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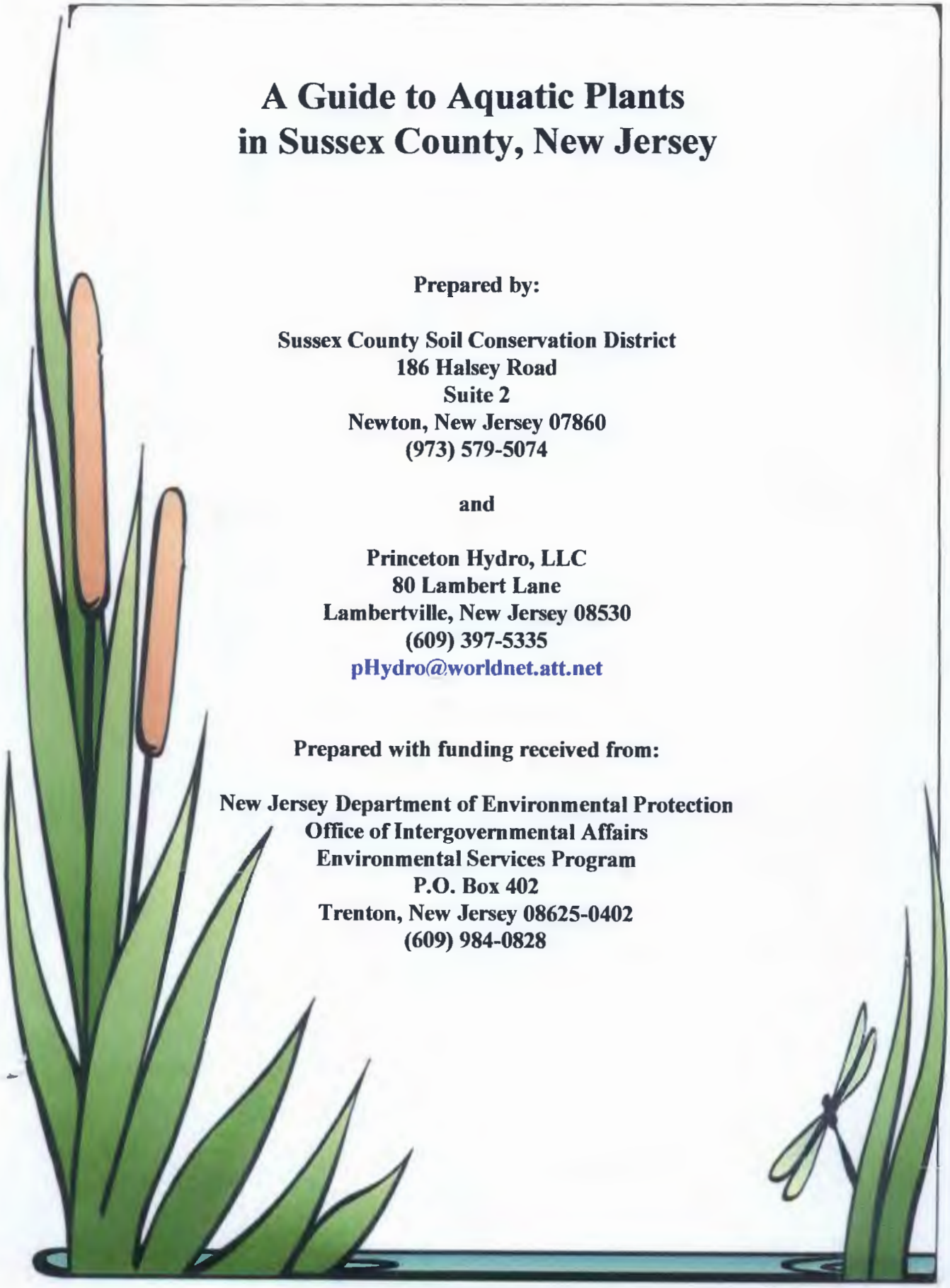
A Guide to Aquatic Plants in Sussex County, New Jersey



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Prepared with funding received from:

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Lakes and ponds are an important and integral component of the topography and landscape of Sussex County, New Jersey. Over the last 100 years, human activities within Sussex County have resulted in an increase in the annual nutrient (phosphorus and nitrogen) and suspended sediment loads entering these waterbodies. Over time, these increased loads of nutrients and suspended sediments have created conditions more favorable for the growth of aquatic plants and algae. In turn, increases in the amount of aquatic plant biomass and the size and frequency of algal blooms have produced a decline in the water quality, recreational value and overall aesthetics of these lakes and ponds.

