information. It would also allow for the submittal of …laboratory information electronically, and it would immediately be posted to that site for that facility.

According to McCutcheon, Air Management has recently begun using a system that relies on tables of the kind needed to create the hub; however, it was "designed in a vacuum," and cannot be easily altered for wider use. Unfortunately, given the resources already dedicated to developing Air Management's inadaptable system, he described the notion of a creating a divisional hub as “lying on the ground, wounded,” indicating that, at least for the moment, the future of this type of automatic data sharing is uncertain.

Despite the unclear future of the project as a whole, some of the functions of the proposed hub will likely be implemented in the near future. The capacity to upload laboratory results directly to the SERTS tracking system is among the additions that both Chronert and Buell have planned, eventually intending to move to a completely paperless form of case management. An initial version of this function is already in use for historic releases, as the State Spills Coordinator explained. “Within the last month, we’ve deployed a system where you can email your lab results…to us in a generic email account. There’s one in each of the regions and there are a number of people that check it daily. So, we’re moving (towards fully digitized reporting).”

Clearly, SERTS, like all digital applications, is still evolving to meet the needs of the BRR staff. However, by all accounts, the system, as it exists today, is an invaluable tool for spills regulators, having addressed all of the major concerns which prompted its creation. Among the most commonly cited benefits of SERTS relate to the ease with which data can be accessed, the major reduction in the types of redundancies experienced under the old system, and the considerable increases in staff and overall programmatic efficiency that have come about since its deployment. Easy access to spills data has also proven invaluable in responding to public inquiries and for program performance monitoring. When asked what she considers to be the most significant outcomes associated with SERTS’ implementation, Ms. Chronert answered:

> When a spill closes, we don’t have to send it down to a program assistant to key it in; as soon as a spill closes it’s in BRRTS. (Also), anyone at any point can follow up on a spill. If somebody’s working on an incident, and someone else gets a call on it, they can quickly identify that somebody’s

> already working on it (so) we're not entering duplicate spills. That's not to say that a second Warden couldn't be working on it from somewhere else, but because they all have air cards…everyone can see what everybody else is doing. (T)wo people can be working on the same incident, and be documenting their actions at the same time. That is really huge.
>
> You can answer general public questions, especially when you get multiple complaints on the same incident. It really helps us to not stumble over each other…
>
> The information (tracked in SERTS) is so useful, especially if the legislature calls and wants to know, 'How much money have we spent on abandoned containers?, or 'How much money have we spent on Spills this month, or this fiscal year?' It's all tied in now…and everything is just so accessible by anyone who cares.

"I think everybody's proud of (SERTS);' said Mr. Buell, describing the overall reaction since the system's release, 'a big investment's been made… We have a good infrastructure that allows us to push the envelope a little bit." Janet Sausen, a programmer who recently assumed the role of Automation Team Leader for the BRR, seconded this idea, underscoring the importance of the Bureau's infrastructural investment in making SERTS possible. "The infrastructure is really key, no matter what program you're in.' she said, '(The BRR) has the infrastructure; the servers, staff and software; that can support serving this stuff over the web. You really have to have all that." She continued, "This program is so IT-desirable. They really want it, they spend money on it, they put resources behind it. They're very very IT-focused. They have high expectations and that's good." "We always try to improve the system, which is, I think, why it's as good as it is.," added Buell.

That 'IT-desirability' comes at a price; however, and is a decision which is reevaluated during every biannual budget meeting . Using funds from the general operating budget, BRR contracts for 80% of Mr. Buell's time, at a salary of $75 per hour, and provides him with all the equipment and space needed to run BRRTS and SERTS. Ms. Sausen represents a much more recent investment on the Bureau's part; hired during the Summer of 2008, she is the first fulltime staff person dedicated entirely to the creation and maintenance of BRRTS on the Web and other GIS-related functions. "These systems have been expensive to get to where they are today, but in the scheme of things, it has been money well spent.' said McCutcheon when asked about the costs of automation, 'Had we not had these systems in place our staff time and associated costs in responding to requests and inquiries would have been much higher than what it is right now."

Having fought for SERTS' creation against competing demands for regulatory resources and skeptics of the automation process, Roxanne Chronert is also quite satisfied with the outcome. She feels strongly that the future lies, not in paper documents, which she hopes to eliminate completely from her program in the near future, but in digital record keeping. "I think that there's a younger generation coming up,' she said, 'that really realizes where automation can take us and (how it can) make our jobs easier. That is the future."

Conclusion

Wisconsin's BRR is uniquely committed to using the latest technological advances to facilitate the collection and treatment of case-specific data, and to the sharing of this information with members of the general public and other interested parties. These initiatives have resulted, over the course of more than a decade, in the development of two data tracking systems and two web-based portals for querying site- and spill-specific data.

Despite the state's long history of automation, Wisconsin regulators had used a system based on out-dated technologies and inconsistent practices for the purpose of spill management. The results of this approach were unruly case records, lengthy timelines to case closure and wasted regulatory resources. Recognizing the need to address these inefficiencies, the Bureau of Remediation and Redevelopment's Automation Management Team made the creation of automated spill tracking a priority. Using the state's existing data management system and considerable IT infrastructure as a foundation, SERTS was designed.

In the year since its initial deployment, SERTS has provided myriad benefits for the spills program. Users report that the new system has facilitated faster case closures, easier data monitoring and performance tracking, and the ability to provide more accurate and timely data to the public at large. Building on these accomplishments, planned additions include new and more sophisticated capabilities that are intended to increase the system's efficiency still more.

SERTS can serve as a model, even for less IT-savvy states looking to streamline the spill reporting and response processes. Although designed to work in conjunction with the existing BRRTS platform, there is no reason that a system of this kind could not be developed and utilized as a stand alone application. Adopters could also make an independent determination as to whether and how data should be made accessible to the public through the World Wide Web. Wisconsin's commitment to automation is a longstanding one, and the infrastructure they have in place to support their efforts is considerable. Even the least technologically-savvy state could benefit from their expertise and investments, however, by creating an approach that acts to replicate the capabilities provided by SERTS.

The essential components of the SERTS system are those that facilitate the seamless, real-time transfer of data between users, make possible the tracking of changes to active case files, and allow for the querying and compilation of case data for performance monitoring purposes and to answer external inquiries. To replicate these functions, therefore, investments must be made in hardware (servers, laptops with air cards, etc.) and in programming, and personnel must be trained in their use.

A system of this kind is not a one-time endeavor, as new needs and opportunities for expansion or revision are constantly uncovered. In speaking with the BRR staff, it became clear that one of the keys to their automation success has been their retention of the same programmer since the initiative began. Pat McCutcheon's declaration that "Jim Buell is a God," while clearly an exaggeration, hints at the benefits afforded to the program by having at its disposal, an individual who is intimately familiar with the design and functioning of their multiple databases and interfaces, and able to fix any problems, and address any newly-identified needs as they arise. It is wise, therefore, to view an initiative of this kind as a long term commitment, rather than a one time endeavor.

Part of that commitment involves recognizing that there is no 'finished product' when it comes to data management systems. In Wisconsin's case, possible integration across programs, electronic submissions of externally-generated case documents, and eventually, a completely paperless reporting system, have been identified as future programmatic goals. The creation of standardized digital reporting forms was also of interest to the Coordinator of Florida's Used Oil Recycling Program, as it would reduce or even eliminate inaccuracies in data submissions and provide for a level of uniformity that does not currently exist. Although not identified by any study participants, data collection of this sort could also be used for tracking purposes; for instance, to monitor which cleanup methodology produces the fastest results, or which contractors tend to accomplish their tasks under- or over-budget.

