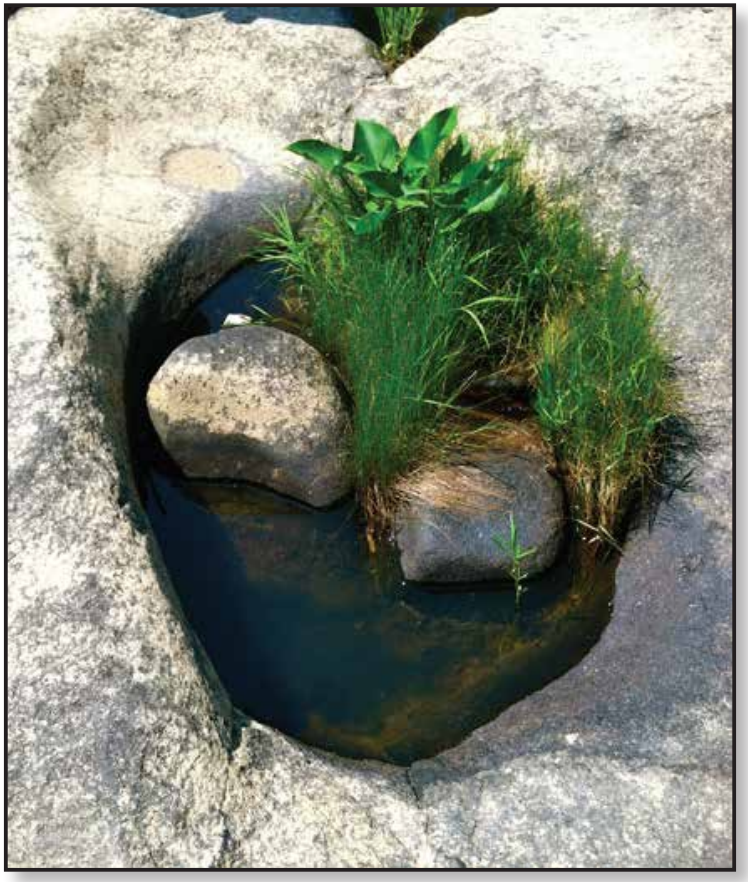
PLANTS OF THE ROCK POOLS



SUMMER / FALL
BELLE ISLE SOUTH

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SCIENCE in the Park

Science in the Park provides science-focused educational materials about the geology, habitats, and flora and fauna of the James River Park System in Richmond, VA. We hope to enrich the Park experience for local and regional school systems, communities, visitors, and regular users of the Park through web-based, self-directed explorations, guides, videos, and lesson plans. Only when people know something can they love it; only when people love something will they cherish and protect it.

Our project has been funded by private grants. It is a collaborative effort between Virginia Commonwealth University's Life Sciences Outreach Education and: the VCU Biology Department, Ralph White, the Friends of James River Park, the City of Richmond's James River Park System, and many, many talented and knowledgeable individuals.

Field Notes – 23 August 2012. Location: 37° 32′ 3″ N, 77° 27′19″ W to 37° 31′28″N, 77° 27′19″ W; James River between the end of the service road east of Park Headquarters and the area even with the apartment high-rise on Riverside Drive. Description: exposed granite bedrock on south side of river, small sandy islands anchored by trees, cracks between rocks & rock pools. River level very low (3.88 ft at Westham Gauge at noon & dropping). 53 spp. identified.

— Catharine White Tucker

Rock Pools and How They Form

Holes in the granite riverbed are referenced as potholes. They are caused by the grinding action of gravel and larger stones that lodge in the cracks of rocks during floods. When a pebble is trapped, it is vibrated by the current and grinds down the rock around it. As the indentation widens, water swirls the rock inside, eventually creating a circular hole. Over time, one hole may eat into another, creating an oval shape. Some pot holes hold water; others connect to underlying cracks in the bedrock and slowly drain. Some are deep (> 5 feet), but most are shallow (~ 1 foot). Some are very large (>10 feet), but most are 1 or 2 feet in diameter. Shallow holes and depressions tend to dry out during the summer.

Rock Pools are usually potholes that have collected sand and soil. The scouring of muddy floodwaters can cause rock pools to form in odd depressions behind boulders. Rock pools have also formed in cavities left by the quarry industry's cutting and removal of curbstones from the bedrock. Pools that accumulate the most sand generally grow the biggest plants, provided there is moisture. As the roots of vegetation trap more sand and silt, the plants grow bigger. Large floods can reverse this process by stripping everything away.

Helpful References

- *Flora of Virginia* by Alan S. Weakley, J. Christopher Ludwig, John F. Townsend
- *Wildflowers & Grasses of Virginia's Coastal Plain* by Helen Hamilton and Gustavus Hall

James River Rock Pool Flora

TREES

Woody Plants (Trees and Shrubs)

Woody plants invest energy in growing strong trunks or stems to lift their leaves to the sunlight. In this Fall Zone environment, they are more stunted than their counterparts on the banks, often having multiple trunks, with trees tending to look like shrubs. Both are usually perennial.

Unique environmental conditions sculpt plants growing in and around the rock pools. Floods break off branches, there is often little space for roots, and nutrients are scarce. The bedrock holds the summer heat, and reflections off the water can be intense. On the plus side, sunshine and moisture are usually abundant, competition is limited, and there are few plant-eaters. Plants come back year after year, proof that living is reasonably good for those who can adapt.

Trees and shrubs listed here are either specifically designed for severe conditions or have adapted to the harsh environment. Only a few species, mostly native to Virginia, can tolerate this unpredictable environment, so identifying them is relatively easy. Both Common and Latin names are given as well as the Plant Families. Non-native and invasive plants are indicated, along with interesting facts and suggestions to help identification and spur curiosity.

Buttonbush

Cephalanthus occidentalis L.

Madder Family (Rubiaceae)

Honey Balls, Globe Flower

This small shrub grows in damp, sandy areas and in shallow water. The glossy, oblong leaves have pointed tips, are 2 to 3 inches long, and grow in whorls of 3 or 4. Stems and twigs are often reddish. It is easily identified by sight (or nose) in mid-summer by distinctive clusters of globular, white, fragrant flowers that look like fireworks or exploding stars. Dry seed heads often remain over the winter.

LOOK FOR the small, round seed heads that look like old-fashioned buttons once used in the Middle Ages and in colonial America. To make a button, a needle was pushed through the soft, unripe fruit to make a hole. When it hardened in the fall, it was harvested and sewn onto a garment.

Eastern Cottonwood

Populous deltoids Bartr. Ex Marsh
Willow Family (Salicaceae)

Eastern Cottonwood

A large, moisture loving tree with alternate, large, triangular to heart-shaped leaves with wide bases that make them shake with the slightest breeze. Leaves taper to a pointed tip and are edged with shallow, rounded teeth. Flowers are produced on dangling, fox-tail catkins are followed by seed capsules which split and release multiple seeds with cottony threads attached. Fluffy white cottonwood seeds drift on the wind and collect in cracks, and pockets in the rocks, only to be washed downriver in heavy rains.

LOOK FOR heart-shaped leaves with yellow mid-veins and flattened leaf stalks, shaking in the wind.

Winged Elms

Ulmus alata Michx.

Elm Family (Ulmaceae)

Winged Elm

A medium sized tree (to 60 ft) that grows in wet or dry conditions. Along the James, this sun-lover inhabits the shoreline and rocky, sunlit areas. The slightly rough, oblong leaves are 2 inches long with toothed side edges. The base is lopsided.

LOOK FOR cork-like ridges along the twigs and 2 inch leaves.

Elms

American Elm *Ulmus americana*

Elm Family (Ulmaceae)

American Elm

Once a common, large-sized tree (to 80 ft) of wetland habitats, it now grows only as a sapling or small tree and then dies back as a result of Dutch Elm Disease, a fungus brought to America in 1940. The smooth, oblong leaves are 3 to 6 inches long with a lopsided base. This was once a favorite shade tree lining urban streets. Mature trees have a tall, wide, vase-shaped growth with tough branches did not snap off.

LOOK FOR smooth twigs and 3 to 6 inch long leaves.

False Indigo-bush

Amorpha fruticosa L.

Bean Family (Fabaceae)

Indigo bush, Leadplant

This many-stemmed shrub anchors the shoreline. Leaf shape is pea-form: alternate, compound and made up of 9 to 35 oval leaflets. Violet-blue flowers grow in tight clusters and yield small pea-like pods with 2 or 3 seeds. These are unlike the usual pea flowers and have only one petal tightly rolled into a cylinder.

LOOK FOR honeybees, beetles and butterflies attracted to the flowers to feed on pollen and nectar. Examine the leaves to find a tiny bristle at the end of each leaflet.

Green Ash

Fraxinus pennsylvanica Marsh.

Olive Family (Oleaceae)

Green Ash, Swamp Ash

A fast growing, medium sized (to 60 ft) tree found occasionally on islands among the pools, along the shoreline, or, more often, inland away from the strongest flood impact. The compound leaves grow opposite each other and are 6 to 9 inches long with 7 to 9 toothed, elongated oval leaflets and. They are shiny, bright green. above and smooth to slightly fuzzy underneath. Male and female flowers are usually on separate trees. Fruits are 1 to 2 inches long, narrow, flat and symmetrically winged. In the fall, the fruits hang in conspicuous clusters.

