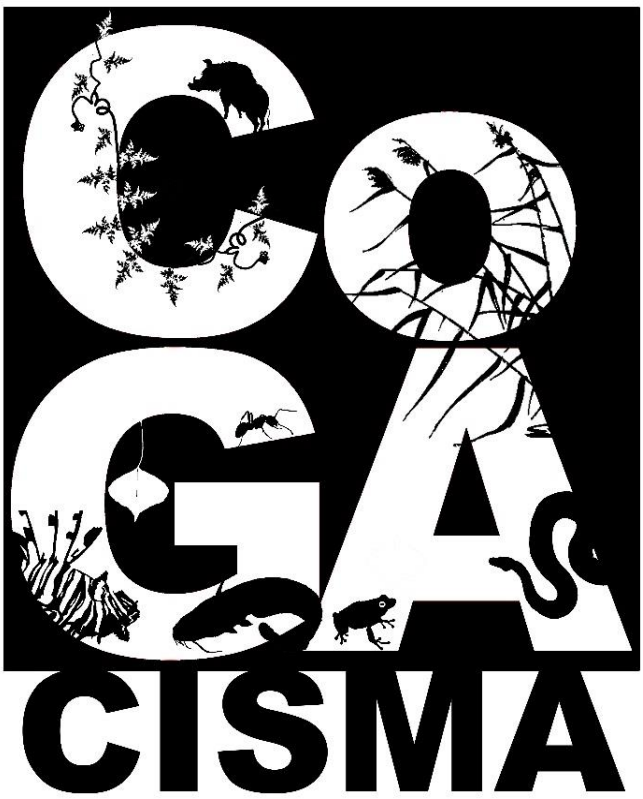


INVASIVE SPECIES PRIORITY LIST 2013

ABSTRACT

Five invasive species lists compiled from roundtable discussions at the March 7th 2013 annual CoGA CISMA meeting.

Compiled by: Eamonn Leonard co-coordinator with assistance by Jessica Ahl

Invasive: 1. Flora, 2. Terrestrial invertebrates, 3. Terrestrial vertebrates, 4. Aquatic Fauna, 5. Marine Fauna

Invasive flora priority list for coastal Georgia

Priority 1 Species that CISMA partners view as a serious ecological threat and currently spend a significant amount of time and/or money on for some aspect of management or plans to spend in the next five years.

- **Cogongrass** - *Imperata cylindrical*

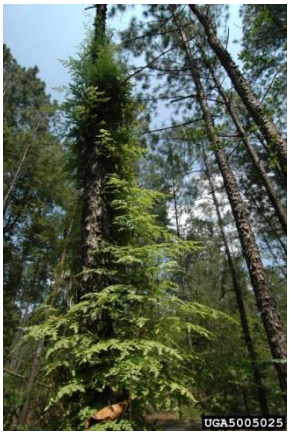
This plant was accidentally and intentionally introduced in the 1900s from Southeast Asia through packing material and for use as erosion control and livestock forage. It's a perennial, colony-forming grass that can grow up to 6 ft. tall. Leaves have serrated edges and an off-center whitish midrib with a pointed tip. Rhizomes are white, branched, sharp and scaly. It can be identified in the spring by its plumes of flowers/seeds that give it a cottony look; these flower heads are 2-8 in. long and cylindrical. Because of its rhizomes it spreads readily in a circular formation, excluding all other vegetation from the area. Seeds are easily distributed by the wind.

- **Chinese Tallow** - *Triadica sebifera*

This tree was introduced in the 1700s from China and Japan, where it's used for cultivating seed oil and as an ornamental. It can grow 60 ft. tall and with spade shaped leaves. New, tender growth is often reddish in color. Spring brings dangling, yellow spikes that give way to three-lobed fruit, and these split to drop seeds in fall and winter. These seeds spread by water and birds, and seedlings can reproduce by 3 years of age. This species turns landscapes into monospecific forests; its fallen leaves release toxins that kill off other native species. In addition to seeds, it spreads through root sprouts. In the winter, leaves turn red.

- **Japanese Climbing fern** - *Lygodium japonicum*

This perennial, climbing, vine-like fern was introduced in the 1930s as an ornamental from Japan and Australia, and can easily be 90 ft. long. Leaves are divided and lace-like on green, orange, or black vines. It forms thick mats, shading out vegetation and covering shrubs and trees. Rhizomes spread underground, providing more wiry black stems. Spores are easily disbursed through the wind and on clothing and equipment. While it dies back in the winter, the dead vines provide access for re-establishment and further provide wildfires access to taller trees.



- **Common Reed** - *Phragmites australis*

This is an invasive strain on a native species. European strains were believed to have been introduced through ship ballasts in the 19th and 20th centuries. It can grow over 19 ft. high and forms dense colonies through the use of rhizomes. Leaves are lanceolate. Flowers appear in mid-summer on tawny spikelets with silky hairs and seeds are created with cross-fertilization of plants. Plants can be found in freshwater and brackish water and because of their rhizomes, shade out and outcompete native species. Invasive *Phragmites* is thought to have more of a blue-green color, excludes other plants with its dense colonization, and seems to have no susceptibility to native fungi that appear as white spots on the native's stalks/leaves.

- **Tamarisk** - *Tamarix canariensis*

Also known as Salt Cedar or Canary Island Tamarisk, this tree has a feather or fluffy-like appearance. It was introduced to control soil erosion and as an ornamental from Europe and the Mediterranean and can be found in the southeast states and in west Texas. Flowers are monoecious (both sexes) and pink. Seeds have hairs and are borne on the wind. Plants can tolerate salty or alkaline soils and have the capacity to reproduce clonally. Spreading this way, they crowd out native species; salt cedar has a higher capacity to draw water from the soil and can leave salty patches around them in the soil, further harming natives.

- **Water Hyacinth** - *Eichhornia crassipes*

This floating perennial plant is a pest in many parts of the world, having originated from the Amazon basin. Leaves are round and leathery, attached to bulbous stalks that can be spongy or inflated. Roots are dark purplish to black and feathery. Plants form dense mats, clogging waterways for wildlife and boat traffic. Plants produce offsets through stolons, creeping steadily over the water surface. Flowers appear in showy, purple spikes 12 to 20 in. high. Populations can double in as little as 6 days and intense management is needed to control it. Plants not only impede water travel, but also limit air-water surfaces and thus oxygen levels and light availability for aquatic plants.

- **Chinaberry** - *Melia azedarach*

This deciduous tree grows up to 50 ft. high. Leaves are dark green and pinnately divided and bear a musky odor. Spring flowers are in lavender clusters and give way to poisonous, yellow berries. Plants originated from the mid-1800s in Asia as an ornamental. Plants are disastrous to native species as fallen leaf litter raises the soil pH. This is exacerbated by the fact trees are fast growing and can reach 18-24 ft. in height in 4-5 yrs. Further, plants produce offsets through root sprouts and bird-dispersed seeds.



Priority 2 Species that CISMA partners deal with infrequently or attempts to control in selected high-priority areas (because they are thought to be lesser threats, or because they are widespread and difficult to control)

- **Beach Vitex** - *Vitex rotundifolia*

A perennial shrub, this 2 ft. tall plant can spread up to 60 ft. with woody stems. Plants were brought from Asia in the 1980s as a method to control beach erosion. Leaves are oval, silvery green 1-2 in. long. Violet flowers occur year-round at the ends of branches. Fruits are purple-black and 0.25 in. in diameter. Plants outcompete native species, forming dense colonies, and can take over nesting habitat for sea turtles.



- **Camphor Tree** - *Cinnamomum camphora*

Another Asian introduction, this plant has been around since the late 1800s and was founded as a failed method of camphor production. It is now sold as an ornamental. Crushing leaves or peeling twigs or bark release a camphor scent. As an evergreen, trees have oval to elliptical dark green leaves that are pointed on the ends and alternate on the stem. Twigs are initially green but turn reddish-brown. Bark is variable and can be scaly to furrowed. Most are 25-40 ft. tall but some can be 100 ft. Flowers are greenish white or pale yellow on panicles. Fruits are blue to black and fleshy. All parts of the plant are poisonous to humans in large enough doses. Trees are fast-growing, outcompete natives, and produce lots of seed readily ate by birds.



- **Tree of Heaven** - *Ailanthus altissima*

Introduced as an ornamental in the 1700s, this plant originates from China and Taiwan. Growing up to 70 ft. tall, trees are deciduous, and dioecious flowers are yellow-green with a smell likened to cat urine or rotting cashews or peanuts. Leaves are alternate and compound, with several teeth near the base. Plants are highly adaptable to soils, disturbance, and drought. In addition to this, seeds are produced prolifically and plants produce chemicals that impede the growth of other plants around them. This allows trees to create dense stands, and in urban areas, plants have been known to damage concrete and sewer structures.



- **Lantana** – *Lantana camara*

An ornamental introduced from the West Indies in the 18th century. This shrub can grow up to 6 ft. tall, and has square stems, hairy or prickly stems, and sandpaper-like serrated ovate leaves. Leaves are aromatic when crushed. Flowers appear in dense clusters and are multicolored as they age. Fruits are a 2-seeded drupe that turns black when ripe. Plants bloom from summer till frost. Plants escape cultivation and grow wild in croplands and natural areas, displacing native plants, providing a secondary host plant for some pests, and is poisonous to people and animals. Butterflies and other pollinators are highly attracted to it, which may hinder pollination of native plants.