The continued availability of funding for a program of this kind is clearly a concern, and although the BRR has repeatedly stood by its decision to dedicate a portion of its operating budget to the undertaking, this kind of discretionary spending stream could be subject to cuts during tight budgetary times. Drawing on the findings discussed in Chapter 3, it is recommended that any state looking to initiate an automation program such as BRRTS and/or SERTS identify or create a dedicated funding source to support their effort. Any number of possible taxes or fees could be leveled for this purpose; however, the most logical and defensible mechanisms are likely to be those directly associated with the use and/or function of the automated systems. A charge leveled in conjunction with title transfers, or paid annually by all private companies involved in environmental remediation, perhaps in conjunction with their professional licensing, could be used to fund these efforts.

As with previous case studies, Table 6.2 provides an overview of programmatic practices and design elements to adopt and amend.

(Table 6.2)

Element	Replicate	Amend
Data Management	• Maintain record of all changes made to case files, including indication of when and by whom all alterations were made. • Allow multiple users to access a case file simultaneously. • Allow for the merging or deletion of records in rare instances where more than one account exists of actions on a single case. • Create a repository where all open cases can be viewed and queried simultaneously. • Allow users to search database using multiple query functions. • Provide for selective public access to site and spill data.	• Allow for direct electronic submittal of lab and contractor reports using standardized forms. • Track progress/effectiveness of various cleanup technologies and/or individual contracting firms.
Infrastructure	• Provide all field personnel with remote access to shared database through the use of laptops equipped with broadband wireless cards	
Funding		• Create a dedicated funding stream. Funds should be generated through taxes/fees incurred as a result of activities directly related to, or dependent on, the automated systems' functioning, such as title transfers or engineers' or geologists' professional licensing.
Other	• Include 'pestering system' to send automatic reminders to case managers when required actions are not taken in a timely manner	

- Chapter 7 -

Conclusion:
Summary of Findings, Future Research and Policy Implications

Introduction:

The study presented here is unique in a number of fundamental ways, and it is largely because of its breaks with tradition that the types of conclusions and policy implications discussed in this chapter came about. Suggested future research is also presented here, much of which emphasizes the need to continue to look at the problem of oil pollution through lenses that reflect the critical, yet ever-changing nature of this policy and regulatory challenge.

In defining the topic of interest in terms of polluting substance, this work assumes a vantage point fundamentally different than that traditionally embraced. Past academic research into the functioning of environmental regulation, for example, has typically focused at the level of individual laws (such as CERCLA or RCRA) or programs (i.e. Superfund). This approach is also at odds with that assumed by the state regulatory bodies, whose endeavors as they relate to oil pollution were of interest here, as they tend to define their responsibilities according to source (storage tanks, pipelines, etc.) or impact types (for instance, drinking water effects).

This conceptual departure proved to be at once the work's greatest strength and its most fundamental weakness. By examining the field of state-level oil pollution regulation in its entirety, holistic and far-reaching conclusions could be drawn regarding common practices and challenges that would have been impossible had a more myopic focus been adopted. At the same time, the lack of specificity and investigation of multiple program types meant that an in-depth understanding of any single approach could not be gained. Finally, because of the methodology employed, the absence of a reliable national spills database, and the nature of the programs under investigation, the information attained varied considerably across states. Given this, coupled with the relatively small sample size, the analyses presented herein do not rely upon advanced quantitative techniques, but instead are largely qualitative in nature.

<u>Summary of Findings</u>:

Despite conjectures in the literature about the influence of various factors, such as the political party affiliation of the governor or the richness of its populace, in the case of oil pollution regulation, it appears that only two truly discernable influences can cause a state to initiate a new intervention. The importance of actions taken by federal lawmakers and agencies was clearly demonstrated by the high number of survey respondents who named these factors as among the motivations for their programs' creation. Also influential were the occurrence of focusing events, primarily in the form of large, highly-injurious oil spills. The role of the *Exxon Valdez* spill was significant, particularly in states that are similar to Alaska with regard to economic and ecological characteristics. Clearly, the influence of this single event on the course of oil pollution regulation in the United States cannot be overstated, as it also provided the impetus for the passage of the Oil Pollution Act of 1990, the piece of legislation under whose authority many federally-administered programs are run.

In speaking with regulators, it became evident that among the numerous sources of oil pollution, a few stand out as of greatest concern. Industry has traditionally been portrayed as posing the largest threat to environmental quality, and certainly, sources such as oil wells, refineries and pipelines remain among state regulators' greatest concerns. These sources are often described as posing a 'significant threat;' however, as evidenced in the trends recorded in the National Response Center database, the incidence of large, highly-damaging spills has decreased considerably since the passage of OPA90. Many participants attributed this decline, both to the diligent work of state and federal regulators, and to the realization on the part of industry that increased safety measures were a necessity. Some, but not all respondents, also noted that in light of new regulatory requirements, many small operators were forced out of business due to their inability to comply. Others cited the advanced technology used in today's offshore extraction operations as another major contributor to the observed decrease in spills.

Today, it appears that in terms of actual polluting events, other, much smaller scale sources contribute far more to overall environmental degradation than do larger, more highly-publicized incidents such as tanker spills. Traffic accidents, particularly ruptures of large trucks' saddle tanks and lines, were named by the largest proportion of survey respondents, even by those working in states such as Texas, where the oil industry presence is significant. Commercial and residential storage tank releases, vessel accidents, transformer malfunctions, and other use-related incident types were also frequently cited.

Perceptions aside, one of the most important points to be taken away from this research is the finding that all jurisdictions, regardless their economic profile, population density, size and other characteristics, are at considerable risk of experiencing deleterious releases of petroleum. The exact degree to which each suffers from this type of pollution could not be determined because reliable and comprehensive data were not available; however, the incident count reported by some states was upwards of 3,000; 4,000; or even 9,000 releases annually. This finding indicates that the often-cited National Response Center Database falls far short of capturing all spills involving petroleum, a condition that is hardly surprising given its scope and intended use, but which supports the conclusion that the overall magnitude of the problem remains as yet unknown, but is likely far greater than what the current consensus appears to support.

There are a number of reasons for the poor quality and general inaccessibility of spills data, some of which are historic, others logistical. At the most basic level, the system is one based upon fragmented authority and little sharing of information. Each state uses a myriad of different programs, dispersed among a variety of agencies, to address the sources and impacts it considers to be of greatest importance. Although a few engage in exemplary data management and make information accessible to external parties, the majority do not. Apart from a few relevant federal programs over which states can assume primacy, there are no uniform reporting or performance monitoring standards that apply across states, and in many instances, data are not communicated between programs within a single agency, or are tracked separately by entities in different locales and/or levels of government.

At a more fundamental level, many of the same characteristics that help explain data insufficiencies support the general conclusion that the regulatory structure is largely insufficient to manage the problem of oil pollution as it exists today. Sadly, it appears that many jurisdictions' already deficient regulatory capacities are actually diminishing, despite the fact that the scope and severity of the problem remains considerable.

Evidence of this trend abounds, and can be found, for example, by examining programmatic funding. All of the programs interviewed reported relying on one or more of four general revenue sources, namely: dedicated funding, appropriations, federal monies, and penalties. Despite the many combinations and specific funding designs, none of these mechanisms was found to provide a consistently sufficient source of support, as many respondents noted that high case loads and cleanup costs combined with small programmatic staffs were a major concern.

With a large number of jurisdictions reporting insufficient resources to carry out their current duties, some also expressed concern over the ongoing diversion of federal resources that were formally dedicated to oil spill prevention and response in order to address issues of terrorism and homeland security. This trend, coupled with changes to the U.S. Coastguard's staffing policies and the fact that decreasing state budgets make the availability of federal dollars and expertise all the more important, combine to create a rather grim image of state level oil pollution regulation today. Unfortunately, there does not appear to be any reason to expect that conditions will improve in the near future, particularly given that the data needed communicate the magnitude and severity of the problem faced by state regulators do not exist, and the NRC data appear to support the conclusion that the incidence and severity of oil spills has decreased considerably in recent years.

