FLOATING AND SUBMERGED PLANTS OF UTAH

POCKET FIELD GUIDE
Kate Sinnott | Karin Kettenring

USU Wetland Ecology & Restoration Laboratory
Contents

Introduction v
Resources and Acknowledgments vi
How to Use This Guide vii
Plant Identification Pages 1
Pondweed Key 37
Glossary 39
References 43
Photo Credits 44
Introduction

Submerged and floating plant species play critical roles in aquatic ecosystems. They provide habitat to aquatic organisms, improve water clarity by trapping sediment, and absorb excess nutrients from the water column, amongst many other vital services. However, they have been threatened and degraded by pollution, land conversion, and introductions of harmful species. Identifying both native and non-native plants is an important component of tackling this degradation and promoting the conservation and restoration of aquatic plant communities. We hope this book finds a home in the pocket of your waders or the bottom of your kayak and guides you in the process of getting to know these fascinating species.
Resources

Many plant identification sources were used to compile the descriptions of each species: *Aquatic and Wetland Plants of Southwestern United States*,¹ *Wetland Plants of Great Salt Lake*,² the U.S. Forest Service,³ *Aquatic and Wetland Plants of Southeastern United States*,⁴ the Biota of North America Program (BONAP),⁵ *Aquatic Plants of the Upper Midwest*,⁶ AquaPlant,⁷ the PLANTS Database,⁸ and *A Utah Flora*.⁹ These sources may be consulted for additional information.

Acknowledgments

This work was generously supported by Utah Reclamation Mitigation and Conservation Commission, Ducks Unlimited, Utah State University (USU) Ecology Center, USU Department of Watershed Sciences, and USU Extension.
Each of the plant identification pages in this guide contains information on the species’ habitat and characteristics.

**Duration**
- **Annual (A):** completes life cycle in one growing season
- **Perennial (P):** part of the plant persists year to year
- **Annual or perennial (AP):** depends on local conditions

**Nativity**
- **Native (N):** naturally occurring in Utah
- **Introduced (I):** introduced from outside Utah
- **Aquatic Invasive Species (AIS):** not native and a known invasive species

**FAMILY**
*Genus species*
*Common name*

**Habitat**
This plant lives in these sorts of conditions.

**Stems and roots**
These are the characteristics of the stems and roots.

**Leaves**
These are the characteristics of the leaves. We may describe them using technical words.

**Flowers and seeds**
These are the characteristics of the flowers and seeds.

**Additional facts**
This is where you’ll find fun facts, synonyms of species names, and look-alike species.

The color of the plant information box indicates where this species grows in the water column:
- Yellow: Most of the plant is floating on or above the surface of the water
- Green: The plant is both on/above the water’s surface and submerged
- Blue: The plant is entirely submerged

Definitions of underlined words can be found in the glossary (pg. 39).

**Commonness**
- **Common (C):** found abundantly in Utah
- **Uncommon (U):** found less abundantly in Utah
- **Occasional (O):** found infrequently in Utah

(Commonness defined in glossary on pg. 39.)
**SALVINIACEAE**

*Azolla microphylla*

Mexican mosquito fern

**Habitat**
Surface of lakes, ponds, and quiet waters of streams and canals.

**Stems and roots**
Plants are flattened, forming free-floating mats. 1–3 cm across. Small roots reach into water.

**Leaves**
Scale-like, green to red, lobes that are somewhat irregular in shape, small hairs on upper lobe.

**Reproduction**
Pitted spores located on underside of leaves.

**Additional facts**
Synonym: *A. mexicana*
Fixes atmospheric nitrogen.

<table>
<thead>
<tr>
<th>Nativity:</th>
<th>Duration:</th>
<th>Commonness:</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>AP</td>
<td>U</td>
</tr>
</tbody>
</table>
Ceratophyllum demersum

Habitat
Entirely submerged in quiet waters of lakes, ponds, and streams.

Stems
Not rooted. Stems up to 3 m long, branched and forming large masses ①–②. Brittle.

Leaves
In whorls of 6 to 12. Leaves are variable in length, typically around 15 mm. Forked ③. Serrate.

Flowers
Inconspicuous flowers in leaf axils ④.

Additional facts
Provides habitat for aquatic animals such as shrimp and fish as well as food for waterfowl.
CHARACEAE
Chara spp.
Muskgrass, stonewort

Habitat
Entirely submerged in shallow to deep hard or alkaline water.

Structure
Although it looks a lot like a vascular plant, Chara is a genus of algae. It is highly branched and has 6 to 16 branchlets around each node. These branchlets often have spine-like appendages. It does not have roots but can attach itself to the substrate with root-like appendages.

Reproduction
Does not have flowers or seeds. Reproduces via fragments or oospores (a thick-walled cell formed by fertilization).

Additional facts
Easily distinguished by its foul, musty smell. It often has a grainy or crunchy texture from calcium deposits.
Chara is commonly considered an indicator of high water quality.

Nativity: N  Duration: AP  Commonness: C

See the small orange spheres? Those are the oospores!
Duckweeds
*Lemna, Spirodela, and Wolffia*

**Habitat**
Floating on surfaces of slow-moving, still, or stagnant waters.

**Structure**
Duckweeds are *thalli*, meaning leaves and stems are not differentiated, and they lack a *vascular* system. *Lemna* and *Spirodela* have a single, flat, oval leaf/stem. *Lemna* are typically less than 5 mm wide and have one root ①, whereas *Spirodela* are slightly larger at 10 mm wide and have multiple roots. *Wolffia* plants are cylindrical in shape, much smaller ②, and do not have roots.

**Reproduction**
Plants in these genera rarely flower. They reproduce vegetatively by forming chains of buds that can then break off. They can do this quite rapidly ③.