- **Golden Bamboo** - *Phyllostachys aurea*

As an introduction from SE China in the 1800s, this species was selected for its ability to provide a noise barrier while acting as an attractive front. Now it is sold as an ornamental. Plants can grow up to 30 ft. tall. Stems are green, but turn yellow in the sun. Short, swollen internodes at the base of the culms (stems) define golden bamboo from others. Leaves are lanceolate and while plants flower in frequently (up to several decades apart), the main mode of reproduction is by rhizomes and side shoots. Left unchecked, this plant creates dense stands with its fast-growing ability. Plants invade forests, blocking out sun and outcompeting native species for space.

- **Chinese / Japanese Wisteria** - *Wisteria sinensis / W. japonica*

These species were introduced from China and Japan in the 1800s for use as ornamentals. As vines, they will grow up anything in their path, and are capable of climbing over 65 ft. high. Leaves are pinnately compound and leaflets are ovate with wavy margins. Japanese wisteria stems are white in comparison to Chinese wisteria's dark gray. Japanese wisteria also twines clockwise while Chinese wisteria twines counter-clockwise. Flowers are born hanging on racemes that are 4-20 in. long. Velvet seed pods take the place of racemes, 4-6 in. long and turn dark brown when ripe. Seeds are poisonous. As a vine, plants' harm lies in the fact that they climb into canopies and shade out the plants below, and trees they climb can be girdled with the vines. Not only can they spread by seed, but plants reproduce by sprouting roots at each node and if cut back or trimmed, plants easily re-sprout.

- **Japanese / Glossy/ Chinese privet** – *Ligustrum japonicum / L. lucidum / L. sinensis*

Both Japanese and Glossy privet were introduces from China and Korea as ornamentals. In terms of identification, Japanese privet has smaller leaves and a duller point than glossy privet. Both have ovate, glossy-on-top leaves with pointed tips and clusters of white dioecious flowers. Twigs are greenish-brown to gray with raised corky lenticels (dots). Plants are evergreen shrubs or small trees. Plants are shade tolerant, tolerate poor environmental conditions, and form thickets by root sprouts and animal dispersed seeds.

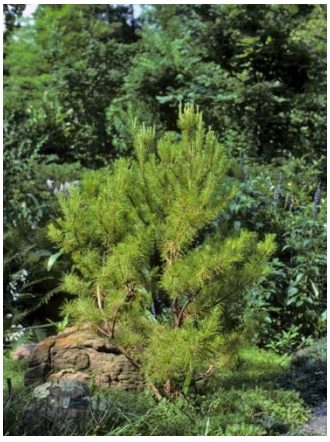
L. lucidum **(top) compared to** ***L. japonicum*** **(bottom)**

- **Coral Ardisia** - *Ardisia crenata*

Another native of SE Asia, this plant was introduced in the 1900s as an ornamental. Leaves are evergreen, leathery, glossy, and dark green at 4-8 in. long. Flowers aren't usually noticed, but the deep red berries are. Birds and raccoons eat them year-round as they stay on the plant and spread the seed. Shrubs grow up to 6 ft. high and grow in clumps to colonies due to seedlings and rhizomes. Because of these thick colonies, native species get shaded out, and it is naturalized across many areas in Florida. Plants can re-sprout after a fire and grow in acidic or alkaline soils.

- **Sand Pine** - *Pinus clausa*

Native to Florida and one county in Alabama, this plant was introduced in other southern states in the forestry industry. An evergreen, this tree grows 20-40 ft. high and has a bushy crown. Needle fascicles are in 2s, and needles are slightly twisted and yellow-green. There are two varieties of it: the Ocala variety is native to the FL peninsula and needs fire to release its seeds while the Choctawhatchee variety grows in the FL panhandle and in Alabama and spreads its seeds regularly. Its ability to grow in poor and salty soils, its seedy nature, and bushy habit allow it to crowd out native species.



- **Pindo palm** – Butia capitata

Native to South America, this species is planted as an ornamental in yards and parking lots. Plants are defined by their blue-green, graceful fronds that curve towards the trunk. The trunks are stocky and covered with leaf bases. Trees produce clusters of date-sized orange-yellow fruits that are used in jam/jelly recipes, which give this plant its other name: jelly palm. This species grows slowly but can reach 20 ft. high. It can tolerate temperatures down to -10C. Its high tolerance, excessive seeds, and enhanced plantings by humans make it a candidate to watch.

- **Alligatorweed** - *Alternanthera philoxeroides*

This emergent or floating invasive originates from South America in the 1900s. Leaves are opposite, and white flowers occur in short spikes. Plants root in wet soils or shallow water and spread into waterways where mats expand along the surface. If needed, plants grow terrestrially with smaller, thicker leaves. New plants come about from rooted nodes; when plants spread into waterways, pieces can be swept downstream to start new mats. Stolons can re-sprout from up to 12 in. deep in the mud. In addition to this, plants can tolerate brackish water and therefore can grow in marshes as well as rivers. Because of its tendency to create these mats, plants shade out underwater vegetation, limit air-water surface oxygen levels, increase sedimentation, and clog waterways.

Priority 3 Species that CISMA partners deal with only in unusual circumstances, either because they represent minor threats or are essentially naturalized and impossible to control with current methods.

- **Air yam / Chinese yam** - *Dioscorea bulbifera / Dioscorea oppositifolia*

Also known as air potato, *D. bulbifera* is an introduction from Asia in the 1900s. A defining characteristic is the leaf veins, which all arise from the leaf base. Leaves alternate on this plant and as a vine it can grow up to 70 ft. in length. Reproduction is mainly through vegetative, where plants form "air potatoes" at the leaf axils as well as large tubers underground.

Plants can grow up to 8 in. a day, and crowd out space at the tree canopies. Bulbs can sprout even when they're small and for some time without adequate water or sunlight. Plants die back in the winter but regrow come spring. Toxic.

D. oppositifolia, cinnamon vine, is another vine from Asia from the 1800s. These can climb up to 65 ft. high and cover shrubs and trees. Leaves have long petioles and are heart-shaped, usually opposite. These too spread by potato-like tubers at the leaf axils (up to 20 a year) and through underground tubers (up to 1 m long). Plants shade out natives underneath them and are fast-growing. Plants also die back in the winter, but come back from tubers.

- **Japanese honeysuckle** - *Lonicera japonica*

Another Asian introduction from the 1800s as an ornamental, this plant is widely spread today. Gardeners favor it because of its highly fragrant flowers and fast growth. An evergreen vine, this plant climbs shrubs and trees. Leaves are ovate and opposite, with fuzzy petioles. Tender, new growth is reddish in color and fuzzy while older stems have brown bark that peels in long strips. Stems can be 80-120 ft. long. White flowers fade to yellow. Black berries are produced. While birds eat these, plants also spread through rhizomes and aboveground runners. This coupled with it climbing, shading habitat, large seed production, fast growth, and lack of predators creates bad news for competing natives.

- **Mimosa** - *Albizia julibrissin*

Introduced in the 1700s as an ornamental from China, this plant is still popular. It is a tree that can grow 20-40 ft. Leaves are bipinnately compound with 20-60 leaflets per branch. Flowers resemble pink pom-poms at terminal clusters. Seeds appear in flat pods that are straw colored. Seeds need scarification to germinate, but this also allows them to remain viable for several years, aiding in dispersal. Stands can become dense with seedlings, shading out native species, and easily takes over disturbed areas like roadsides. As a member of the legume family, it can fix nitrogen, which gives it a further edge in nutrient poor environments.

- **English Ivy** – *Hedera helix*

This evergreen perennial vine was introduced from Europe in colonial times and can grow 100 ft. Today, it's still sold as an ornamental. Leaves are dark-green with whitish veins and 3-5 pointed lobes (juvenile). At 10 yrs. Of age, plants turn into erect plants or branches with unlobed leaves. Flowers are in terminal clusters and purple berries form. Vines climb trees, shading them out and eventually killing them. Trees with ivy are at an increased risk for blow-overs. On the ground, ivy forms dense mats. English ivy is also a reservoir for a plant pathogen, Bacterial Leaf Scorch (*Xylella fastidiosa*). Plants spread asexually through rooted pieces and through seed which is readily eaten by birds.

- **Kudzu** - *Pueraria montana*

Kudzu was introduced in the 1800s as a forage crop and ornamental, and later as a candidate for erosion control. This semi-woody, perennial vine can reach 100 ft. in length. Leaves are alternately arranged and compound with 3 broad leaflets. Leaflets can be entire or deeply 2-3 lobed with hairy margins. Seed pods are brown, hairy, and flattened with 3-10 seeds. Kudzu has a massive taproot, over 7 in. in diameter and over 6 ft. in length, sometimes weighing up to 400 lbs. Many vines can grow from a single crown. Mostly, plants spread from runners, rhizomes, and vines that root at the nodes, while still growing at a rate of 1 ft. per day. With this kind of capability, they create dense stands of vines, covering and shading out everything else.

- **Rattlebox** - *Sesbania punicea*

This woody shrub is from South America and was founded in North America and other parts of the world as an ornamental. Growing up to 15 ft. high, the bark is covered with lenticels and is gray to reddish-brown. Leaves alternate and are compound, up to 5-7 in. long. Leaflets appear in 7-16 pairs, oppositely arranged and are elliptical. Flowers are bright orange-red and appear in clusters. Seed pods are 3-4 in. long and have longitudinal wings. These pods give the plant its name as they make a rattling sound when shaken. Spreading primarily by seed, this plant forms dense thickets, and can clog waterways when they grow along it. Plants can reach maturity from seed in a year and germination is high even after several years.