*LOOK FOR 3 trees in the Park with leaves, twigs, and branches that grow opposite each other-***Green Ash***, Maple, and Dogwood. Green Ash is easy to confuse with Box Elder, also called Ash-leafed Maple.*

Halberd-leaved Rose Mallow

Hibiscus laevis All.

Mallow Family (Malvaceae)

Scarlet Rose Mallow, Halberd-leaved Hibiscus

Tall (4 to 6 ft) perennial with large, alternate leaves with 3 to 5 pointed lobes. Flowers are large (~5" across) with rounded, overlapping pink petals and a prominent central reproductive column protruding from the red-purple throat. Flowers bloom at the leaf axils from the bottom to the top of the erect stalks in mid- to late summer. Each flower lasts a day, opens in the morning and closes tightly at night.

LOOK FOR large, distinctive seed pods with flattened sides.

Mimosa

Albizzia julibrissin Durazzini

Bean Family (Fabaceae)

Mimosa *(Non-native)*

A small tree with alternating, finely cut, compound leaves that give the tree a fern-like appearance. Leaves have 18 to 32 small, oblong leaflets that sometimes fold up when touched. Introduced from Asia in the 1800's as an ornamental, mimosas have spread into the wild, preferring partial shade along the forest and shoreline edge.

LOOK FOR delicate, sweet-scented, 2" globular pink flowers in May. The fruits resemble flat beans.

Multiflora rose

Rosa multiflora Murray

Rose Family (Rosaceae)

Multiflora rose, Blackberry rose

(Non-native and invasive)

A thorny shrub with arching branches, or canes, with alternating compound leaves of 7 to 9 leaflets. In spring and early summer, short-lived, fragrant white flowers bloom, producing clusters of small, red, apple-like fruit (rose hips) attractive to birds and small animals. These bushes were introduced in highway median strips because their dense thickets could safely stop any car that ran off the road, but they are highly invasive and difficult to control.

LOOK FOR the round stems and thin, straight thorns. In contrast, wild blackberry bushes have 5 ridges on the stems and slightly curved stout thorns.

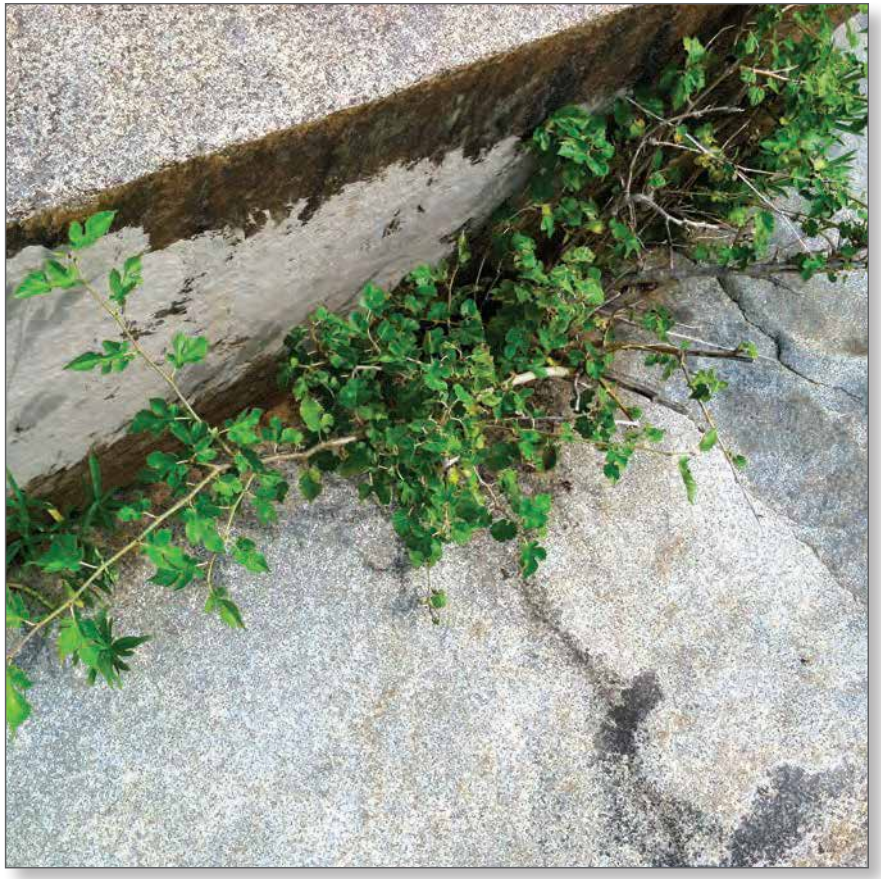
Red Mulberry

Morus rubra L.

Mulberry Family (Moraceae)

Red Mulberry

A medium-sized tree (to 60 ft) with spreading branches. Leaves are 3 to 5 inches long and can have any of 3 shapes: oval, mitten, or 3 lobed. The slightly rough leaves have toothed edges and are downy underneath. In exposed or restricted sites among the rocks, these trees may have smaller than normal leaves and distorted shapes.



LOOK FOR dense collections of 1" long cylindrical fruit in late spring that look like narrow blackberries. When ripe, the fruit is popular with birds, many other animals and are even eaten by fish.

Redbud

Cercis canadensis L.

Bean Family (Fabaceae)

Redbud , Judas Tree

A small tree (up to 40 ft) with dark gray, spreading branches that look black when wet. Leaves are heart-shaped, 3 by 5 inches long and wide, with smooth edges. Bright purple flowers bloom along the twigs and branches in early spring. Clusters of flat, dangling brown pods appear in late-summer and fall. As a member of the Bean Family, its roots produce nodules containing nitrogen-fixing bacteria that take nitrogen gas out of the air and change it to a form used as fertilizer. This adaptation enables it to grow in poor soil and also helps adjacent plants. According to myth, Judas hanged himself on the Asian relative of this tree, and its white flowers changed color with his shame. Occasional specimens of both species show up white.

LOOK FOR the purple outline of the tree in spring, the clusters of small bean pods in late summer, and the yellow, heart-shaped leaves on the ground in early fall.

River Birch

Betula nigra L.

Birch Family (Betulaceae)

River Birch, Red Birch, Southern Birch, Black Birch

A slender, small to medium tree that prefers river or stream banks and ponds, instantly identifiable by distinctive gray-white bark peeling to show red-brown areas. Leaves are alternate, simple, 1½ to 3 inches long with double-toothed edge and wedge-shaped base that makes them look like a small, fat Christmas tree. They are dark green above and light underneath. The flowers are borne in catkins pollinated by the wind. This is the only birch native to the Coastal Plain.

LOOK FOR trees with peeling bark, usually arching out over the water's edge.

Silver Maple

Acer saccharinum L.

Maple Family (Aceraceae)

Silver Maple, White Maple

Normally a large tree (to 80 ft), small versions establish themselves in barren, rocky areas where shallow roots take hold in deposits of sand and soil. Leaves are opposite with toothed edges and have 5 deep lobes, each coming to a point. The top surface is green and the bottom almost white. One of the first bloomers, tiny reddish clumps of flowers appear in early spring, giving the branches of the forest a blurry, reddish glow. In late spring, the distinctive fruits appear- paired seeds with stiff wings that form a 2 inch long 'V'. When they drop, they spin through the air like tiny helicopters away from the parent tree. This is a method of seed dispersal.

LOOK FOR 3 trees in the Park with leaves, twigs, and branches that grow opposite each other—Green Ash, **Maple***, and Dogwood. Look for a flash of silver when the wind reveals the white undersides of the leaves.*

Swamp Rose-mallow

Hibiscus moscheutos L.

Mallow Family (Malvaceae)

Swamp Rose-mallow, Wild Hibiscus, Marsh Mallow, Crimson-eyed Rose-mallow

This tall (3 to 6 ft) perennial shrub has multiple hairy stems and alternate oval leaves that taper to a sharp point. Unlike most perennials, these plants die back each year, their stalks looking like clumps of scattered broomsticks in the winter. In late July-August, large, white flowers appear in the axils of the leaves- 3 inches across, with a ruby-red band at the base of each petal, and long, bright yellow stamens protruding from the center. Distinctive dry seed capsules persist through the winter. A similar species with pink flowers also grows in this area. It is said that Native Americans taught the Colonial settlers to whip the juice from the roots into a thick froth, which was then mixed with sweetener and baked to make a dessert we now call marshmallows.

LOOK FOR last year's tan stalks among this year's green ones. If you are patient you may see hummingbirds feeding at the flowers.