<table>
<thead>
<tr>
<th>Nativity:</th>
<th>Duration:</th>
<th>Commonness:</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>P</td>
<td>C</td>
</tr>
</tbody>
</table>

Dense populations of duckweed can inhibit light access for submerged plants.

Lemna is more common than *Spirodela* or *Wolffia*.

Reddish plants are *Lemna*, smaller green plants are *Wolffia*. 
HYDROCHARITACEAE

Egeria densa
Brazilian waterweed

Habitat
Submerged except flowers in fresh water of lakes, ponds, pools, ditches, and quiet streams.

Stems and roots
Rooted. Stems ascending and simple or sparingly branched.

Leaves

Flowers
Flowers just above the surface of the water. Three white petals.

Additional facts
Native to South America. Can be distinguished from E. canadensis (pg. 7) and H. verticillata (pg. 8) by number of leaves in the upper whorls.

Nativity: AIS
Duration: P
Commonness: O
Eichhornia crassipes
Common water hyacinth

Habitat
Floating on the surface of ponds, streams, and ditches.

Roots
Roots purplish and dangling in water below leaves.

Leaves
Leaves round and in clusters. Petiole is distinctively spongy and inflated ①.

Flowers
Showy purple to light blue flowers on spike. Top petal has purple or blue spot with yellow center ②.

Additional facts
Synonym: Pontederia crassipes
Native to South America. Extremely aggressive. Not yet spreading in Utah, but if found, report it to the county weed supervisor for that area.

Nativity: AIS
Duration: P
Commonness: NA
Elodea canadensis
Canadian waterweed

Habitat
Submerged except flowers in lakes, ponds, and slow-moving streams, especially calcareous areas.

Stems and roots

Leaves
Middle and upper leaves are in whorls of 3. Linear to tapering oblong. Thin, finely serrate.

Flowers and seeds
Flowers bloom above the surface of the water. Three white petals.

Additional facts
Can be distinguished from the invasive species E. densa (pg. 5) and H. verticillata (pg. 8) by the number of leaves in each whorl.

Nativity: N
Duration: P
Commonness: C
HYDROCHARITACEAE

Hydrilla verticillata

Waterthyme

Habitat
Submerged except flowers in streams, ponds, and lakes.

Stems and roots
Rooted. Vertical stems are highly branched. Has horizontal stems in the substrate that sometimes form tubers.

Leaves
In sessile whorls of 4 to 8. Serrate. Tip is acute.

Flowers and seeds
Female flowers translucent, sometimes with a purple tinge.

Additional facts
Likely native to Asia, Africa, and/or Australia. Not yet spreading in Utah, but if found, report it to the county weed supervisor for that area. Can be distinguished from E. densa (pg. 5) and E. canadensis (pg. 7) by serrate leaf margins.

Nativity: AIS
Duration: P
Commonness: NA
**ISOETACEAE**

*Isoetes bolanderi*

Bolander’s quillwort

**Habitat**

Ponds and lakes. Typically entirely submerged, but can survive emerged.

**Stems and roots**

Fleshy underground stem. Roots branch dichotomously.

**Leaves**

Leaves of 6 to 25 emerging from underground stem ①. Quill-like, gradually tapering from the base, up to 15 cm long.

**Reproduction**

Spores contained in sporangia at the base of leaves ②. Macrospores (female spores) white to blueish and and covered in bumps or wrinkles.

**Nativity:** N  
**Duration:** P  
**Commonness:** U
ISOETACEAE

Isoetes echinospora
Spiny-spored quillwort

Habitat
Ponds and lakes in shallow, clear water. Typically entirely submerged, but can survive emerged.

Stems and roots
Fleshy underground stem. Roots branch dichotomously.

Leaves
Wide rosette of leaves emerging from the underground stem ①. Lighter green at base. Quill-like, up to 10 cm.

Reproduction
Spores contained in sporangia at the base of leaves. Macrospores (female spores) spiny ②.

Additional facts
Synonym: Isoetes tenella
Can be distinguished from I. bolanderi (pg. 9) by spines on macrospores (requires magnification).

Nativity: N  Duration: P  Commonness: O
HALORAGACEAE

Myriophyllum sibiricum

Northern watermilfoil

Habitat
Submerged except flowers in lakes and streams, shallow to deep water ①.

Stems and roots
Rooted. Stem whitish or tan, sometimes with reddish tint.

Leaves
Leaves in whorls of four. Simply pinnate with 4 to 11 segments on each side of the central leaf axis ②.

Flowers and seeds
Whorled spike that emerges from the water ③.

Additional facts
Forms winter buds (turions) that look like sections of the plant with very condensed leaves.
Can hybridize with the invasive M. spicatum (pg. 12), so genetic testing may be necessary for identification.

Nativity: N  
Duration: P  
Commonness: C
**HALORAGACEAE**

*Myriophyllum spicatum*

Eurasian watermilfoil

**Habitat**
Submerged except flowers in lakes, ponds, slow-moving streams (1).

**Stems and roots**
Rhizomatous with branching leafy shoots. Up to 2.5 m long. Stems reddish brown to pinkish.

**Leaves**
In whorls of 3 to 5. Simply pinnate with 12 or more segments on each side of the central leaf axis (2).

**Flowers and seeds**
Flowers and seeds on spike above the surface of the water. Small, inconspicuous, white to pink.

**Additional facts**
Can hybridize with the native *M. sibiricum* (pg. 11), so genetic testing may be necessary for identification.

---

**Nativity:** AIS

**Duration:** P

**Commonness:** C
HYDROCHARITACEAE

*Najas marina*

Spiny naiad

**Habitat**
Entirely submerged in lakes and ponds.

**Stems and roots**
Rooted. Stems branched with large teeth on internodes.

**Leaves**
Brittle, linear, opposite to somewhat alternate. Rigid and curved. Teeth on margins of leaves and occasionally the midrib of the leaf.