- **Water lettuce** - *Pistia stratiotes*

This floating plant has been around at least since 1765 when the explorer William Bartram first described and drew in in Lake George in Florida. Appearing as a head of lettuce, leaves are thick, dull light green, hairy and ridged. With no leaf stalks, roots emerge from the base as feather-like projections. Flowers are hidden and inconspicuous, leaving behind a green berry. As a nuisance, this plant commonly forms large mats that block up lakes and rivers. The associated harm to the environment come with this, including depleted oxygen levels due to less surface-air interface, less sunlight for aquatic plants, and thus less fish. Daughter plants are formed off stolons of the mother plant.

- **White mulberry** – *Morus alba*

This 30-50 ft. tree originated from China during colonial times when it was introduced as a potential food source for silkworms. Leaves are glossy, which distinguishes it from the native red mulberry, and are alternate, ovate, simple, and have 3 main veins running from the rounded or notched base. Leaves can be slightly hairy underneath and coarsely-toothed. Plants are dioecious and berries are white, purple, or pinkish. Plants have a high growth rate and can outcompete native species. It possibly hybridizes with the red mulberry while also transmitting a root disease to it.

- **Russian Thistle** – *Salsola kali*

This species is native to Russia and Siberia, but was brought to the US in the 1800s in contaminated flax seed. Growing 1-5 ft., plants are bushy, dense annuals. Leaves are alternate and can be threadlike, cylindrical, or awl-shaped with pointed tips. Flowers are small and green to white and lack petals. Fruits contain a single seed and 5 wings. When a plant is mature, it breaks off at the base, forming tumbleweeds that enhance seed dispersal. Plants are drought-tolerant, and seedlings need little moisture to germinate. Plants become pests in dry areas due to these features. Plants become fire hazards and also play host to the sugarbeet leafhopper, which facilitates the curly-top virus the insect carries and which can spread to tomatoes, beans, and sugar beets.

- **Asparagus fern** – *Asparagus aethiopicus*

Hailing from South Africa, this evergreen herb is used an ornamental. It's not even a fern at all, but a lily. Branches are upright to trailing, and its leaves are fine and needle-like, giving it a fluffy appearance. Flowers are white or light pink but aren't usually noticed. The bright red berries have 3 seeds each and birds eat them, facilitating spread. Plants have the capacity to smother understory plants.

- **Indian fig** – *Opuntia ficus-indica*

This plant has been cultivated since ancient times for its fruit, but its origin is believed to have been in Mexico. Plants are also cultivated as ornamentals. Also called sweet prickly pear, it can grow 9-16 ft. high. Branches are flattened, grey to grey-green. Leaves are minute.

Flowers are bright yellow, orange, or red. Red berries are edible and covered with tiny spines. In dry areas, this plant threatens cattle ranching as it displaces native species and impedes animal movement, and is a noxious weed in South African and parts of Australia.

- **Sword fern** – *Nephrolepis cordifolia*

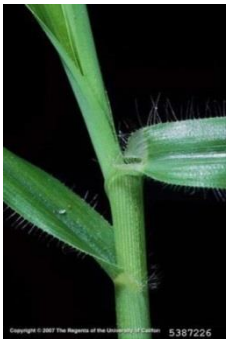
Introduced as an ornamental, this plant came from Asia and Australia. As a woodland fern, this plant produces pinnate fronds up to 3 ft. tall. The pinnae (leaflets) along the rachis are lanceolate with an auricle that overlaps the rachis. Plants spread through both spores and rhizomes, the latter of which are orange-brown to brown with linear scales and hair-like

tips. Stolons are pale yellow and produce underground tubers – the presence of which differentiates the invasive from the natives. These four methods of reproduction and the plant's aggressive, spreading nature give it the edge over natives, allowing it to produce dense stands.

- **Torpedo grass** – *Panicum repens*

An introduction from Africa and/or Asia, this plant was originally intended as a forage crop in the 1800s. Like its name, leaves are sharply pointed or torpedo-like. It can grow up to 3 ft. tall, and its leaf sheaths are hairy with the hairs also on the upper margins of the leaves. Blades are stiff, linear, flat, or folded, often with a waxy or whitish coating. Flowers appear in panicles 3-9 in. long, but plants spread primarily through rhizomes. Plants grow in or near shallow waters, forming thick monocultures and excluding natives. This plant displaces native marshes, impedes water flow in ditches and canals, and restricts recreational use of lakes and ponds.

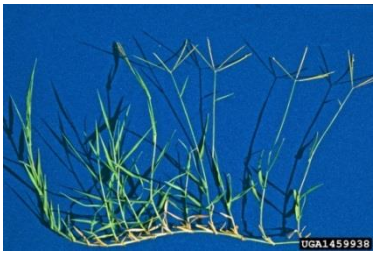
- **Durban crowfoot grass** – *Dactyloctenium aegyptium*



Found around the world in the tropics and subtropics, and introduced to North America, this is a weed from Africa. Reproduction occurs through seeds which occur in heads that split open to reveal a crowfoot like shape, and through stems that root at the lower nodes. Leaf blades are flat and lined with hairs, up to a 1 ft. tall. This plant acts as an annual, preferring heavy, moist soil. Because of its tendency to invade disturbed areas and its copious seed, it is a successful invader.

- **Bermuda grass** – *Cynodon dactylon*

This grass entered North America in the mid-1800s as a pasture grass from Africa, and is still used today as a turf grass. Plants spread vegetatively through above- and underground runners. Leaves are grey-green and between 1-6 in. long. White hairs lie at the junction between leaf and leafstalk. Flowers occur on 1-3 in. spikes in late summer. Because of its rhizomes and stolons, and its ability to grow on all soil types, plants spread fast into turfs and push out natives.



- **Bahia grass** – *Paspalum notatum*

A perennial grass planted for forage and soil stabilization, this species hails from Central and South America. Rhizomes are stout and covered with the bases of old leaf sheaths. The live leaf bases at the terminals of each rhizome have a purplish color. Leaves are dark green and linear-elongate in shape. Inflorescences have two or more spicate branches, and each of those have two rows of spikelets. Spikelets are broadly ovate or obovate. Plants readily invade disturbed areas and are adapted to fire, restricting the regrowth of long-leaf and slash pine with their fast growing nature due to rhizomes and seed.

- **Sawtooth Oak** – *Quercus acutissima*

A deciduous tree that can grow up to 50 ft. tall, this tree originates from Asia as an ornamental and wildlife food source. Leaves alternate, are broadly lance-shaped, 4-7.5 in. long, and have bristly teeth along the margin. Large acorns replace inconspicuous flowers, with spreading, curved scales on the involucre (base of the inflorescence). Plants have heavy crops that drop every other year, and are tolerant of many types of soils. Plants escape into native forests, displacing natives and hybridizing with native oaks.

- **Non-native Lespedeza** – *Lespedeza cuneata, L. thunbergii & L. bicolor*

- *L. cuneata* is semi-woody shrub from Asia in the 1800s that was introduced for erosion control and as a forage crop. It grows up to 6 ft. tall. Stems are slender and gray-green with hairs. Leaves are thin, alternate, and three-parted. Leaflets have wedged-shaped bases, are 0.5-1 in. long and hairy. Creamy-white flowers with purple throats appear in clusters of 2-4 in the summer. Seed pods are flat and ovate to round and form at the terminal axils scattered along the stem. This plant is an aggressive invader that outcompetes natives; its copious seed remain viable for decades. A single plant can form a large stand that can live for 20 yrs. or more.

- *L. thunbergii* has wider, more pointed leaves than *L. cuneata*. From Asia, this plant produces stems up to 7 ft. tall. Dying back in the fall, plants will also produce pinkish to purplish blooms in the summer. Like other *Lespedeza* species, this plant can become invasive.

- *L. bicolor* can reach 3-10 ft. in height. Leaves are alternate with 3 elliptical leaflets. Stems are grey-green. Flowers are purple and 4-6 in. long and appear June-Sept. Also introduced for soil stabilization and wildlife food, it is invasive as it can form dense stands and limit forest regeneration by natives. Animals spread the seeds.

- **Red Algae** – *Gracilaria vermiculophylla*

Native to the Northwest Pacific Ocean and Japan, it was introduced to the West Pacific and the Atlantic Oceans probably through imported oysters, boats, and fishing equipment. Highly tolerant of water conditions and stressors, it invades estuarine areas and marshes and displaces natives. It is cylindrical and up to 50 cm long. Coarsely branched, it can be found as loose-lying thalli or attached to shells or stones. Usually found in the vegetative stage, reproductive structures are necessary for correct identification. For human use, this species is collected to create biopolymer agar, which is used widely in the pharmaceutical and food industries. It reproduces through non-motile spores which are dispersed through the water. Not only does this algae outcompete native algae, but it also has negative impacts on native seagrass beds by decreasing the net photosynthesis and survival rates. These impacts increase with temperature, which could have implications for global warming. The algae's structure provides a foothold for other species of algae animals, both of which could be non-native.

- **Clumping bamboo** – *Fargesia sp.*

Introduced from China for the ornamental trade, instead of spreading through rhizomes, this bamboo spreads out from clumps, spreading a few inches a year instead of feet. It can grow 10-15 ft. tall. Plants flower once in their lifetime before dying, sometimes after decades. Being evergreen, fast-growing, shade-tolerant, cold-tolerant, and deer-resistant lends this plant its invasiveness. Because of this and their lack of predators, this genus is to be monitored.