Many of the lakes and ponds in Sussex County, New Jersey are used by both residents and visitors for a wide variety of recreational activities including boating, sailing, swimming, fishing, wet and jet skiing and general aesthetics. Thus, given the environmental and economic value of these lakes and ponds, it is critical that water quality problems such as excessive densities of aquatic plants be eliminated or, at least, minimized.

For aquatic plants, also called macrophytes, there are a variety of in-lake management techniques designed to reduce their densities. However, it should be emphasized that these management techniques focus on the symptom of the water quality problem and not the cause, which is the lake's annual nutrient load. The only way of addressing the cause of the problem is to focus on reducing the watershed-based nutrient and suspended sediment loads. While focusing on the cause of the problem will improve in-lake conditions in the long-term, the immediate short-term need for non-impaired waters dictates that in-lake management techniques are necessary.

Of the in-lake management techniques that are currently available to control excessive plant growth, the relative effectiveness of four of the more frequently used techniques are address for each identified species. These four techniques include winter drawdowns, sterile grass carp, mechanical weed harvesting and aquatic herbicides. Before any of these, or any other, management technique is implemented, the lake user should obtain more information on the technique and determine if it is appropriate for the given circumstances. The literature and organizations cited at the end of this guide will provide the lake user with more detailed information to make such management decisions.

Before an in-lake management program can be designed and implemented to reduce or control nuisance densities of aquatic plants, these nuisance plants need to correctly identified. As stressed throughout this guide, different aquatic plants response in varying ways to different management technique. So, while a given technique may reduce the densities of one species, the same technique may have no effect, or even increase the densities, of another species. Thus, it is critical to properly identify the nuisance and dominant aquatic plants of a lake or pond, before the design and implementation of a management program.

This visual key is by no means a complete inventory of the aquatic plants of Sussex County, New Jersey. However, the key does provide some basic taxonomic, ecological and management information on a number of aquatic plants have been well documented to create nuisance conditions in Sussex County.

Coontail or Hornwort

(*Ceratophyllum demersum*)

Description - Unlike many other submersed plants, coontail is usually rootless, anchored in the mud early in the growing season and later is floating near the surface. The central stem is hollow, branched and slender, being either flexible or stiff. Leaves are in whorls of 5 to 12 and more condensed at the stem tip. While the leaves of milfoil are more feather-like, the leaves of coontail are distinctly forked. All leaves are submersed and their color ranges from olive to dark green. Coontail can usually be found in ponds or slow-moving streams and can grow in depths up to 16 feet. It tends to grow in moderate to high nutrient, hard waters and can easily adapt to different water levels and turbidity.

Benefits and Problems - Coontail provides good shelter for young fish and aquatic invertebrates. The fruits of coontail are eaten by a variety of waterfowl and shorebirds. In spite of its value to wildlife, coontail can attain nuisance densities by late summer. Although this plant starts the growing season by growing immediately over the sediments, toward the end of the summer it is typically floating immediately on the water's surface.

Management and control of the weed - Coontail is not technically a rooted aquatic plant, which allows it to more easily distribute itself throughout a waterbody. In addition, unlike most other aquatic plants, coontail can attain nuisance densities in very turbid conditions. In contrast to most aquatic plants, coontail can easily adapt to varying water levels and turbidity. The impact of **winter drawdowns** on coontail tends to be variable; coontail densities have been documented to both decline and increase after a winter drawdown. Although not as well documented as other aquatic plant species, coontail can be controlled through the grazing of **sterile grass carp**. Since coontail is not a rooted aquatic plant and reproduces primarily through fragmentation, **mechanical weed harvesting** only moderately controls excessive densities of this plant. Some of the NJDEP-certified **aquatic herbicides** well documented to control coontail include Reward and Sonar.

Fanwort

(Cabomba caroliniana)

Description - Fanwort is a submersed aquatic plant that has distinctive fan-shaped leaves, arranged in pairs on the stem. Most of the leaves are opposite or whorled and on short or long stalks which are in pairs at each joint. The flowers are six-parted and white or lavender and float on the surface, however, the plant tends to reproduce through fragmentation. In addition, a few leaves reach the surface and are small and narrow.

Benefits and Problems - Fanwort is not native to the Northeast and was initially identified in New England. It provides little value in terms of habitat or food for local wildlife. The plant is also very aggressive in growth and has been documented to out-compete native and more beneficial aquatic plants. Fanwort has been known to completely dominant an aquatic macrophyte community, creating one large "monoculture" of fanwort. Such conditions can have seriously negative impacts on the ecological and recreational aspect of a waterbody.

