PINE RIVER POND

Aquatic Plant Management Report

October 2024

PREPARED FOR:

Pine River Pond Association

PREPARED BY:

SŌLitude Lake Management

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1.0 INTRODUCTION

For the 2024 season, SŌLitude Lake Management was contracted by the Pine River Pond Association to conduct a macrophyte survey of Pine River Pond, located in East Wakefield, NH. The primary objective of the survey was to assess and document the growth and potential spread of native whorled watermilfoil (*Myriophyllum verticillatum*), first identified in the pond in 2014. This survey aimed to monitor changes in the population and distribution of this species, as well as to evaluate the overall composition and abundance of other macrophytes within the littoral zone.

During the survey, all macrophyte species present were identified and mapped, with particular attention given to areas where milfoil growth was detected. Approximate locations of observed species were recorded, and detailed distribution maps were created to illustrate species occurrence and density throughout the littoral zone.

This report provides a detailed analysis of macrophyte growth in Pine River Pond, including species composition, spatial distribution, and any significant changes compared to previous surveys. The remainder of this text reports on the results of the 2024 survey.

Key Survey Findings

- Native milfoil documented at trace to moderate density in three localized areas.
- 24 species, including filamentous algae, were observed.
- Five new species observed.
- Filamentous algae recorded for the first time.

1.1 Lake Description

Pine River Pond is a 570-acre lake located in East Wakefield, NH, with an average depth of 15 feet and a maximum depth of 55 feet, according to New Hampshire Fish and Game. The lake's shoreline is moderately developed, featuring both seasonal and year-round residences, which may influence nutrient loading and aquatic plant growth through runoff and other anthropogenic inputs. The lake receives inflow from tributaries, surface water runoff, and groundwater, while its primary outflow is through the Pine River, eventually feeding into Ossipee Lake. The Arthur H. Fox Memorial Dam, constructed in 1977, regulates the water level, augmenting the lake system and contributing to the stability of the aquatic environment.

Pine River Pond is located within a relatively small 8,200-acre watershed, primarily consisting of undeveloped, forested hillsides, which helps maintain its mesotrophic state by limiting nutrient input from human activity. The limited development within the watershed likely contributes to lower nutrient levels, controlling algal blooms and excessive aquatic plant growth, both of which are critical factors in lake management.

The lake supports a diverse range of aquatic habitats, particularly around its 15 islands and areas of macrophyte growth. These regions provide critical habitat for aquatic organisms, supporting fish populations, macroinvertebrates, and other wildlife. The substrate is predominantly

composed of rock and sand, with some limited areas of organic matter and muck, which influences the distribution of macrophytes. Macrophyte growth is concentrated in shallower areas with suitable substrates, where species can anchor and thrive, shaping the biological dynamics of the littoral zone. Understanding these ecological and limnological characteristics is essential for effective aquatic plant management, as nutrient availability, substrate composition, and water depth all play crucial roles in the distribution and density of plant communities.

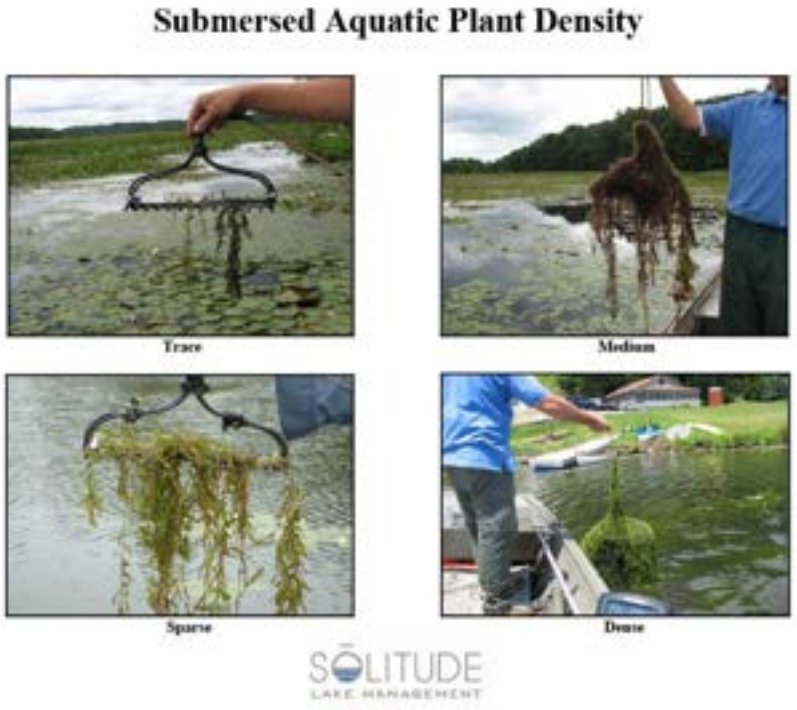
2.0 AQUATIC VEGETATION SURVEY

2.1 Methods

The macrophyte survey of Pine River Pond was conducted on July 23, 2024, spanning the morning and afternoon. Survey efforts focused on the littoral zone, defined on-site using a Lowrance depth and biovolume unit, which allowed for precise determination of the vegetated areas within the pond. A 14-foot boat was used for navigation throughout the survey.

Vegetation growth in terms of plant density was assessed visually where possible, with areas of submersed macrophyte growth further evaluated using a throw-rake to sample species not visible from the surface (Image 1). All macrophytes observed were identified to the most specific taxon possible, typically at the species level, using morphological characteristics and field guides. Each species was recorded along with its relative location, which was documented using a hand-held GPS unit to ensure accurate spatial representation in the final report.

Image 1. Plant Density Scale



This year's survey was conducted slightly later in the growing season compared to previous years due to contract and scheduling adjustments. However, the timing still captured peak macrophyte growth, allowing for a comprehensive assessment of the aquatic plant communities within Pine River Pond.