In terms of their relations with external parties, a number of conclusions can be drawn from this investigation. While large environmental organizations such as the

Sierra Club rarely play a role in the regulatory process, for example, smaller, more locally-focused organizations often act to supplement staffs' knowledge of impacted areas and can help in response efforts. Arguably the most important finding in this regard, however, was that state regulators tend to heavily favor cooperation and stepped enforcement over the traditional command and control stance. Many respondents indicated that their programs rarely impose penalties, reserving such sanctions for only the most willful or egregious violations. A considerable number described their focus as on cleanup, rather than punishment, belying a perception that penalties act more as a roadblock to case closure, than as an incentive not to pollute.

In light of the fact that most states described the imposition of fines and other sanctions as a rarity, it is perhaps not surprising that few conduct natural resource damage assessments (NRDAs) for oil spills. Despite the fact that the NRDA process is intended to recover damages for lost resource values, not to penalize responsible parties, state regulators' responses indicated that this practice is viewed as similarly risky, in that legal challenges may result. Also, in spite of the fact that many participants were concerned with the impacts to use and non-use values resulting from oil pollution, the costs and long time frames typical of NRDA also appear prohibitive.

Despite this grim assessment, some states were found to implement innovative and effective programs designed to address particular aspects of their oil pollution problems. Four such programs are profiled here and their components analyzed to facilitate the diffusion of these unique regulatory designs among potential adopters. Florida's Used Oil Recycling Program and formulaic approach to natural resource damage assessment, combine good data practices with the educational, technological and legal constructs necessary to support successful regulation. Similarly, Wisconsin's Professional Nutrient Applicators' Training Program and sophisticated data management systems (BRRTS and SERTS) prevent polluting incidents, streamline the handling of individual response efforts and cleanups, and facilitate information sharing and performance monitoring.

Given the presence of these and other promising solutions, there is reason to believe that some of the more pressing problems in the field of state-level oil pollution regulation have already been addressed in various ways by different jurisdictions. By disseminating information about these approaches, this research aims to help speed the adoption of these promising techniques, thereby creating a more uniform and effective regulatory environment nationwide.

Future Research:

This study has identified a number of areas in which research could be conducted in the future, and by virtue of the fact that programmatic models have been suggested, has set the stage for potential alterations to the regulatory landscape. Given the real world applications of this research, one of its overarching goals has been the dissemination of information to those working in the field. In fact, access to all research products was promised to interviewees as an incentive for their participation. Many expressed an interest in learning about the activities of others in their field, and the genuine hope that someone had devised a workable solution to one or more of the problems they encounter on a daily basis.

It would be interesting, therefore, as a direct follow-up to this work, to investigate what, if any, impacts will result from the conduct and dissemination of this study. Will any states opt to implement a program based upon the four case studies presented here? If so, what alterations to the original designs were necessary, and were they successful in solving the problem(s) they hoped to address? Will the realization of the true scope and extent of the oil pollution problem in this country cause state and federal lawmakers and regulators to reprioritize resources to address it more effectively? Only time will tell, but clearly, a follow-up survey similar to the one conducted during the initial phase of this research could provide such answers.

In this work, the approaches adopted by the states themselves have provided the pool from which innovative solutions have been selected, yet this is not the only approach that could be taken. One could, for example, look to other public or even private sector activities for successful funding schemes, data management approaches, public outreach and education or initiatives, some of which could undoubtedly be adapted to meet the needs of those engaged in oil pollution regulation. Such a strategy was adopted to a certain extent here, as the Professional Nutrient Applicator's Association training program was used as a model for a potential solution to truck-generated diesel releases. Clearly, casting a wider net could prove quite advantageous, as the number and variety of potential solutions would be much greater; yet as this case study made clear, the fit between an original model and its proposed future uses would likely be much looser than if it had been developed for the expressed purpose of oil pollution regulation, a condition that might lessen the degree to which it would be considered a viable option by potential adopters.

If existing models could not be identified, researchers could work together with state agencies to devise new methodologies, designed to satisfy the specific needs and constraints of those in the field. These original interventions could take the form of generalized programmatic structures or practices that would act to address common problems, but which could be adapted for use by individual jurisdictions. Similar to the approach used by the University of Wisconsin Extension, this option is appealing, because it would provide some degree of uniformity across states, a characteristic which is largely absent from today's oil pollution regulation. Clearly, however, the development of new, widely-applicable solutions of this kind would require considerable buy-in on the part of state regulators; and likely the dedication of significant resources. Neither condition appears likely to be satisfied, however, given current economic conditions and the highly fragmented nature of the state regulatory system.

One of the major conclusions to come from the survey portion of this investigation was the finding that many states engage in a cooperative or tit-for-tat-style relationship with members of the regulated community. This state of affairs appears to result from a number of factors, including limited agency expertise and the perception that rigid enforcement will likely slow remediation progress, something evidenced by the large number of respondents who indicated their states' focus on cleaning up, rather than penalization.

This movement away from the traditional command and control stance is a phenomenon that has been observed in the past, and alternately described as an indication that the regulatory system is becoming less effective, or more realistic. It would be interesting, therefore, to investigate whether either of these interpretations has merit, or if the reality of the situation lies somewhere in between. This could be accomplished by comparing variables such as time to cleanup completion, overall case-related expenditures on the part of the responsible party and the regulatory agency, and levels of environmental degradation, for spills handled using either a cooperative or a coercive approach. Such comparisons could be made between cases handled within the same program, or if more generalizeable results were desired, multiple programs and/or states could be included.

Another conclusion to come from this and other works, is the fact that the incidence and severity of industry-generated releases has decreased considerably since the passage of OPA90. In investigating this phenomenon, scholarly attention has traditionally focused on the interventions of regulators but certainly, actions on the part of the regulated community have contributed considerably to this outcome as well. Future research could be dedicated to investigating the ways in which members of the oil industry have changed their practices in the nearly two decades since the law's passage, to determine how legal and regulatory requirements, as well as other extant conditions such as changing technologies and crude oil prices, have combined to bring about the seemingly much safer dynamic in place today. Such a study would not only act to fill a void in our current understanding of this phenomenon, it could also help to identify which elements of the current governmental interventions and requirements could be adopted for more widespread use in other environmental protection contexts.

Finally, a number of conditions, including political relations with the oil-producing countries of the Middle East, increased demand for petroleum from developing nations such as China, and the extremely tumultuous character of global markets of late, have combined to yield highly unstable oil prices. July, 2008, for example, saw the cost of crude oil reach an unprecedented $147 per barrel, only to plummet to less than half that amount just three months later. Despite such vacillations, the overall price trend is increasing, and there appears to be little doubt that the days of low cost oil are behind us (Carlisle, 2008). There is an obvious need, therefore, to investigate how higher prices will impact the nature and scope of the oil pollution problem faced by states in the years to come.

Although not explicitly intended to measure the effects of the rapid price increases experienced during the Summer of 2008, some of the participants in this study provided an indication of how higher crude costs impact the field of oil pollution regulation. Florida emergency responders, for example, noted that more and more often they are called to scenes where would-be thieves have spilled diesel fuel on an agricultural field in an attempt to siphon the contents of a farmer's storage tank, or punctured a car's gas tank while it sits in a parking lot, so as to drain its contents for their own use. Incidents of this kind were not prevalent in years past, but may well become common place as gasoline becomes a more and more costly commodity. At the same time, used oil collection and recycling is enjoying considerably more popularity as the economic balance sheet tips in favor of reusing product, rather than buying virgin oil. Regulators in Utah and Florida, for example, noted that collection centers are being paid unprecedented amounts by haulers who go on to sell the substance for reuse or re-refinement. Future research, therefore, should focus on determining the exact nature and extent of the impacts of higher gas prices and larger climatic issues, on this type of regulation.