**Flowers and seeds**
Flowers in leaf axils. Seeds ovoid.

**Nativity:** N

**Duration:** A

**Commonness:** U

---

This is a tooth on the internode (the area of the stem between leaf nodes).
**BRASSICACEAE**

*Nasturtium officinale*

**Watercress**

**Habitat**
Can be submerged, emerged, or floating in clear waters of slow-running streams and in or near cold springs ①.

**Stems and roots**
Rooted. Stems *glabrous*, sometimes rooting at the nodes.

**Leaves**
Pinnately compound with 3–9 segments. *Ovate* to oval. Terminal lobe is larger than the lobes on sides ②. Somewhat fleshy.

**Flowers and seeds**
White, four-petaled flowers. Fruit is a pod that curves upward.

**Additional facts**
Edible. Synonym: *Rorippa nasturtium-aquaticum*

<table>
<thead>
<tr>
<th>Nativity:</th>
<th>Duration:</th>
<th>Commonness:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>P</td>
<td>C</td>
</tr>
</tbody>
</table>
NYMPHAEACEAE
Nuphar polysepalala
Great yellow waterlily

Habitat
Floating, emergent, or rarely submerged in mountain ponds and lakes, especially where scoured by glacial activity.

Roots
Rhizomatous. Leaves arise directly from rhizomes.

Leaves
Ovate and sagittately lobed on the base. 8–25 cm long. Leathery.

Flowers and seeds
Stigma broad, forming a circular disk. Sepals 5–12, yellow or tinged with green or red. Petals yellow to purple ①. Fruit is ovoid and 4–6 cm long.
NYMPHAEACEAE

*Nymphaea odorata*
American white waterlily

**Habitat**
Floating in ponds and springs.

**Roots**
Rhizomatous. Leaves arise directly from rhizomes.

**Leaves**
Round, basally sagittately lobed, leathery.

**Flowers and seeds**
Stigma broad, forming a circular disk. Many petals, pink to white.

**Additional facts**
Introduced in Utah but native in other parts of the United States.

These notches in the leaves create the sagittately lobed shape.
**POLYGONACEAE**

*Polygonum amphibium*

Water smartweed

**Habitat**
Floating in springs, streams, ponds, lakes, reservoirs, and irrigation canals.

**Stems and roots**
Rhizomes or stolons. Stems floating or erect.

**Leaves**
Length of 3–18 cm, lanceolate to oblong, obtuse to square basally, acute to round tip.

**Flowers and seeds**
Flowers bright pink on spike-like panicles. Fruit brown and lenticular.

**Additional facts**
Synonym: *Persicaria amphibia*. Floating leaves can be distinguished from *Potamogeton nodosus* (pg. 23) by the pinnate leaf venation.

**Nativity:** N  
**Duration:** P  
**Commonness:** C
Potamogeton alpinus
Alpine pondweed

Habitat
Submerged except flowers in streams, ponds, and lakes.

Stems and roots
Rooted. Stems reddish brown, simple or rarely branched ①.

Leaves
Submerged leaves 0.5–2 cm wide, 4–18 cm long, translucent, obtuse. Floating leaves oblanceolate, translucent, and tapering ②. Leaves may have red tint.

Flowers and seeds
Spikes dense and compact, 5 to 9 whorls. Flowers greenish to red.

Additional facts
Floating leaves thinner (more membranous) than *P. gramineus, P. natans*, and *P. nodosus*. Can be distinguished from *P. praelongus* by absence of whitish zigzag stems.

Nativity: N  Duration: P  Commonness: U
POTAMOGETONACEAE

Potamogeton crispus
Curly-leaf pondweed

**Habitat**
Submerged except flowers in ponds and streams, often abundant in quiet calcareous water.

**Stems and roots**
Stem simple or branched. Rhizome reddish, about the same thickness as the stem.

**Leaves**
Bright green to dark green or reddish. Very characteristic wavy leaf margins ①.

**Flowers and seeds**
Flowers on spikes above water's surface. Fruits are achenes with a beak and keel.

**Additional facts**
Seldom found fruiting. Often reproduces by fragments or turions ②. Aboveground biomass dies off in summer.

Nativity: AIS
Duration: P
Commonness: C

This is a turion, or a winter bud.
The curly leaf margin is a clear distinguishing feature.
Potamogetonaceae

Potamogeton foliosus

Leafy pondweed

Habitat
Entirely submerged in fresh (mostly calcareous) or brackish water of ponds, irrigation ditches, and streams.

Stems and roots
Rhizome freely branching, rooting at nodes. Stem simple below, branched above.

Leaves
Grass-like leaves, green to bronze, up to 10 cm long. Entire margins. Acute or subacute tip. Leaves are very flat ①.

Flowers and seeds
Flowers/fruits on spikes. Fruits suborbicular with dorsal keel.

Additional facts
Can be distinguished from P. pusillus (pg. 25) by presence of obvious keel on the fruit ②.

Nativity: N
Duration: P
Commonness: C
POYAMOGETONACEAE
Potamogeton gramineus
Variable-leaf pondweed

Habitat
Submerged and floating in ponds, lakes, and slow streams.

Stems and roots
Rhizomatous. Stems slender.

Leaves
Floating leaves on petioles, leaves are usually shorter than petioles. Submerged leaves abundant, sessile, linear to lanceolate.

Flowers and seeds
Flowers and fruits on compact spikes. Fruits keeled.

Additional facts
Leaves are variable (hence the name!). Can resemble other Potamogeton species.