2.2 Survey Results

The macrophyte survey conducted on July 23, 2024, in Pine River Pond revealed a diverse aquatic plant community, with species densities ranging from trace to dense (Table 1). The survey documented significant variations in species presence, densities, and distribution across the pond, highlighting both the resilience of native plants and the spread of invasive species. The primary focus of the survey was on whorled watermilfoil, a species of special interest, as well as the continued monitoring of the invasive inflated bladderwort, which was documented for the second consecutive year (Table 2).

The results showed that whorled watermilfoil, a species of special interest, continues to maintain a significant presence in Pine River Pond (Table 1, Table 2). This plant was observed at trace to moderate densities, consistent with previous years. Whorled watermilfoil is a submersed, perennial macrophyte that can form dense mats under favorable conditions, often competing with other species for light and nutrients. Its reproduction through both seed production and fragmentation makes it a resilient species capable of rapid colonization. In Pine River Pond, whorled watermilfoil occupies areas within the littoral zone, where it competes with other plants for space and resources. While it contributes to habitat structure and provides shelter for aquatic invertebrates, dense growth can also impede recreational activities and reduce light penetration, potentially altering the aquatic ecosystem.

Among the native species, pipewort and bur-reed were found in varying densities, ranging from trace to dense in several areas. Flat-leaved bladderwort also showed significant density variation, with patches ranging from trace to dense growth. In contrast, large-leaf pondweed and watershield were observed in lower densities, with watershield being documented for the first time during this survey. Long-leaf pondweed, also new to the survey, exhibited trace to moderate densities.

Other species, such as robbin's pondweed, water-starwort, and ludwigia, showed more limited presence, with sparse to moderate densities observed. Notably, northern naiad was recorded for the first time and showed trace to moderate growth. A mix of bladderwort species was found at trace to moderate levels, with floating bladderwort observed for the first time this year. Slender naiad, present in trace to sparse amounts, remained consistent with previous surveys, while grassy pondweed and white waterlily were documented in trace to moderate and trace to sparse densities, respectively.

Several native pondweed species, including ribbon-leaf pondweed and thin-leaf pondweed, exhibited trace to moderate and trace to dense growth, respectively, while spike-rush was found in sparse to dense patches. Yellow waterlily maintained a sparse presence, and tapegrass appeared in small, consistent amounts, reflecting similar patterns from prior years.

In terms of invasive species, inflated bladderwort was detected at trace to sparse densities for the second year. This species poses a significant concern due to its potential to outcompete native vegetation and alter the lake's nutrient dynamics. The continued presence of inflated bladderwort highlights the need for careful management and monitoring to prevent further spread.

Several species that were observed in previous years were absent in 2024 (Table 2). Aquatic moss, which had been present from 2021 to 2023, was not found, along with arrowhead, which was previously recorded in 2021 and 2023. Floating pondweed was absent this year, despite being documented in previous surveys from 2021 to 2023. The survey also did not detect horned bladderwort, which had been recorded only in 2021, or humped bladderwort, which had been consistently present from 2021 to 2023. Macro algae, observed for the past three years, was also absent, along with several bladderwort species that were previously documented but not found this year, including purple bladderwort and mixed bladderwort species. The absence of these species may be indicative of shifting environmental conditions or competition from other species.

On a positive note, the survey documented several species for the first time, including ludwigia, long-leaf pondweed, northern naiad, water-starwort, and white waterlily, highlighting shifts in the aquatic plant community.

Inflated bladderwort, the only invasive species detected, continues to raise concern. Its presence at trace to sparse densities this year suggests that it is still establishing in the pond. Inflated bladderwort is known for its aggressive growth and ability to dominate shallow, nutrient-rich environments, making it a potential threat to native plant communities and overall lake health. The management of this invasive species will be crucial moving forward, as unchecked growth could lead to significant ecological changes.

The absence of certain species, such as floating pondweed, macro algae, and several bladderworts, could suggest that environmental factors, competition, or shifts in lake dynamics are influencing species distribution and abundance. On the other hand, the documentation of new species like ludwigia and northern naiad points to changes in the aquatic plant community that may be linked to water quality, nutrient availability, or other ecological factors.

In summary, the 2024 macrophyte survey of Pine River Pond revealed a stable but dynamic plant community, with both native and invasive species playing key roles. The presence of diverse native species suggests a relatively healthy ecosystem, while the spread of inflated bladderwort poses a potential threat to biodiversity. Continued monitoring and adaptive management strategies will be essential to maintaining the ecological balance of the lake.

Table 1. 2024 Pine River Pond Aquatic Plant Composition and Density
*Red indicates invasive species

Common Name	Scientific Name	Observed Plant Density
American Tapegrass	*Vallisneria americana*	Sparse
Bur-reed	*Sparganium spp.*	Trace to Dense
Common Bladderwort	*Utricularia vulgaris*	Trace to Sparse
Filamentous Algae	*Various species*	Not Quantified
Flat-leaved Bladderwort	*Utricularia intermedia*	Trace to Dense
Floating Bladderwort	*Utricularia radiata*	Trace to Sparse
Grassy Pondweed	*Potamogeton gramineus*	Trace to Moderate
Inflated Bladderwort	*Utricularia inflata*	Trace to Sparse
Large-leaf Pondweed	*Potamogeton amplifolius*	Trace to Moderate
Ludwigia	*Ludwigia spp.*	Sparse to Moderate
Long-leaf Pondweed	*Potamogeton nodosus*	Trace to Moderate
Northern Naiad	*Najas flexilis*	Trace to Moderate
Pipewort	*Eriocaulon aquaticum*	Trace to Dense
Ribbon-leaf Pondweed	*Potamogeton epihydrus*	Trace to Moderate
Robbin's Pondweed	*Potamogeton robbinsii*	Sparse
Slender Naiad	*Najas gracillima*	Trace to Sparse
Spike-rush	*Eleocharis spp.*	Sparse to Dense
Thin-leaf Pondweed	*Potamogeton pusillus*	Trace to Dense
Water-Starwort	*Callitriche spp.*	Sparse
Watershield	*Brasenia schreberi*	Trace to Sparse
Whorled Watermilfoil	*Myriophyllum verticillatum*	Trace to Moderate
White Waterlily	*Nymphaea odorata*	Trace to Sparse
Yellow Waterlily	*Nuphar variegata*	Sparse