Policy Implications:

A number of policy implications have come from this investigation, and although the focus here has been on state-level efforts, these cannot be meaningfully separated from federal initiatives, a finding made clear in the following paragraphs. Also, although this research has focused exclusively on the efforts of regulators, the discussion here highlights the fact that to truly address the current oil pollution problem, private parties will likely be required to assume an active role.

The need for more accurate, comprehensive and standardized data collection among state programs is quite evident, and actions should be taken, most likely at the federal level, to ensure that this shortcoming is addressed. Although the problem of oil pollution is certainly a serious one, current data collection practices make its true extent and severity impossible to quantify with any certainty. Ideally, a single platform could be developed for use by all state agencies, which would facilitate uniform, comprehensive reporting practices and make possible the compilation of a reliable national database of polluting incidents not required to be reported to the National Response Center. A repository of this kind would be designed to track incidents of all product types, volumes and sources; and could be used, much as Wisconsin's BRRTS and SERTS systems, to monitor case progress, as well as to facilitate performance monitoring. Such a database would allow for the discernment of both micro- and macroscopic trends for a variety of indicators, including the impacts of various regulatory interventions, as well as changes in economic conditions.

Recognizing the benefits of data standardization and widespread dissemination, a number of federal efforts are underway to accomplish these goals. One such program, the EPA's GeoData Gateway, is designed to facilitate the sharing of geospatial data through, among other things, the standardization of metadata terminology and recording practices (FGDC, 2008). The Environmental Information Exchange Network (EIEN) represents a much more comprehensive endeavor, as it intended to be a web-based portal for the exchange of environmental information between federal and state regulatory bodies, tribes and territories. Participants create and maintain a node through which data sharing and exchanges within the network of organizations occur, and they must conform to certain reporting criteria. The use of XML limits the need for re-keying of information to facilitate the transfer of data from programs' internal systems to the larger network (EIEN, 2008).

Currently, every state maintains a node; however, it appears that in its current form, the EIEN functions almost exclusively to satisfy federally-mandated data reporting requirements, such as facility registration and toxic release inventory information. The Network-defined 'communities of interest,' which include categories such as "water," "air," and "waste," clearly reflect the fact that the system is intended to facilitate exchanges structured along traditional lines of regulatory thinking. It does appear, however, that the EIEN could provide a platform for the exchange of information focused on oil pollution, more generally, rather than differentiating between polluting events of this type according to the media affected. Inclusion of the "natural resources," "health," and particularly, "cross-program" communities within the Network's conception allude to this possibility, although they do not appear to be active at the present time.

The notion of inter-agency data sharing is not new; but as evidenced in a number of interviews conducted throughout this research, is difficult to accomplish for a variety of reasons. Among these, resource availability; data collection needs and constraints; and program-specific measurement conventions, reporting timeframes, and other design specifics can quickly cripple any such attempts. To increase the chances of success, it makes sense that this endeavor be undertaken at the federal level, both because of its scale, and because contacts with all state programs are already established through regional offices such as those maintained by the EPA. For these reasons, adaptations and/or additions to the existing EIEN are recommended.

Even if the EIEN were selected as the platform for the type of data sharing suggested here, certain conditions would have to be met to ensure successful implementation. A workable solution would address all programmatic needs of all jurisdictions, and could be retrofitted to function in conjunction with existing systems and capacities. Also, many state programs reported experiencing budgetary and personnel shortfalls at the present time, making the availability of additional resources to support a new initiative doubtful. In fact, this finding may help explain why the EIEN is currently used only to satisfy the existing reporting mandates to which programmatic funding is tied. For this reason, either federal moneys could be relied upon entirely, or a system would have to be developed that would satisfy the above criteria and could be operated by state agencies at extremely low cost.

A data-sharing program, if mishandled, certainly has the potential to become yet another burden for programs whose staff and budgets are already stretched, and if ill-conceived, could represent simply one more bureaucratic bean to count. To ensure that a shared data repository would be both useful and useable, it is important that the reporting process be swift, and the data requirements minimal. Perhaps an annual summary listing the number of incidents, source and product types, and volumes would be sufficient, at least at the outset, to gauge the nature and extent of the oil pollution problem in the U.S. Future efforts might then be directed, either towards increasing the sophistication of the reporting mechanism, or devising a unified data monitoring approach of the kind proposed above

Another of the major policy implications of this work relates to the availability and quality of federal resources for spill prevention and response. One of concerns frequently cited by survey and case study participants was the observation that recent changes to the emergency response functions as carried out by agencies such as the U.S. Coast Guard and NOAA, have resulted in the dedication of fewer dollars and less manpower to the issue of oil pollution. A number of regulators noted the diversion of these resources to homeland security and terrorism-related concerns, issues that all consider to be important, but which have rendered the nation's spill response capacities weakened relative to their former levels. Others identified the Coast Guard's use of two year rotation schedules as particularly detrimental, because by the time an officer has gained sufficient expertise in the area of oil spill response, they are frequently replaced by another individual with little or no experience in the area. These two phenomena, while certainly not deliberate attempts to weaken the regulatory and response infrastructure, have nonetheless had this effect.

The keys to preventing a catastrophic spill are planning and preparedness; characteristics that were wholly lacking in the pre-*Valdez* era, and which appear to be waning as the memory of that spill fades, and the threat of terrorism takes center stage. There is no reason to expect, however, that the possibility of a large and highly-injurious oil spill has been negated, one need only look to the recent *Cosco Buson* spill into San Francisco Bay or *American Commercial Lines* Barge release into the Mississippi River, to realize that the threat of large incidents has not been eliminated. It is recommended, therefore, that Coast Guard rotations be ceased or extended for personnel dealing with this sensitive issue, and that proper training, perhaps in the form of an apprenticeship period, be provided to incoming officers. Similarly, funding cannot be continually siphoned away from spill response functions; because the threat of large spills clearly remains.

Perhaps the largest policy implication to come from out of this investigation, however, derives from the inescapable conclusion that on the whole, the states are largely ill-equipped to handle the sheer number and variety of oil pollution-generating activities that occur within their borders. Dispersed, small in scale, and typically resulting from use-related activities, many of today's oil spills are difficult to anticipate and perpetrated by parties with little knowledge of proper response techniques or regulatory requirements, that are unlikely to possess the financial wherewithal to cover the frequently astronomical cleanup costs. Singularly, any one of these characteristics is a regulatory challenge, taken together, it is a wonder that the states have managed to launch any sort of offensive against this type of pollution.

Given this reality, it is difficult to identify a single "silver bullet" policy, that could be devised to handle the many thousands of non-industry releases that occur throughout the nation each year. It is likely that none exists. The most promising courses of action, however, appear to be those that act to shift responsibility from the shoulders of state regulators, to a third party, one with a financial interest in preventing releases from occurring at all, or the financial responsibility for covering the costs should one happen. This trend is evident in the move towards requiring financial responsibility of potential spillers, something asked of tank owners, for example, under the EPA's LUST Program, and of transporters, by Florida's Used Oil Recycling Program (FUORP). It is also apparent in the innovations profiled here, such as Wisconsin's training program, in which state regulators play only a tangential role, and in the FOURP's reliance on private companies for much of the collection and reuse activities. Finally, although not selected for case study analysis as part of this research, Washington's Tank Insurance, Massachusetts' Licensed Site Professionals, and Alaska's Community Spill Response Programs, all make use of external supports to supplement, or even replace, state resources, while acting to safeguard human health and environmental quality from oil pollution-induced injury.

Given that most state agencies' budgets and staff are limited, and in light of the profile of the typical spill and spiller, it seems logical that the future of this regulatory field must take the form of efforts to externalize responsibilities, rather than continuing to rely upon the tax payer-funded bureaucracy to address a problem type which it is so clearly ill-equipped to manage. Who then should assume the mantel for preventing and responding to oil pollution? In the post-OPA era, it became clear that with adequate laws and regulations in place, members of the oil industry could be made to embrace safer operating practices, resulting in a considerable diminution in large spills. Although the nature of the current problem is quite different, there do exist potential leverage points through which private parties could be made to take actions to prevent many harmful releases from occurring.