- **Heavenly Bamboo** – *Nandina domestica*

From China and Japan, this plant came to the US in the 1800s as an ornamental. However, while attractive, it grows quickly and reproduces by seed and root fragments, which quickly becomes a nightmare for the average gardener. As a semi-evergreen woody shrub, it can reach 6-8 ft. tall. Leaves are compound, tri-pinnately compound and alternately arranged. Leaflets are ovate, 1-2 in. long. Leaves start out reddish-bronze, then turn green and finally red in the fall. The inner bark is yellow. While not technically a bamboo, it resembles one. White flowers appear in panicles on the ends of stems. Fruit is red and is eaten by wildlife, enhancing its spread. Plants grow vegetatively through suckers and rhizomes, forming dense thickets that shade out everything else.

- **Tungoil Tree** – *Vernicia fordii*

A deciduous tree that can grow 66 ft. tall, this plant came from China in the 1900s for use in the tungoil industry, but is now an ornamental. It has milky white sap. Leaves are simple, 6-10 in. long, alternate, and are either heart-shaped or with three pointed lobes. Petioles are long and have a distinctive red gland at the base of each leaf. Flowers are showy with five white petals with red veins and bloom before the leaves emerge. Fruits are toxic and reddish-green, about 2-3 in. in diameter. Plants are fast-growing, forming dense stands. Plants come back from stumps and animals spread the berries. Even at three years of age, plants can begin to reproduce. All parts of this plant are toxic, and even one seed can be fatally so if ingested.

- **Brazilian vervain** – *Verbena incompta*

Introduced as an ornamental, this perennial herb originates from South America. Stems grow 3-6 ft. and are rough and square. Leaves are dark green, obovate to elliptic to lanceolate, have serrate margins, appear in a basal rosette, and are opposite and attach directly to the stem with the leaf bases narrowing. Flowers are small and purple, with five petals and appear in compact terminal fascicles within hairy sepals and bracts. Plants bloom all summer through fall. Plants are capable of blooming for long periods of time, self-seed, and produce copious amounts of seed. In addition, plants are heat and drought tolerant, often popping up along roadsides, forest edges, and other disturbed areas.

Invasive Species Watch List

Species considered future threats because (1) they are not known to be present in the state but have been documented in other southeastern states and have been shown to have significant ecological, economic, or health impacts where they occur; or (2) the species is present in Georgia and is currently not considered a serious pest in coastal Georgia, but may become one based on its history in other states.

- **Australian Pine** – *Casuarina equisetifolia*

Originating from Australia and Southeast Asia, this tree entered North America as an ornamental. Growing up to 150 ft. high, trunks are reddish brown to gray and bark is rough, brittle, and peels. Leaves are tiny scales, 6-8 whorled around grayish-green branchlets that resemble pine needles. Plants have both male and female cones. This species displaces native communities, altering community structures and possibly hybridizing with natives.

- **Giant Reed** - *Arundo donax*

From western Asia, northern Africa, and southern Europe in the 1800s, this species probably arrived on the west coast first, and today is planted as an ornamental or for erosion control. As a perennial grass, plants grow over 20 ft. tall, spreading through creeping rhizomes that form compact masses. Leaves are elongate, 1-2 in. wide and a foot long. Flowers appear on 2 ft. long, dense plume-like panicles in the fall. Plants invade riversides and streams, chasing out natives, interfering with flood control, increasing fire risks, and reducing habitats for wildlife. The interconnected root mats can collect debris behind man-made structures such as bridges that can cause damage. Fragments can float downstream and root in new areas with its fast growth rate. Furthermore, plants have a high tolerance for salinity and can grow in a wide variety of soil types.

- **Old World Climbing Fern** - *Lygodium microphyllum*

This species is a vine from Asia and Australia, introduced as an ornamental in the 1900s. This plant has climbing fronds (which resemble stems) up to 100 ft. long. Leafy branches off the sides are 2-5 in. long. Two types of leaflets occur on this plant: a simple unlobed vegetative leaflet and a more convoluted leaflet with sporangia along its margin, containing spores. Plants can resprout from any along each climbing leaf and dense plants can be fire hazards. Plants create dense mats, smothering natives and taking over.

- **Tropical Soda Apple** - *Solanum viarum*

Native to South America, plants are believed to have possibly arrived here through the feces of Brazilian cattle carrying undigested seed in the 1980s. Leaves are shaped like oak leaves, flowers are tiny and white, and fruits are green to yellow and golf-ball sized with a fragrance that attracts animals. Typically invading pastures, leaves and stems are unpalatable to cattle, and its prickly shrub-like form prevents cattle movement, especially in the shade where cattle need to avoid the heat. TSA is a reservoir for at least six crop viruses (affecting crops such as potato, tomato, tobacco, and cucumbers) and a potato fungus. Plus, insect pests use it as a vector, including potato beetles, tomato and tobacco caterpillars, peach aphids, whiteflies, loopers, and stink bugs. Plants displace natural vegetation as well, impacting biodiversity and interfering with ecological management. As a perennial, plants also grow year-round in southern areas, furthering the length of time they can spread and cause trouble.

- **Brazilian Pepper** - *Schinus terebinthifolius*

Introduced in the 1800s as an ornamental, this South American native is in the same family as poison ivy, poison oak, and poison sumac. Its bright red berries and bright green leaves are frequently used for Christmas decorations. Growing up to 30 ft. tall, his plant has a short trunk. Leaves are alternately arranged with elliptic, finely toothed leaflets, are reddish and often have a reddish midrib. Flowers appear in clusters from Sept. to Nov. and are white. Glossy fruits appear in clusters that turn from green to red when ripe. Animals eat the fruits, dispersing the seed which have high germination rates. Plants are aggressive invaders, taking over disturbed areas and even areas such as hammocks, pinelands, and mangrove forests. Plants can resprout after fires. Due to their high germination and dispersers, plants can form dense stands chasing out native vegetation and communities.

- **Chinese silvergrass** - *Miscanthus sinensis*

Another plant introduced as an ornamental, it came to us in the 1800s from Asia. Growing up to 12 ft. tall, this densely bunched grass has leaves that are up to 18 in., slender, upright to arching, and have silver tips and rough margins.

Midribs are silvery in color. Flowers are on summer panicles that are fan-shaped and 2 ft. long, silvery to pink in color. Plants spread through seed as well as rhizomes, forming large clumps in disturbed areas, displacing natives. These large clumps are also a larger fire risk.

- **Brazilian elodea** - *Egeria densa*

From South America, this plant is not actually *Elodea* for which its common name gives. As an aquatic, this plant is rooted, but fragments can be found drifting. Leaves are small and strap-shaped, about 1 in. long. Stems are usually a foot or two long, but can grow much longer. Leaf edges have fine saw teeth you need a magnifying glass to see. Leaves themselves occur in whorls of 3-6. Flowers appear on short stalks above the water with three petals and are 0.75 in. across. Easily confused with *Hydrilla*, they can be differentiated by flowers and midrib. *Hydrilla*'s flowers are very small on very thin flower stalks, and their midribs have one or more teeth on the underside of the midribs, where *Egeria* never has teeth. *Egeria* also never produces tubers and turions.

- **Hydrilla** – *Hydrilla verticillata*

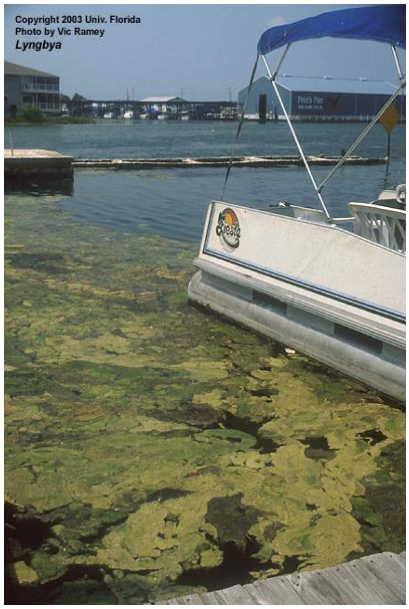
Originating from Europe, plants came to America by the 1950s in the aquarium trade. There are two forms of *Hydrilla*: the monoecious form originating from Korea, and the dioecious form originating from India. Stems are slender, branched and grow up to 25 ft. long. The small leaves are strap-shaped and pointed, growing in whorls of 4-8. Leaf margins are saw-toothed, and leaf midribs have one or more teeth. Tiny white flowers are produced on tiny stalks. Plants also produce turions and tubers. Growing to the surface of waterbodies and forming dense mats, this plant can detach and float to new areas to colonize. Plants form the turions as leaf axils, which can serve as another means of dispersal, and tubers from attached to roots in the mud. Native aquatic plants get shaded and outcompeted, and tubers can remain viable for up to 4 yrs. Plants also can grow in 7% salinity, in low and high nutrient conditions, and can grow even in low light.

- **East Indian hygrophylia** - *Hygrophila polysperma*

Introduced in the aquarium trade from India and Malaysia in the 1950s, this plant grows mostly submersed. Stems are square, growing up to 6 ft. long, and leaves are opposite. Flowers are bluish-white to white, and have two lips, growing from the axils where leaves meet the stems. Plants form large, dense stands, shading out natives, impacting water temperature, and getting spread by boats, birds, and water. Plants can clog water ways and culverts and canals. Supposedly, even a free floating leaf can develop into a plant. It tolerates a wide range of pH, water hardness, and light. Adventitious roots develop at nodes, and its fast growth even allows it to outcompete *Hydrilla verticillata*.

- **Blue-green algae** - *Lyngbya spp.*

Hair-like and filamentous, this alga can form large benthic and surface mats. It chases out native algae, and actually smothers native plants with its density. It's easily dispersed by animals, either on their body or through feces. Boats and fishing equipment are also valid dispersers. Dense mats can become problems when photosynthesis' gases allow them to float to the surface and float to shore or against channels. They smother eelgrass, a food of the endangered West Indian manatee, and some species are linked to "swimmers' itch".