Table 2. Four-Year Species Absence and Presence (2021-2024)
*Red indicates invasive species

Common Name	Year			
	2021	2022	2023	2024
Aquatic Moss	x	x	x	
Arrowhead	x		x	
Bur-reed	x	x	x	x
Common Bladderwort	x	x	x	x
Common Horsetail			x	
Filamentous Algae				x
Flat-leaved Bladderwort	x	x	x	x
Floating Bladderwort				x
Floating Pondweed	x	x	x	
Grassy or Variable-leaf Pondweed	x	x	x	x
Horned Bladderwort	x			
Humped Bladderwort	x	x	x	
Inflated Bladderwort			x	x

Common Name	Year			
	2021	2022	2023	2024
Large-leaf Pondweed or Big-leaf Pondweed	x	x	x	x
Ludwigia				x
Long-leaf Pondweed				x
Macro Algae	x	x	x	
Mixed Bladderwort	x			
Northern Naiad				x
Pipewort	x	x	x	x
Purple Bladderwort	x	x	x	
Ribbon-leaf Pondweed	x	x	x	x
Robbin's Pondweed		x	x	x
Slender Naiad	x	x	x	x
Snail-seed Pondweed	x			
Southern Naiad	x	x	x	
Spike-rush	x	x	x	x

Common Name	Year			
	2021	2022	2023	2024
Tapegrass	x		x	x
Thin-leaf or Small Pondweed	x	x	x	x
Water-Starwort	x			x
Watershield				x
Waterweed	x	x	x	
Whorled Watermilfoil	x	x	x	x
White Waterlily				x
Yellow Waterlily	x	x	x	x

3.0 2025 RECOMMENDATIONS

To ensure the long-term health and sustainability of Pine River Pond, SŌLitude Lake Management recommends that the Association and the community take a proactive and multifaceted approach to lake management, building upon previous efforts while addressing emerging issues.

A key recommendation is to advance the existing survey program by incorporating an annual comprehensive point-intercept survey. This method offers a detailed and systematic approach to documenting the distribution and abundance of aquatic plant species throughout the lake. The value of such a survey lies in its ability to detect both native and non-native species, track changes in plant communities over time, and provide critical data to inform management strategies. A comprehensive survey also allows for the precise mapping of plant densities and the identification of areas requiring attention. This information is vital for early detection and rapid response to potential infestations of invasive species. Furthermore, the survey can help monitor the effectiveness of management efforts, providing a scientific foundation for future decision-making.

Continuing and expanding the 'Weed Watcher' program, involving state-trained volunteers to monitor seasonal changes in aquatic vegetation, is also highly recommended. These additional sets of eyes on the lake can improve the early detection of problematic growth and allow for timely interventions. We encourage the Association to continue this initiative while ensuring that volunteers receive adequate training to recognize both native and invasive species.

Diver hand-pulling remains the most appropriate management technique for addressing nuisance and/or invasive species like inflated bladderwort. This method minimizes disturbance to surrounding vegetation, particularly in sensitive areas like the quaking bog, which supports high native biodiversity. Diver hand-pulling is precise, effective for small to moderate infestations, and avoids the need for chemical treatments that could harm non-target species. However, it is crucial to continue working closely with the NH Wetlands Bureau to ensure compliance with state permitting requirements for this activity. At this time, herbicide treatment is not recommended for any species.

In terms of filamentous algae, its widespread presence throughout Pine River Pond is a clear signal of nutrient enrichment, particularly from phosphorus inputs. This issue requires immediate action to prevent further ecological degradation. Filamentous algae can outcompete beneficial submerged vegetation, reducing water clarity and overall lake health. To address this without resorting to chemical interventions like algaecides or phosphorus-removing agents, the Association should focus on long-term strategies aimed at reducing nutrient loading into the lake:

1. **Nutrient Management**: Implement best management practices (BMPs) to control nutrient runoff. This includes maintaining vegetative buffer strips along the shoreline, reducing the use of fertilizers, and ensuring that lawns and landscaping near the lake prioritize native, low-maintenance plants that require minimal fertilizer and irrigation.

2. **Septic System Improvements**: Encourage lake residents to regularly inspect and maintain their septic systems. Failing or outdated systems are a significant source of phosphorus and other nutrients that contribute to algal growth. Where possible, homeowners should consider upgrading to modern, environmentally friendly systems designed to minimize nutrient discharge.
3. **Stormwater Management**: Installing stormwater controls, such as rain gardens, permeable paving, and infiltration trenches, can help capture and filter stormwater before it reaches the lake. This is particularly important in areas with increased development, where impermeable surfaces lead to higher volumes of nutrient-laden runoff.

By adopting these nutrient management strategies, the Association can effectively mitigate the growth of filamentous algae while promoting long-term ecological stability in Pine River Pond.

In summary, the Association's continued efforts to monitor and manage aquatic vegetation, coupled with enhanced nutrient management practices, will help protect the lake's water quality and biodiversity. An advanced, science-based approach—centered on thorough surveys, early detection, and sustainable management—will ensure Pine River Pond remains a healthy ecosystem for future generations.

SŌLitude Lake Management thanks the Pine River Pond Association for their continued partnership and looks forward to collaborating in the 2025 season.