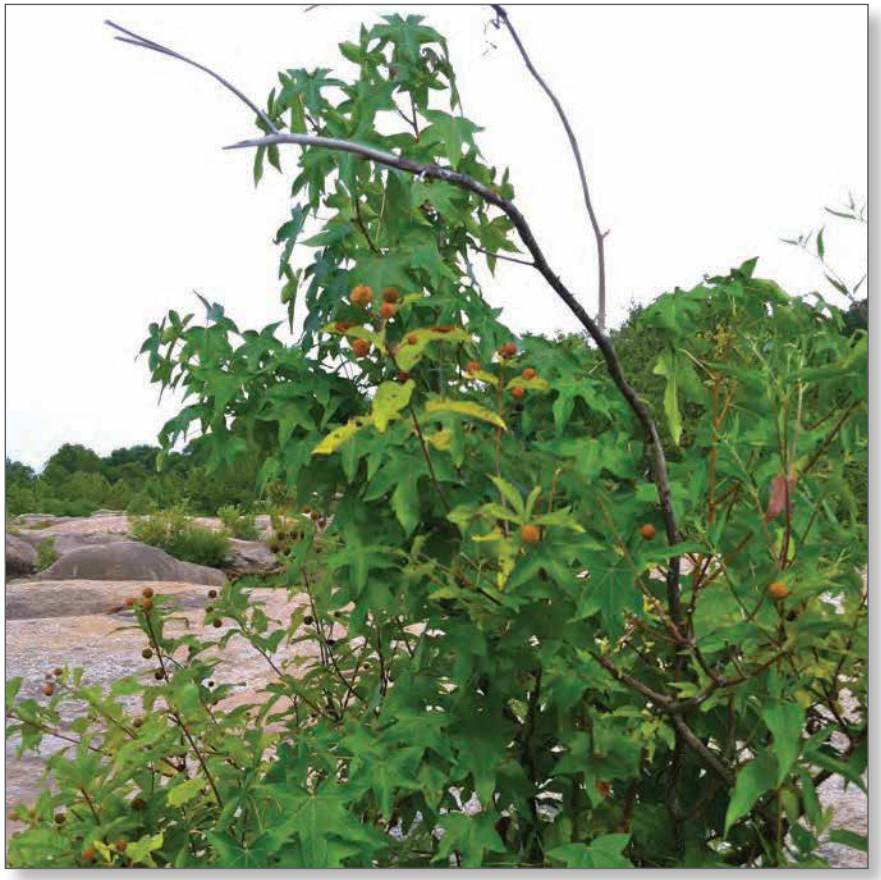
Sweetgum

Liquidambar styraciflua L.

Witch-hazel Family (Altingiaceae)

American Sweetgum, Alligator-wood

A common medium to large tree with alternate, simple, star-shaped leaves with 5 (sometimes 7) sharply pointed lobes. Fruit is an easily recognizable 1 to 1½ inch globe, made of many capsules and are known as 'gum balls'. In fall, the tree can have leaves in brilliant shades of red, purple, gold and orange simultaneously. The Genus name refers to a fragrant, sticky sap that exudes from the tree when damaged.



LOOK FOR sap deposits on damaged areas of Sweetgum trunks. This sap was once used as chewing gum.

Sycamore

Platanus occidentalis L.

Planetree Family (Platanaceae)

Sycamore, American Planetree

The largest tree in the floodplain, sycamores can exceed 100 feet in height and 10 feet in diameter and are easily identified by peeling patchworks of tan, green, and brown on a smooth white trunk. Leaves are alternate, large (3 to 7 inches), broadly 5-lobed, and edged with large teeth. The base of each leaf covers a bud and is surrounded by two mini-leaves called bracts. The globular fruits are brown and lumpy, hanging on 3 to 4 inches stems. Their tiny, very hairy seeds attract small birds. The wood rots easily, so when limbs break off, the interior quickly crumbles. Entire tree trunks can become hollow yet the trees continue to stand and grow. Trees often have holes used in succession by woodpeckers, owls, and raccoons. If sycamore seedlings gain a foothold in restricted environments like rock cracks, tree growth can be stunted, but where sand and soil accumulate, they grow into shrubby trees that help to create or anchor and enlarge islands in the river.

LOOK FOR the splotchy green-white-and tan camouflaged trunks in summer and the bare, smooth, white appearance in winter. Seen in the morning mists of December, you can understand their early description as "the Ghosts of the Forest". These are the most common big trees you will see in the James River Park System.

Willows

Salix spp.

Willow Family (Salicaeae)

Two species of willow grow along the shoreline and among the rocks in this area: Black Willow and Carolina Willow. Both have alternate, narrow lance-shaped leaves that come to a point, and have finely toothed edges. In spring, the male and female flowers are borne in catkins that look like fox tails. The catkin fruits persist into the fall. Fibrous root systems anchor the trees on unstable substrates, stabilizing shorelines or helping to create islands in the river. The stems are flexible and tolerant of flood impact. If broken, branches can quickly take root in a new area. The tiny seeds can sprout in a matter of hours if they land on mud, and seedlings can appear in 2 to 3 days. These species are truly adapted to disaster. You will find them thriving in areas highly impacted by floods.

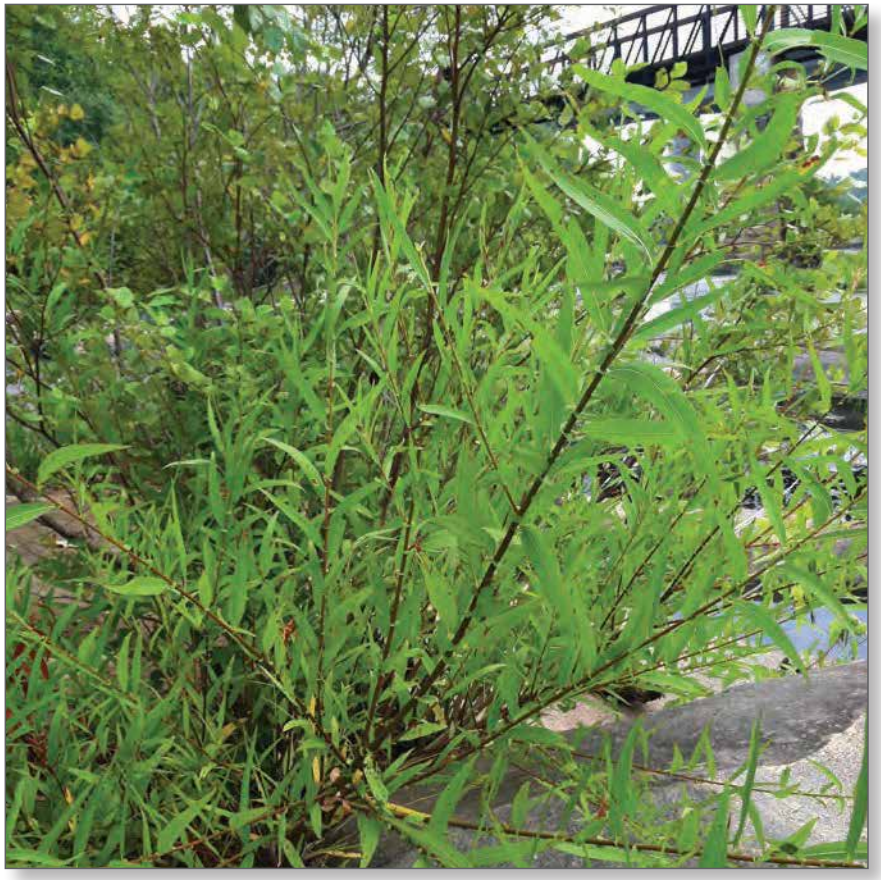
INTERESTING FACT: Willow sap contains salicylic acid, the chemical from which aspirin is derived, and for hundreds of years the bark was crushed and soaked to make a pain reliever.

Black Willow

Salix nigra

Black Willow, Swamp Willow

These vary in size from small to a very large (30 to 100 ft). In the Park, Black Willows tend to be small, and often have 2 or 3 trunks. In pioneer times, they were used extensively to produce fine charcoal required to make gunpowder and later, in the South, to make boxes, barrels and interior trim.



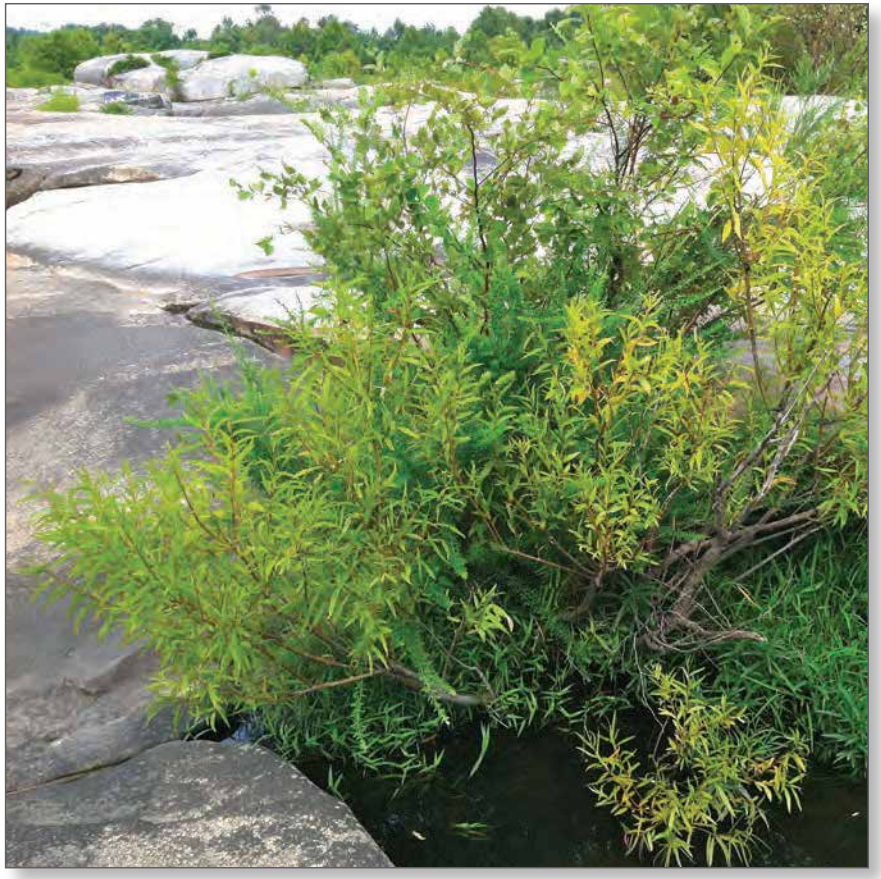
LOOK FOR leaves that are green on both top and bottom.