Management and control of the weed - The aggressive nature of fanwort indicates that this plant has the potential of attaining nuisance conditions in a waterbody. Thus, if the plant is identified, its rate of expansion must be closely monitored. In some instances, a stand of fanwort has been known to remain fairly stable over time, showing no evidence of expansion. In such cases, the stand should be monitored to identify signs of expansion if or when it occurs. In contrast, if a pond or lake is already infested with fanwort, or if expansion of a resident population is evident, a number of management techniques are available. **Winter drawdowns** have been used to control fanwort, however, a very dry, cold winter is required to achieve a measurable amount of control. **Sterile grass carp** are known to eat fanwort, but no information is currently available on the relative grazing efficiency of these fish on fanwort. Unless most of the area of a lake or pond is infested with fanwort, **mechanical weed harvesting** should not be used to control this plant; its primary mode of reproduction is fragmentation. Any piece of fanwort not removed from a waterbody by the harvester could colonize areas not infested with the plant. Most NJ DEP certified **herbicides** do <u>not</u> control fanwort, which is another reason why this plant can be a particularly problematic species. In fact, the only herbicide well documented to effectively control fanwort is the systemic herbicide Sonar.

Bladderwort

(*Utricularia vulgaris* and *spp.*)

Description - Although it is possible that a number of different species of bladderwort are found in Sussex County, current data suggest that the dominant species is *Utricularia vulgaris*. The stems of bladderwort grow horizontally over the sediments but are not rooted. Leaves are tiny and finely forked on flexible stems. The most distinguishing characteristic of bladderwort are the small roundish bladders. When in bloom, bladderwort flowers emerge out of the water and are yellow, purple or white

Benefits and Problems - Bladderwort is typically found in relatively shallow waters, over sediments with large amounts of decaying vegetation. The plant is also frequently found floating in the water column. Bladderwort tends to proliferate in acidic or soft-water habitats, however, it does occur in alkaline waters. The bladders are used to trap small aquatic insects and crustaceans for sources of nitrogen. Bladderwort can attain nuisance densities, however, this usually occurs only in acidic waters. Bladderwort is not used by waterfowl but does serve as a source of food and cover for many fish.

Management and control of the plant - Bladderwort tends to be a nuisance in acidic waters, since it is one of the few aquatic plants that can tolerate such conditions. Thus, while bladderwort is present in many lakes and ponds in Sussex County, it does not tend to be the dominant nuisance species. In contrast, bladderwort is frequently a dominant nuisance plant in southern New Jersey waterbodies. Bladderwort densities decline with **winter drawdowns**. In contrast, **sterile grass carp** are only marginally effective in controlling bladderwort. **Mechanical weed harvesting** can be used to reduce nuisance levels of bladderwort. However, since bladderwort is not a rooted plant, harvesting focuses more on collecting plant material from the water column than actually cutting the plant. Thus, since bladderwort reproduces primarily through fragmentation and is easily distributed throughout a waterbody, the effectiveness of weed harvesting is marginal for this plant. Certain **aquatic herbicides**, such as Reward, Rodeo and Sonar, are effective in reducing nuisance levels of bladderwort, however, should be noted that the herbicide Aqua-Kleen does not control this plant.

Naiads

(*Najas spp.*)

Description -Naiads are a group of submersed plants that are found in fresh inland waters, as well as coastal brackish waters. There are about six species currently found within the United States and the only way they can be told apart is by using a hand lens or microscope. The more common species expected to be found in Sussex County include *Najas minor* and *N. flexilis*. In general, most naiads have slender stems that are highly branched and purplish green in color. The leaves are usually deep green in color, very narrow and pointed. Several species, such as *Najas minor*, have marginal teeth along the outer edge of the leaves. In addition, *N. minor* is typically brittle to the touch, so its sometimes called brittle naiad.

Benefits and Problems - As with many submersed plants, naiads can attain nuisance densities in ponds and the littoral zone of lakes. The wildlife or fishery value of the naiads depends upon the species. For example, *N. flexilis* is an excellent source of food for waterfowl and food and cover for fish, while *N. minor* is not a substantial source of food for waterfowl.

Management and control of the plant - The response of naiads to **winter drawdowns** depends upon the identified species. *N. flexilis*, a species identified within Sussex County, has been well documented to increase in response to winter drawdowns, while *N. guadalupensis*, a southern species of naiad, decreases in response to winter drawdowns. Thus, it is critical that the species of naiad be properly identified down to the species level before a winter drawdown is conducted. Most species of naiad are documented to be effectively controlled through the grazing of **sterile grass carp**. Since naiad are submersed and rooted plants, they can be effectively controlled with **mechanical weed harvesting**, however, since they are frequently distributed through fragmentation, care must be taken in the design and implementation of any harvesting program. A number of **aquatic herbicides** are known to control nuisance densities of naiads. Some of these herbicides include Reward, Aqua-Kleen and Sonar.