APPENDIX

- 2024 Survey Maps
  - Figure 1. Vegetation Overview
  - Figure 2. Whorled Watermilfoil
  - Figure 3. Inflated Bladderwort
  - Figure 4. All Bladderwort Species
  - Figure 5. Pondweeds
  - Figure 6. Floating Species
  - Figure 7. Submersed Species
  - Figure 8. Emergent Species
  - Figure 9. Algae

- Pine River Pond 2024 Vegetation Index

Figure 1. 2024 Vegetation Overview

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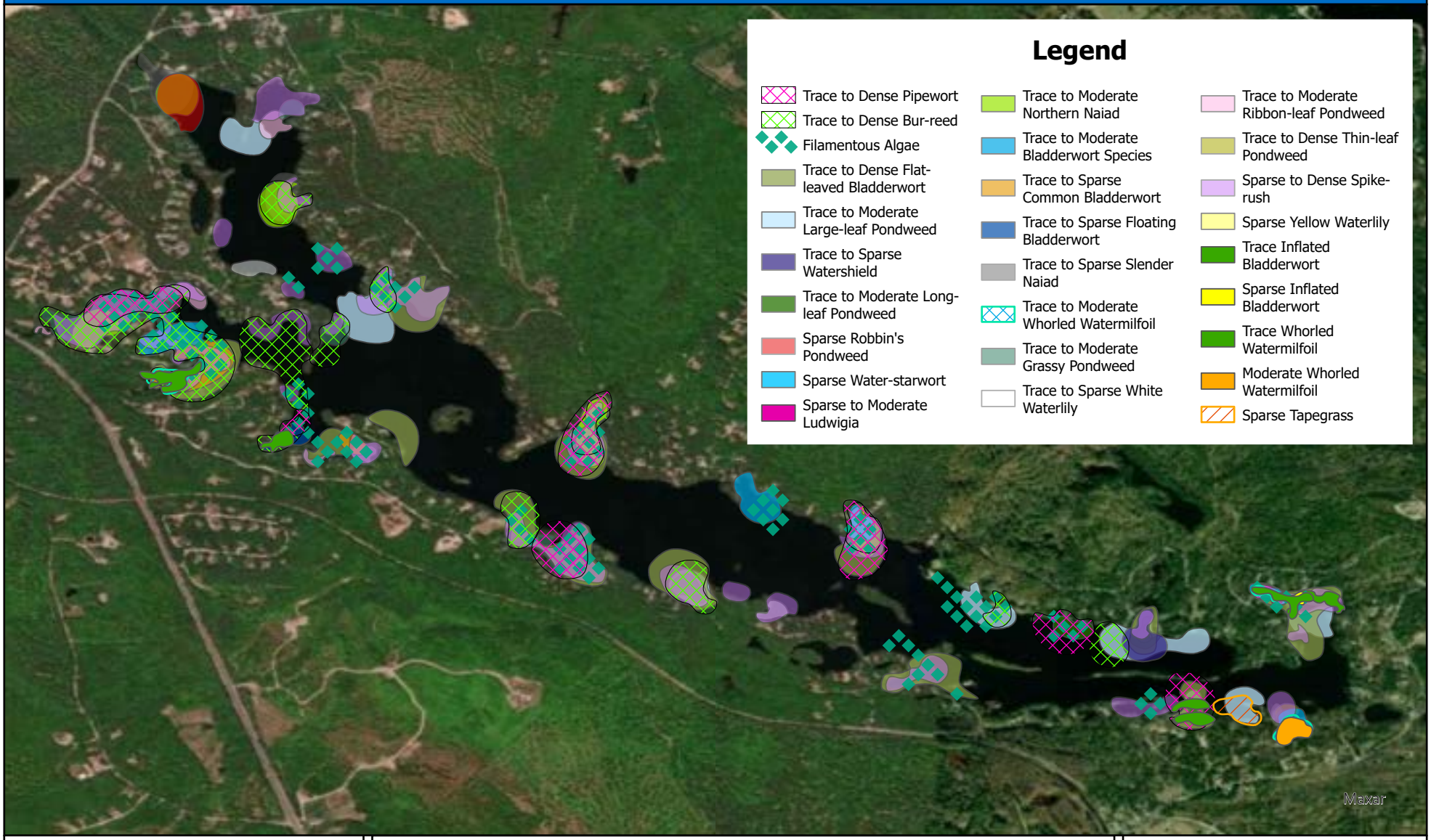

Pine River Pond
East Wakefield, New Hampshire

Center: 71°1'21"W 43°37'54"N
Scale: 1:25,846

N

PINE RIVER POND

0 0.25 0.5 1 Miles

Survey Date: July 23, 2024
Map Date: October 21, 2024

Prepared by: E. Vulgamore

Office: Shrewsbury, MA

Figure 2. 2024 Whorled Watermilfoil (*Myriophyllum verticillatum*) Distribution and Density

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Pine River Pond
East Wakefield, New Hampshire

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Figure 3. 2024 Inflated Bladderwort (*Utricularia inflata*) Distribution and Density

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Pine River Pond
East Wakefield, New Hampshire

Center: 71°1'21"W 43°37'54"N
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Figure 4. 2024 All Bladderwort Species