Nativity: N
Duration: P
Commonness: C
**Potamogeton natans**

Floating pondweed

**Habitat**
Submerged and floating in marshy ponds and lakes, often brackish.

**Stems and roots**
Stems branch from rhizome. Stems usually simple.

**Leaves**
Submerged leaves very thin, up to 2 mm wide. Floating leaves often subcordate at base.

**Flowers and seeds**
Flowers and fruits on spikes. Peduncles are 1.5 to 3 times as long as the spike. Fruit are strongly keeled.

**Additional facts**
Submerged leaves are less wide than *P. gramineus* (pg. 21) and *P. nodosus* (pg. 23), and floating leaf bases are subcordate.

- **Nativity:** N
- **Duration:** P
- **Commonness:** U
Submerged leaf.

**Habitat**
Submerged and floating in streams and lakes.

**Stems and roots**
Rhizome flat, covered or spotted with rusty red. Stem simple, often pressing very flat.

**Leaves**
Has both floating and submerged leaves. Submerged leaves thin, up to 20 cm long with white veins. Floating leaves with long petioles, lenticular to elliptical.

**Flowers and seeds**
Green to brown flowers on spike. Seed keels prominent.

**Additional facts**
Floating leaves can be distinguished from *P. amphibium* (pg. 17) by parallel venation and from other floating-leaf Potamogeton species by its long petioles.

---

**POTAMOGETONACEAE**

**Potamogeton nodosus**
Longleaf pondweed

**Nativity:**
N

**Duration:**
P

**Commonness:**
C
**POTAMOGETONACEAE**

**Potamogeton praelongus**

**Whitestem pondweed**

**Habitat**
Entirely submerged in deep cold water lakes and slow-moving streams.

**Stems and roots**
Rooted. Stems whitish to olive green, zigzag \( \textnormal{①} \), simple or occasionally branched.

**Leaves**
Leaves all submerged, oblong-lanceolate, cordate or clasping at the stem, translucent stipule \( \textnormal{②} \).

**Flowers and seeds**
Spikes compact with 6 to 12 whorls of greenish flowers. Fruit has acute dorsal keel.

**Additional facts**
The boat-shaped leaf tip \( \textnormal{③} \) and zigzag stem can distinguish this species from other *Potamogeton* spp.

<table>
<thead>
<tr>
<th>Nativity:</th>
<th>Duration:</th>
<th>Commonness:</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>P</td>
<td>C</td>
</tr>
</tbody>
</table>
Potamogeton pusillus

POTAMOGETONACEAE
Small pondweed

Habitat
Entirely submerged in neutral or slightly brackish or alkaline ponds and rivers.

Stems and roots
Rooted, but no rhizome. Stem highly branched. Usually a pair of translucent glands at nodes. Late in the season, branches often have winter buds.

Leaves
Linear, entire, light green. Up to 7 cm long and 3 mm wide.

Flowers and seeds
Spikes with 3 to 5 separate whorls of flowers. Seed keels are indistinct.

Additional facts
Can be distinguished from P. foliosus (pg. 20) by lack of obvious keel on the fruit and presence of winter bud.

Nativity: N
Duration: P
Commonness: U
POTAMOGETONACEAE

Potamogeton richardsonii
Richardson’s pondweed

Habitat
Entirely submerged in shallow ponds, lakes, and slow-moving streams ①.

Stems and roots
Rooted. Stems round and sparingly branched.

Leaves
Ovate-lanceolate, 3–10 cm long and 1–2 cm wide. Clasping at the base ②. Margins a little wavy. Acute tip.

Flowers and seeds
Spikes crowded. Flowers large and greenish. Dorsal keel low and rounded.

Additional facts
Synonym: Potamogeton perfoliatus ssp. richardsonii. Distinguishable by clasping leaf bases and pointed leaf tip.

Nativity: N  Duration: P  Commonness: U
Ranunculus aquatilis  
White water crowfoot

Habitat
Floating and submerged in ponds, streams, pools, and springs, often in swift-flowing water ①.

Stems and roots
Stems submerged, rooting at the lowest nodes.

Leaves
Submerged leaves finely dissected in sets of three that look like crows’ feet ②. Alternate.

Flowers and seeds
Five petals, white, sometimes with yellow bases. Sepals light green. Fruit an achene.

Additional facts
Synonym: Ranunculus trichophyllus

Nativity:  N  
Duration:  P  
Commonness:  C
The inflorescence looks like a stack of burgers before it emerges from the leaf sheath.

Check out the curl on this peduncle!

The RUPPIACEAE

Ruppiaceae
cirrhosa
Spiral ditchgrass

Habitat
Entirely submerged in shallow, brackish water.

Stems and roots
Stems grow from rhizomes. Stems up to 80 cm high.

Leaves
Thread-like leaves, not numerous. An expanded sheath is present at the base of most leaves.

Flowers and seeds
Flowers and seeds are on a long, spiraling stalk (peduncle) – ③.

Additional facts
Holds its shape out of water more than the grass-like species in Potamogetonaceae.

Nativity: N
Duration: P
Commonness: U
Floating and emerged leaves are shaped like arrows, whereas submerged leaves are linear.

**ALISMATACEAE**

*Sagittaria cuneata*

Arumleaf arrowhead

**Habitat**
Submerged to emergent in shallow ponds, lakes, and streams.

**Stems and roots**
Leaves arise directly from tubers.

**Leaves**
Submerged leaves are flat and linear with prominent midvein. Floating/emerged leaves are on long petioles and are sagittately lobed ①–②.

**Flowers and seeds**
Flowers on long stalk in whorls of three. Each flower has three round, white petals ③.

**Additional facts**
Tubers are edible and have a potato-like texture.
Stuckenia filiformis
Fineleaf pondweed

Habitat
Entirely submerged in brackish waters: ponds, slow streams, and ditches ①.