Whenever feasible, those who profit from the sale and/or use of petroleum products should be made to take full responsibility. Requiring increased safeguards, the development of closed-loop supply chains and extended producer responsibility[148] are arguably the best avenues through which the nation's considerable oil pollution problem can be meaningfully diminished. The fuel lines linking large trucks' saddle tanks, for example, were described as a common spill source, as minor accidents or even flying road debris can compromise these fragile connections, causing diesel fuel to escape. One of the respondents from Florida expressed frustration at this phenomenon, noting that simply placing a protective shield over these lines would likely diminish the occurrence of these incidents considerably. If such a simple solution could help to address one of the most often named sources of oil pollution, use of these safeguards should be mandated.

Truck spills are not the only concern for which simple solutions may be readily available. A number of survey takers identified electrical transformers, for example, as a spill source of concern; the respondent from California, in contrast, noted that his state had outlawed the use of traditional transformers, an act which completely negated this risk. There is other evidence of this kind of proactive regulation. For instance,Texas' Clean Marinas Program provides participating marinas with sorbent guards for their gas pumps as a way of ensuring that petroleum is not spilled during the refueling process; and a number of states have experimented with providing boaters with 'bilge socks;' small

[148] For in-depth discussion of these topics see, for example: Douwe, Simme, P. Flapper, J. Van Nunen, and Luk N. Wassenhove. 2005. Managing closed-loop supply chains Springer.; Fenerol, Claudia, and et al. 2004. Economic aspects of extended consumer responsibility Organization for Economic Co-Operation and Development.; and Walls, Margaret. 2006. Extended producer responsibility and product design: Economic theory and case studies. Resources for the Future, RFF DP 06-08.

devises that selectively bond to oil in ships' bilges, preventing it from entering the environment when they are emptied. A large number of states must contend with home heating oil spills, and while some have devised programs for cleanup assistance, the financial and personnel commitments required to engage in these activities are typically quite high. Washington's Tank Insurance Program offers a unique solution to this conundrum, as the oil distributors themselves have assumed financial responsibility for preventing and responding to this type of release.

Finally, several states have created programs aimed at the collection and reuse of used oil; and in fact, a case study of Florida's approach is in this report. It may well be, however, that the functions of used oil collection and reuse could be better and more consistently handled through cooperative efforts on the part of the oil industry and retail distributors. Together, these entities could create a deposit refund and public education system to encourage consumers to bring back their used product, and even work to address the more challenging aspects of this supply chain, such as oil bottles and filters. Although such an outcome may develop independently given the high cost of oil, the development of an industry-led program of this kind could be encouraged through the creation of various regulatory carrots and sticks.

Conclusion:

This work has investigated the nature of oil pollution regulation as carried out by state regulators, has sought to understand the challenges commonly encountered through the course of such endeavors, and worked to identify innovative solutions to these problems that have been developed and successfully implemented by individual jurisdictions, such that they can be described and amended for use as models for more widespread adoption. In all, regulators in 42 states, representing multiple agencies and programs, have contributed their time and knowledge to creating the descriptions and facilitating the analyses contained herein.

The result of this effort has been the creation of a unique snapshot of a field, defined in terms of a single polluting substance, or rather class of substances, whose presence is ubiquitous in every state, and which is responsible for untold environmental and human health injuries annually. To be sure, more research is warranted in this area, yet a number of important conclusions and policy implications have come to light as a result of this effort. While progress has clearly been made with regard to industry-generated releases, smaller scale, use-related spills are still a major concern. Unfortunately, the regulatory infrastructure in place today appears largely incapable of addressing, or even fully measuring, the scope of the nation's oil pollution problem. Still, there is reason to believe that through a continuation of efforts to enhance prevention and response capabilities, particularly by leveraging the resources and expertise of external parties, the frequency and injuries caused by releases of petroleum can be considerably diminished.

Our dependency on oil will likely remain into the foreseeable future, yet factors such as pricing, availability, and global climate change, mean that the shape of tomorrow's oil pollution problem is difficult to predict. It is clear, however, that we cannot afford to continue to rely on a fragmented, resource-deficient regulatory system, and certainly cannot go on weakening it through the diversion of skilled personnel and federal dollars to other programs and uses. Spills of the kind most frequently experienced in the U.S. are not flashy, they don't kill thousands or wipe out entire ecosystems. They are typically small volumes, they may impact a roadside ditch or a neighbor's drinking water well, but they occur by the thousands annually, and although most don't make the evening news, each one represents an incremental loss of environmental quality and a potential threat to human health. Oil pollution is a constant in our modern lives, we must treat it accordingly, dedicate the necessary resources to address it, and work to devise innovative solutions in order to minimize the incidence of polluting events, and the burden that must be born by our regulatory bodies.

Appendix A

Interview Protocol

Part A: Background Information

1. How long have you worked in the field of oil pollution regulation?

Part B: Regulatory Framework

2. Does your state pursue damages for oil pollution and/or penalize polluters independent of federal involvement?
    a. Does your state act as a participant in federal-led responses?
3. What laws/rules/regulations govern oil spill response, restoration and the penalization of responsible parties?
4. In Washington, which agencies or other entities have regulatory authority when oil is spilled?
    b. What responsibilities does each have?
5. Are other groups (i.e. tribes, business associations, advocacy groups, etc.) ever involved in response, restoration, or any other aspect of the regulatory process? If so, in what capacity?
6. How many state employees work on spill prevention? Response/restoration? Other?
7. How is your oil pollution program funded? (i.e. through regular budgetary appropriations, through penalties imposed on spillers, etc.)
8. In what year did your state initiate this program?
    a. What prompted the creation of the program? (i.e. a large spill, interest group involvement, etc.)

Part C: Extant Conditions

9. What are the major sources of oil pollution in your state?
10. In which areas (i.e. coastal, harbor, roadways) are polluting incidents most frequent?
11. Which natural resources are most often impacted?
    c. What kinds of resource uses are affected? (i.e. fishing, recreation, etc.)
12. Do responsible parties often challenge penalties and/or damage claims?

Part D: Enforcement Practices

13. How are penalties/damages calculated for oil releases?
    d. Does the assessment methodology vary according to the identity of the responsible party? The volume/severity of the release? The natural resources affected?

14. Do state regulators work cooperatively with the regulated community (for example, through education or training exercises)? If so, how?
15. Does your state keep its own spills database? If so, is it publicly accessible?
16. Is program performance monitored? If so, how?

Part E: General

17. What do you consider to be your state's greatest strength(s) with regard to oil pollution regulation?
18. What do you consider to be the greatest challenge(s) to oil pollution regulation in your state?
19. Is there a recent report or other document containing information about your state's regulation of oil pollution that I could examine?

Appendix B

Dear _____________,

My name is Josephine Faass. I am a Ph.D. candidate studying environmental policy at Rutgers University, and am contacting you in conjunction with a large-scale research project I'm conducting, focused on state-level oil pollution regulation.

The goal of this research is to learn as much as possible about the approaches to this type of regulation adopted by each of the states, such that a comprehensive description can be created and an analysis of related spill data conducted. While it is known that states take a variety of approaches to oil pollution regulation, an investigation of this type has not been completed previously.

It is my sincere hope that by compiling and analyzing information on this topic, a greater understanding, not only of what is currently being done, but of which regulatory approaches constitute effective and efficient uses of states' regulatory resources, can be had. To this end, I am contacting individuals, such as yourself, to gather the necessary information, and will be sharing the study's findings with them at its completion.