Broad-leaf Pondweed

(*Potamogeton amplifolius*)

Description - Another species of pondweed commonly found throughout Sussex County and northern New Jersey. The plant has alternating leaves. The submersed leaves are wide and wavy and have a tendency to curl. Broad-leaf pondweed commonly has floating leaves that are flat and not wavy along the edge. The stem of this plant is typically thicker than other species of pondweed.

Benefits and Problems - Broad-leaf pondweed is commonly found in hard water throughout the northern half of the US and the plant often appears brown due to deposits of calcium carbonate. The seeds of broad-leaf pondweed are known to a fair source of food for waterfowl. The plant itself serves as a direct source of food for fish and aquatic invertebrates that are used by fish as food. This plant can obtain nuisance densities in northern New Jersey.

Management and control of the plant - As a result of the geology within Sussex County, many of the lakes in this region of New Jersey have moderately hard and alkaline water. Such conditions are preferred by broad-leaf pondweed, which has resulted in it attaining nuisance conditions in many ponds and lakes in Sussex County. **Winter drawdowns** have been reported to result in both increases and decreases in broad-leaf pondweed densities. Therefore, winter drawdowns need to be closely compared to other management techniques for the control of broad-leaf pondweed. The very "leafy" and "fleshy" texture of this plant makes it very susceptible to grazing by **sterile grass carp**. Since broad-leaf pondweed is a rooted, submersed macrophyte, it can be effectively control by **mechanical weed harvesting**. However, as with most other aquatic plants, broad-leaf pondweed can easily be distributed to uncolonized sites through fragmentation, so a harvesting program needs to consider and include the active gathering of cut weeds in order to minimize the distribution of fragments. This is especially the case where only a portion of the littoral zone is plagued with nuisance densities of broad-leaf pondweed. This species of pondweed can be controlled through a number of **aquatic herbicides**, however, 2,4-D is not effective in controlling broad-leaf pondweed.

Curly-leafed Pondweed

(*Potamogeton crispus*)

Description - This submersed rooted aquatic plant has alternating arranged leaves. The main stem is often red-brown in color and the leaves are long and flattened, usually having "ruffled", crispy or wavy edges. This species of pondweed is one of the few that thrives in brackish waters. Although the plant is described as a perennial, it only tends to attain nuisance densities during the late spring - early summer season. Densities substantially decline by mid- to late summer.

Benefits and Problems - Curly-leafed pondweed was introduced to the United Stated from Europe in the 1800's and now has world-wide distribution. While it is an exotic species, the plant and seeds of curly-leafed pondweed are eaten by a variety of waterfowl, marsh birds and shorebirds. The plant is frequently the first nuisance plant of the growing season in many Sussex County lakes and ponds, since it tends to attain maximum densities in the late spring - early summer season.

Management and control of the weed - Since curly-leafed pondweed only tends to be a nuisance during the late spring - early summer season, the management and control of this plant should primarily focus on this portion of the growing season. In fact, depending upon the specific seasonal recreational uses of a given waterbody, one management option may be to allow the plant to grow and die off naturally. The effects of **winter drawdowns** on curly-leaved pondweed are not well established, however, a few studies have documented declines of the plant subsequent to a winter drawdown. **Sterile grass carp** have been well documented to reduce curly-leafed pondweed densities through grazing. One of the most effective ways of controlling excessive densities of curly-leaved pondweed is through **mechanical weed harvesting.** Curly-leaved pondweed only tends to be a nuisance during the first half of the growing season, so harvesting is typically not required through the summer season, when many lakes receive their heaviest amount of recreational use.

Curly-leafed Pondweed (continued)

Curly-leaved pondweed is highly susceptible to a number of **aquatic herbicides** including Reward and Sonar, however, the preference of this species of pondweed for alkaline waters can reduce the effectiveness of such chemical treatments. High levels of photosynthesis in alkaline lakes can produce a layer or crust of calcium carbonate over the plant tissue. This crust reduces the degree of contact between the plant and the herbicide which, in turn, reduces its effectiveness. Therefore, timing of the early season application is critical for the control of curly-leaved pondweed in moderately to high alkaline waterbodies. If the herbicide treatment is conducted too late, when the plants have the crust of calcium carbonate, the effectiveness of the treatment will be reduced. In contrast, conducting the treatment too early could reduce its impact on the curly-leaved pondweed since water temperatures may not be high enough to attain maximum herbicide effectiveness. The terms "late" and "early" are functions of site specific and local climatic conditions. Finally, it should be emphasized that these potential problems with treatment effectiveness are with **contact herbicides** such as Reward and Rodeo. **Systemic herbicides**, such as Sonar, enter the plant through the roots and kills the plant internally. Thus, a coating of calcium carbonate over the a plant will not reduce the effectiveness of a systemic herbicide the way it will for a contact herbicide.