Stems and roots
Rooted. Stems slender, branchy.

Leaves
Slender, thread-like. Up to 12 cm long and 0.5 mm wide, blunt or obtuse ②.

Flowers and seeds
Flowers and fruit on spike ③. Peduncle up to 10 cm long. Fruit beak short, wartlike, nearly central.

Additional facts
Synonym: Potamogeton filiformis
Branching is not as fan-like as S. pectinata (pg. 31), and leaf tips are blunt.

Nativity: N
Duration: P
Commonness: C
**Stuckenia pectinata**

**Sago pondweed**

**Habitat**
Entirely submerged in alkaline, brackish, or saline water of ponds, quiet rivers, and marshes.

**Stems and roots**
Rhizome creeping, with small tubers. Stem round or slightly compressed, abundantly branched near summit (fanlike) ①.

**Leaves**
Leaves threadlike, entire, up to 15 cm long and 1 mm wide. Leaf tip is an acute point (sometimes obtuse on young seedlings).

**Flowers and seeds**
Spikes with 2 to 5 whorls of sessile flowers ②. No dorsal keel on seed.

**Additional facts**
Synonyms: *Potamogeton pectinatus, Coleogeton pectinatus*
Can be distinguished from other species of *Stuckenia* by acute leaf tips and fanlike shape.

---

**Nativity:** N

**Duration:** P

**Commonness:** C
**POTAMOGETONACEAE**

*Stuckenia striata*

Broadleaf pondweed

**Habitat**
Entirely submerged in quiet or flowing fresh or brackish water.

**Stems and roots**
Rhizome creeping, rooting freely at the nodes. Stem whitish, simple below, repeatedly branched above.

**Leaves**
Linear, entire, green to bronze, rather opaque, up to 5 mm wide, tip obtuse to rounded.

**Flowers and seeds**
Spikes on peduncles. Fruits ovoid with convex sides.

**Additional facts**
Leaves much wider than the other species in *Stuckenia*.

**Nativity:** N  **Duration:** P  **Commonness:** U
**Stuckenia vaginata**  
*Sheathed pondweed*

**Habitat**  
Entirely submerged in ponds, streams, and lakes.

**Stems**  
Rooted. Stems round, greenish, and branching.

**Leaves**  
Threadlike to linear, 1–2 mm wide. Rounded or obtuse at the tip. Stipules joined to the base of the leaf, forming a closed, clasping sheath around the stem. This sheath is usually brownish and swollen.

**Flowers and seeds**  
Spike with 4–9 evenly spaced whorls. Flowers small and brownish. Fruit with inconspicuous dorsal keel.

**Additional facts**  
Synonym: *Potamogeton vaginatus*. Distinguishable by leaf sheath.
**LENTIBULARIACEAE**

**Utricularia macrorhiza**

Common bladderwort

**Habitat**
Submerged except flowers in deep to shallow quiet water.

**Stems and roots**
No roots. Stems up to 2 m long, floating just below the water’s surface.

**Leaves**
Leaves are much-dissected, with numerous large bladders. Featherlike branches of foliage.

**Flowers and seeds**
Flowers emerge out of the water. Yellow with brown or orange vertical stripe. Seeds brown.

**Additional facts**
Synonym: *U. vulgaris*
Plants in the genus *Utricularia* are carnivorous.

<table>
<thead>
<tr>
<th>Nativity:</th>
<th>Duration:</th>
<th>Commonness:</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>P</td>
<td>C</td>
</tr>
</tbody>
</table>
**LENTIBULARIACEAE**  
*Utricularia minor*  
Lesser bladderwort

**Habitat**  
Submerged except flowers in shallow ponds and lakes, growing along the bottom or floating.

**Roots**  
Does not have roots but can affix to the substrate.

**Leaves**  
Alternate, 4–10 mm long and branching. Bladders are found on leaves and are 1–2 mm long.

**Flowers**  
Flowers are emergent, yellow, and 5–9 mm long. The spur is short or lacking.

**Additional facts**  
Plants in the genus *Utricularia* are carnivorous.

**Nativity:** N  
**Duration:** P  
**Commonness:** U
Zannichellia palustris

POTAMOGETONACEAE

Horned pondweed

Habitat
Entirely submerged in ponds, lakes, marshes, streams, and irrigation canals.

Stems and roots
Rhizome creeping, stem slender, simple or branching.

Leaves
Mostly opposite. Linear or threadlike, entire, up to 10 cm long. Acute at the tip. Leaves flat.

Flowers and seeds

Additional facts
Easily distinguished from other species in Potamogetonaceae by its banana-shaped seeds. Fruits and foliage eaten by waterfowl and fish.

Nativity: N  Duration: P  Commonness: C
Pondweed Key

Trust me, we hear ya—the pondweeds are tricky! Here’s a key for figuring them out. This key includes only the members of the family Potamogetonaceae that are included in this guide.

1. **Stipules clasping leaf base** (2) ➔
2. **Stipules free from the leaf** (5)

2 [1]. Leaves less than 2 mm wide (3)
2. Leaves greater than 2 mm wide

3 [2]. **Sheathed stipules** not inflated (4)
3. **Sheathed stipules** inflated, 2–3 times as thick as the stem

4 [3]. Leaf tips blunt or obtuse
4. Leaf tips acute, leaves branch like a fan

5 [1]. Floating leaves absent or similar in shape to submerged leaves (6)
5. Floating leaves present and different in shape from submerged leaves (11)

6 [5]. Flowers and seeds on **spike** (7)
6. Flowers and seeds in **axil**, seeds banana-shaped

7 [6]. Leaves less than 3 mm wide (8)
7. Leaves are greater than 3 mm wide (9)
8 [7]. **Dorsal keel** on fruit ................................................................. *Potamogeton foliosus* (pg. 20)
8. **Dorsal keel** on fruit absent .......................................................... *P. pusillus* (pg. 25)

