

## Wetlands Producers

# Cattails

### description

The broad & narrow-leaved species are very similar, but do have a few differences. Both are tall stiff plants, with leaves that look like giant blades of grass. Both species have a flower structure made up of a brown cylindrical spike on the bottom, which is the female portion, and a narrower yellow spike on top, which is the male portion. (See picture)

- The broad-leaved species has pale green leaves nearly one inch wide and it grows up to ten feet tall.
- The narrow-leaved species plant is smaller and somewhat more salt tolerant. Its leaves are thinner, deeper green and typically extend beyond the spike. Also the male and female portion of the flower structure is separated by an inch or so of bare stem.

### habitat

Cattails are usually found in a dense stand (many together) in up to 2 ft. of water in marshes and other wetlands throughout most of the world.

### adaptations

Cattails adapt in a variety of interesting ways:

- They can live in fresh or somewhat brackish water, and can live in up to 2 feet of water or grow in floating mats.
- They have two ways to spread: Seeds made by their flowers, and roots that creep, called rhizomes. Rhizomes grow new shoots quickly, creating thick stands that are great cover for many animals.
- Cattails use the wind to spread their fluffy seeds, and discourage over-population in well-established stands by emitting a toxin that prevents germination of their own species.

### reproduction

As mentioned above, Cattails reproduce by seed but more extensively, rhizome. In fact, an entire acre of cattails may consist of only a few individual plants (see adaptations). They flower from May through July, but the tiny flowers have no petals. They're packed into dense, cylindrical spikes; the narrow upper one contains the male parts, the wider lower one, the female parts. In the spring, the entire spike will appear until

the male spike falls away after it's pollen is shed. In early fall, the brown flower head enlarges (giving it that "hot dog on a stick" look), then pops open to let wind, water and gravity spread it's fluffy seed.

The fruit of a cattail is a tufted nutlet that is less than 2 mm long!

## ecology

Cattails provide important food and cover for wildlife and have been used by people in a variety of ways.

Yellow-headed and red-winged blackbirds, and marsh wrens perch and build their nests on them. Waterfowl, such as Mallards and Canada Geese, nest among them. Frogs and salamanders lay their eggs in the water on and between them. Fish hide or nest among them. Many birds use the seed fluff to line their nests.

Muskrats use rhizomes for food and the foliage to build their houses. This then provides resting and nesting sites for water birds. Deer, raccoons, cottontails and turkeys use them as cover. Insects eat and live on them.

All of the cattail is edible. American Indians prepared the parts in many ways. The leaves were used for baskets, chair seats and mats.

The fluffy seeds are used as insulation for pillows and coats, and glue can be made from the stems. The pollen can be used like flour and is sometimes used in fireworks. The silky down surrounding the seeds can be used to stuff life jackets and mattresses.

## key facts

- Two Ways to Spread: Cattails can reproduce by seed or rhizome.
- Groundskeeper: Their root systems help prevent erosion.
- Homesites: Their stands create protection and nesting habitat for many birds, reptiles, insects and animals.
- They use the wind's energy to spread their seeds.
- Food Market/Food Chain: Their "nutlet" seed fruits are an important food source. Many species of insects eat and live on them and become food for other species.
- Nest maker: Fluff from their seeds is used by birds in nestbuilding.
- Useful to People: The American Indians ate various parts of the cattail plant, and wove chairs, mats and baskets from their leaves. The fluffy seeds are used for insulation for pillows and coats.

## Wetlands Producers

# Sedges

Sedges are one of a large family of grass-like plants that grows in wet places throughout the world, thriving in marshes, swamps, shallow water and moist meadows. Although similar to grasses, sedges have 3 rows of long narrow leaves and round or triangular solid stems. Grasses have 2 rows of long narrow leaves with round hollow stems.

The sheath (covering) at the base of each sedge leaf is closed around the stem. In grasses, the sheath is split and overlaps.

Sedges have tiny green flowers on small spikes called **spikelets**. These flowers have no petals, but do have small bristles. Sedges also bear small fruits called **nutlets**. The ancient Egyptians made a writing material called papyrus, from a type of sedge.