I have created a short survey designed to gather data about each state's approach to oil pollution regulation. A copy of the survey is attached to this email for your review. None of the questions are personal in nature; they are designed to gather the information needed to create an accurate description of your state's regulatory approach and of the oil pollution problem to which it was designed to respond. I will not use your name or any information that could be used to identify you in any products of this research; your identity will remain confidential.

I have been able to find answers to some of my questions using your website; however, I need to confirm that I have accurate and up-to-date information. I would like to administer the survey over the phone, either to you, or if you would prefer, to someone else in your office who would be willing and able to complete it. Shortly thereafter, the survey-taker will be provided with a copy of their responses, and allowed to make any changes or amendments they deem necessary, before the information they provide is incorporated into the research project. Please let me know, either by responding to this email, or by calling me directly at (215) 438-3179, how you would like to proceed.

I am available to carry out the proposed interview at whatever time is most convenient and will send a paper copy of the interview questions and some related materials, as soon as I receive your response.

Thank you in advance and I hope to hear from you soon.

Sincerely,
Josephine Faass, Ph.D. A.B.D.
Bloustein School of Planning and Public Policy
Rutgers, The State University of New Jersey

Appendix C

Dear __________,

My name is Josephine Faass. I am a Ph.D. candidate studying environmental policy at Rutgers University, and am contacting you in conjunction with a large-scale research project I'm conducting, focused on state-level oil pollution regulation. I have already corresponded with (Name of the first individual here) and they advised me that you possess the necessary expertise and might be willing to assist me with the research I'm conducting.

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It is my sincere hope that by compiling and analyzing information on this topic, a greater understanding, not only of what is currently being done, but of which regulatory approaches constitute effective and efficient uses of states' regulatory resources, can be had. To this end, I am contacting individuals, such as yourself, to gather the necessary information, and will be sharing the study's findings with them at its completion.

I have created a short survey designed to gather data about each state's approach to oil pollution regulation. A copy of the survey is attached to this email for your review. None of the questions are personal in nature; they are designed to gather the information needed to create an accurate description of your state's regulatory approach and of the oil pollution problem to which it was designed to respond. I will not use your name or any information that could be used to identify you in any products of this research; your identity will remain confidential.

I would like to administer this survey over the phone, either to you, or if you would prefer, to someone else in your office who would be willing and able to complete it. Shortly thereafter, the survey-taker will be provided with a copy of their responses, and allowed to make any changes or amendments they deem necessary, before the information they provide is incorporated into the research project.   Please let me know, either by responding to this email, or by calling me directly at (215) 438-3179, how you would like to proceed.

I am available to carry out the proposed interview at whatever time is most convenient for you, and will send related materials, as soon as I receive your response.

Thank you in advance and I hope to hear from you soon.

Sincerely,
Josephine Faass, Ph.D. A.B.D.

Bloustein School of Planning and Public Policy
Rutgers, The State University of New Jersey

Appendix D

Dear _______,

SUBJECT: OIL POLLUTION REGULATION RESEARCH PARTICIPATION

Thank you for participating in this research study. Enclosed for your review are two copies of an Informed Consent Form. The use of this form is required by the Rutgers Institutional Review Board of any research involving participants such as yourself, and is intended to ensure that you are fully aware of the nature of the study, and of your rights as a contributor to it. Please initial/sign one copy of the form and return it to me in the envelope provided, the other copy is yours to keep.

Also included here is a transcript of the interview questions you will be asked regarding (state name)'s approach to oil pollution regulation. This document has already been provided to you as part of the initial contact email; however, a paper copy is supplied here for your records.

Once the interview is complete, your responses will be transcribed (from the interviewer's notes) and a copy will be provided to you for review. If you wish to make any corrections or additions to this record, you are welcomed to do so. When the entire project is complete you will be given access to the final research product.

Again, I want to thank you for your participation. If at any time you have questions regarding this research, please don't hesitate to contact me, either via email (jfaass@eden.rutgers.edu) or by phone at (215)-438-3179.

Sincerely,

Josephine Faass
Ph.D. A.B.D.
Rutgers, The State University of New Jersey

Enclosures (3)

6814 ARDLEIGH ST.
PHILADELPHIA, PA
19119

APPENDIX E

CONSENT FORM
State-Level Oil Spill Regulation Research

You are invited to be in a research study focused on states' approaches to oil spill regulation. You were selected as a possible participant because you are an employee of a state agency and work in the field of spill regulation. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by: Josephine Faass, Ph.D. A.B.D.; Rutgers University.

Background Information

The purpose of this study is: To identify and describe the approaches to oil spill regulation adopted at the state level. To discern the effects of these programmatic strategies in terms of deterring spills; thereby identifying the factors that characterize effective regulatory designs.

Procedures:

Employees of state agencies devoted to oil spill regulation across the country (approximately 50 individuals) will be interviewed for the purpose of this study.

If you agree to be in this study, we would ask you to do the following things:
To engage in a 20 to 40 minute telephone interview focused on your state's approach to oil spill regulation, the nature of the problem as it exists within your state, as well to provide some basic information about the regulatory agencies involved. To respond to any follow-up contact, in the form of emails and/or telephone calls, needed to clarify survey responses. In the event that a follow-up contact is deemed necessary to clarify one or more of you responses, it will occur within two weeks of the initial interview. In total, involvement in this research project should not require more than two hours of your time.

Risks and Benefits of being in the Study

Participation in the study does not pose any risk to you.

The benefits to participation are: By participating in this study you will be facilitating the creation of a comprehensive list of state approaches to oil spill regulation, an inventory which to date does not exist. The information you provide will also allow for the identification of challenges which must be overcome by state regulators, as well as the solutions they've adopted that have proven effective at lessening the frequency and/or severity of oil spills. The final product of this research will be made available to you and to all other participating programs free of charge. Through the collection and analysis of programmatic and spill data, a clear understanding of the practices employed and results achieved across the nation can be had by all involved. It is hoped that this study will provide valuable information to regulators who are curious about what is done in other jurisdictions, and may be used as an aid in the creation of effective and efficient approaches to spill regulation.

Compensation:

No monetary compensation will be offered to participants; however, all will be provided will the full results of the study once completed.

Confidentiality:

As a participant in this study, your identity will be kept confidential; in the final research report, you will be identified by your agency affiliation only. No names, titles or other personal identifiers will be made public. To ensure that your confidentiality is maintained, a numeric code will be created to link the information you provide with your identity. A master list of codes and corresponding identities will be stored in a password protected file.

Research records will be stored securely and only researchers will have access to the records. Electronic copies of files will be stored under password protection and paper copies in a locked file cabinet. Three years after the study's completion, records of conversations and any other data you may provide will be erased (if in electronic format) or shredded (if on paper) to ensure that your confidentiality is maintained indefinitely.

Voluntary Nature of the Study:

Participation in this study is voluntary. Should you decide not to participate, you will incur no penalties or suffer a loss of benefits to which you are otherwise entitled. Similarly, you are free to terminate your participation once started for any reason, by simply indicating this decision via phone or email.

Contacts and Questions:

The researcher conducting this study is: Josephine Faass. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at:
6814 Ardleigh St. Philadelphia,
PA 19119

Tel: (215) 438-3179
Email: jfaass@eden.rutgers.edu.

This research is being conducted for the purpose of a doctoral dissertation. If you have any questions you wish to ask the advisor of this project, please feel free to contact:
Professor Michael Greenberg
Tel: (732) 932-4101 ext. 673
Email: mrg@rci.rutgers.edu.

If you have any questions about your rights as a research subject, you may contact the Sponsored Programs Administrator at Rutgers University at:
Rutgers University Institutional Review Board for the Protection of Human Subjects
Office of Research and Sponsored Programs
3 Rutgers Plaza
New Brunswick, NJ 08901-8559
Tel: (732) 932-0150 ext. 2104
Email: humansubjects@orsp.rutgers.edu

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

Signature:____ Date: ___________________

Signature of Investigator:___________________________________ Date: ___________________

Appendix F

The data used to create Figures 4.4 – 4.6 were derived from the following sources.