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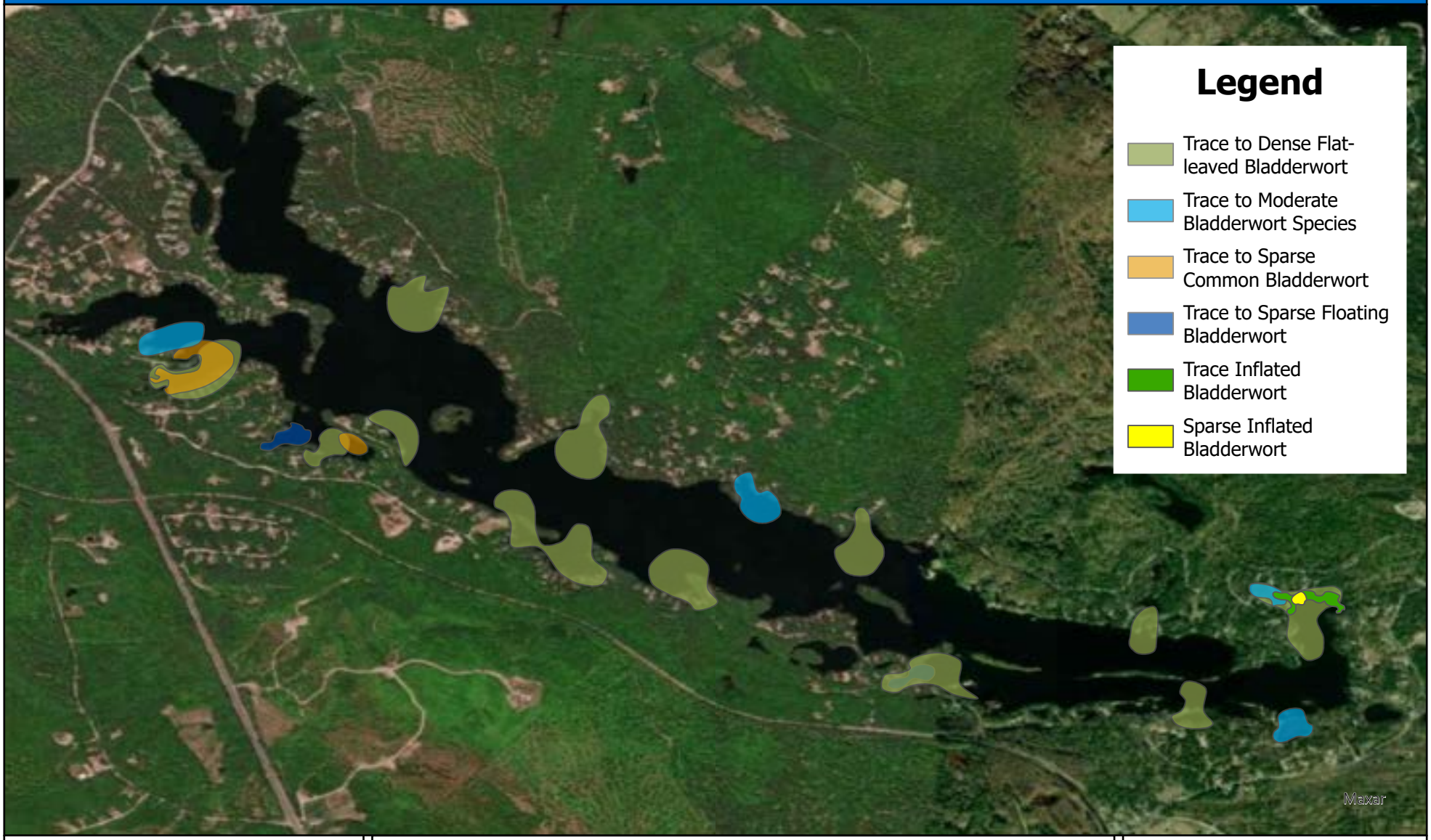

Pine River Pond
East Wakefield, New Hampshire

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Scale: 1:25,846

N

PINE RIVER POND

0 0.25 0.5 1 Miles

Survey Date: July 23, 2024
Map Date: October 21, 2024

Prepared by: E. Vulgamore

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Figure 5. 2024 Pondweeds

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Pine River Pond
East Wakefield, New Hampshire

Center: 71°1'21"W 43°37'54"N
Scale: 1:25,846

N

PINE RIVER POND

0 0.25 0.5 1 Miles

Survey Date: July 23, 2024
Map Date: October 21, 2024

Prepared by: E. Vulgamore

Office: Shrewsbury, MA

Figure 6. 2024 Floating Species

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Pine River Pond
East Wakefield, New Hampshire

Center: 71°1'21"W 43°37'54"N
Scale: 1:25,846

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PINE RIVER POND

0 0.25 0.5 1 Miles

Survey Date: July 23, 2024
Map Date: October 21, 2024

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Figure 7. 2024 Submersed Species

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Pine River Pond
East Wakefield, New Hampshire

Center: 71°1'21"W 43°37'54"N
Scale: 1:25,846

N

PINE RIVER POND

0 0.25 0.5 1 Miles

Survey Date: July 23, 2024
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Figure 8. 2024 Emergent Species

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Pine River Pond
East Wakefield, New Hampshire