Coastal Plain Willow

Salix caroliniana Michx.

Coastal Plain Willow, Southern Willow, Carolina Willow

This grows as either a small tree or large bush.



LOOK FOR leaves that are green on top and whitish underneath.

James River Rock Pool Flora

VINES

Vines are plants with long, flexible stems that climb over other plants and objects as they grow. This strategy enables them to reach sunlight without investing large amounts of energy and resources in tall, strong stems.

They can be annual or perennial, woody or herbaceous.

Bindweed

Calystegia sepium (L.) R. Brown

Morning Glory Family (Convolvulaceae)

Wild Morning Glory, Hedge Bind-weed

An annual, twining vine, similar to a morning glory, but with more narrow, grey-green, arrowhead-shaped leaves. The 2 to 3 inches funnel-shaped flowers are white or pink with white lines. This is a native plant, often found in damp places. The leaf shape and flower color of this plant are very variable.

LOOK FOR the white or pink flowers. They will have a wider mouth than Morning Glory flowers.

Dodder

Cuscuta gronovii Wild ex J.A. Schultes

Morning Glory Family (Convolvulaceae)

Common Dodder, Love Vine

This unusual plant starts as a tiny green seedling with leaves and roots. As it grows and touches another plant, it loses the leaves and roots, attaches, and becomes parasitic on its host plant, sharing its sap. The adult parasite has no leaves or chlorophyll of its own and develops a yellow-orange color. It weakens and sometimes kills its host, and is a big pest in agricultural fields. Dodder vines have recently been shown to use airborne volatile organic compound cues to locate their host plants. The old folk name, Love Vine, may reflect a sense of humor since these plants "hug" too tightly and suffocate the host!

LOOK FOR snarls of yellow yarn tossed over other plants (especially water willow). Look for dense clusters of tiny white flowers in mid-summer.

Groundnut

Apios americana Mdik.

Bean Family (Fabaceae)

Groundnut

A climbing, twining, herbaceous, perennial vine with compound leaves comprised of 5 to 7 oval, pointed leaflets. The brownish-purple flowers, borne in the leaf axils, resemble a small elephant head with an upturned trunk! Flowers are very fragrant. The fruit is a long, skinny bean which dries up and splits along its length to release seeds. The rootstock is comprised of many small, sweet-tasting, potato-like tubers that were once collected by Native Americans for food. (This is prohibited in the park today.)

*LOOK FOR vines with alternate, compound leaves, and many bees around the flowers._

Morning Glory

Ipomoea purpurea (L.)

Morning Glory Family (Convolvulaceae)

Morning Glory *(Non-native)*

A reclining (or twining), weak, herbaceous, annual vine with fuzzy stems and alternate, heart-shaped leaves. Flowers located in the leaf axils are funnel-shaped and are purple, or sometimes pink or white. Tiny seeds are released when ½ inch round, brown capsules dry and break open. Related to sweet potatoes and white-flowered bindweeds, this plant was introduced from Europe and has spread widely in a variety of disturbed habitats. In the Park, seeds wash in during floods and can grow in any sunny place along the shore or forest clearing nearby as well as among the rocks.

LOOK FOR the bright, purple, 2 inch, funnel-shaped flowers open in the morning but closed in the afternoon.

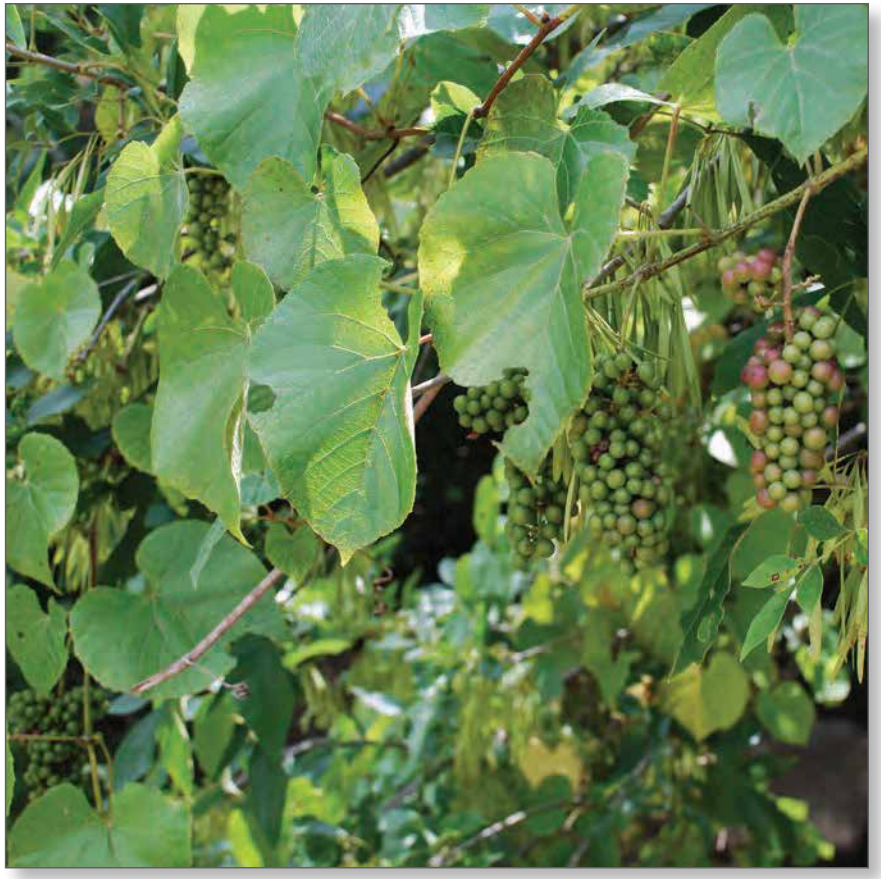
Muscadine Grape

Vitis rotundifolia Michx.

Grape Family (Vitaceae)

Muscadine Grape

A woody, high-climbing (or trailing) perennial vine wraps its tendrils around adjacent vegetation to climb and reach the sunlight, often smothering and killing small trees. The leaves are broadly heart-shaped, 3 to 4 inches across, with coarse, saw-toothed edges. Small, 5-petaled fragrant flowers bloom in early summer. Tiny fruits (½ - 1 inch in diameter) hang in clusters in late summer. These wild grapes range from bronze to dark purple to black in color when ripe; however, many wild varieties stay green through maturity. They are edible, vary in sweetness, and have skin sufficiently tough that eating the raw fruit often involves biting a small hole in the skin to suck out the pulp inside. Muscadines are not only eaten fresh, but are also used in making wine, juice, and jelly. They are quickly eaten, however, by birds and small mammals like flying squirrels.



LOOK FOR a vine with stringy bark. It is distinctive and comes off in strips that break at 90 degree angles.

Purple Passionflower

Passiflora incarnata L.

Passion-flower Family (Passifloraceae)

Maypops

This herbaceous vine sprawls over the ground or climbs with tendrils. Alternate leaves have 3 broad lobes with finely toothed edges. Blue-purple, circular, fringed flowers are so distinctive they almost look artificial. The Spanish saw religious significance in the flower features, naming it after the Passion of Christ. Fruits are globe-shaped with a juicy interior that is tart and refreshing. It was a favorite summer food of Native Americans and English Settlers. Fruits ripen in August-September, and, when shaken, the seeds rattle inside. The name 'Maypop' is the English pronunciation of the Virginia Indian word **maracock** that approximates 'rattle fruit'.

LOOK FOR the distinctive flowers, and try to find the religious reference points.

Poison Ivy

Toxicodendron radicans L. Kunze

Cashew Family (Anacardiaceae)

Poison Ivy

This woody, perennial vine sprawls over the ground and climbs by small, aerial rootlets growing from the stems. Alternate, shiny leaves are actually 3 leaflets connecting to one stem, and give rise to the expression 'leaves of three, let it be'. Tiny white flowers appear in late spring or early summer in conspicuous clusters, becoming white berries that last well into the winter. ALL PARTS OF THE PLANT contain an oily sap which causes blistering and itching when contacted and not washed off with soap. The oil persists even in the winter when the leaves have dropped off. Wildlife can eat the plant and seeds without problems.

*LOOK FOR leaves of three and then **let it be**!*

Swallow-wort

Cynanchum laeve (Michx.) Pers.

Dogbane Family (Apocynaceae)

Honeyvine, Sandvine

A twining, climbing, perennial vine with opposite, heart-shaped leaves that have prominent veins and long, tapered tips. (The suffix "wort" is Old English for "plant"; "swallow" may refer to its growing over other things.) Greenish white flowers about ¼ inch wide are borne in clusters at the leaf axils (where the leaf stems attach to the main stem). Tear-drop shaped cases contain flat brown seeds with fine silky hairs attached that help dispersal by wind and water. When crushed or broken, the stems exude milky sap which may irritate skin.