- **Eurasian water milfoil** - *Myriophyllum spicatum*

Originating from Eurasia or northern Africa, this plant's introduction could be attributed to ship ballast in the 1800s or as packing material for worms sold to fishermen. It is continually spread through boats, fishing gear, and water currents. Stems are reddish-brown to whitish-pink, growing 6-9 ft. Leaves are deeply divided, soft and feather-like, about 2 in. long and arranged in whorls of 3-6. Flowers are reddish and very small, held above the water on a water spike several inches long. This plant also forms dense mats, shading out natives and impacting ecosystems.

- **Variable Leaf Milfoil** - *Myriophyllum heterophyllum*

Also called the two-leaf water milfoil, this plant is native to Florida to Texas, and has made its way up north through waterways. This plant has stout green stems with leaves that are green and in whorls of 4-6. This plant has two leaf types: emergent and submersed. Emergent leaves can reach 4-6 in. above the water and are stiff, serrated or lobed along the margins, and are lanceolate, lance-spatulate, or elliptic. Submersed leaves are feather-like, pinnate, with 4-10 paired pinnae. Flowers are small, and petals are reddish and oval shaped. Plants spread to other areas by people, animals, and water currents. Plants make dense stands and mats, preventing water flow, reducing light and oxygen, and impeding recreation.

- **Spiny leaf naiad** - *Najas marina*

An aquatic plant introduced from Europe, this plant has slender green leaves with deep, conspicuous teeth along the edges. Leaves are usually opposite with a wide base and tapered tips, brittle, re-curved, and branching. Flowers occur along leaf axils. It has a great tolerance for turbidity and low-nutrient conditions, driving out other native *Najas* spp. Usually found in lakes and ponds, it can move into rivers, forming dense mats that choke out natives. I can survive in saline, alkaline, and freshwater, particularly noticeable for colonizing brackish water. Plants reproduce through fragments, and can be spread through animals and equipment.

- **Common salvinia** - *Salvinia minima*

A rootless aquatic fern long considered native, it is now believed to have been introduced in the 1920s from South America and Mexico. Emergent fronds are oblong, flat or semi-cupped, growing in chains and float on the water surface. Leaves grow in pairs. A thread-like, brown leaf hands underwater, and all join at a node along an underwater stem. The upper surface of the green leaves is covered with rows of white, coarse hairs acting as water repellant. Hairs are unjointed at the tips. Plants spread through mats, and by budding at nodes and broken stems. Populations can double in as little as two weeks, covering water bodies from shore to shore. Because of its dense mats, natives get crowded out, irrigation pipes get blocked, and boating is restricted.

- **Parrotfeather** - *Myriophyllum aquaticum*

A native of South America, this plant is still sold as an ornamental. As an emersed plant, it grows along the ground or water surface of water bodies. Its delicate, feathery, bright green leaves give it its name, growing in profusion. Leaves are oblong, deeply cut and feathery, arranged in whorls of 4-6 on the stem. Stems can be 5 ft. long. Emergent leaves are less divided and less green than emersed leaves. Plants spread vegetatively with fragments, creating dense monocultures that clog waterways, impeding boats, chasing out natives, and provide breeding areas for mosquitos.

- **Callery pear (Bradford pear)** – *Pyrus calleryana*

Originating from China and Vietnam in the 1900s, this plant was brought here to develop a fire blight resistant in common pear, and later gained popularity as an ornamental. Trees go to be 30-50 ft. tall, and young plants can be thorny. Leaves are deciduous, alternate, broad-ovate to ovate, shiny dark green and leathery, have small round-toothed margins, and have purple hues in the fall. White flowers appear before leaves in the spring. Plants spread through copious amounts of seed and vegetative means; a plant can produce a sizeable patch in several years, eliminating natives.

- **Water Spinach** - *Ipomea aquatic*

Native to the West Indies, this is another plant escaped from cultivation in the late 1900s. An aquatic that acts as an herbaceous, trailing vine, it has milky sap. Stems are hollow, rooting at the nodes. Leaves are alternate, with simple, glabrous petioles with blades that are arrowhead shaped but can be variable. Blades are glabrous or rarely pilose, with pointed tips, and are held above the water when stems are floating. Flowers resemble morning glory blooms, solitary or in few-flowered clusters at leaf axils. Petals are white or pink-lilac. Its threat is in the way it creates dense mats, shading out underwater natives and competing with native emergent plants.

- **Sweet autumn virginsbower** - *Clematis terniflora*

A climbing, semi-evergreen vine, this plant was an ornamental introduced from China and Japan. Leaves are opposite, compound (3-5 leaflets), and the margins are entire. Flowers are white, fragrant, and have four petals, appearing late summer through fall. Seeds are numerous and have long, feather-like hairs attached.

Because of its prolific seeding, plants invade forest edges, rights of ways, and disturbed spaces near creeks.

References:

Information gathered informally and from online sources: GADNR, GA Invasive Species Strategy, GA – Exotic Pest Plant Council

Invasive terrestrial invertebrate priority list for coastal Georgia

Priority 1 Species that CISMA partners currently spend a significant amount of time and/or money on for some aspect of management or plans to spend in the next five years.

- **Emerald ash borer** - *Agrilus planipennis*

This insect pest arrived from Russia, China, Japan, and Korea back in the 1990s as an accidental import in cargo. Beetles target ash trees. Trees infected with EAB lose 30-50% of their canopy in two years, and die within 3-4 yrs. The females lay eggs two weeks after emerging, and after 1-2 weeks, the larvae hatch and bore through the bark and into the cambium and phloem. Larvae are around 1 in. with flat, broad, segmented bodies. Adults emerge mid-June, leaving "D" shaped emergence holes. The whole life cycle takes 1-2 yrs. depending on the climate. Larvae leave segmented galleries that girdle and kill trees. The larvae tunnel into sap wood to pupate. This pest is spreading rapidly to other states, killing healthy and young trees.

Priority 2 Species that CISMA partners deal with infrequently or attempts to control in selected high-priority areas (because they are thought to be lesser threats, or because they are widespread and difficult to control)

- **Redbay ambrosia beetle** - *Xyleborus glabratus*

Native to India, Japan, Myanmar, and Taiwan, this beetle was discovered in 2002. It infects redbay and sassafras trees along the coastal areas of Georgia, South Carolina, and Florida. The adults are small (0.08 in. long), slender, cylindrical, and brown-black in color.

Larvae are white, c-shaped, legless grubs with an amber colored head capsule. Adult females construct galleries in the sapwood and inoculate the galleries with a fungus. Both adults and larvae feed on the fungi and not on the wood of the damaged host plant. It is the fungus that gradually kills the tree. Plants show signs of "flagging", where limbs die off. Females can fly 2-3 km in search of a host, and males are dwarfed, haploid, and flightless.

- **Red imported fire ant** - *Solenopsis invicta*

Native to Central South America, this species is established in the US and in Australia. The pedicel (waist) is made up of two segments. Workers are between 0.12-0.25 in. The mandible has four distinct teeth and the antennae are 10-segmented, ending in a two-segmented club. A sting is present at the end of the gaster. Body color is red to brown with a black gaster. Mounds are rarely larger than 18 in. in diameter. When disturbed, ants emerge to bite and sting; a white pustule appears the next day at the site of the sting. Workers of *S. invicta* do not have workers which disproportionate head to body ratios as the native *S. geminata* do. This ant has been reported throughout the world, supposedly as an accidental stowaway on transportation.

- **Cactus moth** - *Cactoblastis cactorum*

A South American native, this insect was introduced in other parts of the world as a biocontrol for *Opuntia* cacti. From there, it has spread into areas with native *Opuntia* and has begun attacking them. Adults are nondescript and gray-brown with faint dark spots and wavy transverse lines marking the wings. The rear margins of the hindwings are whitish and semitransparent. The antennae and legs are long. Wing span is 22-35 mm. Larvae are more noticeable as orange-red and large dark spots that form transverse bands. Larvae start out pink-cream colored and become orange with age, just as the black and red dots coalesce with age to form bands. Native *Opuntia* provides food and shelter to the endangered Schaus swallowtail, birds, reptiles, and other insects. Once larvae hatch, they bore into the cactus pad and grow there in groups, hollowing it out. They emerge to form cocoons and pupate on the ground at the base of the cactus, and when adults emerge, they only live for 9 days, but can disperse fair distances.

Priority 3 Species that CISMA partners deal with only in unusual circumstances, either because they represent minor threats or are essentially naturalized and impossible to control with current methods.

- **Kudzu bug** - *Megacopta cribraria*

Arriving in the US in 2009, this insect is native to Asia. They are able to attach to clothing and vehicles and their spread is facilitated that way. Insects are 3-5 mm in length, have a round body shape and a dorsally flattened posterior end. They're brown with darker punctures along the dorsal side of the abdominal region. Nymphs resemble adults, but have a lighter brown color and wing buds that develop through 5 instars. They feed on soy beans, kudzu, and other legumes, which makes them a crop pest. Insects accumulate in aggregations, releasing a foul odor if disturbed. Insects moved into barns or homes to overwinter. Females lay egg masses along with brown symbiont capsules that larvae have to ingest to obtain symbiotic bacteria.