Center: 71°1'21"W 43°37'54"N
Scale: 1:25,846

N

PINE RIVER POND

0 0.25 0.5 1 Miles

Survey Date: July 23, 2024
Map Date: October 21, 2024

Prepared by: E. Vulgamore

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Figure 9. 2024 Algae

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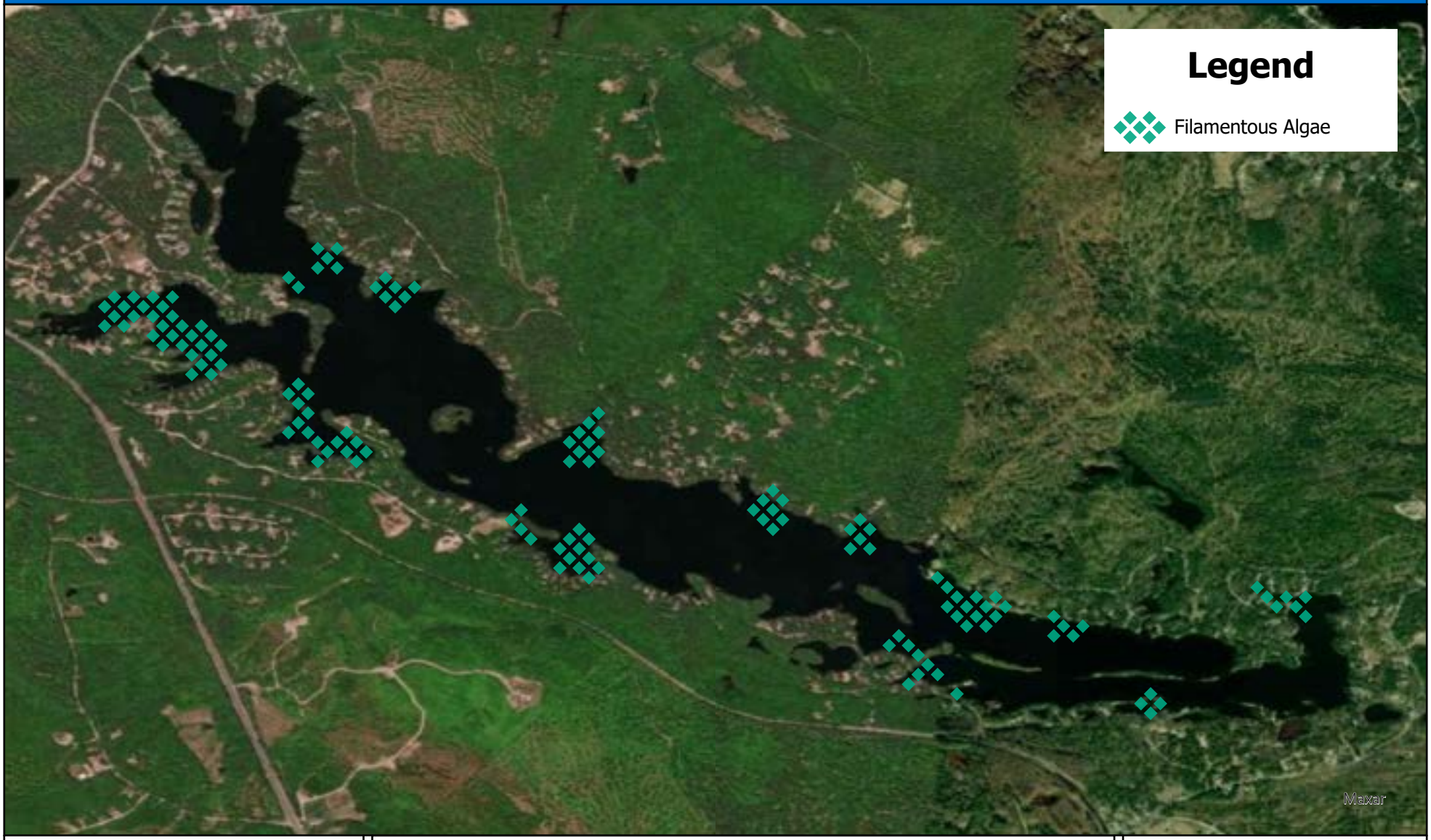

Pine River Pond
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PINE RIVER POND VEGETATION INDEX

American Tapegrass
Vallisneria americana

American Tapegrass is a submerged aquatic plant characterized by long, ribbon-like leaves that can grow up to 1 meter in length. It typically forms dense beds in shallow waters and is often found in lakes, ponds, and slow-moving streams. This species plays a vital role in lake dynamics by providing habitat and shelter for various aquatic organisms, including fish and invertebrates. American Tapegrass is a critical oxygen producer, contributing to water quality and clarity through photosynthesis. Its growth is primarily influenced by temperature and light availability, with peak growth occurring during the warm summer months. As a perennial species, it exhibits seasonal dieback in winter, with new growth emerging in the spring.

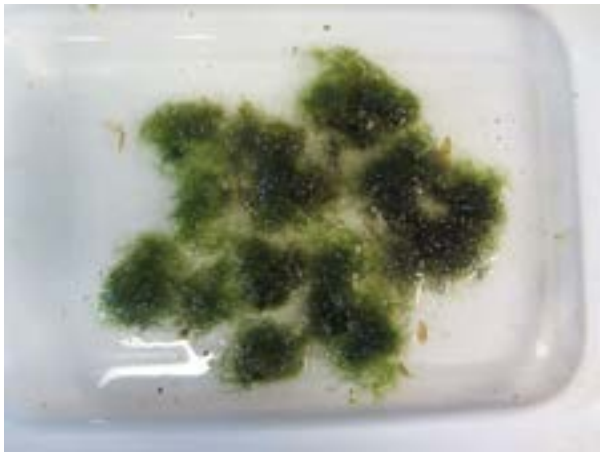
Bur-reed
Sparganium spp.

Bur-reed comprises several species of emergent plants that thrive in shallow water habitats. Characterized by their cylindrical flowering spikes and broad, flat leaves, Bur-reeds provide essential shoreline stabilization and habitat for aquatic wildlife. They are often found in wetlands and marshes and can tolerate a range of water levels. In terms of limnology, Bur-reed plays a crucial role in nutrient cycling, as its biomass contributes organic matter to the sediment upon decomposition. Growth patterns vary by species, but they generally establish in the spring and produce flowers in mid to late summer, contributing to the overall biodiversity of aquatic ecosystems.

Common Bladderwort
Utricularia vulgaris

Common Bladderwort is a unique, floating aquatic plant distinguished by its submerged, filamentous growth and small bladder-like structures that capture prey. These bladders are adaptations for nutrient acquisition, allowing the plant to thrive in nutrient-poor waters. Commonly found in ponds and lakes, it provides cover for fish and invertebrates. This annual species grows rapidly during the warm months, producing flowers that rise above the water's surface in mid-summer. As temperatures cool in the fall, the plant may die back, with seeds remaining viable in sediment for future growth.

Filamentous Algae
Various species



Filamentous algae encompass a diverse group of algae characterized by their thread-like structures, often forming green mats on the water's surface. These algae thrive in nutrient-rich environments and are common indicators of excess nutrient inputs, particularly phosphorus. While they play a role in primary production, excessive growth can lead to decreased water clarity and negatively impact submerged vegetation. Filamentous algae typically exhibit rapid growth during warm weather, flourishing in late spring and summer. Their presence can signal shifts in lake dynamics, requiring careful monitoring to manage nutrient loads effectively.