LOOK FOR this plant in wet, disturbed areas like sandy, flood-scoured river shorelines. Look for lines of fine hairs on the stems.

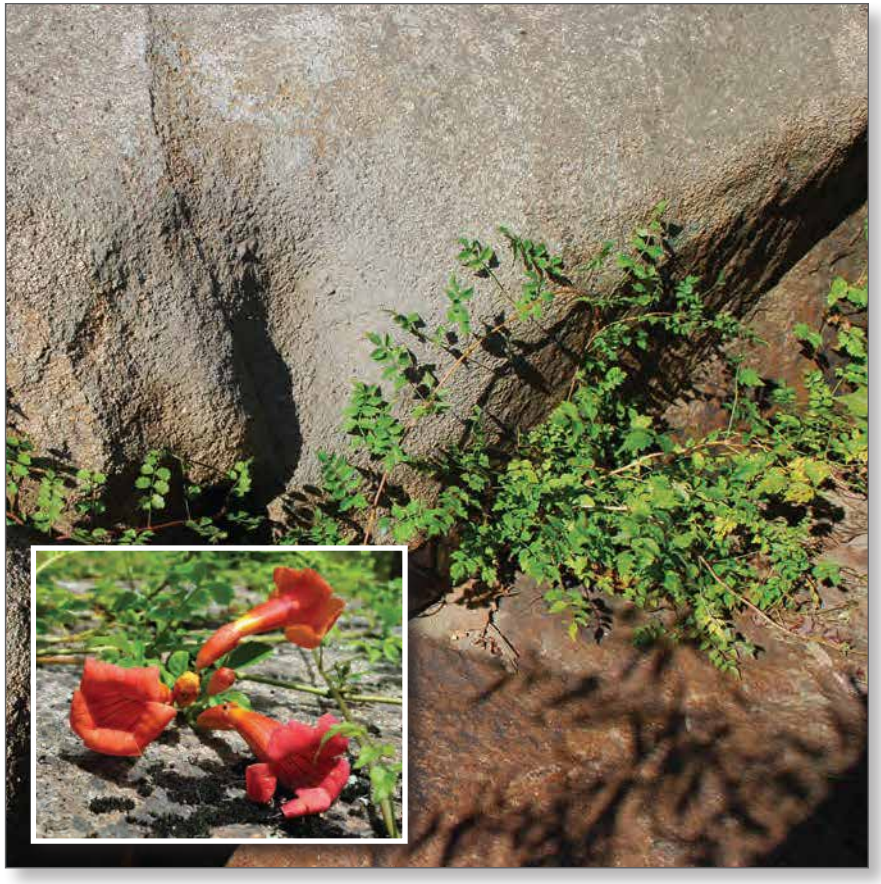
Trumpet Vine

Campsis radicans (L.) Bureau`

Bignoniaceae Family (Bignoniaceae)

Trumpet Creeper, Cow Itch

Woody perennial that climbs by twining stems. Opposite, compound leaves have at least 7 pointed, toothed-edged leaflets. Three-inch long bright orange-red, trumpet-shaped flowers appear in summer and are much sought out by hummingbirds. Woody, drooping clusters of 6" pods containing seeds follow in fall.



LOOK FOR how the flower shape and reproductive structures are adapted to pollination by hummingbirds.

Virginia Creeper

Parthenocissus quinquefolia (L.) Planchon

Grape Family (Vitaceae)

Woodbine, Five-finger, Five-leaved Ivy

A tough, woody, perennial vine that hangs on by gripping with adhesive disks that form at the ends of branched tendrils, like the introduced English Ivy. Leaves are alternate and palmately compound with 5 oval leaflets that form a fan shape. New or damaged leaves may have only 3 leaflets, making it easy to confuse this vine with Poison Ivy. Leaves turn a brilliant red in the fall, making it easy to separate from the yellow to orange Poison Ivy. Leaves are the main food source for three species of Sphinx Moth caterpillars. Berries are dark blue and last on the vine well into the winter, serving as late season food for birds and mice.

LOOK FOR the adhesive disks formed by attached tendrils. Now try to find tendrils that do not touch anything. They will not develop the disks.

James River Rock Pool Flora

AQUATIC PLANTS

Aquatic plants grow in and around the rock pools and slow channels of the river. Some are rooted in mud or cracks in the rocks; others float on, or near, the water surface. They tend to be soft, fleshy, and easily torn. A few reproduce aggressively and can become invasive. With exceptions, most bloom in mid- to late-summer when the water warms and the river level is low.

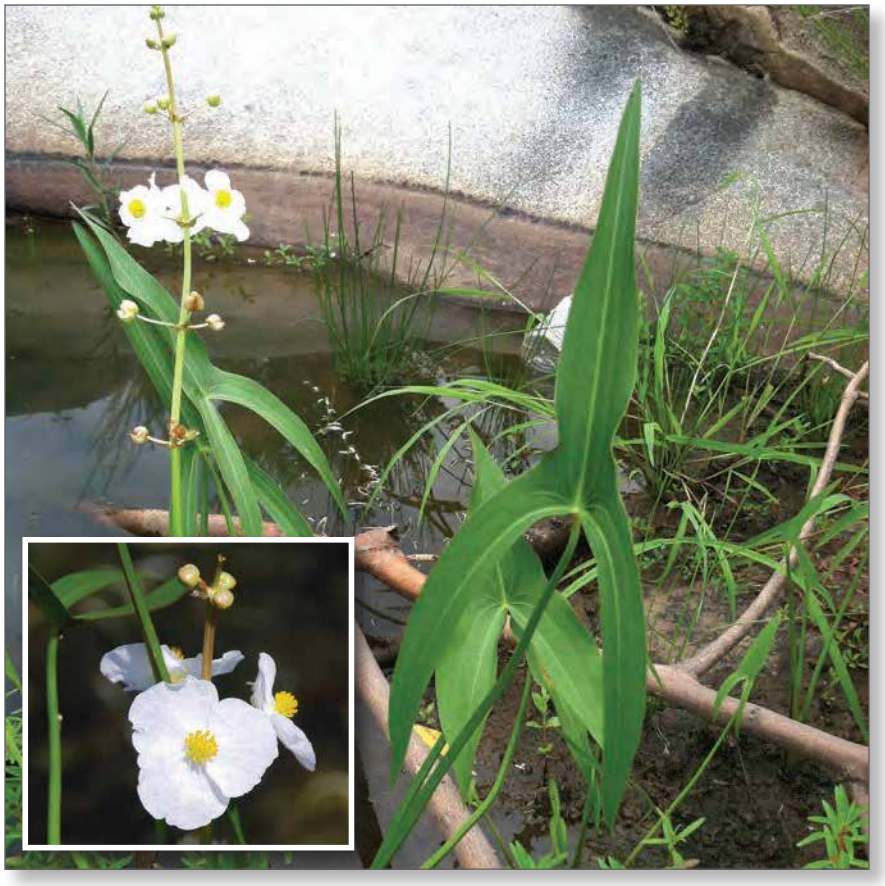
Arrowhead (Duck Potato)

Sagittaria latifolia Willd.

Water-plantain Family (Alismataceae)

Arrowhead

Arrowhead is one of two plants found in the rock pools with clusters of arrowhead-shaped leaves growing ankle to knee high in height. The other is Pickerelweed. Both Arrowhead and Pickerelweed tolerate being submerged in high water and drying out in late summer, and are rooted in mud rather than sand. The leaves of Arrowhead have thick, fleshy stems 3 to 15 inches long and leaf blades up to 7 inches long. Leaf blades may be broad or narrow, but have sharply pointed tips and basal lobes, differentiating it from Pickerelweed, which has rounded leaf tips and heart-shaped bases. White flowers with 3 petals are borne in whorls of 3 on stalks 6-20 inches tall. The upper flowers produce pollen only, while the lower ones produce round balls of tightly packed seeds. Plants bloom from June through September.



LOOK FOR tubers, or corms, at the base of the stems. These anchor the plant and, during the winter, provide food for muskrats and waterfowl, hence the common name, 'duck potato'. They were harvested by Native Americans, and in this area, were called 'Tuckahoe' from which the local creek, school, highway, and plantation were later named.

Marsh Dewflower

Murdannia kiesak (Hassk.) Hand.-Maz

Spiderwort Family (Comellinaceae)

Marsh Dewflower

(Non-native and aggressively invasive!)

An invasive annual plant from Asia that sprawls across mud, sand, and shallow water to form dense mats that crowd out native wetland plants. The leaves are narrowly lance-shaped, and fold to form a sheath around the spreading, prostrate stems. The flowers are about 1/2 inch across, have 3 petals, vary from pale pink or bluish pink to maroon, and are borne singly in the axils of leaves. It is related to and resembles our native spiderwort, but prefers wet conditions. It appears to be spreading in central Virginia.

LOOK FOR low growing plants with stems crisscrossing outward, forming mats or colonies that cover the rocks.

Duckweed

Lemna spp.