# Bulrushes

## description

Bulrush is the name given to several plants of the sedge family. Bulrush is a type of sedge. Several species of bulrush grow in the wetlands of the Great Salt Lake. They like full sun and grow in large colonies in marshes or wet meadows, in saturated conditions. The tough stems are round or triangular, some up to 12 feet tall. The pointy stems rise up singly or a few together with three leaves per stem. Leaves have a center rib crease and tightly serrated edges. At the top of each stem are spikelets, rusty brown clusters of seeds 2-15mm.

- They are able to spread by seed, and roots that creep called rhizomes. Rhizomes are edible raw, cooked, dried, and ground into flour
- Young stem tips, pollen and seeds also are edible. Stems also furnish raw materials for thatch, boats, and houses and can be woven into mats
- The plant provides cover, and the seeds provide food for waterfowl and small mammals.

# Three-Square Bulrush (AKA Basketgrass)

## description

Growing up to 5 ft. tall, this bulrush is easily identified by its sharply triangular stems, usually unbranched, with two or three concave sides. Its leaves, up to ½ inch wide without hairs, form basal sheaths and are less than half the height of the stems. A specialized leaf resembles a continuation of the stem beyond the spikelets. Narrow, 2-4mm grass-like basal leaves are all in the lower third of the stem.

## habitat

Three-square bulrush is found in deep and shallow marshes, borders of lakes and streams, and usually in water 6-8 in. deep but sometimes up to 2½ ft. deep. It is frequently found in brackish water and likes full sun.

## adaptations

Some useful three-square bulrush adaptations are:

- It can reproduce from both rhizomes and seeds. The seeds are dispersed by wind and water.
- It can survive seasonal drought, with the water table more than 3 ft. below the surface, and it can tolerate alkaline and saline conditions as well as freshwater.
- Its shape makes it able to stand rigid and tall against the wind and moving water.

## reproduction

As with all bulrush, it spreads by seeds and rhizomes. It flowers July into September with 1-8 Spikelets that are ¼ - ¾ in. long, stalkless, crowded and oblong oval. Nutlets (seeds) are up to 1/8 inch long, with a distinct point at the tip. Seeds ripen in July and August, and many are held a few months before being dislodged by wind or eaten. To germinate, they need scarification, (the hard outer coating is scraped by abrasion), and exposure to cold, followed by increased light, moisture and heat.

## ecology

Three-square bulrush provides an excellent wildlife food source and valuable cover for birds and mammals. The stems provide nesting habitat for blackbirds and marsh wrens. Snow geese are also known to use it.

It is also especially good for stabilizing or restoring disturbed or degraded areas and for erosion and slope control.

The cylindrical stalks have been used to weave matting, as well as for bedding and roofing material. Various indigenous peoples ate the fleshy rootstocks and rhizomes, or used the stalks and oil on a child's head to make the hair grow long and thick.

The seeds, being less hairy and larger than cattail, are the choice food for wetland birds like bufflehead, mallard, pintail, shoveler, blue-winged teal, cinnamon teal, greater scaup, lesser scaup, avocet, marbled godwit, clapper rail, Virginia rail, sora rail, long-billed dowitcher, and the red-winged blackbird.

### key facts

- **Provider:** Three-square bulrush provides important cover for birds, mammals, fish, reptiles and insects. Its large seeds are an important food source for wetlands residents.
- **Two Ways to Spread:** It can reproduce from rhizomes or seed and uses the wind and water to disperse its seeds.
- **Conservationist:** Its dense colonies and extensive root network helps build wetlands soils and to control erosion.
- **Well Adapted:** It tolerates alkaline and saline conditions as well as freshwater. Its shape and rigidity allows it to withstand wind and moving water.
- **Part of Prehistory:** Three-square bulrush is also called "basketgrass," and has been used by people for thousands of years to weave bedding, mats and baskets and as building material for boats and homes.

# Hardstem Bulrush

## description

Its stems are upright, gray-green to dark olive green, round, 1-2 cm thick and tapered near the pointed tip. They are 3-9 ft. high, with clasping sheaths and small or no leaf blades at the base. Stems are small chambered, making them stiff and not easily crushed between the thumb and index finger.