Flat-leaved Bladderwort
Utricularia intermedia

Flat-leaved Bladderwort is a floating aquatic plant with distinctive, flat, strap-like leaves and specialized bladders for capturing small organisms. Commonly found in nutrient-rich, shallow waters, it plays a vital role in controlling insect populations and provides habitat for various aquatic organisms. This species typically exhibits a robust growth pattern from late spring through early fall, producing flowers above the water surface during the summer. Its growth is closely linked to water quality, as it can thrive in conditions that support a rich diversity of life while indicating potential nutrient overloads.

Floating Bladderwort
Utricularia radiata

Floating Bladderwort is a unique aquatic plant that drifts on the water's surface, characterized by its small, floating leaves and specialized bladders that capture prey. It is commonly found in nutrient-rich environments, where it plays a significant role in regulating nutrient levels and supporting aquatic food webs. This annual species exhibits rapid growth during the warm months, with flowering typically occurring in mid-summer. While it contributes to primary production, its prevalence can indicate nutrient loading, making it an important species to monitor in lake management efforts.

Grassy Pondweed
Potamogeton gramineus

Grassy Pondweed is a submerged aquatic plant known for its grass-like leaves and ability to grow in a variety of water conditions, from shallow to moderately deep areas. It serves as an important habitat for fish and invertebrates, contributing to the overall biodiversity of the ecosystem. This perennial species typically grows vigorously in late spring, with peak biomass occurring in summer before senescing in the fall. Its presence enhances water clarity and quality, as it stabilizes sediments and provides oxygen through photosynthesis.

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Inflated Bladderwort
Utricularia inflata

Inflated Bladderwort is an invasive, floating aquatic plant distinguished by its large, inflated bladders and elongated leaves. This carnivorous plant captures small organisms, enabling it to thrive in nutrient-poor waters. Often found in lakes and slow-moving streams, it plays an important role in nutrient cycling and supports aquatic food webs. Inflated Bladderwort typically grows from late spring through early fall, with flowering occurring during the summer. Its growth is closely tied to water quality, making it an important species for assessing ecosystem health.

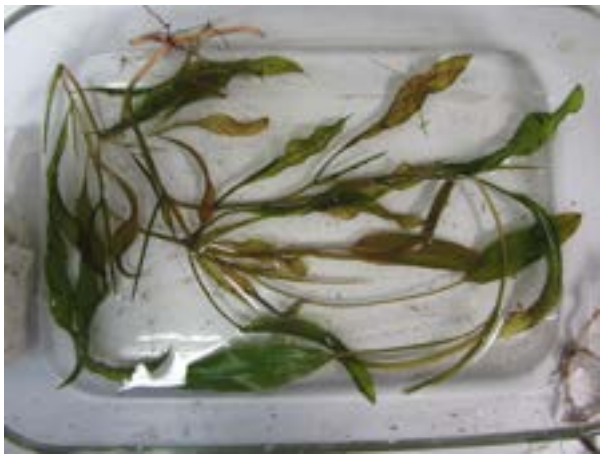
Large-leaf Pondweed
Potamogeton amplifolius

Large-leaf Pondweed is characterized by its broad, floating leaves that can reach substantial sizes, providing excellent habitat for aquatic organisms. Found in a variety of freshwater habitats, this perennial species supports biodiversity and improves water quality by stabilizing sediments and providing oxygen. Large-leaf Pondweed typically exhibits rapid growth from late spring through summer, with flowering occurring in mid-summer. Its seasonal growth patterns are influenced by light and nutrient availability, making it a key species for understanding lake dynamics.

Ludwigia
Ludwigia spp.

Ludwigia consists of various species that can be found in both emergent and submerged forms. Characterized by their distinct, opposite leaves and yellow flowers, Ludwigia can thrive in a range of wetland habitats, including lakes and ponds. These plants play a role in stabilizing shorelines and providing habitat for aquatic fauna. Some species can become invasive under certain conditions, which may disrupt local ecosystems and alter nutrient dynamics. Growth typically begins in early spring, with flowering occurring in late summer. Monitoring Ludwigia is essential to manage its potential impacts on lake health.

Long-leaf Pondweed
Potamogeton nodosus



Long-leaf Pondweed is recognized for its elongated, narrow leaves that can float on the surface or grow submerged. This species thrives in a variety of aquatic environments and contributes to habitat diversity for fish and invertebrates. Long-leaf Pondweed generally exhibits vigorous growth during the warm months, with flowering occurring in mid-summer. As a perennial plant, it can influence sediment stability and nutrient cycling, playing a significant role in maintaining water clarity and quality in its habitats.

Northern Naiad
Najas flexilis

Northern Naiad is a submerged aquatic plant characterized by its slender, finely dissected leaves that can reach up to 1 meter in length. It is often found in clear, nutrient-poor waters, providing essential habitat for fish and invertebrates. This annual species typically exhibits rapid growth during the warm summer months, contributing to primary production and water quality enhancement. Its seasonal lifecycle includes dieback in fall, with viable seeds persisting in sediment for future germination. Northern Naiad's presence can indicate healthy, stable aquatic ecosystems.

Pipewort
Eriocaulon aquaticum

Pipewort is an emergent aquatic plant with a distinctive, tufted appearance characterized by narrow leaves and globe-like flower heads. It typically grows in shallow water and can be found in wetlands and lake margins. Pipewort plays a significant role in stabilizing sediments and providing habitat for various aquatic species. Its flowering occurs in mid to late summer, attracting pollinators and contributing to local biodiversity. As a perennial, Pipewort demonstrates resilience to seasonal fluctuations in water levels, enhancing the overall ecological health of its habitat.