Duckweed Family (Araceae)

Duckweed

Tiny, bright-green, floating plants consisting of one round leaf (less than 1/4 - 3/8 inch across) with a single rootlet. It is the smallest flowering plant, producing one tiny flower with either a single stamen or single pistil. Duckweed reproduces rapidly, often carpeting the surface of still pools or slow-moving backwaters like green scales. It re-populates pools quickly after floodwaters recede. Mallard ducks and geese feed on it, giving it another common name: 'duckmeat'. It is sometimes grown commercially for animal feed, primarily for fish and poultry.

LOOK FOR different species. One is very small, one is larger, and one has red underneath. Some have single rootlets, others have several. You will need a hand lens for this activity. Also notice the temperature difference between the surface water and water underneath floating mats of duckweed.

Hydrilla

Hydrilla verticillata (L.f.) Royle

Water Plantain Family (Hydrocharitaceae)

Hydrilla

(Non-native and aggressively invasive!

Be careful not to take any with you!)

This aquarium plant escapee originates from Europe and Asia and forms masses of branching, rope-like underwater stems that root loosely to the substrate. The 1/2 inch leaves are arranged in whorls of 3-8 around the stem, and have fine marginal teeth visible to the naked eye. This differentiates it from similar-looking native species with smooth margined leaves. Inconspicuous white flowers are borne singly at the water's surface in mid-to late-summer. Male and female flowers are separate on the same plant. The stems uproot and break easily, readily sprout roots, and grow quickly, making it one of our most aggressive and invasive aquatic plants. It often clogs waterways, fouling boat motors and destroying both water sports and recreational fishing.

LOOK FOR the color change of leaves as you go down the stem. Bright green at the surface, they become dark brown as the upper growth captures the sunlight and stops the photosynthesis below. These dying leaves use up the dissolved oxygen in the water, making the lower areas devoid of life.

Grassy Mud Plantain

Heteranthera dubia (Jacquin) Macmillan
Pickerelweed Family (Pontederiaceae)

Grassy Mud Plantain

Two types of perennial mud plantains are found in the rock pools, and their common names clearly describe their differences. Grassy Mud Plantain has 6-inch long leaves about 1/2 inch wide that float on the surface of still pools or wave in the gentle to moderate currents of the river. Leaves have no mid-vein and leaf bases form a sheath around the stem. Yellow, star-shaped flowers appear in late summer and fall in leaf axils on 3-4-inch stems that hold them at or just above the water's surface. Each flower lasts only a day and is followed quickly by slim pods with tiny seeds. Another name for this plant is Water Star-grass.

LOOK FOR strange little swellings called plant galls on the lower part of the stem. These are caused by a harmless fungus. Find them by feeling down to the roots, but do not pull up the plant.

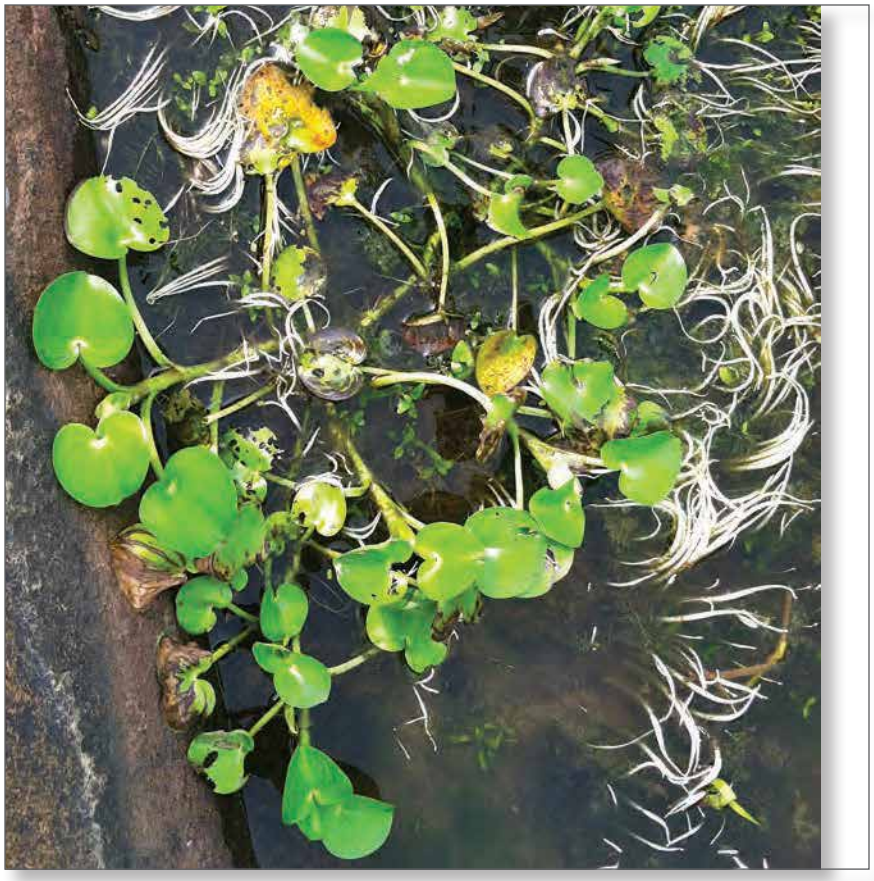
Roundleaf Mud Plantain

Heteranthera reniformis R & P

Pickerelweed Family (Pontederiaceae)

Roundleaf Mud Plantain

Sprawling around pool edges and in shallow waters, this plant arranges its 2-inch leathery, kidney-shaped leaves to expose each to the sun. Leaf stems are slightly swollen and fleshy. Its growth-form and roots help to trap sediment and build up soil to provide habitat for other plants to colonize. White flowers are borne in spikes of 4-8 blooms which all open on the same day. Blooming may begin in June and continue through September, depending on temperatures and water levels. These plants are sometimes used in aquariums.



LOOK FOR yellow or green spots at the base of the top petal on the flowers.

Pickerelweed

Pontederia cordata L.

Pickerelweed Family (Pontederiaceae)

Pickerelweed

Arrowhead-shaped leaves with rounded leaf tips and heart-shaped leaf bases help differentiate this plant from its look-alike, Arrowhead. Pickerelweed is one of the first plants to colonize muddy shorelines, and serves as a protective habitat for small fish and amphibians. Its violet-blue flowers have 3 upper lobes joined together and 3 separate lower lobes and are clustered in spikes 3-4 inches long. They resemble garden hyacinths and may begin blooming in June, continuing sporadically into the fall.

LOOK FOR slender, predatory fish called Pickerel hunting amid its vegetation. They get their name from taking advantage of this habitat.

Water-willow

Justicia americana (L.) Vahl

Acanthus Family (Acanthaceae)

Water-willow

Water-willow forms large colonies in the James River as its creeping underground stems take root on shorelines, shoals, and the river bottom in slower moving water. Among the rock pools, the colonies are limited in size, sometimes to just a few plants, by the amount of soil available. Growing 12 inches to 2 feet tall, with lance-shaped, opposite leaves, the plants resemble young willow bushes. White flowers with a purple throat look like miniature orchids and are grouped between stem and leaf bases. They appear from early summer into the fall. The dense growing habit make beds of Water Willow both a nursery for many fish and a filter that traps sediment and builds up shoals for trees like American Sycamore and Black Willow to colonize.

LOOK FOR honey bees and butterflies sipping nectar from the flowers and first-year water snakes hunting minnows among the stems. Pull on a stem and you will see how well anchored it is.

Water-celery or Wild Celery

Vallisneria americana Michaux

Frog's-bit Family (Hydrocharitaceae)

Water-celery, Wild Celery

In shallow, moving water look for clumps of long, narrow, blunt-tipped leaves waving like ribbons just under the surface. Clear light green leaf edges contrast with the darker green, net-veined center section. The short stems of this perennial branch and root repeatedly, forming patches which provide shelter for small fish and invertebrates and trap sediment, gradually building up habitat for other plants. Male and female flowers are produced separately in late summer, the male flowers separating to float freely, and the solitary female flowers remaining attached to a long stem that holds them at the waters' surface. Once pollinated, these flower stems contract, pulling the fruit under the surface to ripen and survive cold weather. These underground buds, leaves and seeds are highly nutritious and easily reached, thus making this a valuable food plant for wildlife. It is eaten by ducks, geese, muskrats and even fish.

LOOK FOR the two shapes the slender flower stem assumes. When straight or loosely coiled, it is ready to produce female flowers at the surface and brittle male flowers underwater that break off and float up. When coiled or tightly kinked, it has pulled the seed pods back underwater.

James River Rock Pool Flora

WILDFLOWERS

Wildflowers

Wildflowers are herbaceous plants of moist to dry conditions. Soft-stemmed perennials or annuals, they grow in silt that collects around the edges of rock pools or in the sand and soil that accumulates between rocks. They may be in standing water part of the time, but also tolerate dry areas among the rocks. Some have large or colorful flowers, and some have small flowers, often in showy clusters. Most bloom in mid-summer to fall.

Buttonweed

Diodia teres Walter

Madder Family (Rubiaceae)

Buttonweed

This many-branched, sprawling plant roots in quickly draining, sandy soils that accumulate among the rocks around pools. It has 4-sided, hairy stems and leaves that are narrowly-shaped, grow opposite each other, and clasp the stem. White or pale purple flowers have 4 small petals and grow out of the leaf axils- where leaves attach to the plant stem.