There is 1 spikelet or many, on stalks  $\frac{1}{4}$  to  $\frac{3}{4}$  in. long. They are oval to cylindrical, exceeded by a specialized leaf that appears to be a continuation of the stem. Flowers are tiny, with no petals and concealed by spirally arranged overlapping scales.

Nutlets are 2.2-2.7 mm. long, covered by whitish-brown scales, and have 6 basal bristles. Scales have marginal hairs and red dots on the back.

## habitat

Hardstem bulrush is found in deep and shallow marshes, lakes and streams. It usually grows in areas of standing water ranging from 4 in. to more than 6 ft. in depth, but will not tolerate long periods with very deep water.

## adaptations

Some useful hardstem bulrush adaptations are:

- It can reproduce from both seeds and horizontal underground rhizomes, from which roots and multiple stems arise.
- It will grow and spread in alkaline, saline, and brackish water.
- It will grow in many kinds of soils, will re-sprout after fire and can tolerate periods of drought and total inundation.

## reproduction

It spreads by seeds and rhizomes and will spread more than 18" in one growing season. It flowers from June to September with its seeds ripening in late August into September. They need light, moisture and heat to germinate, which they do readily in marshlands with freshly deposited, fertile, moist soil.

## ecology

Hardstem bulrush provides nesting habitat and cover for a wide variety of birds and furbearers, as well as spawning and nursery habitat for fish. It is the preferred nesting habitat for redhead and canvasback ducks, and muskrats will use the stems for building their houses. Waterfowl feed on the seeds, and geese, muskrats and beaver will eat the rootstocks and young shoots.

Its dense root mass is very important for soil stabilization with the dense colonies providing protection from erosive wave and stream erosion. The rhizomes form a matrix for many beneficial bacteria aiding with decomposition and water purification.

Native Americans used roots, pollen, and flowering spikes as food. Stems were used to construct baskets, mats, temporary shelters, and other household items.

## key facts

- Hardstem bulrush provides important cover for birds, mammals, fish, reptiles and insects. Redhead and canvasback ducks prefer it for nesting, and muskrats use the stems for building their houses.
- Fast Grower: It can reproduce from both seeds and rhizomes using the wind and water to disperse its seeds...and it can spread fast, 18 inches in one growing season.
- Team Player: Its dense colonies and extensive root network help build wetlands soils and to control erosion. Its maze of roots support bacteria that are active in decomposition and water purification.
- Grocer: It is important wildlife food: waterfowl eat the seeds, and geese, muskrats and beaver eat the roots and young shoots.
- Adaptable: Its rigid and round stem enables it able to stand up against strong wind and moving water. It survives high water and draught and tolerates alkaline, saline and fresh water.
- Useful to People: It has been used by people for thousands of years to weave bedding, mats and baskets and as building material for boats and homes.

# Saltgrass

## description

Saltgrass gets its name from its tolerance for low soil salinity and the salt that is expressed from its leaves to form visible crystals.

It's a stiff, perennial grass 4–16 in. high, with straight, vertical stems with leaves arranged in two opposite rows tapering to sharp points and. Distinguished by its 5-15 flowered straw-colored spikelets, with the two sexes separate plants, and by its sod-forming habit in salty and alkaline areas.

Its vigorous, asexual reproduction produces circular mats of genetically identical individuals where it has recolonized previously flooded playa margins. The female plants usually have shorter stems than the male plants.

- Stems rise up to 15 inches tall, and are smooth and stiff. Leaves are narrow, elongated, flat or rolled into a tube, long-tapering to the tip, up to 1/8 inch wide and rough to the touch.
- Flowers number 5-15 in a spikelet, many of which extend from a short panicle (main stem with branches) up to 3 inches long; each spikelet is up to 3/4 inch long.

## habitat

Saltgrass usually grows in the drier soils of wetlands found in broad, flat valleys and basins, on the margins of ponds, lakes and reservoirs, and in seepage areas. It grows in areas inhospitable to most plants, in salty and alkaline soils that are poorly drained with a high water table.

It requires a good seasonal supply of water, and grows most rapidly in areas where soil salinity is .1%-1.5%. It often appears as dense carpets covering the GSL playas.