Residential Home Heating Oil Sales in 2006:

Energy Information Administration (EIA). 2006. *Fuel oil and kerosene sales report, 2006.* DOE/EIA-0340(06)/1.

Number of Registered Recreational Vessels in 2006:

National Marine Manufacturing Association. 2007. *2006 recreational boating abstract.*

Number of Interstate Highway Miles:

U.S. Department of Transportation: Federal Highway Administration. FHWA route log and finder list: Interstate routes in each of the 50 states, district of columbia, and puerto rico. 2007 [cited January 2008]. Available from http://www.fhwa.dot.gov/reports/routefinder/table3.cfm.

Total Crude Oil Production:

Energy Information Administration (EIA). Crude oil production. 2008 [cited January 2008]. Available from http://tonto.eia.doe.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_a.htm.

Number of Crude Oil Import and Seaport Sites:

Energy Information Administration (EIA). State energy profiles. 2008 [cited January 2008]. Available from http://tonto.eia.doe.gov/state/.

revised

FLORIDA DEPARTMENT OF NATURAL RESOURCES DNR

MEMORANDUM

May 27, 1992

To: Office of Coastal Protection Staff

RLH

Through: Richard L. Healy, Chief
Office of Coastal Protection

From: Debra Preble Debra Preble
Environmental Administrator
Office of Coastal Protection

Subject: Pollutants

Our legal staff has recently provided comments on what constitutes a "derivative thereof" of a "pollutant" as defined in section 376.031 F.S. Based on their comments, I have prepared the attached list of pollutants. I have also included a list of substances that are not pollutants under section 376.031 F.S. Items not on either list have not been addressed. I have tried to address all substances that have in the past been questioned. The list will be updated and revised periodically as new substances are considered. If you have questions about a substance that is not listed, please call me.

Many of these derivatives of oil do not share oil's physical properties. Additionally many of these substances are very hazardous. Vessels which carry these pollutants as cargo are required to have proof of financial security as per our usual requirements. Vessels having a storage capacity to carry 10,000 gallons or more of pollutants as fuel and cargo are required to have a ship-specific spill contingency plan on board the vessel in accordance with our usual requirements.

I doubt you will find many of these more unusual derivatives stored in bulk at terminal facilities. If you do find these substances stored at terminal facilities, then a waiver or substitution in accordance with our proposed rules should be considered. The granting of waivers for the issuance of an SPRC for terminal facilities that store substances you are unfamiliar with should not be approved in the Field. Such incidents, should be referred to me and together we will determine what, if any, waivers or substitutions will be appropriate.

II. GASOLINE and it's derivatives

all types of gasoline and gasoline mixtures
acetone
benzene
cumene

III. PESTICIDES are any substance used to destroy or inhibit the action of plant or animal pests. Pesticides include herbicides, insecticides, fungicides, rodenticides, and miticides. There are over 1200 different pesticides. Pesticides are required by law to be labelled as such, so their identification should not be difficult. Attached is a list of common pesticides.

IV. AMMONIA is most commonly found as anhydrous ammonia which is a colorless gas at standard temperature and pressure. It is transported as a liquid under pressure. The determination of ammonia derivatives to be regulated as pollutants is pending legal and policy decisions which are expected in the near future.

V. CHLORINE is a gas at standard temperature and pressure. Chlorinated hydrocarbons are derived from chlorine and petroleum products. A number of chlorinated hydrocarbons are also used as pesticides. Chlorinated hydrocarbons are highly toxic, many are carcinogenic. Chlorinated hydrocarbons include the following:

carbon tetrachloride (tetrachloromethane, perchloromethane)
chlorobenzene (monochlorobenzene, phenyl chloride)
chloroform (trichloromethane)
chloronaphthalene
chlorophenol
dichlorobenzene
dichloroethane (ethylene dichloride; ethylene chloride; Dutch oil)
dichloroethylene (acetylene dichloride; dichloroacetylene)
dichloropropane (propylene chloride; propylene dichloride)
dichloropropene (dichloropropylene)
tetrachloroethane (acetylene tetrachloride)
trichlorobenzene
trichloroethylene

The following are pollutants as defined in section 376.031 F. S.:

"Pollutants" includes oil of any kind and in any form, gasoline, pesticides, ammonia, chlorine, and derivatives thereof, excluding liquefied petroleum gas.

I. OIL and it's derivatives

acetylene
asphalt
butyl alcohol (butanol; methylethylcarbinol)
coal oil
coal tar
crude oil
cyclohexane (hexamethylene; hexanaphthene)
diesel fuel
essential oils (orange, lemon, peppermint, spearment etc.)
ethane
ethylene
ethyl alcohol (ethanol; grain alcohol)
fuel oils
gas oil
jet fuel
kerosene
limonene (dipetene)
lubricating oils
methyl alcohol (methanol; wood alcohol)
mineral oil
motor oils
naphtha (mineral spirits)
naphthalene (tar camphor)
paraffin (paraffin distillates; chlorinated paraffins)
plant oils (vegetable oils; peanut oil)
phenol (there are many different phenols)
propyl alcohol (isopropyl alcohol; propanol)
propylene
pine oil
synthetic oils
tallow
turpentine
toluene (methylbenzene; phenylmethane)
waste oils
xylene (dimethylbenzene)

The department will be the lead agency for discharges of any of these substances into coastal waters seaward of the DNR/DER jurisdictional line. Many of these substances cannot be treated as oil in that they are difficult to clean up and unsafe to contain. The Department of Environmental Regulation will provide technical assistance as requested. If you need additional information or have any questions, please call me.

DJP/

attachments

cc: Mr. Don E. Duden
Mr. R. Dale Patchett
Colonel Cliff Kidd

The following are not pollutants as defined in section 376.031 F. S.:

antimony pentachloride
antimony trichloride
barium chloride
caustic soda (sodium hydroxide)
chloroethyl vinyl ether
dichloromethane (methylene chloride)
ethane (dimethyl; methylmethane)
hydrochloric acid
hydrazine
Liquefied Petroleum Gases (LPG) including:
    butylene
    butane
    isobutane
    propane
methane (marsh gas; methyl hydride)
methyl ethyl ketone (MEK)
naphthol
nitric acid
phosphoric acid
phosgene
sulfuric acid

Appendix H


AL
GA
NORTH
Tallahassee
Jacksonville
Crystal River
Orlando
Port
Canaveral
Tampa
St. Petersburg
St Lucie
FLORIDA
GULF
OF
MEXICO
Hialeah
Miami
Port
Everglade
Turkey
Point
0 75 150
miles
Energy Information Administration
Mouse over symbols for more details.
Electricity Transmission Line (>= 345 kV)
Oil Seaport
Oil Import Site
Petroleum Refinery
Coal Mine, Surface
Coal Mine, Underground
Natural Gas Flow
Hub
(1 mile band width = 100 million cubic feet/day)
Oil and Gas Active Leases
Major Electric Power Plants (>=100 MW)
Nuclear
Solar
Petroleum
Hydroelectric
Coal
Wind
Natural Gas
Wood
Geothermal
Renewable Energy Potential
Solar - (>= 6.0 kWh/m2/day)
Wind - (>= 4 Power Class)
Geo. - (>= 80 milliwatts/m2)

Appendix I


LAKE SUPERIOR
NORTH
Superior
MI
WISCONSIN
Green Bay
Kewaunee
Point Beach
MN
IA
LAKE MICHIGAN
Madison
Milwaukee
0 40 80
miles
Energy Information Administration
Mouse over symbols for more details.
Electricity Transmission Line (>= 345 kV)
Oil Seaport
Oil Import Site
Petroleum Refinery
Coal Mine, Surface
Coal Mine, Underground
Natural Gas Flow
Hub
(1 mile band width = 100 million cubic feet/day)
Oil and Gas Active Leases
Major Electric Power Plants (>=100 MW)
Nuclear
Solar
Petroleum
Hydroelectric
Coal
Wind
Natural Gas
Wood
Geothermal
Renewable Energy Potential
Solar - (>= 6.0 kWh/m2/day)
Wind - (>= 4 Power Class)
Geo. - (>= 80 milliwatts/m2)

Appendix J

For a number of reasons, no statistical analyses to determine which factors acted to encourage innovation in the field of oil pollution regulation were reported within the body of this report. This outcome is in part due to the fact that no statistically significant and theoretically important results of this kind could be discerned from the data generated using the survey instrument; but more importantly, it reflects the researcher's recognition that the methodologies employed throughout the study were not amenable to this sort of analysis.