9 [7]. Leaf margin is slightly wavy, *entire* (10)
9. Leaf margin is very wavy, **serrate** ................................................... *P. crispus* (pg. 19)

10 [9]. Leaf tip is boat-shaped .............................................................. *P. praelongus* (pg. 24)
10. Leaf tip is sharply pointed ............................................................. *P. richardsonii* (pg. 26)

11 [5]. Submerged leaves **sessile** (12)
11. Submerged leaves on long **petiole** ............................................. *P. nodosus* (pg. 23)

12 [11]. Submerged leaves greater than 2 mm wide (13)
12. Submerged leaves less than 2 mm wide .......................................... *P. natans* (pg. 22)

13 [12]. Floating leaves tapering to **petiole** .................................... *P. alpinus* (pg. 18)
13. Floating leaves typically rounded at base .................................... *P. gramineus* (pg. 21)
GLOSSARY

achene: a small, dry fruit with a single seed
alternate: a single leaf arises from each node, alternating sides as they go up the stem
axil: angle between the leaf and the stem bearing the leaf
axis: a stem on which parts are arranged
beak: a long, substantial point
bladder: hollow, submerged structure used to trap and digest prey
brackish: water with moderate concentration of dissolved substances, especially salts
calcareous: containing an excess of calcium that is available to be absorbed
clasping: leaf bases wrap around the stem
commonness: a description of the occurrence of species

Note. In this guide, we used BONAP maps to determine commonness. If the species was described as “present and not rare” in >30% of Utah counties, it is noted as “common; in <30% of counties, “uncommon”; and in <10% of counties, “occasional.”
cordate: heart-shaped with a notched base
dichotomous: in pairs
dorsal: pertaining to the back, away from the main line/central part
elliptical: shaped like an oval, broadest in the center
entire: leaf margin void of indentations, lobes, or teeth
glabrous: without hair
internode: the part of the stem between two adjacent nodes
invasive species: non-native, spreading prolifically, and disrupting ecosystems
keel: a prominent ridge along the longest edge
lanceolate: a shape that is longer than wide, tapering to a point with petiole at wide end
lenticular: convex on both sides, lentil-shaped
linear: long and narrow shaped, with near-parallel sides
node: section of stem where leaves originate
oblanceolate: a shape that is longer than wide, tapering to a point with petiole at the narrow end
oblong: shape that is longer than wide, sides near parallel
opposite: occurring two at a node on opposite sides of the stem
ovate: egg-shaped, petiole at widest end
ovoid: egg-shaped
**panicle**: a compound inflorescence, in which the **axis** is branched one or more times  
**peduncle**: the stem of a solitary flower or the main stem of the flower cluster  
**petiole**: stalk of the leaf  
**pinnate**: leaflets arranged on opposite sides of the leaf **axis**  
**rhizomatous**: proliferating by means of underground, horizontal stems  
**rhizome**: thick, horizontal underground stems  
**sagittate**: shaped like an arrow  
**sepal**: a single part of the outermost **whorl** of flower organs  
**serrate**: having marginal teeth pointing forward  
**sessile**: joined directly to the base without a stalk or **petiole**  
**sheath**: a tubular tissue enclosing another tissue, usually referring to the area where a leaf base encloses the stem  
**simple**: neither branched nor otherwise compound  
**spike**: an inflorescence consisting of a long **axis** with unstalked flowers  
**sporangia**: an enclosure in which spores are formed  
**spur**: a hollow, elongate, pointed, or blunt outgrowth on the flower
**stigma**: the part of the flower that receives the pollen

**stipule**: an appendage frequently occurring at the base of a leaf

**stolon**: long, horizontal, creeping stem, rooting at nodes

**subacute**: between acute and obtuse

**subcordate**: somewhat cordate

**suborbicular**: roughly spherical

**substrate**: the surface or material on or from which the plant lives, grows, or obtains its nourishment

**thalli**: plants that are not clearly divided into stem and leaf (singular: thallus)

**tuber**: thickened portion of rhizome bearing nodes and buds

**turion**: small, overwintering shoot

**vascular**: plant tissues have a system of vessels that transports water and nutrients

**venation**: the pattern of veins

**whorl**: a ring of leaves, flower parts, or flowers occurring at a single node
REFERENCES


PHOTO CREDITS

Page 1: Azolla microphylla
Background* & Inset*: 葉子, license¹, link: inaturalist.org/observations/57801308,
Photo 1: Jon D. Anderson, license², link: flickr.com/photos/jon_d_anderson/37120261412

Page 2: Ceratophyllum demersum
Photo 1*: Jacopo Werther, license³, link: commons.wikimedia.org/wiki/File:Ceratophyllum_demersum_(8443788275).jpg
Photo 2*: Patrick Hacker, license⁴, link: inaturalist.org/photos/151073728
Photo 3*: Zihao Wang, license⁴, link: inaturalist.org/observations/132046928
Photo 4: Kate Sinnott

Page 3: Chara spp.
Background & Photos 1 & 2: Kate Sinnott

Page 4: Duckweeds
Background*: Kevin Thiele, license³, link: flickr.com/photos/66951228@N07/6280656204
Photo 1: Peter de Lange, license¹, link: inaturalist.org/observations/1562651
Photo 2*: John Walter, license⁵, link: inaturalist.org/observations/144471326
Photo 3: Igor Balashov, license⁴, link: inaturalist.org/observations/92248018

Page 5: Egeria densa
Background*: 葉子, license¹, link: inaturalist.org/observations/39527616
Photo 1: Vasily Vishnyakov, license⁵, link: inaturalist.org/observations/144918578
Photo 2*: heikindai_87, license¹, link: inaturalist.org/observations/76092674