## adaptations

Saltgrass uses several survival tricks:

- It can grow in soils with salinity up to 3%, thanks to the salt secreting glands on the surface of its leaves. These glands secrete the salt taken up by the roots and delivered to the leaves by the vascular system of the plant.
- It reproduces by seed and by extensive, branched, underground horizontal rootstocks called rhizomes, approximately 6" deep.
- Plants are either male or female.

- Uses a special type of photosynthesis (C4), similar to cacti, which allows it to gather sunlight during the day, but absorb carbon dioxide and complete its energy production in the cool of night.
- It is quite resistant to fire and trampling.

## reproduction

Saltgrass growth starts in early summer and it has a slow growth rate, remaining green until fall. Seeds are produced, but most growth is from rhizomes. It has separate male and female plants, flowers are yellowish, short and narrow and appear May -August.

## ecology

Clusters of saltgrass develop and stabilize soils. It also slows the overland flow of water and reduces the salinization of fresh water streams. At the GSL, Saltgrass and its seeds are a key food source for the birds, insects and the meadow vole. It also provides shelter for spiders, grasshoppers and other insects.

Saltgrass forms large dense areas of grass, which are used by animals to hide from predators and in which to nest. The Savanna sparrow and the meadow vole use the saltgrass zone for hiding from predators, such as the northern harrier. The meadow voles make extensive tunnel systems in the saltgrass zone where they hide, and in the spring they eat the young grass shoots.

Native Americans in Nevada and Utah used saltgrass as a cereal crop.

## key facts

- Tolerant: Saltgrass can grow in salty soils like no other grass can!
- Erosion Control: It grows in dense mats that both help it retain water and help protect soil from wind and water erosion.
- Habitat Specialist: It helps fill in the drier, saltier spaces in wetlands where other wetland plants won't grow.
- A Boy-Girl Plant: It has male plants and female plants.
- Home: It makes good shelter for insects and small birds and mammals.
- Restaurant: Small mammals eat its leaves and birds and insects love to eat its seeds.

## Reeds

Reed is a common name for many kinds of tall, slender grass plants. The word may also refer to the stems of these plants, which are often jointed in many places. The stems may be as slender and fragile as straw, or as thick and sturdy as bamboo. The pith that fills the center of the reed can usually be removed, leaving a hollow, jointed tube. The hollow stems of the reed have been used to make musical instruments.

Reed musical instruments, like the clarinet, have a mouthpiece containing a vibrating strip that was once made only of reed. Now plastic, wood, glass, and metal are often used to make the reed.

The American Indians often made the roots, young leaves, and stems of various reeds a part of their diet. Farmers in Europe thatch their homes with other types of reeds.

# Reedgrass (AKA “common reed,” “northern bamboo” or by its genus, Phragmites.)

## description

Reedgrass grows up to 15 feet tall and its stiff, smooth, erect stems are hollow, round, and unbranched, and can be an inch thick. The stems can be almost woody, and are sometimes purplish. The long, sharp, and bluish-green leaf blades are up to 24 inches long and ½ to 1½ inches wide.

- The foliage is gray-green during the growing season. The plant turns tan in the fall and most leaves drop off. The erect stems with their plume-like tips remain conspicuous in the winter landscape.
- Flowers develop by mid summer and have many parts. First, they have a panicle, a long stem, and on each one there are many spikelets with up to seven small reddish flowers on it. The flowers are less than 1” long. When the flowers die small gray fruits with many seeds take their place.
- Recent research in molecular genetics has shown that there are native North American strains of this reed, but they have been largely replaced in the Northeast and parts of the West by an invasive form from Eurasia.

Habitat Reedgrass is usually found growing in marshes or along the edges of ponds, lakes and streams. They can grow in shallow water, or in relatively dry places.

## adaptations

Reedgrass uses many methods to survive:

- It is very competitive and will often crowd out other plants, such as cattails. It grows fast by spreading underground stems, called rhizomes.
- It grows in disturbed or polluted soils along roadsides, ditches, dredged areas, and almost anywhere there are slight depressions that hold moisture. One of the most common means of spread is when fragments of rhizome are transported by road maintenance equipment.
- It is a perennial plant, so even though stems, leaves, and flowers die in the winter, rhizomes grow new ones in the spring.
- It tolerates both alkaline and acidic conditions and once established spreads rapidly.
- It uses the wind to spread its pollen.