- **Brown widow spider** - *Latrodectus geometricus*

Coming to North America in the 2000s, this spider is believed to have originated from Africa or South America. Its color is a mottling tan and brown with black accent marking. Mature females usually have a dorsal longitudinal stripe and three diagonal stripes on each flank. Of the three stripes, there is also a black mark at the top which is squareish. It has an hourglass mark but it is orangish rather than red. The distinctive egg sac of a brown widow has multiple silk spicules projecting out from the surface, described as looking like a large pollen grain or a WWII harbor mine designed to blow up ships. There are 120-150 eggs per sac and spiders can produce 20 egg sacs in a lifetime. Mature females do not seem to have or cannot inject as much venom as its larger relatives; victims often say the bite hurt when it was inflicted and it left a red mark. This species is spreading throughout the coast and should be monitored.

- **Asian tiger Mosquito** - *Aedes albopictus*

Native to Asia, this species came to the United States as early as the late 1800s. The importation is believed to be linked to imported tires that are left outside in the rain. Female mosquitos are aggressive biters and can vector diseases such as West Nile, Dengue, and Japanese Encephalitis. Adults have conspicuous black bodies and white stripes. There is also a distinctive single white band down the length of the back. Bodies are 3/16 in. long.

Invasive Species Watch List

Species considered future threats because (1) they are not known to be present in the state but have been documented in other southeastern states and have been shown to have significant ecological, economic, or health impacts where they occur; or (2) the species is present in Georgia and is currently not considered a serious pest in coastal Georgia, but may become one based on its history in other states.

- **Khapra beetle** - *Trogoderma granarium*

First noticed in 1953 from India, this beetle is frequently intercepted on imported cargo. Insects are destructive pests of grain products and seeds. Adults have wings but do not fly. Adults live between 4-30 days (female) or 7-12 days (male). Complete development from egg to adult is temperature dependent but is between 26-220 days. Females lay 50-90 eggs. Larvae enter diapause if temperatures fall below 77F (25C) or if conditions are crowded, and can remain this way for several years. They can survive temperatures as low as 17.6F (-8C), and can develop in humidity as low as 2%.

- **Asian gypsy moth** - *Lymantria dispar dispar*
  European Gypsy moth – *Lymantria dispar*

Introduced from Europe in the 1800s, it was imported for silk production. However, larvae can feed on over 300 trees and shrubs, including oak, apple, alder, basswood, birch, poplar, sweet gum, and willow. With one generation per year, females attach egg masses mid-June to July on sheltered outdoor places, and these masses can contain up to 1,000 eggs. Eggs overwinter and hatch in April or May. As larvae eat, entire trees can be defoliated, resulting in reduced vigor, recreational, and habitat value. If this defoliation continues over several years, plants can die completely. Larvae have tufts of hair on each end and have a pattern of blue and red dots on their back. Larvae pupate in dark brown pupal cases in sheltered areas. Male adults are smaller, with light tan to brown wings marked with wavy dark bands across the forewing. Females are white, larger than males and flightless. The Asian strain of this moth arrived in 1991 and has a broader host range and the females are active fliers, potentially allowing a much larger dispersal range.

- **Rosy gypsy moth** - *Lymantria mathura*

This Asian moth is not yet present in the United States, but has a high risk for invasion and damage. It eats a large variety of hardwoods, and densities can be up to 1,000 caterpillars per tree. Eggs overwinter with larvae as white, fuzzy egg masses, ready to hatch in the spring. Young larvae have the capability to utilize a trailing silk thread and air currents to "balloon" to other locations. Most feed at night, and then mature larvae pupate in flimsy cocoons on the host tree. Females lay egg masses of 150-600 on the bark of host trees or other objects. One or two generations a year.


- **Asian long horned beetle** - *Anoplophora glabripennis*

This insect was found in the United States in 1996; originating from Asia, it's likely it came here as an accidental import with cargo. Larvae feed on hardwoods and can take 1-2 years to complete their life cycle. Larvae are indiscriminate, attacking healthy as well as stressed trees. As several generations develop within a tree, the plant eventually succumbs and dies. When adults emerge – mostly in June and July – they come out of round exit holes and remain on or near their emergence tree, feeding on leaves and bark. Eggs are laid under bark where females chew. Once eggs hatch, larvae feed in the cambium of the tree and later enter the heartwood. Pupation chambers are dug inside the tree as well, which can be filled with frass (poop).

References:
Information gathered informally from: GA Invasive Species Strategy, Bugwood, Invasive.org.

Invasive Terrestrial Vertebrate priority list for coastal Georgia

Priority 1 species are those that the organization currently spends a significant amount of time and/or money on for some aspect of management or that the organization definitely plans to spend time and money on in the next five years.

- **Hog** – *Sus scrofa*

Present since the 1500s from Eurasia, hogs were imported as a food source and either escaped domestication or were released. Omnivorous, feed by rooting with their snouts and can cause disturbance of soil and ground cover. Occupying a wide variety of habitats, hogs reach sexual maturity between 5-12 months and females produce 3-12 young a litter, producing 1-2 litters a season. Feral swine are capable of transmitting brucellosis, psuedorabies, leptospirosis, foot-and-mouth disease and Japanese encephalitis. They may threaten human health by carrying helminth parasites that are passed to humans through the consumption of improperly cooked meat (ISSG 2008). Feral hogs also represent a significant threat to a number of rare plants, including the federally endangered relict trillium. On Georgia barrier islands, feral hogs are a major predator of loggerhead sea turtle eggs.

- **Feral cat** – *Felis catus*

Descendants of domestic cats released into the wild. They have shown the potential for large-scale losses of small vertebrate populations across their range. Females can bear several litters a year, with her offspring reaching maturity in as early as 5 weeks and capable of the same. Depending on the local dynamic for a particular CISMA partner, effort may be focused more on education and outreach and less on control, as needed.

Priority 2 species are those that the organization deals with infrequently or attempts to control in selected high-priority areas (because they are thought to be lesser threats, or because they are widespread and difficult to control).

- **Coyote*** – *Canis latrans*

Large mammalian predator that thrives in urban, rural, and wildland settings and are opportunistic predators. Found throughout the United States and parts of Canada. Females can have 5-13 pups in a litter once a year, but sometimes can breed in the winter as well if food is plentiful. Able to attack pets and small children, they are a known threat to shorebirds and sea turtle nests in coastal GA.

- **Nine-banded armadillo*** – *Dasypus nonvemcintus*

Native to South America, this species can harm landscapes and biotic communities in a similar fashion to the hog as they root and forage on the ground. Animals are omnivorous, eating anything they can find in the leaf litter, and are out in the day as well as at night. Females can have an annual litter of four offspring, and can delay implantation of fertilized eggs for up to 14 months after mating. Given their long lifespan (20 yrs.) armadillos can persist in areas for a long time. Populations in Florida have also been known to predate on sea turtle eggs, a learned behavior.

- **Brown-headed cowbird*** - *Molothrus ater*

A brood parasite, this species lays its eggs in the nests of other bird species resulting in significant loss of productivity for host species including migratory song birds as parasitized nests are more likely to be predated and the parent birds' own chicks are neglected or abandoned. Prior to European settlement it is believed that the species was restricted to the short-grass prairies of the mid-west, following the bison. They have been widespread throughout the eastern U.S. since the late 1800s with the eradication of forests and the spread of livestock. Birds transitioned well from bison to cattle, and brought their brood parasitism where they went. Males are black with the brown head, but females are a drab brown.

***There is some uncertainty about the degree to which these species' occurrences have been influenced by human introductions, anthropogenic land-use change, and natural range expansion. They are however relative newcomers to coastal Georgia and are known to be ecologically disruptive to sensitive habitats and species.**

- **Cuban Treefrog** – *Osteopilus septentrionalis*

Native to Cuba, the Cayman Islands, and the Bahamas, this frog was likely an accidental hitchhiker on cargo or plants. Preys upon native herpetofauna such as squirrel treefrogs (*H. squirella*), green treefrogs (*H. cinerea*), southern toads (*Bufo terrestris*), and southern leopard frogs (*Rana spehenocephala*). Currently present in the coastal plain of Georgia. Will also consume anything that fits in its mouth, including insects, arachnids, snails and hatchling birds. Individuals are large, 1-6.5 in. long from snout to vent, with typical treefrog toepads. Skin secretions may make it unpalatable to predators. Reproduction can potentially be year-round, and females can lay up to 15,000 eggs in a season.

- **Brown anole** – *Anolis sagrei*

Since introduction, *A. sangrei* has become one of the most abundant lizards in Florida. They are present in coastal Georgia and will prey on a variety of insects, spiders, and invertebrates. Brown anoles have been shown to chase the native green anoles up into canopies and off the ground, limiting resources for the native. Browns will also prey on young anole hatchlings, whether they are their own or the native's. Both greens and browns have been observed mating together, but the verdict of such a match and their potential offspring is still out.

- **Fallow deer** – *Cervus dama*

Medium-sized deer. Males have large, palmate antlers. Introduced in parts of the United States for hunting, some believe they will compete with white-tailed deer (*Odocoileus virginianus*) for sources of food.

- **Feral Horse**
  Descendants of domestic horses released into the wild. Causes erosion and overgrazing of native plants.

- **Feral Cattle**
  Descendants of domestic cows released into the wild. Causes erosion and overgrazing of native plants.

- **Feral Dog** – *Canis familiaris*
  Descendants of domestic dogs released into the wild. Can spread disease and hybridize with native canines (coyotes, wolves), as well as potentially serving as a danger to humans or their pets. Would generally be the responsibility of county animal control services.

Priority 3 species are those that are dealt with only in unusual circumstances, either because they represent minor threats or are essentially naturalized and impossible to control with current methods.

- **Feral Goat**
  Descendants of domestic goats released into the wild. Causes erosion and overgrazing of native plants.