Long-leaf or American Pondweed

(*Potamogeton nodosus*)

Description - This aquatic plant is a perennial and has both floating and submersed leaves. The stems of long-leaf pondweed can reach up to 7 feet long and the leaves are alternately arranged on the stem. The floating leaves are larger, more oval and have a waxy coating on the surface, while the submersed leaves tend to be more elongate or lance-like with no waxy coating. In contrast to many other pondweeds, this species generally has sparse leafing along the stem.

Benefits and Problems - Long-leaf pondweed tends to be found in rivers and streams, however, it has been identified in standing waters as well. The plant also has a tendency to reside in deeper waters (> 8 ft), relative to other species of pondweed. Thus, long-leaf pondweed is not typically a common nuisance species in Sussex County. The seeds of long-leaf pondweed are a good source of food for waterfowl and plant itself provides food and cover for many fish species.

Management and control of the plant - The overall growth habitats and distribution of long-leaf pondweed limits, but does not prevent, this plant from being a nuisance in Sussex County. Currently, there is insufficient data to identify if long-leaf pondweed is effectively controlled by **winter drawdown**. In contrast, **sterile grass carp** are known to control this aquatic plant through grazing. Another means of control is **mechanical weed harvesting**, however, care must be taken to minimize the re-distribution of this plant by collecting and removing all cut plants from the waterbody being harvested. Nuisance densities of long-leaf pondweed can be controlled by a number of **aquatic herbicides** including Rodeo, Reward and Sonar. It should be emphasized that since this plant prefers deeper waters, it may only be a minor nuisance to lake users in terms of recreational activities (i.e. boating, swimming), so control of this plant may not be warranted in most cases.

Redhead-grass Pondweed

(*Potamogeton perfoliatus*)

Description - This species of pondweed is a perennial with a short, slender and many-branched stem. The leaves alternate along the stem and are relatively small, varying in shape from round to ovate. An additional feature of this plant is the clasping bases of the leaves.

Benefits and Problems - Redhead-grass pondweed is found in calcareous (hard) and even brackish waters. This species of pondweed is typically found in waterbodies with neutral to alkaline pH. Although its usually found along the Atlantic and gulf coasts, it has been documented to attain nuisance densities in waterbodies in northern New Jersey.

Management and control of the plant - Since the distribution of redhead-grass pondweed is limited to waters with pH values greater than 7.0, it can be a nuisance species in many of the alkaline waterbodies located in Sussex County. Very little is known on how redhead-grass pondweed responses to **winter drawdown**, so any such activity to control this aquatic plant should be closely monitored for objective documentation. Like almost all other species of pondweed, redhead-grass pondweed is highly susceptible to grazing by **sterile grass carp**. Since this plant is a rooted, submersed plant, **mechanical weed harvesting** can be used to reduce nuisance densities, however, caution should be used in such an undertaking to prevent, or at least minimize, the distribution of the plant through fragmentation. Redhead-grass pondweed can be controlled with many of the standard **aquatic herbicides** certified by both US EPA and NJ DEP. These herbicides include the contact herbicide Reward and the systemic herbicide Sonar.

Waterthread or Snailseed Pondweed

(*Potamogeton diversifolius*)

Description - Waterthread pondweed has both floating and submersed leaves, however, in comparison to long-leaf pondweed, the floating leaves of waterthread are smaller in length and width. Submersed leaves are very thin and can be up to 2 inches in length. One notable structure is a leaf base making a sheath around the stem. These structures usually have several ball-like seed heads with the seeds resembling tiny, flat snails.

Benefits and Problems - Waterthread is commonly found in lakes, ponds and slow moving streams and prefers relatively shallow waters. Its preference for shallow water habitat means it can be a nuisance aquatic plant. The seeds of this plant is a fair source of food for waterfowl.

Management and control of the plant - Waterthread pondweed can, in certain waterbodies, attain nuisance densities, especially in shallow, slow-moving habitats. Based on the currently available information, **winter drawdowns** are <u>not</u> effective in controlling waterthread; this plant is known to increase in density after a winter drawdown. In contrast, **sterile grass carp** are effective in reducing densities of waterthread. As with almost all species of *Potamogeton*, **mechanical weed harvesting** can be an effective way of reducing nuisance densities of waterthread, however, such an activity needs to be properly planned to prevent, or at least minimize, the unwarranted distribution of plant fragments to uninfested portions of the managed waterbody. Most of the Federal and State approved **aquatic herbicides** are effective in reducing nuisance densities of waterthread except for 2,4-D. Some of the aquatic herbicides well known to effectively control waterthread include the contact herbicides Rodeo, Reward and the systemic herbicide Sonar.