## reproduction

The seeds disperse and set through fall and winter and may be important in colonization of new areas. Many seeds are produced, however research has shown that few are viable.

Germination occurs in spring on exposed moist soils, but reedgrass spreads mainly by elongation and fragmentation of rhizomes. Vegetative spread by below-ground rhizomes can result in dense clones with up to 200 stems per square meter.

Mature plants have long, stout, scaly, creeping rhizomes (underground stems) that form extensive mats just below the soil surface. Roots and erect shoots are produced at the joints of the rhizomes.

This grass often forms thick stands (areas where one species of plant takes over so there is hardly any room for other plants).

## ecology

The greatest benefit to wildlife is as protection and cover. Reedgrass is so tall it can hide big animals, like White-tailed Deer, and smaller animals, such as frogs and insects. Many water birds nest in these reeds, including Mallards, Canada Geese, and herons. Most birds nest near the edges of stands, where the reeds are not so thick. Birds eat the seeds of Reedgrass, and Muskrats eat the rhizomes.

Reedgrass is a difficult plant for people to figure out. We get concerned because they crowd out other plants in marshes, and when they get too thick, many water birds have trouble finding nest sites. But when the reeds are in smaller stands, or mixed with other plants, they provide great cover for wildlife.

People use reeds to stop erosion on the edges of streams and ponds. Their roots help hold the soil in place. People have also used reeds to make paper, baskets and brooms. Sometimes they are ground up to use as filler for upholstery. Stalks contain a sugary paste that was once used by Aboriginal peoples as a sweetener.

The invasive Eurasian strain of this reed grows aggressively in areas that are disturbed or stressed by pollution, dredging or other alteration of the natural hydrologic process. Wetlands have less native plant diversity in areas where Eurasian reedgrass grows.

## key facts

- Reedgrass is a grass that grows 15 feet tall! Stems are still and hollow, like bamboo. Long-lasting underground stems, rhizomes, mean it can re-sprout right away in spring without growing from seed each year. The rhizomes also help it spread quickly.
- Benefits to Wildlife: It grows dense and tall to hide and protect large and small animals. Birds eat the seeds and muskrats eat the roots. Waterbirds nest in these reeds.

- A relative from Asia is replacing our native species in many parts of the US. It can be very competitive and crowd out other important wetlands plants, and isn't bothered as much by pollution.

# Duckweed

## description

Duckweed looks like tiny floating leaves on the water surface. The name refers to several species of tiny native free-floating aquatic perennial plants seen on pools and ponds in marshes and lakes. It gets its name from being a food for ducks, although many fish and other animals also eat it.

Duckweed does not have the typical stem or leaves of most plants. It has a round, slightly oval-shaped body, called a "frond", and a small root-like structure, called a "rootlet", hanging down underneath. Fronds tend to grab each other, forming the thick mats covering the surface of the water.

- The common (or lesser) duckweed is the smallest flowering plant known in the world, measures only 1/16 to 3/16 inch (1.6 to 4.8 millimeters) long and has only a single rootlet.
- Greater duckweed fronds have several roots, show distinct veins and are up to twice the size of common duckweed.
- A third species here, Star Duckweed, is easy to identify because of its elliptic fronds that taper to a narrow stalk at the base.
- Most populations of duckweed are mixtures of two or more species. Duckweed fronds are usually pale green, but can be a reddish-purple.

## habitat

Duckweed is usually found growing on pools and ponds in marshes and lakes. It can tolerate brackish water up to 0.4%.

## adaptations

Some neat survival tricks include...

- Each frond absorbs nutrients through the whole plant and not through a central root system.
- Duckweed grows in full sunlight as well as dense shade. It can grow in temperatures close to freezing, and can tolerate below-freezing temperatures in dormancy.
- It produces fall budding pouches that produce smaller, rootless, dark green or brownish daughter plants. These dormant structures sink in the fall and rise in the spring due to changes in starch composition and gas spaces.

## reproduction

Reproduces by seed and vegetatively (see below), but during the growing season nearly all plants arise by vegetative reproduction.