LOOK FOR oval or top-shaped seeds. These were reportedly used in Colonial times as ball-like buttons. Tied to a thread, they could be passed thru a cloth loop instead of a buttonhole, a design still used in Tibetan shirts today.

Common Sneezeweed

Helenium autumnale L.

Aster Family (Asteraceae)

Common Sneezeweed

This perennial, from 1 to 3 feet tall, is usually found around the edges of sandy or muddy pools. The leaves are lance-shaped to oblong and slightly toothed. The leaf bases taper down onto the stem forming slight wings. From late summer into fall, many bright yellow flower heads top the open-branched plants. Flowers have dome-shaped centers formed by a cluster of small gold flowers surrounded by golden ray petals which bend downward as the flowers mature. The common name comes from a powder made from dry flowers which was used to make snuff.

LOOK FOR a plant in full flower and take a big sniff to understand the name.

Cardinal-flower

Lobelia cardinalis L.

Lobelia Family (Lobeliaceae)

Cardinal-flower

These perennial plants vary from about a foot to several feet tall. Around the rock pools, where flooding exposes them to damage, they are often shorter with fewer leaves and flowers than Cardinal-flowers growing along the riverbanks in deeper soils. Leaves are alternate, lance-shaped, tapering at both ends, and irregularly toothed. Spectacular scarlet, 2-lipped, tubular flowers on spikes topping single stems call attention to these plants in late summer and fall and earn the plant its colorful name. Hummingbirds as well as insects are attracted to these bright flowers.

LOOK FOR the special way the flowers bloom to reduce self-pollination. The stringy male parts appear first on the lower flowers, then work their way up the stem. As they die back, you can find the female parts that look like little pedestals inside the flower throat.

Joe-pye-weed

Eutrochium maculatum (L.) E.E. Lamont

Aster Family (Asteraceae)

Joe-pye-weed

A tall plant (2 to 6 ft +) with whorls of lance-shaped, toothed leaves on a spotted stem. Large clusters of small, tightly packed, pinkish-purple flowers make Joe-pye-weed unmistakable in late summer and fall. This perennial plant requires damp soil: shorter plants grow in shallow soils around the pools, taller ones in deeper soils.

LOOK FOR the small tubes of the disk flowers. These hold nectar and attract insects like butterflies and bees. The tightly packed design also facilitates self-fertilization. Brush your fingers across the flowers to watch the pollen-bearing stamens contact the pollen-catching stigmas.

Late Thoroughwort

Eupatorium serotinum Michx.

Aster Family (Asteraceae)

Late Thoroughwort

Flat-topped clusters of tiny white flowers on erect, fuzzy stems identify this perennial in late summer and fall. The opposite, oval-to-lance-shaped leaves are slightly toothed and smooth on the upper surface, but softly fuzzy on the lower surface. Like Joe-pye-weed, these plants attract butterflies and other pollinating insects.

LOOK FOR pollinating insects on the flowers.

Lespedeza

Lespedeza cuneata (Dumont-Cours.) G. Don

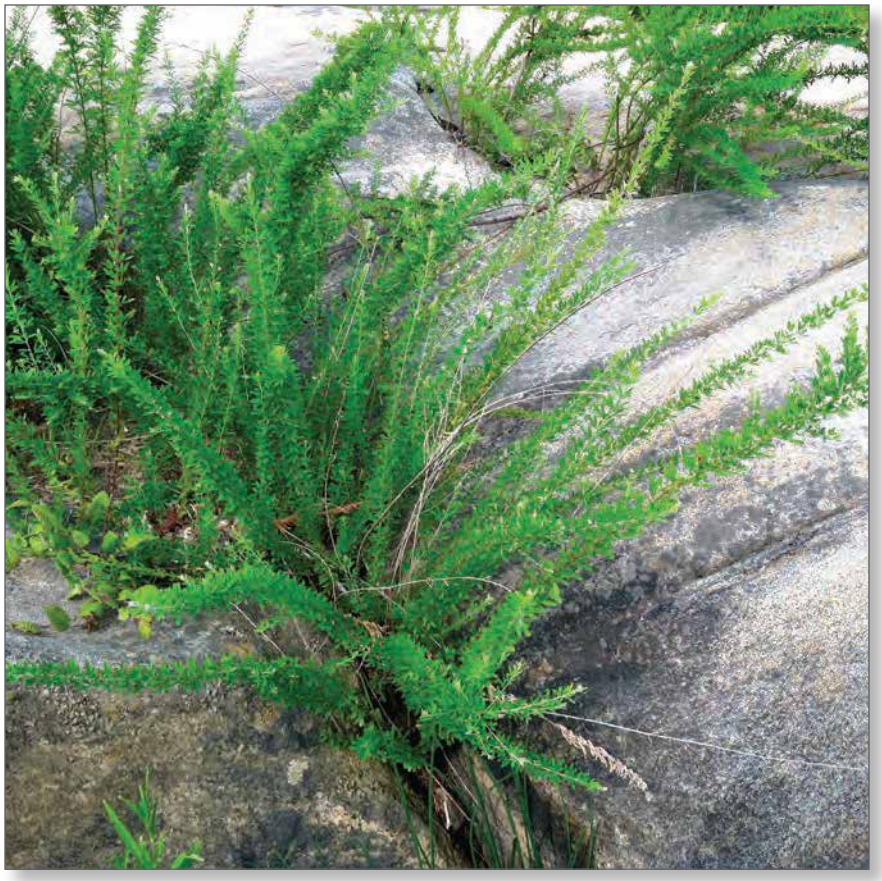
Legume Family (Fabaceae)

Lespedeza

(Non-native and aggressively invasive.)

This non-native perennial from Asia grows to 4 feet tall from a woody taproot and is distinctive for its many wand-like branches. Short, alternate leaves are clustered densely along the stem. Each leaf is divided into 3 wedge-shaped leaflets, narrowed at the base, broader and blunt at the tips. Tiny pea-like flowers, shorter than the leaves, are borne in clusters of 1 to 4 between the stem and leaves along the upper parts of the stems. Blooms appear from July to October.

Lespedeza was introduced in the late 1800's and has been widely used as cover for disturbed areas. It out-competes native plants and its seeds can remain viable for decades, making it difficult to eradicate.



LOOK FOR stiff hairs on the somewhat woody stems and white flowers with purple markings.

Marsh Seedbox

Ludwigia palustris (L.) Elliott

Evening Primrose Family (Onagraceae)

Marsh Seedbox

Another name for this sprawling, creeping, or partially floating perennial is Common Water-purslane. Its stems are soft, smooth and succulent. The leaves are lance-shaped, slightly toothed and spaced alternately on the stem. Flowers are small and reddish, borne singly in axils of the leaves from May to October. The fruits are elongated, rounded, 4-sided capsules (hence the name 'seedbox') with distinctive darker green bands and remains of flower parts that resemble a tiny crown.

LOOK FOR a tiny "crown" shape on the side of the unripe seed pod. These are the remains of the flower parts.

Mistflower

Conoclinium coelestinum (L.) DC

Aster Family (Asteraceae)

Mistflower

This perennial with fuzzy periwinkle blue flowers resembles a cultivated plant called Argeratum. It grows from 2 to 12 inches high and often forms colonies. The opposite leaves are oval with slightly toothed or wavy edges and taper to pointed tips. They may be smooth or slightly hairy on the upper surface, but are softly hairy or sticky on lower surface. .

LOOK FOR dense clusters of 'misty' looking blue flower heads attracting many small bees and butterflies.

New York Ironweed

Vernonia noveboracensis (L.) Michx.

Aster Family (Asteraceae)

New York Ironweed

Tall, coarse, perennial with narrowly ovate leaves and eye-catching sprays of tiny, dark purple flowers, it is impressive in early fall. The oval, pointed, opposite leaves can be 1 to 3 inches long, 3 to 5 inches wide, and are slightly hairy beneath. Large clusters of small flowers can be 20 inches across. Seed heads have individual seeds with tufts of hair in 2 rows that facilitate dispersal by wind. Yellow goldfinches feeding on these seeds among late-blooming flowers can provide spectacular photos.

photo courtesy of E. Gianfortoni

LOOK FOR small and medium sized butterflies like skippers probing the tubes of the disk flowers in mid – summer.

Pennsylvania Knotweed

Persicaria pennsylvanicum (L.) M. Gomez

Buckwheat Family (Polygonaceae)

Pennsylvania Knotweed or Pinkweed

This erect annual grows 1 to 3 feet tall with shiny, lance-shaped leaves 4 to 6 inches long. Sheathes around the stem form at the base of each leaf and stems are thicker at these nodes and often reddish. This gives the appearance of jointed stems. Compact spikes 1 to 2 inches long of small pink flowers appear at the stem tips from summer until frost. The flower spikes often weigh the stems downward, placing ripening seeds conveniently near the ground or water. Knotweed grows in moist or wet, disturbed areas and is an important source of food for waterfowl and birds.

LOOK FOR thickened areas at the leaf nodes. These 'knots' are where it gets one of its common names.

Purple Loosestrife

Lythrum salicaria L.

Loosestrife Family (Lythraceae)

Purple Loosestrife

(Non-native and aggressively invasive!)