Page 6: Eichhornia crassipes
Background*: Irina Bobyleva, license⁵, link: inaturalist.org/observations/144998171
Photo 1: Djowers, license⁵, link: inaturalist.org/observations/148763605
Photo 2*: Lucía Poccioni, license⁵, link: inaturalist.org/observations/148211060

Page 7: Elodea canadensis
Background*: Irina Hohryakova, license⁴, link: inaturalist.org/observations/128567872
Photo 1*: Christian Fischer, license⁶, link: commons.wikimedia.org/wiki/File:ElodeaCanadensis.jpg
Page 8: *Hydrilla verticillata*
Photo 1*: H.T. Cheng, license⁵, link: inaturalist.org/observations/164782100
Photo 2: Eric C. Maxwell, license⁵, link: inaturalist.org/observations/156808124

Page 9: *Isoetes bolanderi*
Background*: Faerthen Felix, license⁵, link: inaturalist.org/observations/89788833
Photo 1: Timothy McNitt, license⁴, link: inaturalist.org/observations/102241006
Photo 2: Steve Matson, license⁵, link: inaturalist.org/observations/66385070

Page 10: *Isoetes echinospora*
Background*: Timothy McNitt, license⁴, link: inaturalist.org/observations/135639045
Photos 1* & 2*: Nate Martineau, license⁵, link: inaturalist.org/observations/130327543

Page 11: *Myriophyllum sibiricum*
Photo 1*: Lew Stringer, license⁵, link: inaturalist.org/observations/81581890
Photo 2*: Yaroslav Magazov, license⁵, link: inaturalist.org/observations/138845114
Photo 3*: Allan Harris, license¹, link: inaturalist.org/observations/37633691

Page 12: *Myriophyllum spicatum*
Background*: Kent McFarland, license¹, link: inaturalist.org/observations/6971261
Photo 1*: Bonnie Isaac, license¹, link: inaturalist.org/observations/56414012
Photo 2*: Natalie, license², link: inaturalist.org/observations/128242655

Page 13: *Najas marina*
Background*: Татьяна Горбушина, license¹, link: inaturalist.org/observations/89160575
Photo 1: Lalithamba, license³, link: commons.wikimedia.org/wiki/File:Najas_minor_Ali--Flickr--lalithamba.jpg
Photo 2*: Stephan Lefnaer, license⁷, link: commons.wikimedia.org/wiki/File:Najas_marina_sl11.jpg

Page 14: *Nasturtium officinale*
Background*: Matthew Fainman, license⁴, link: inaturalist.org/observations/99241226
Photo 1: Patrick Alexander, license¹, link: inaturalist.org/observations/90433050
Photo 2: Patrick Hacker, license⁴, link: commons.wikimedia.org/wiki/File:Nasturtium_officinale_154629037.jpg

Page 15: *Nuphar polysepalus*
Background*: John Rusk, license³, link: flickr.com/photos/john_d_rusk/9381302186
Photo 1º: Brocken Inaglory, license⁶, link: commons.wikimedia.org/wiki/File:Nuphar_polysepalus_in_Yellowstone_National_Park_cropped.JPG
Page 16: **Nymphaea odorata**

Photo 1*: Per Verdonk, license⁸, link: flickr.com/photos/per_verdonk/50017718417
Photo 2*: Simon Pierre Barrette, license⁶, link: commons.wikimedia.org/wiki/File:Nymphaea_odorata_PP.jpg
Photo 3: Cbaile19, license¹, link: commons.wikimedia.org/wiki/File:Nymphaea_odorata,_2015-06-02,_Homewood_Cemetery,_01.jpg

Page 17: **Polygonum amphibium**

Background*: Sander van der Molen, license⁶, link: commons.wikimedia.org/wiki/File:Persicaria_amphibia-01_(xndr).jpg
Photo 1*: NobbiP, license⁶, link: commons.wikimedia.org/wiki/File:Wasser-Kn%C3%B6tterich_Persicaria_amphibia_6349.jpg
Photo 2*: Crusier, license⁶, link: commons.wikimedia.org/wiki/File:Persicaria_amphibia_flower.JPG

Page 18: **Potamogeton alpinus**

Photo 1*: Gennadiy Okatov, license⁵, link: inaturalist.org/observations/41156130
Photo 2*: Alexander Bobrov, license⁹, link: commons.wikimedia.org/wiki/File:Potamogeton_alpinus,_robust_form_(the_River._Uftyuga,_Vologda_reg.,_Russia).jpg

Page 19: **Potamogeton crispus**

Background*: Kate Sinnott
Photo 1: Jacopo Werther, license³, link: https://commons.wikimedia.org/wiki/File:Potamogeton_crispus_(8405383222)_(cropped).jpg
Photo 2*: Kristian Peters, license⁶, link: commons.wikimedia.org/wiki/File:Potamogeton_crispus_ueberdauerungsform.jpeg

Page 20: **Potamogeton foliosus**

Background*: John Kees, license¹, link: inaturalist.org/observations/98447939
Photo 1*: Patricia Butter, license⁵, link: inaturalist.org/observations/134682723
Photo 2*: Zihao Wang, license⁴, link: inaturalist.org/observations/134195734

Page 21: **Potamogeton gramineus**

Photo 1**: William Starkey, license¹⁰, link: geograph.org.uk/photo/4015993
Photo 2**: Tristan He, license⁷, link: commons.wikimedia.org/wiki/File:Potamogeton_gramineus_cultivated.JPG

Page 22: **Potamogeton natans**

Background** & Photo 2*: Stephan Lefnaer, license⁷, link: commons.wikimedia.org/wiki/File:Potamogeton_natans_sl4.jpg
Photo 1*: Andre Hosper, license⁵, link: inaturalist.org/observations/21600591