Perhaps the most important factor underlying the decision to forego this type of predictive modeling, is the recognition that the methodologies employed can in no way be expected to have produced an exhaustive and all-inclusive list of oil pollution-related innovations; a fact which renders any analysis intended to discern predictors of such practices suspect. Part of this outcome stems from the fact that 'innovation' is quite a general term, for which no more specific definition had been defined for the purpose of this study before its commencement. This non-specificity was unavoidable given the exploratory nature of this endeavor, yet the resulting lack of standardization cannot be overlooked. Similarly, respondents were not directly asked to identify and/or discuss innovative practices engaged in by their respective states; an approach which was deliberately utilized for reasons discussed in Chapter 3 (Methods), but which further reduces the probability that all possible innovations were identified through the course of this research.

In recognition of the desirability of such a predictive model, however, a number of analyses of this kind were attempted, several of which are presented here. Below, a brief explanation of the variables used, as well as the logic behind their inclusion, is included. Then a sample of three models is provided; each of which is accompanied by a brief discussion.

<u>Variables:</u>

In the following analyses, the dependent variable ('oilinnov') was coded as '1' if the state in question had been observed to employ one or more regulatory innovations, '0' otherwise. Other attempts were made using a dependent variable whose value reflected the number of innovations found to exist in each state; however, this approach led to even less meaningful results than the one described here.

The dependent variables are as follows:

'forbes' = a score of states' environmental friendliness and intended to measure whether a state's established stance with regard to environmental protection would be useful in predicting their behaviors in this particular area of regulation.

'income' = a measure of per capita income (for 2006), intended to determine whether wealthier states would be innovative

'%oil' = a measure of the percentage claimed by each state of the national total of oil consumed in 2006; since more oil-intensive states can reasonably be expected to have greater pollution problems, this variable was considered a proxy for problem size 'nrcspilltotal' = a measure of the total number of polluting incidents involving oil that were reported to the National Response Center in 2006, a direct measure of problem severity; however, given the partial nature of this database (discussed throughout Chapters 2 and 4), this was not considered a reliable standalone measure of pollution severity

'envexpend' = Average dollars spent on environmental regulation and enforcement efforts between 2005 and 2008, although annual totals were available, an average for this time period was considered more reliable, because in a number of jurisdictions, spending varied widely from year to year

'crudetot' = the total volume of crude oil produced in each state in 2006, this variable represents not only a spill source of considerable concern and one which has warranted the creation of specific, highly-developed forms of monitoring and regulatory intervention (much of which takes the form of collaborative efforts between state and federal agencies); it also functions here as a measure of industry importance within each state

'governor' = past studies have found that states with Republican governors are less focused on environmental regulation and innovation, while those with Democratic leaders are more dedicated to these activities, this variable was included here to determine what, if any, effect party affiliation might have on innovations in the field of oil pollution regulation

Logistic Regression #1

All of the potential explanatory variables were included in this model. Although the model as a whole is significant at the 0.1 level, it's overall explanatory power is quite low, as evidenced by the Pseudo R^2, which is equal to just 0248. It is also likely that some portion of even this limited explanatory power is due to the (relatively) large number of independent variables, none of which is significant at even the 0.1 level.

LR chi2(7) = 13.80
Prob > chi2 = 0.0549
Log likelihood = -20.918519 Pseudo R2 = 0.2480

oilinnov	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
forbes	1.075832	.0779274	1.01	0.313	.9334435	1.23994
income	.9999869	.0000887	-0.15	0.883	.9998132	1.000161
%oil	1.14175	.7003909	0.22	0.829	.3430942	3.799522
nrcspltot	1.003757	.0031103	1.21	0.226	.9976793	1.009871
envexpend	1	2.48e-09	-0.86	0.390	1	1
crudetot	1.000007	.0000122	0.57	0.570	.999983	1.000031
governor	.413007	.339218	-1.08	0.282	.0825722	2.065765

Logistic Regression #2

This model was created by stepping back (according to the significance level of the individual independent variables) from the one above. Here, the overall significance of the model is greatly improved, the explanatory power is decreased somewhat, but of the three explanatory variables included, only one is significant at the 0.1 level.

It is interesting to note, though not appropriate for inclusion amongst the study's findings, that per capita income, percentage of oil consumption, total environmental expenditures and crude oil production were of no assistance in predicting states' innovative tendencies. Although their affect on the model's predictive ability is not great enough to be considered statistically significant, it does appear that, as predicted by the literature, environmentally-friendly states and those with Democratic governors are more likely to act as regulatory innovators. The impact of higher spill totals (as measured by the Nation Response Center), also appears to have the expected impact, leading to more innovative regulation on the part of state agencies.

LR chi2(3) = 12.25
Prob > chi2 = 0.0066
Log likelihood = -22.218766 Pseudo R2 = 0.2161

oilinnov	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
forbes	1.060584	.053496	1.17	0.244	.9607495	1.170792
nrcspltot	1.003137	.0017292	1.82	0.069	.9997533	1.006532
governor	.3043553	.2309166	-1.57	0.117	.0687968	1.346461

Logistic Regression #3

Of all the variables thought predictive of innovation, only one, states' spill totals as reported by the NRC, made a significant contribution to predicting such behaviors. The logistic regression below makes use of this single variable to predict whether or not states were found to engage in any innovative regulatory behaviors with regard to oil pollution. The model is significant, although it does not explain much of the variation present in the dependent variable; and indicates that a positive relationship exists between the number of oil spills reported within a state and the likelihood that a jurisdiction will engage in innovative regulatory behaviors.

LR chi2(1) = 8.76
Prob > chi2 = 0.0031
Log likelihood = -23.966741 Pseudo R2 = 0.1545

oilinnov	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]	
nrcspltot	1.002982	.0014708	2.03	0.042	1.000104	1.005869

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Curriculum Vita

Josephine Faass

Colleges Attended

September 2005 – May 2009	Rutgers University, Urban Planning and Public Policy, Doctorate of Philosophy
September 2003 – May 2005	Rutgers University, Public Policy, Master of Public Policy
January 2000 – May 2003	Florida State University, Biological Sciences, Bachelor of Science
June 1998 – December 2000	Tallahassee Community College, General, Associate of Arts

Principle Occupations

September 2003 – May 2008	Research Assistant, National Center for Neighborhood and Brownfields Redevelopment, Rutgers University
September 2003 – May 2008	Graduate Assistant, Bloustein School of Planning and Public Policy, Rutgers University
July 2001 – April 2003	Petroleum Cleanup Site Manager, Florida Department of Environmental Protection

Publications

June 2007	Faass, Josephine and Michael Lahr. Towards a More Holistic Understanding of American Support for Genetically Modified Crops: An Examination of Important Factors Using a Binomial Dependent Variable. University Library of Munich, Germany; MPRA Paper 6124. Available at: < http://ideas.repec.org/s/pra/mprapa.html>
June 2006	Mayer, Henry; Faass, Josephine and Michael Greenberg. 2006. Environmental Cleanup of the Nation’s Former Nuclear Weapons Sites: Unprecedented Public-Private Challenges at the Largest Facilities.

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