- **Pigeon** – *Columba livia*

Also called the Rock Dove or feral pigeon, their natural range is hypothesized to be in western and southern Europe, North Africa, and South Asia. Comprises a large diet for raptors in urban settings. Takes up resources originally for native birds. Found in abundant numbers globally.

- **House sparrow** – *Passer domesticus*

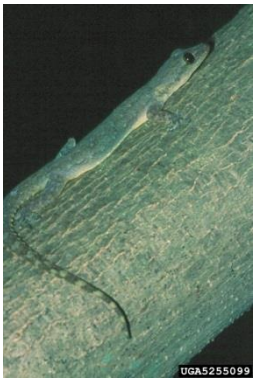
Small, non-migratory bird that is found in agricultural, suburban, and urban areas. North America's population can be traced to 1851, when a population of 100 was released in Brooklyn, New York. Will feed on a variety of farm products such as grains, vegetables, and fruit. Will outcompete native birds such as Carolina wrens, woodpeckers, and martins. Adults can take over nests of native birds, expelling adults and nestlings by force.

- **Eurasian collared dove** – *Streptopelia decaocto*

Introduced into the Bahamas in the 1970s as released pets, this bird has since spread across the majority of the United States. Birds can be found close to human habitation and in suburban areas, where grain is available and food is provided through humans. This species can be a carrier for West Nile and the Pigeon circovirus.

- **European starling** – *Sturnus vulgaris*

Robin-sized bird that weighs approximately 90g. Native to Eurasia, birds were introduced in the late 1800s as part of a plan to introduce all the birds in Shakespeare's works to the U.S. Adults are dark with light speckles on the feathers. They are selective feeders and will cause problems by consuming cultivated fruit and grains, destroying crops, and outcompeting native species. It can carry parasites and become pests with their noisy roosts and messes.



- **Indo-pacific Gecko** – *Hemidactylus garnotii*

The indo-pacific gecko is from Southeast Asia and is unisexual. Reproduction occurs through parthenogenesis. They are mostly nocturnal, found almost exclusively with human areas, and will feed on insects that are attracted to light. Their skin is smooth, unlike the non-native Mediterranean gecko.

- **Cosmopolitan house gecko** – *Hemidactylus mabouia*

Nocturnal. Native to sub-saharan Africa and has been introduced to the Americas and Caribbean through the agriculture and plant trade. Approx 5 inches in length. Diet includes invertebrates and small lizards such as anoles, and is the most likely gecko species to be found far away from human habitations.

- **Mediterranean gecko** – *Hemidactylus turcicus*

Small, nocturnal gecko that is common to the Mediterranean and has bumpy or warty skin. Insectivorous, rarely over 6 inches in length. Animals can be found around human habitation, rarely found far from outdoor lights. Present in southeast coastal Georgia and on some barrier islands, such as Jekyll. Animals can be expected to take resources intended for native species, but further impacts are still to be determined.

- **Greenhouse frog** – *Eleutherodactylus planirostris*

Small, 0.5-1.25 inches in length. Reddish to brown coloration. It is native to Cuba and likely hitchhiked here on plants and cargo. Diet consists of small invertebrates such as ants. Calls can be confused for the sound of crickets. In Georgia, has been found in Savannah, Thomasville, and Jekyll Island, and St. Simons Island (sound recording).

- **Brahminy Blind Snake** - *Ramphotyphlops braminus*

From Africa and Asia, this species is completely fossorial, resembling earthworms but do not have the segments. Also called “flowerpot snake” because animals are believed to have been introduced through the plant trade. Adults are between 2.5-6.5 inches in length. Rudimentary eyes resemble a pair of dots under the head scales and the tail-tip has a spine. These eyes are covered with translucent scales, rendering the snakes blind to all but light and giving their name. Coloration varies from shiny silver grey to charcoal grey or purple. Animals eat the larvae, eggs, and pupae of ants and termites. Parthenogenetic, all individuals collected have been female and give birth up to eight eggs or young.

Invasive Species Watch List

Species are considered to be future threats if (1) they are not known to be present in the state (and there is not a formal program to prevent their occurrence) but they have been documented in other southeastern states and have been shown to have significant ecological, economic, or health impacts where they occur; or (2) the species is present in Georgia and is currently not considered a serious pest, but may become one based on its history in other states.

- **Argentine Black and White Tegu** – *Tupinambis merianae*

Large (4 ft.) mostly terrestrial lizard that is native to savannas and semi-deserts of east and central South America. Sold in the pet trade and released in Florida, they fill a similar ecological niche to that of monitor lizards. They are omnivorous and will eat the eggs and young of ground-nesting bird, turtles, and other vertebrates as well as fruits and seeds. Have been noted to invade the burrows of gopher tortoises. Highly intelligent, animals can live 15-20 yrs. and is the first known partially warm-blooded lizard with a temperature that can rise 10 C above ambient temperature.

- **Monk parakeet** – *Myiopsitta monachus*

In its native range, in subtropical and temperate South America, it populates savannah woodlands, farmland, plantations, orchards and cultivated forests in low elevations up to one mile above sea level. In its introduced range it lives almost exclusively in urban areas, preferring open habitats including parks, planted urban areas, golf courses, farms, gardens and orchards. In its native range, monk parakeets are considered to be a significant agricultural pest, often causing damage to field crops and orchards. There have also been reports of transmission lines short-circuited by nesting birds. In its introduced range, impacts are uncertain. Monk parakeets have not caused the agricultural devastation predicted, nor have there been any solid evidence that native fauna are negatively affected by their establishment (ISSG 2008). Found in Florida since the 1980s. Estimated to be in at least 52 counties in Florida. Still, animals are almost certainly using up resources that were intended for natives.

- **Brown tree snake** – *Boiga irregularis*

A member of the *Colubridae* family, native to northern Australia and Papua New Guinea, this reptile was first detected in Guam in the 1950s, probably through cargo. Since then, it has caused a massive decline and extinction of native bird and lizard species there, with further impacts on fox bats and future implications for crops and farm animals. Native plants were also impacted as pollinators were removed. Has also been shown to cause power outages from interactions with power lines. Its cat eye pupils are distinctive. Color is variable, from blotches on a brownish-yellow background, blue or red banding on a white background, or black speckling. Adults are usually 1-2 m long.

- **Cane toad** – *Bufo marinus*

Currently founded with populations in Florida and Hawaii, this species came from Central and South America as escaped pets. Frogs grow 4-6 in. and sometimes up to 9 in. The body is tan to reddish-brown, dark brown or grey, and the back has dark spots. Skin is warty. Large, triangular parotoid glands on the shoulders are distinctive (natives have oval glands). They also do *not* have ridges or crests on the top of their head. They feed on a variety of invertebrates, but also frogs, small birds, reptiles, and mammals. Animals prey on and outcompete native species and are highly toxic which can lead to negative interactions with predators including pets.

- **Green iguana** - *Iguana iguana*

Native to Central and South America and the Caribbean, this reptile is another result of escaped pets. Iguanas are herbivores, diurnal, and stick mostly to trees and canopies. In its native habitat, it is endangered in some parts, known and eaten as the "chicken of the trees". Animals can be green, but blue colors are known, as are lavender, black, red, orange and pink. A row of spines go along the back and tail, and tails can break off if grabbed by predators. Dewlaps are also used for temperature regulation in addition to courtship and territorial displays.

- **Pythons (Burmese, Rock, Reticulated)** – Python bivittatus, P. sebae, P. reticulatus

- *Python bivittatus* (Burmese python) originated from Southeast Asia, and established populations were reported in the US in 2000. Imported as pets, animals escaped or were released. Animals have very few natural predators here and prey on or outcompete native and endangered species. Adults reach 6-9 ft. but can be up to 17 ft. Coloration is tan with dark blotches, resembling puzzle pieces of those on a giraffe. The stomach is white. The head is pyramid shaped with a dark, arrowhead marking extending towards the nose. Able to swim and climb, they can be found by or in the water and in trees. Females lay eggs.

- *Python sebae* (African Rock python) is a native of sub-Saharan Africa and was first noted in south Florida back in 2001 as either escaped or released pets. Animals usually grow up to 10-14 ft., but 20 ft. has been recorded in Africa. They prey on mammals, birds, reptiles, and fish, and in their native habitat will even catch crocodiles and antelopes. Because of their few predators and large size, this is a species to be monitored. Similar to the Burmese python, the rock python has a less defined pattern on its back. However, its belly scales have a pattern of black and white markings where the Burmese python are only white. Females lay eggs and guard them even after hatching.

- *Python reticulatus* is native to Asia but came to the United States as escaped or released pets. Often growing around 12 ft., this reptile is the longest in the world (but not heaviest) and can grow up to 21 ft. This snake has a tan body color with the back and sides marked with a dark netlike pattern accented with bits of yellow and white. There is a dark line down the center of the head, and thin facial bands leading from the eyes to the corners of the jaw. Eyes are reddish in color. The main body incorporates different colors; the back usually has a series of irregular diamond shapes surrounded by smaller marks with light centers. A good swimmer, it has colonized many islands in its range. Females lay eggs.

- **Boa** – *Boa constrictor*

First located in Florida in 1990, the common boa is native to Central and South America, where it grows 8-13 ft. The animal's back is typically yellow, grey, or light brown with dark brown saddle patches, and the tail saddles are often red. Animals become active at night and twilight, climbing well as they crawl. They constrict their prey and feed on lizards, birds, and mammals. This can have negative impacts on native species. Females give birth to 15-40 live young, which eliminates the vulnerable egg period. Given Florida's warm climate, the snake's prey items, and its prolific breeding method, this is species to be watched.