Stoneworts

(*Chara spp.* and *Nitella spp.*)

Description - These two genera are actually algae, members of the green algal group Chlorophyta, and not aquatic plants. However, their plant-like appearance and potential to create nuisance conditions warrants their consideration in this guide. Stoneworts are submersed and rooted. Whorled branches are distributed at regular intervals along a main thallus or "stem". Small red or orange fruiting bodies may be present on the whorled branches. The algae vary from gray-green to near black in color and have a strong and musky odor.

Benefits and Problems - Stoneworts are usually found in shallow, slow moving streams or lakes. *Chara spp.* prefer more alkaline waters, while *Nitella spp.* prefer neutral to acidic waters. Under certain circumstances, stoneworts can attain nuisance conditions. *Chara spp.* can have a coating of lime, while *Nitella spp* do not. Stoneworts are a good source of food for waterfowl.

Management and control of the plant - Since most of the lakes and ponds in this portion of New Jersey are alkaline, *Chara spp.* tends to be the more frequently identified stonewort in Sussex County. Stoneworts have variable responses, both increasing and decreasing in abundance, in response to **winter drawdown**. Stoneworts are the few algae that **sterile grass carp** will regularly feed on and control. Under certain conditions **mechanical weed harvesting** can be used to control nuisance densities of stoneworts, however, a more precise determination can only be made on a site by site basis. Since stoneworts tend to reside in relatively shallow waters, grow relatively close to the sediments, and are easily distributed to uninfested parts of a waterbody through fragmentation, mechanical weed harvesting tends to produce marginal results in controlling stoneworts. Stoneworts are algae and <u>not</u> aquatic plants, so **aquatic herbicides** are generally <u>not</u> effective in controlling stoneworts. Instead, any chemical treatments considered for stoneworts should focus on **algicides**. Almost all algicides are copper-based products; copper inhibits algal photosynthesis and alters nitrogen metabolism. Copper sulfate and chelated forms of copper sulfate, such as Cutrine-Plus, are some of the more common algicides used to control stoneworts. Granular algicides are generally preferred over liquid forms, since stoneworts grow immediately on the sediments.

Tape Grass

(Vallisneria americana)

Description - Tape grass is a submersed perennial with ribbon-like, round-tipped leaves that can be up to 2 yards in total length. Occasionally, the upper portions of the paper thin leaves float on the surface in shallow waters. By the late summer the female flowers reach the water's surface from a long, thin stalk. Once the flower is fertilized, the stalks become coiled and retract the fruit beneath the surface. In spite of producing seeds in the late summer, the primary mode of reproduction for tape grass are fibrous rootstocks that creep through, and are firmly attached to, the sediments.

Benefits and Problems - Tape grass is found in lakes and slow moving streams in shallow water, typically no more than 10 feet deep. Thus, tape grass has the potential to be a nuisance aquatic plant. Tape grass is an important source of food for ducks and other waterfowl. This plant is also used by fish for cover and food. Thus, tape grass is one of the most important native aquatic plants in Sussex County, with regard to general environmental value.

Management and control of the plant - Since tape grass has a high environmental value, control programs for this plant should only be implemented when absolutely necessary. Tape grass densities have been documented to increase with the implementation of **winter drawdown**, so this management technique is <u>not</u> recommended for this plant. **Sterile grass carp** can control nuisance densities of tap grass though grazing. While **mechanical weed harvesting** can be used to reduce nuisance densities of tape grass, this plant has been documented to increase in abundance after the implementation of harvesting. Mechanical harvesting removes only the a portion of the plant above the sediments, leaving plant biomass on or in the sediment in tact. Thus, the fibrous rootstocks may provide a competitive advantage to tape grass, relative to other aquatic plants, for mechanical weed harvesting. **Aquatic herbicides** provide only limited control of tape grass. For most aquatic herbicides, results are highly dependent upon chemical formulation and specific environmental conditions. However, in general, herbicides are <u>not</u> recommended for the control of tape grass.

White Waterlily

(*Nymphaea odorata*)

Description - White waterlily is another floating leaved plant commonly found in Sussex County. The leaves of mature white waterlilies are usually firm, round and floating on the surface. The flowers are white or rarely pink. The leaf and flower stocks grow out of a stout, creeping rootstock that lies on or in the sediments. Mature leaves of white waterlily are generally smaller than those of yellow waterlily.