Unlike the ordinary leaves of most plants, each duckweed frond contains buds from which more fronds may grow, doubling in population in as little as 48 hours! These buds are hidden in pouches along the center axis of older fronds. As they grow, new fronds emerge through slits in the side of their parent fronds. Until they mature, daughter fronds may remain attached to the parent frond. Rapidly growing plants often have three or four attached fronds.

Duckweed blooms June through September, with microscopic flowers in tiny pouches and oval-shaped tiny fruits. Both are difficult to see with the unaided eye. It can reproduce at twice the rate of other vascular plants and spread rapidly, especially in water containing high levels of nitrogen and phosphates. Duckweed can also be transported by birds and high-water movement.

Duckweed spends the winter at the bottom of ponds in the form of a bulblet, called a turion, which sinks following frost. Greater light and warmer temperatures in the spring result in more oxygen in the turions, prompting them to float to the surface again.

## **ecology**

Duckweed is an important wetlands community member for many reasons. It is a food source for many birds, fish, reptiles and mammals, being very high in nutritional value. (40% protein, dry weight; it produces more protein per square meter than soybeans.)

It provides shelter and protection for aquatic animals, such as frogs, snakes, fish, insects, crustaceans, and dozens of tiny zooplankton. A large number of invertebrates live among the duckweed mats, providing additional food opportunities to wetland wildlife.

While duckweed can be an indicator that excessive nutrients exist in the water, it doesn't contribute to water quality problems. In fact, it is one solution to water pollution. Sewage and animal wastes, especially from farming, pollute water with too much nitrogen and phosphates. This plant improves water quality by removing phosphorus and nitrogen and by naturally filtering unwanted matter. Duckweed grows quickly by using these up and then animals eat up the duckweed.

Duckweed provides oxygen to and absorbs excess nutrients from surface waters, including phosphorus and ammonias, reducing suspended solids and reducing biochemical oxygen demand.

A cover of duckweed fronds shades the water below, reduces evaporation and reduces the growth of algae. A full, thick mat of duckweed may have a temperature of about 10° above ambient air conditions due to radiation providing warmth for small animals.

Researchers are using these plants to study basic plant development, plant biochemistry, photosynthesis, the toxicity of hazardous substances, and much more.

Genetic engineers are cloning duckweed genes and modifying duckweeds to inexpensively produce pharmaceuticals. Environmental scientists are using duckweeds to remove unwanted substances from water. Aquaculturists find them an inexpensive feed source for fish farming.

### key facts

- **Tiny:** Duckweed is the world's smallest flowering plant!
- **Colonizer:** Unlike ordinary plant leaves, each duckweed frond contains buds from which more fronds may grow, so duckweed can double its population in as little as 48 hours!
- **Bounces Back:** It sinks to the bottom of ponds as a small bulb for winter, and then rides an air bubble back to the top to continue growing in spring.
- **Health Food:** Excellent source of nutrients for many birds, fish, reptiles and mammals.
- **Habitat:** Its leafy mats and the shade it provides protects many aquatic fish, reptiles, amphibians and invertebrates.
- **Water Purifier:** It filters and absorbs pollutants and improves water quality.
- **Footwarmer:** It provides some evening warmth to small animals by absorbing heat during the day and re-radiating it after sunset.

# Algae

(A single plant is an alga, algae is the plural form.)

Creating a detailed summary of algae is similar to an attempt to summarize “animals” in a concise and coherent way. To simplify this task, our discussion of algae is divided into two sections. This first section provides a brief sketch of algae in general, emphasizing the significance of so small an organism in so many ecosystems, and the biosphere itself. The second section focuses on the algae that we can most readily observe at the Great Salt Lake and its wetlands.

Classification The most common “5 Kingdom” classification system distributes algae in more than one kingdom. Most algae are classified in the Kingdom Protista however, some are classified with the bacteria in the Kingdom Prokaryotae. This classification system continues to be intensely debated as new research increases our understanding of the way that these organisms are related.

## description

Algae are a diverse group of simple, plantlike organisms, all of which contain chlorophyll. Like plants, most algae use the energy of sunlight to make their own food, through a process called photosynthesis. However, algae lack the roots, leaves, and other structures typical of plants.