Page 23: **Potamogeton nodosus**

Background*: Krzysztof Ziarnek, license⁷, link: commons.wikimedia.org/wiki/File:Potamogeton_nodosus_kz02.jpg
Photo 1*: Roman_romanov, license⁵, link: inaturalist.org/observations/140192183
Photo 2*: Annika Lindqvist, license⁴, link: inaturalist.org/observations/12436907
Photo 3**: Stephan Lefnaer, license⁷, link: commons.wikimedia.org/wiki/File:Potamogeton_nodosus_sl16.jpg
Page 24: *Potamogeton praelongus*

Photo 1*: Robert W. Harding, license5, link: inaturalist.org/observations/84464728
Photo 2: Peter Jpt29, license5, link: inaturalist.org/observations/55439263
Photo 3*: John Klymko, license5, link: inaturalist.org/observations/73647496

Page 25: *Potamogeton pusillus*

Background*: Graham_g, license5, link: inaturalist.org/observations/165302841
Photo 1°: Stefan Lefnaer, license7, link: https://commons.wikimedia.org/wiki/File:Potamogeton_pusillus_s._str._sl7.jpg
Photo 2°: Stefan Lefnaer, license7, link: commons.wikimedia.org/wiki/File:Potamogeton_pusillus_s._str._sl11.jpg

Page 26: *Potamogeton richardsonii*

Photo 1: Dick Cannings, license5, link: inaturalist.org/observations/90077591
Photo 2: Rob Routledge, license5, link: inaturalist.org/observations/59939872

Page 27: *Ranunculus aquatilis*

Photo 1: Kate Sinnott
Photo 2*: Rob Foster, license4, link: inaturalist.org/observations/133327048

Page 28: *Ruppia cirrhosa*

Photos 1 & 2: Kate Sinnott
Photo 3*: João Farminhão, license5, link: flora-on.pt/#/hgW3b

Page 29: *Sagittaria cuneata*

Background*: Braden J. Judson, license1, link: inaturalist.org/observations/135846828
Photo 1: Trevor Zook, license5, link: inaturalist.org/observations/135706615
Photo 2: Sean Blaney, license5, link: inaturalist.org/observations/134365128
Photo 3: Larry H. Moore, license5, link: inaturalist.org/observations/132701896

Page 30: *Stuckenia filiformis*

Photos 1* & 3: Tyson Ehlers, license5, link: inaturalist.ca/observations/56159693
Photo 2*: Reuvan Martin, license1, link: inaturalist.ca/observations/29477829

Page 31: *Stuckenia pectinata*

Background: François-Xavier Taxil, license5, inaturalist.org/observations/136572204
Photo 1*: Erin Faulkner, license5, link: inaturalist.org/observations/135191464
Photo 2: Татьяна Горбушина, license1, link: inaturalist.org/observations/129941234
**Page 32: Stuckenia striata**

Background & Photos 1* & 2: Daniel Montesinos T, license⁵, link: inaturalist.ca/observations/59963150

**Page 33: Stuckenia vaginata**

Photo 1*: Håkan Sandsten, license⁶, link: commons.wikimedia.org/wiki/File:Stuckenia_vaginata.jpg

**Page 34: Utricularia macrorhiza**

Photo 1*: H. Zell, license⁶, link: commons.wikimedia.org/wiki/File:Utricularia_vulgaris_002.JPG

Photo 2*: H. Zell, license⁶, link: commons.wikimedia.org/wiki/File:Utricularia_vulgaris_003.JPG

Photo 3: Kristine A. Olsen, license⁵, link: inaturalist.org/observations/148643732

**Page 35: Utricularia minor**

Background*: Andreas Fleischman, license⁶, link: commons.wikimedia.org/wiki/File:Utricularia_minor_plant_(01).jpg

Photo 1*: Andrea Moro, license⁶, link: commons.wikimedia.org/wiki/File:Utricularia_minor_traps_(05).jpg

Photo 2: Felix Riegal, license⁵, link: inaturalist.org/observations/145960801

**Page 36: Zannichellia palustris**

Background: Kate Sinnott

Photo 1: Skfork, license⁵, link: inaturalist.org/observations/74334905

Photo 2: Stephan Lefnaer, license⁷, link: commons.wikimedia.org/wiki/File:Zannichellia_palustris_subsp_palustris_sl18.jpg

*Image has been cropped from the original

*Image is licensed under its original license

*Image has been modified from the original to highlight plant characteristics
PHOTO LICENSES

1) CC0 1.0: creativecommons.org/publicdomain/zero/1.0/
2) CC BY-NC-ND 2.0 creativecommons.org/licenses/by-nc-nd/2.0/
3) CC BY 2.0: creativecommons.org/licenses/by/2.0/
4) CC BY 4.0: creativecommons.org/licenses/by/4.0/
5) CC BY-NC 4.0: creativecommons.org/licenses/by-nc/4.0/
6) CC BY-SA 3.0 creativecommons.org/licenses/by-sa/3.0/
7) CC BY-SA 4.0: creativecommons.org/licenses/by-sa/4.0/
8) CC BY-NC 2.0: creativecommons.org/licenses/by-nc/2.0/
9) CC BY 3.0: creativecommons.org/licenses/by/3.0/
10) CC BY-SA 2.0: creativecommons.org/licenses/by-sa/2.0/
COVER AND INTRO PAGES
Photos by Kate Sinnott
Species pictured:

Pages iv-v: *Potamogeton nodosus* (pg. 23)
Front: *Ranunculus aquatilis* (pg. 27)
Back: *Potamogeton crispus* (pg. 19),
*Ranunculus aquatilis* (pg. 27), and
*Zannichellia palustris* (pg. 36)