Benefits and Problems - Although white waterlily has a high degree of aesthetic appeal, it can attain nuisance densities in shallow ponds, lakes and wetlands. Waterfowl eat the seeds and rootstocks of white waterlily, while beaver, muskrat and porcupine each the foliage. Fish use white waterlilies for cover, however, if plant densities become too dense they can negatively impact resident fish populations. Many aquatic invertebrates deposit their eggs underneath the white waterlily leaves.

Management and control of the plant - Although white waterlily is an aesthetically appealing plant and has a relatively high wildlife value, it can attain nuisance densities. There is very little information available on how white waterlily responses to **winter drawdowns**, however, increases, decreases and no measurable changes in white waterlily densities have been documented during **summer drawdowns**. Based on this information, it is more than likely that such variable results would occur during winter drawdowns. **Sterile grass carp** have been known to graze on white waterlily, however, they tend not to feed regularly on this floating leaved plant. Thus, sterile grass carp are <u>not</u> recommended as a means of reducing densities of white watelily. If properly designed and implemented, **mechanical weed harvesting** can be effective in controlling nuisance densities of white waterlily. Under certain situations, **hydroraking** can be even more effective in reducing white waterlily biomass (see yellow waterlily for details). Similar to yellow waterlily, the most effective **aquatic herbicides** for the control of white waterlily are Rodeo and Sonar.

Yellow Waterlily or Spatterdock

(*Nuphar luteum*)

Description - Yellow waterlily is one of the most easily identified aquatic plants. It is a floating-leaved plant with oval to heart shaped leaves. The plant has large flowers that are yellow to reddish in color. The stems arise from a fibrous, creeping rootstock found either on or immediately in the sediments.

Benefits and Problems - Yellow waterlily can attain nuisance densities in sluggish streams, wetlands, ponds and the littoral zone of lakes. Overall, yellow waterlily has little wildlife food value. A few ducks eat the seeds and beaver and porcupine sometimes eat the plants. Yellow waterlily does provide cover and, sometimes food, for fish. In spite of the relatively low value as food, yellow waterlilies have a high aesthetic appeal.

Management and control of the plant - In spite of the overall aesthetic appeal of yellow waterlilies, these plants can attained nuisance densities in shallow, slow moving, aquatic ecosystems. Yellow waterlily usually decreases in response to a **winter drawdown**, however, increases or no change in yellow waterlily densities have occasionally been reported in response to this management technique. **Sterile grass carp** are <u>not</u> recommended as a means of reducing densities of yellow waterlily, since the fish do not find this plant very palatable. Depending upon on-site conditions such as average water depth, size of waterbody and location of launch/disposal sites, **mechanical weed harvesting** can be an effective means of reducing nuisance densities of yellow waterlily. An potentially effective alternative to mechanical weed harvesting is **hydroraking**. Essentially, a hydrorake is a rototiller-like structure on a floating barge that removes both the above sediment, and a substantial portion of the below sediment, plant biomass. This is in contrast to conventional harvesting where only a portion of the above-sediment plant biomass is harvested. The advantages to hydroraking are that it removes more of the plant biomass and can potentially control nuisance densities for a longer period of time (1-3 years). In addition, hydroraking can be done in shallower waters (i.e. closer to the shoreline and near docks) relative to conventional harvesting. The disadvantages of hydroraking are the amount of acres it covers per hour is typically lower than conventional harvesting and it is more expensive than conventional harvesting. The **aquatic herbicides** Rodeo and Sonar are known to effectively control yellow waterlily.

Purple Loosestrife

(*Lythrum salicaria*)

Description - This perennial plant is more of a wetland species than a true aquatic, as it grows in the moist soils of wetlands, lake shorelines, streambanks and sometimes shallow waters. However, due to the potential future impact of purple loosestrife on aquatic ecosystems in Sussex County, this exotic species has been included in the guide. This plant is easily recognized; it blooms from July through August and has a series of attractive purple flowers toward the top that are closely attached to the stem with 5-6 petals per flower cluster. Purple loosestrife can attain heights of 2 to 7 feet, have opposite leaf arrangements and stiff, smooth to hairy, four-sided stems.

Benefits and Problems - Purple loosestrife is an exotic perennial herb, introduced from Europe in the 1800's. It is currently in the process of colonizing lake shores, stream and river banks, and wetlands throughout the northeastern United States. Although it is attractive, purple loosestrife usually out-competes native vegetation for space and resources, forming large monocultures. Thus, this plant has a highly negative impact on native wildlife.

Management and control of the plant - Since purple loosestrife is more of a wetland plant than a true aquatic, many of the management techniques described for the other plants will not be effective in controlling purple loosestrife. **Sterile grass carp** and **mechanical harvesting** are <u>not</u> effective in controlling purple loosestrife. **Winter drawdowns** are known to actually promote the growth of this plant, especially during mild winters. Thus, winter drawdowns are <u>not</u> recommended for the control of this plant.