The earliest lifeforms on this planet are thought to be ancestors of algae. Algae were probably the first organisms capable of photosynthesis and, until the appearance of plants on earth, the only photosynthesizers for billions of years.

- Algae also come in a variety of shapes and forms. The simplest form is the single, self-sufficient cell, such as *Euglena*, dependent only on sunlight and carbon dioxide and minerals from the water.
- Numerous one-celled algae may clump together to form a colony. Although these cells are attached to one another, each cell within a colony continues to function independently.
- Still other algae are multicellular organisms. In the simplest multicellular algae, the cells are joined end to end; forming filaments that are both branched and unbranched.
- More complex structures may be shaped like a small disc, tube, club or even a tree. The most complex algae have highly specialized cells. Some seaweeds, for instance, have a variety of specialized tissues, including a rootlike holdfast, which resembles a plant stalk, and a leaflike blade.

- The five largest groups of algae (phyla) are: Green Algae; Red Algae; Golden-Brown Algae, Brown Algae, and Diatoms (one phylum); Dinoflagellates; and Cyanobacteria.

## habitat

Algae vary greatly in size and grow in diverse habitats. They are found growing in oceans, lakes, rivers, ponds and even moist soil. Some are microscopic and consist of just one cell, and others are large and contain many cells.

Some attach to stones or other water plants. Microscopic algae, called phytoplankton, drift or swim in lakes and oceans. Phytoplankton is so small that 1000 individuals could fit on the head of a pin. The largest forms of algae are seaweeds that stretch 300 feet from the ocean bottom to the water's surface.

Although most algae grow in fresh water or seawater, they also grow on soil, trees and animals, and even under or inside porous rocks, such as sandstone and limestone. They tolerate a wide range of temperatures and can be found growing in hot springs, on snow banks, or deep within polar ice.

## adaptations

A host of adaptive strategies are represented by the many thousands of algal species in terms of their color, movement, reproduction, form of energy production and moisture or temperature tolerances.

## reproduction

Algae reproduce in astoundingly diverse ways. Some reproduce asexually, others use sexual reproduction, and many use both. How fast algae grow depends on how much light it gets, the temperature, and amounts of nutrients in the water. Like other plants, algae can make their own food. To do this, they must have light to complete photosynthesis. Algae can grow faster in warmer temperatures.

In asexual reproduction an individual reproduces without combining its genetic material with that from another individual. The simplest form of asexual reproduction is binary fission, in which a unicellular organism simply divides into two new individuals. Some multicellular algae, reproduce asexually through fragmentation, in which fragments of the parent develop into new individuals. In a similar process called budding, special buds detach from multicellular algae and develop into new individuals. Many algae produce special cells called spores that are capable of growing into new individuals. If these spores move about using flagella, they are known as zoospores.

In sexual reproduction, genetic material from two individuals is combined. The simplest form of sexual reproduction in algae is conjugation, in which two similar organisms fuse, exchange genetic material, and then break apart. Most multicellular

algae undergo a more complex form of sexual reproduction involving the union of special reproductive cells.

Some multicellular green algae follow a distinct pattern of reproduction called alternation of generations, in which it takes two generations – one that reproduces sexually and one that reproduces asexually – to complete the life cycle.

### **ecology**

Algae are the most important photosynthesizing organisms on Earth. They capture more of the sun's energy and produce more oxygen than all plants combined.

# Algae (At Great Salt Lake)

## description

Of the hundreds of algae species in Utah, the most readily observed around Great Salt Lake are those that tint the saline lake waters various shades of pink, red, orange or green, and those that colonize in green mats on the wetland pond surfaces, such as those encountered at the Preserve. Between these two habitats, more than 50 species have been identified.