Ribbon-leaf Pondweed
Potamogeton epihydrus

Ribbon-leaf Pondweed is recognized for its narrow, ribbon-like leaves that can grow submerged or floating. It thrives in a variety of aquatic environments, providing habitat for fish and invertebrates while stabilizing sediments. This perennial species typically exhibits robust growth during the summer months, with flowering occurring in late summer. Its presence can enhance water quality by providing oxygen and supporting nutrient cycling, making it an essential component of healthy aquatic ecosystems.

Robbin's Pondweed
Potamogeton robbinsii

Robbin's Pondweed is characterized by its slender stems and narrow, elongated leaves. This submerged aquatic plant thrives in various freshwater habitats, contributing to biodiversity and water quality. Typically found in moderately deep waters, it serves as important habitat for fish and invertebrates. Robbin's Pondweed experiences peak growth in late spring and summer, with flowering occurring in mid-summer. Its seasonal growth patterns and ability to adapt to varying conditions make it a valuable species in lake ecosystems.

Slender Naiad
Najas gracillima

Slender Naiad is a delicate, submerged aquatic plant characterized by its thin, finely dissected leaves. It often inhabits shallow, nutrient-rich waters, providing habitat for aquatic organisms while contributing to primary production. This annual species typically experiences rapid growth in summer, with flowering occurring in late summer. As temperatures cool in fall, it undergoes dieback, leaving viable seeds to persist in the sediment. Its presence can indicate shifts in water quality and ecosystem dynamics, making it an important species for monitoring.

Spike-rush
Eleocharis spp.

Spike-rush comprises several species of emergent plants characterized by their slender, grass-like stems and spike-like flower heads. These plants thrive in shallow waters and wetlands, providing critical habitat for a variety of aquatic organisms. Spike-rush plays a significant role in shoreline stabilization and nutrient cycling within lake ecosystems. Growth patterns vary by species, but they generally establish in early spring, with flowering occurring throughout the summer. Their resilience to fluctuating water levels makes them essential contributors to the overall ecological health of aquatic systems.

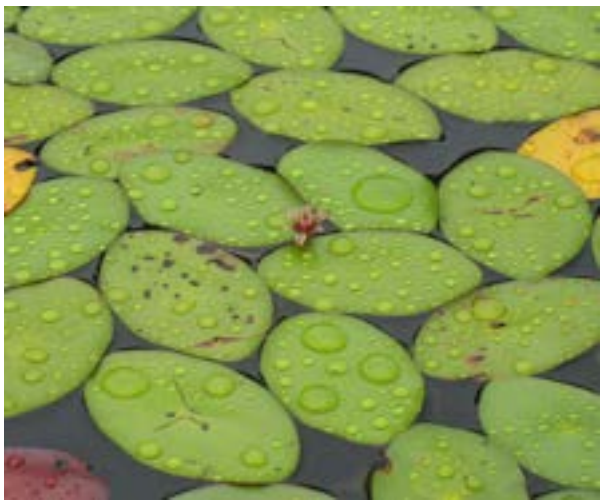
Thin-leaf Pondweed
Potamogeton pusillus

Thin-leaf Pondweed is a submerged aquatic plant known for its narrow, elongated leaves. This species thrives in a range of water depths and is often found in nutrient-rich environments. It provides habitat for fish and invertebrates and plays a role in improving water quality by stabilizing sediments and producing oxygen. Thin-leaf Pondweed typically exhibits robust growth during the warm months, with flowering occurring in mid to late summer. Its adaptability to various conditions makes it a valuable component of aquatic ecosystems.

Water-Starwort
Callitriche spp.

Water-Starwort consists of various species characterized by their small, star-shaped leaves and ability to grow submerged or floating. These plants thrive in shallow waters and wetlands, providing important habitat for aquatic organisms while stabilizing sediments. Water-Starwort plays a role in enhancing water quality by contributing to nutrient cycling and oxygen production. Growth typically occurs from spring through fall, with flowering happening in mid-summer. Their adaptability to varying water levels and conditions makes them a critical part of healthy aquatic ecosystems.

Watershield
Brasenia schreberi



Watershield is an emergent aquatic plant characterized by its floating leaves and unique, jelly-like coating that protects it from herbivory. Commonly found in shallow, calm waters, Watershield provides habitat for fish and invertebrates and plays a role in nutrient cycling. This perennial species typically exhibits robust growth from late spring through summer, with flowering occurring in mid-summer. Its resilience to environmental changes makes it an important indicator of ecosystem health in freshwater systems.

Whorled Watermilfoil
Myriophyllum verticillatum

Whorled Watermilfoil is a submerged aquatic plant distinguished by its whorled leaf arrangement and feathery appearance. This perennial species thrives in a variety of freshwater habitats, providing essential habitat for fish and invertebrates while enhancing water quality through oxygen production. Whorled Watermilfoil typically exhibits rapid growth during the warm summer months, with flowering occurring in mid to late summer. Its adaptability to different water conditions makes it a valuable species for maintaining biodiversity and ecosystem stability.

White Waterlily
Nymphaea odorata

White Waterlily is a well-known aquatic plant characterized by its large, white, fragrant flowers and broad, floating leaves. It typically thrives in calm waters and is often found in lakes and ponds. White Waterlily plays an important role in providing habitat and shade for fish and invertebrates, while its leaves help to stabilize sediments. This perennial species typically begins growth in early spring, with peak flowering occurring in mid-summer. Its seasonal growth patterns and ability to adapt to various conditions make it a key component of healthy aquatic ecosystems.

Yellow Waterlily
Nuphar variegata

Yellow Waterlily, also known as spatterdock, is recognized for its large, round leaves and distinctive yellow flowers. This emergent plant thrives in shallow waters and contributes to shoreline stabilization and habitat diversity. Yellow Waterlily is particularly important for providing shelter and breeding grounds for aquatic fauna. Growth typically occurs from early spring, with flowering in mid to late summer. Its presence can indicate healthy, biodiverse ecosystems, and it plays a role in nutrient cycling within aquatic environments.