Purple Loosestrife (continued)

Since purple loosestrife is a wetland plant and not truly aquatic, most aquatic herbicides will provide a significant degree of control. Of the **aquatic herbicides** that are currently available, only Rodeo is effective in controlling purple loosestrife. Although Rodeo can be sprayed onto the plants, the most effective method of treatment is to directly apply the herbicide onto each standing plant.

No herbivores or pathogens native to North America are known to control purple loosestrife. However, there are a number of insects native to Europe that are well documented to control this plant. These insects include a root-mining weevil and a leaf-eating beetle. Test cases of both insects have been conducted throughout the United States with promising results. Thus, this **biological management techniques** may be available for commercial use within the next few years.

Purple loosestrife is an extremely aggressive exotic species. Therefore, the most effective way of controlling this plant is to prevent it from establishing itself along a given waterway. If purple loosestrife is identified at a site, the earlier it is removed and/or eradicated, the better the chance of preventing the plant from establishment. The following recommendations are made to prevent the further spread of purple loosestrife:

1. Don't plant purple loosestrife. In spite of its attractive appearance, it has a devastating impact on local wildlife and ecosystem. Even varieties of the genus *Lythrum* should be avoided.

2. Closely monitor the shoreline of your lake or pond for pioneering plants or isolated small colonies of purple loosestrife. Such pioneer or isolated plants should be immediately removed by hand.

3. Any equipment, gear, clothing and footwear that was used in infested areas should be rinsed off prior to moving into uninfested areas due to seed dispersal.

4. If purple loosestrife is already established, but is still in an isolated colony, the flower heads should be cut off, bagged and destroyed. This process should be repeated through the plant's growing season (late June through September). This will prevent the millions of seeds from ripening and spreading.

Photographic Citations

The photographs of the aquatic weeds used in this guide were obtained from a variety of sources. A number of the photographs were taken by Princeton Hydro, LLC at various lakes located in Sussex County, New Jersey. The remaining photographs were obtained from the University of California - Daivs, Agronomy Department's web site, the University of Florida Educational web site on aquatic weeds, and a few of the photographs were obtained from the USDA's Aquatic Plant web site.

Literature used in the development of the guide

The taxonomic, ecological and management information included in the guide were obtained from a number of sources which are formally cited:

Cooke, G.D., E.B. Welch. S.A. Peterson and P.R. Newroth. 1993. Restoration and Management of Lakes and Reservoirs, 2nd Edition. CRC Lewis Publishers. Boca Raton, FL.

Elf Atochem. Submersed Aquatic Weeds and Algae Guide. Elf Atochem North America, Inc. Philadelphia, PA.

Hotchkiss, N. 1972. Comm Marsh, Underwater & Floating-leaved Plants of the United State and Canada. Dover Publications, Inc. New York.

New York State Department of Environmental Conservation and the Federation of Lake Associations, Inc. 1990. Diet for a Small Lake: A New Yorker's Guide to Lake Management. New York State Department of Environmental Conservation. Albany, New York.

Rutgers - The State University, Extension Service, College of Agriculture. 1965. Aquatic Vegetation of New Jersey. Extension Bulletin 382. New Brunswick, New Jersey.

US EPA. 1990. The Lake and Reservoir Restoration Guidance Manual 2nd Edition. EPA 440/4-90-006. US EPA. Washington, D.C.

Additional source of information on the ecology and management of aquatic plants

There are a number of organizations that can provide the lake user with a wealth of relevant information on the ecology and management of aquatic plants. Some of these organizations are cited:

The New Jersey Coalition of New Jersey Lake Associations, Inc.
Lake Mohawk Country Club
21 The Boardwalk
Sparta, New Jersey 07871
(973)729-6156

North American Lake Management Society
P.O. Box 5443
Madison, WI 53705-5443
(608) 233-2836
nalms@nalms.org

Sussex County Conservation District
186 Halsey Road
Suite 2
Newton, New Jersey 07860
(973) 579-5074

United States Environmental Protection Agency
Water Resources Center (RC4100)
401 M Street SW
Washington, D.C. 20460
(202) 260-7786
WATERPUBS@EPAMAIL.EPA.GOV

New Jersey Department of Environmental Protection
Bureau of Freshwater and Biological Monitoring
35 Arctic Parkway
P.O. Box 427
Trenton, New Jersey 08625-1095
(609) 292-0427

Pennsylvania Department of Agriculture
Bureau of Plant Industry
2301 N. Cameron St.
Harrisburg, PA 17110
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Wallingford, CT 06492
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