### Lake Algae:

- While filamentous and colonizing species of algae can be found in the lake, the most ecologically significant are the small microscopic single cell variety. The Three major types are red pigmented green algae (red pigments mask the chlorophyll), the green pigmented green algae, and the blue-green algae. These species of algae differ from algae found in freshwater lakes because of their tolerance to the high salinity in the Great Salt Lake.
- Some single-cell algae have a simple membrane covering rather than a rigid cellulose cell wall, which makes them soft to eat for the brine shrimp. Several species of algae form the phytoplankton that float or swim in the salty water, and are eaten by brine fly larvae. Another type of algae, called diatoms, have cells that are covered with a hard silica cell wall. (Brine flies and shrimp cannot eat these.)
- In contrast, some of the bluegreen algae have mucous sheaths coating the filaments or chains of cells. They may also secrete limestone around them to form the living algal reefs growing on the bottom of the lake.
- Larger, multicellular algae can be found growing on surfaces of rocks, wood and sandy beaches. Some grow as hair like filaments or as small chains of cells. Some of the filamentous green algae are washed in the lake from fresh or brackish water sources surrounding the lake.
- The best time of year to appreciate explosive algae growth in Great Salt Lake (such as along the Antelope Island Causeway) is in April and May. This is when the lake turns a cloudy yellow-green from explosive algal growth. By July, the brine shrimp and fly larvae have eaten so much algae that the lake turns nearly clear again.

### Pond Water Algae:

- Most individual algae in pond water require a microscope to see. But when many of one or more species grow together, they will look like green slime in the water. It creates a free floating mass with no true leaves, stems or roots.

## habitat

Our particular interest is in the saline (salty) and hypersaline (saltier than the 3.2% of ocean water) water in Great Salt Lake, and in the fresh (less than .05% salinity) or brackish (.05 – 3% salinity) water in wetlands ponds around the lake.

## adaptation

Algae use some unique tricks for survival:

- A species appears a certain color because the particular pigments it contains. These pigments harness the sun's energy and to filter light in ways that is best for them based on the conditions in their habitat.
- To survive high salinity, algae species in Great Salt Lake produce a chemical (glycerol) that keeps their cells free of excessive salt and prevents the destructive effects of salt that would kill other organisms.
- The best temperatures for the algae is around 85° F, but they can remain active in water temperatures close to freezing. When the water is too cold for too long, the algae can become dormant, usually between November and March. Most winter as spores.

## reproduction

Some reproduce asexually, others use sexual reproduction, and many use both.

## ecology

Food: Single cell algae species – the ones that tint the lake water a cloudy yellow-green in spring – are most important to the ecology of Great Salt Lake. Literally millions of millions of brine shrimp and brine fly larva are food for millions of birds visiting from all over the world!

Algae form the foundation of most aquatic food webs, which support an abundance of animals. In fresh water locations around the lake, microscopic animals that eat algae include amoebas, paramecium, water bears and many others.

Larger animals that use algae for food in fresh water and brackish systems include frogs, salamanders, crayfish, aquatic insects, snails, fish, water fleas, mussels and others.

Cover: When many colonies in the same area stick together, they provide cover for fish, aquatic insects, and other animals.

Oxygen: In healthy systems, algae create oxygen and help purify the air and water by the process of photosynthesis. Algae is the number one oxygen producer in Great Salt Lake and an important oxygen source in all of the surrounding wetlands.

Habitat: Some algae multiply rapidly in polluted lakes and rivers. Thick layers of algae, called algal blooms, may form when waste materials, such as sewage and fertilizers, are dumped in the water. The increased algal population sometimes upsets the natural

balance of life in water. The water eventually may become extremely low in oxygen and unfit for use by most animals or human communities.

Symbiosis: One way that algae are able to spread from one place to another is through the help of birds. When ducks, geese, herons, or other water birds fly to new areas, they carry mud on their feet. Inside the wet mud, algae can survive until it lands in a new body of water.

## key facts

### (Pond Algae)

- Algae come in different colors, depending on the pigments contained inside. These pigments help the alga adapt to the temperature, salinity and sunlight conditions where they need to grow.
- Algae provide the critical foundation of most aquatic food webs (see above). Besides food, algae also create oxygen, purify water and provide cover.
- Algae usually become a problem only when people have dumped too many things into that water that make algae grow too fast.

### (Lake Algae)

- Algae in Great Salt Lake are specially adapted to live in salty water.
- Some algae grows in clusters we can see, and other kinds are so small that we need a microscope to see them. The explosive growth of so many microscopic algae in April turn the clear lake water into a yellow-green stew.
- People mistake the lake's spring algal bloom for polluted water, when it is actually a sign of solar energy being transformed into brine shrimp and fly larvae food, which themselves go on to be meals for millions of birds arriving from continents away.