Stout, shrub-like herb with slightly fuzzy stems that grow 3 to 5 feet high in damp, disturbed areas. Leaves are lance-shaped, 3 to 5 inches long, an inch or so wide, and grow opposite one another or in whorls. In late summer, tall spires of pinkish purple flowers clustered in the leaf axils are colorful but call attention to this invasive plant that spreads readily, replacing native plants. Introduced from Europe for horticultural use, it has become a significant nuisance in wetlands.

LOOK FOR any kinds of wildlife utilizing this plant. Usually there is very little to see except an occasional honey bee.

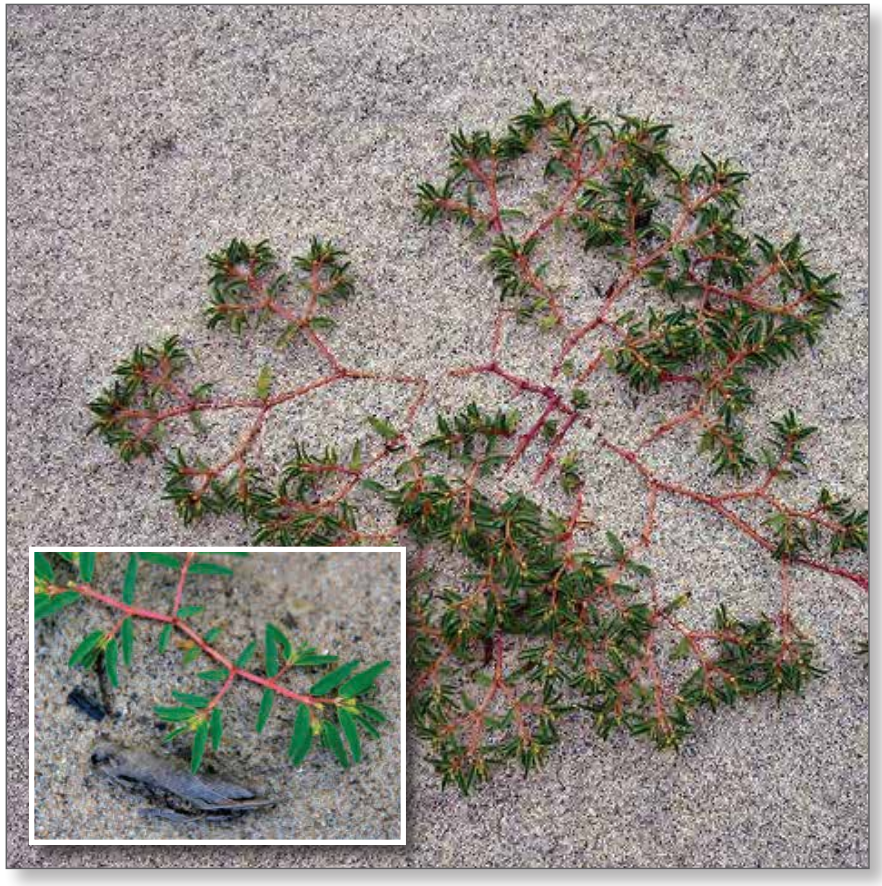
Seaside Spurge

Euphorbia polygonifolia L.

Spurge Family (Euphorbiaceae)

Seaside Spurge

A low, branching, prostrate, plant with tiny leaves scattered along a succulent stem. It hugs the rocks or sand. The tiny flowers are greenish-white (tinged with red) and cluster in the leaf axils. The plant has a milky juice that can irritate bare skin and was once used in tiny drops to remove warts. It was also used in medieval poison recipes. The word 'spurge' comes for the Latin for 'purge' meaning that it will make you vomit.



LOOK FOR the 'false flowers'. What look like petals are really a kind of leaf called a 'bract'.

Tickseed Sunflower

Bidens coronata (L.) Britt

Aster Family (Asteraceae)

Tickseed Sunflower

Sometimes called swamp marigold, these tall, slender sunflowers can grow 2 to 5 feet tall, but usually are shorter around the rock pools because of river flood action. The leaves are deeply divided into narrow segments, almost fern-like. The golden yellow flowers bloom from August through September and create a colorful show all along the river. The flower heads are 2 inches across with small yellow-gold center flowers surrounded by longer rays of yellow-gold petal-like flowers. The flat, black seeds are designed to stick to fur and thereby facilitate dispersal. They are an important food for finches and other small birds in the winter.

LOOK FOR 2 slender bristles (called "awns") on the wedge-shaped seeds that allow them to stick to your clothing. Congratulations. You've become a part of nature's plan to disperse the seeds! The Latin name for the plant is "2 teeth".

Toothcup

Rotala ramosior (L.) Koehne

Loosestrife Family (Lythraceae)

Toothcup

An aquatic or semiaquatic native plant related to the invasive swamp loosestrife is known also as lowland rotala. The leaves are up to 2 inches long and narrow, arranged in pairs, each at right angles to the pairs above and below. The inconspicuous flowers are borne in a calyx cup (hence the common name) in the leaf axils with 4 petals that vary from pink to white and drop off quickly. The fruit is a dry capsule that holds many small oval brownish seeds. An annual, it grows in lakes, streams, and irrigation ditches as well as pools in the river. For most of the season, the whole plant is inconspicuous, but it can easily be recognized in late summer and fall by the bright red colors in stems leaves and fruit.

LOOK FOR the calyx cup and see what you can find inside.

Virginia Dayflower

Commelina virginica L.

Dayflower Family (Commelinaceae)

Virginia Dayflower

Growing tall in surrounding grass or creeping along the edges, perennial blue dayflowers like the sun and earn their name by opening one bloom a day through the summer with the maturing buds almost hidden in a folded leaf. Leaves are longer than wide, pointed and slightly folded, clasping the stem. The flowers are almost 1 inch across on very short stems and have 3 green sepals and 3 sky-blue petals, one of which is slightly smaller than the others. Seeds mature in the fall. Related to both the invasive Dewflower and native Spiderwort, these native plants are found in many other areas besides the rock pools.

LOOK FOR the brilliant golden stamens with black pollen tips that are highlighted against the blue pedals.

James River Rock Pool Flora

GRASSES

Grasses and Plants with Grass-like Leaves

Rooted in the mud or sand around the rock pools are flowering plants with grass-like leaves ranging in size from 4 inches to 3 feet high. Long, slender, leaf blades growing out of a basal clump largely define the character of a grass. Flowers are small, brownish in color, and difficult to see with the exception of the characteristic sausage-like spike of the cattail. Many of these species are difficult to identify without a magnifying glass or microscope. The following descriptions will help you easily recognize four of the most important members of the rock pool ecosystem.

Cattails

Typha angustifolia L.
Cattail Family (Typhaceae)

Cattails

'Corn dog grass' identifies this 1 to 4 foot perennial. The flat, grass-like leaves are ½ inch wide and the roots are actually swollen, underground stems (rhizomes) that spread to form dense, impenetrable mats. Flowers are numerous, tiny, and clustered around the tops of bloom stalks arranged with male flowers at the top, a gap of bare stem, and female flowers below. The male flowers drop early leaving the top of the stem bare. Female flowers remain below as a dense cylinder packed with seeds and soft stuffing. It turns dark brown at maturity, giving the spike the appearance of a corn dog. As the spike deteriorates over winter, it breaks apart into bits of fluff that are caught by breezes, spreading the tiny seeds far and wide. Many birds nest in the protection of the dense vegetation, but few animals use cattails as food except muskrats that chew the roots. Native Americans ate the pollen, the pith, the unripe seed heads, and the starchy rootstock and wove the leaves into baskets and rope.

LOOK FOR the way the roots (rhizomes) stabilize the soft mud and keep out other plants. Try to jam your fingers down thru them! Then feel the sides of rhizome for the actual roots that feel like wires. The lumps and scales on top are actually the buds for next year's plants.

Horsetail Paspalum

Paspalum fluitans (Ell.) Kunth

Grass Family (Poaceae)

Horsetail, Water Paspalum

This annual grass has soft, spongy, round stems that often root at the joints and spread to form mats in shallow water or mud. The tiny flowers bloom in late summer and are clustered on perpendicular branches located at the top of the stem, giving the impression of a bottle-brush.

LOOK FOR the unique shape of the leaves: each pointy blade clasps the stem, but one piece continues down creating an extension that also ends in a point — the result is a grass blade that tapers at both ends.

Sedges

Cyperus spp.

Sedge Family (Cyperaceae)

Sedges

'Sedges have Edges' is the way to differentiate this group of clump-forming, grass-like perennials from true grasses. Sedge stems are triangular, not round. The inconspicuous, short-lived flower spikes produce distinct sprays of small, nutlike fruits. These are an important food for many birds and small mammals. Because many look so similar, few are given common names.

LOOK FOR the way the base of the flat leaves wrap all around the stems to form a closed sheath at each joint. This is another diagnostic feature of sedges.

Spikerush

Eleocharis sp.

Sedge Family (Cyperaceae)

Spikerush

Clusters of needle-like stems that end in clumps of flowers or seeds make Spikerush recognizable. The plants form colonies whose roots trap sand and mud, building up soil for other plants to colonize. Birds eat the seeds and stems are eaten by muskrats.

LOOK FOR the seed heads that resembles tiny pine cones at the ends of thin sticks, creating the look of tall dark Q-tips.