- **Anaconda** – *Eunectes murinus, E. notaeus*

- The green anaconda (*Eunectes murinus*) is the largest snake in the world, olive-green to brown and adorned with circular black markings. Native to South America, these are likely more escaped/released pets in the US and were recorded in 2004. Females are five times larger than males, growing up to 26 ft. As an aquatic snake, its color gives is camouflage as it sits under or near the water's edge. Using its body to constrict its prey, this large snake can prey on a large variety of animals: capybaras, tapirs, deer, reptiles, mammals, birds, fish, and sheep. With a slow acting metabolisms, snakes don't have to eat for weeks or even months after a meal. This snake gives birth to live young as many as 28-82, and this coupled with its large size and prey items make it a dangerous candidate to watch for.

- The yellow anaconda (*Eunectes notaeus*) is also native to South America, and grows up to 15 ft. in length. Individuals in Florida originated as escaped/released pets. Animals are yellow, golden tan, or greenish yellow with black or dark brown saddles, spots, streaks or blotches markings. Like the green anaconda, individuals prefer aquatic habitats but can be found in forests preying on large animals like deer or pigs. Prey items include wading birds, caimans, bird eggs, small mammals, and fish.

References:
Information gathered informally from online sources: SREL, USFWS, University of Florida, National Geographic, GA Invasive Species Strategy, and EDDmaps.

Invasive Aquatic Fauna priority list for Coastal Georgia

Priority 1 Species that CISMA partners currently spend a significant amount of time and/or money on for some aspect of management or plans to spend on in the next five years.

FISH

- **Flathead catfish** – *Pylodictis olivaris*

Native to the Mississippi and Gulf basins of the United States, flathead catfish were introduced into other waterways in the 1950s for sport fishing. Animals are voracious, consuming anything that fits in their mouth, including crayfish and the smaller native catfish species. It has a flattened head, small eyes, and a square-like tail. It is the protruding lower jaw that distinguishes it from other catfish. Coloration is yellow brown and usually mottled from above with a creamy to white to yellow underbelly.

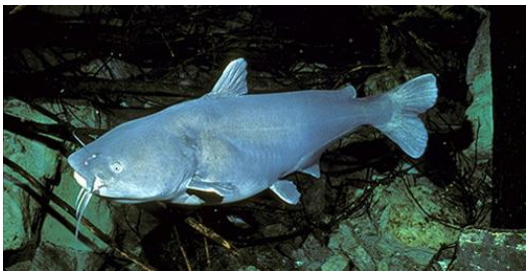
Priority 2 species are those that the organization deals with infrequently or attempts to control in selected high-priority areas (because they are thought to be lesser threats, or because they are widespread and difficult to control).

NONE LISTED AT THIS TIME

Priority 3 species are those that are dealt with only in unusual circumstances, either because they represent minor threats or are essentially naturalized and impossible to control with current methods.

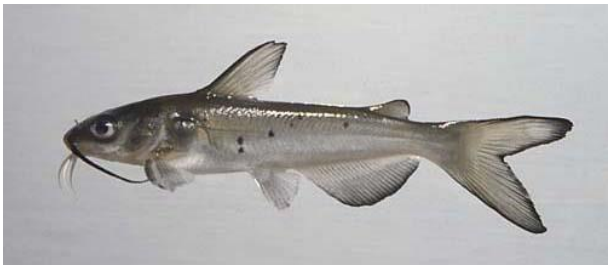
FISH

- **Blue catfish** - *Ictalurus furcatus*



Native to the rivers basins of Ohio, Missouri, and Mississippi, this species' range also extends south into Mexico and South America. It is invasive in the Chesapeake Bay area, and other fish species' populations declined there when it was introduced in the 1990s. Fish eat invertebrates and other fish, and usually weight 20-40 lbs. but supposedly can reach 100-350 lbs. Individuals have a forked tail fin, are bluish-grey to silvery-grey with a grey to white abdomen. The anal fin has 30 or more rays. Considering its size and past history of invasion, this species should be monitored in other waterways.

- **Channel catfish** - *Ictalurus punctatus*



Originating from Central and the Western United States, this species is invasive in Japan as it was introduced for aquaculture and the pet trade. Once established, populations feed on shrimp and small fish, depleting native species. Except for blue catfish, channel catfish are recognizable by their deeply forked tail fin. The upper jaw protrudes and coloration is olive-brown to slate-blue, fading to a silver white on the belly. Sometimes, numerous small black dots are present. The anal fin has 24-29 rays, but never 30 or more. Adults are usually 15-24 in. long, but can get up to 52 in. This species is believed to have been introduced in areas as west as California, in the upper Rio Grande and Pecos river basins, and in the Atlantic Ocean drainage. This species could potentially be outcompeting other species and is using up resources meant for natives.

- **Goldfish** - *Carassius auratus auratus*

Goldfish are widely introduced through aquarium dumping, and can carry fish diseases that can harm natives. Originating from China and Asia, only the fancy goldfish are bright orange. Wild goldfish vary from gold to olive green or even white. It has a stiff, serrate spine at the origin of the dorsal and anal fins. Observed goldfish may be hybrids between carp and the European goldfish subspecies. They reach 6-8 in. usually, and live 6-7 yrs. Goldfish tolerate high levels of turbidity, temperature fluctuations, and low oxygen levels. They are possibly somewhat saline-tolerant (17 ppt) as reported by locations on the coast of the Black Sea and the floodplain of the Russian Ob delta. Fish are omnivores and can impact native vegetation with their rooting efforts. Populations have the capacity to disturb habitats and outcompete natives.

- **Grass carp** - *Ctenopharyngodon idella*

Introduced from Asia in 1963 to control plants in aquacultures in Alabama and Arkansas, fish escaped and compete with natives for food, uprooting vegetation that gives habitat for other species, increase turbidity, and deplete oxygen levels. Fish are also fast growing, growing from 9 in. to 29 in. in 16 months as they devour 40-300% of their body weight per day in plant material. All that eating results in an excess of waste, which contributes to algal blooms and oxygen drops. Animals can also harbor parasites that can infect natives. Silvery to olive in color, they have no barbels. It's common that they reach 65-80 lbs. in their native range.

- **Red-bellied pacus** – *Piaractus brachypomus (Colossoma spp.)*

Also known as piranha, these fish were introduced to Florida as escaped pets from South America. As predators, they can take bites out of larger prey instead of having to swallow the prey whole, though in their native habitat, fish usually eat nuts and seeds. The lower jaw juts forward, forming a V at the angle.

- **Western mosquitofish** - *Gambusia affinis*

Introduced to eat mosquito larvae in the 1900s, this species also eats a variety of other insect larvae, zooplankton, and aquatic plants, as well as preying on the eggs, larvae, and juveniles of native fish and amphibians. By eating zooplankton that graze on algae, mosquitofish indirectly facilitate algal blooms. Livebearers, fish give birth to live young, removing the vulnerable egg stage and giving them and edge. In addition, fish are known to be aggressive towards natives, even larger fish. Monitoring and prohibition is to be used to keep fish out of waterways that can lead to impacts on endangered or threatened species.

- **Green sunfish** - *Lepomis cyanellus*

Native to central North America, this fish has been introduced throughout the country and world. In the US, individuals were accidentally stocked as bluegill as forage fish for smallmouth bass in fish farms, and as a sport fish. Animals have also escaped from flooded ponds or drainage ditches. Its body is elongate laterally compressed with a large mouth. The dorsal surface is brown to olive with black flecks; the sides are lighter and females have 7-12 vertical bars. There are two broad dorsal fins that are joined, the first having 9-11 spines and the second with 10-12 rays. Pectoral fins are short and round. Anal fins have 3 spines and 9-10 rays. The pelvic fin has a single spine and 5 rays. In males, the dorsal, anal, and caudal fin margins are often yellow or orange. At the rear of the dorsal and anal fins, there is a dark spot. Fish can survive in low oxygen, high turbidity, and alkaline waters. Care should be taken.

- **White perch** - *Morone americana*

Originating from the Atlantic coastal region of the United States, fish invaded the Great Lakes in the 1950s through the Erie and Welland canals. Inland waters have been invaded due to unauthorized stocking. Adults grow to 7-12 in. long, and compete with native fish, causing population declines as they eat other fish eggs. Animals also have the capacity to hybridize with the white bass in western Lake Erie. Fish are grayish green, dark along the back with silvery light mottled sides. Bellies are silver white and a bluish tint can be seen along the lower jaw. Unlike native bass, white perch do not have dark lines on their back or sides.

MOLLUSKS

- **Asian clam** - *Corbicula fluminea*

From Africa, Australia, and Asia, this species was first discovered in the US back in 1938, where it was possibly introduced as food. Clams form dense colonies that clog waterways and outputs. By taking up space and resources for natives, it displaces them. Once reaching maturity (1-4 yrs), clams can produce both eggs and sperm, are able to self-fertilize, and can produce 2,000 young per day. Billions are spent clearing pipes of this species.

- **Channeled apple snail** - *Pomacea canaliculata*

An introduction from South America, this mollusk was introduced to Hawaii back in 1989 for the aquarium trade, but now can be found in southern and western states. Animals feed on rice and taro seedlings, competing with native apple snails. Coloration is green to yellow to dark brown. They have deep groves between the whorls on their shell, and are distinguishable from other *Pomacea* species by these sutures that meet at an angle of less than 90 degrees. Sexes are separate, and females lay bright pink egg clusters above the water that contain 200-1000 eggs. Individuals grow up to 4 in, snacking on live and dead organic material. They can tolerate pollution and low oxygen levels and can estivate for up to five months when conditions are bad.

- **Island apple snail** - *Pomacea maculata*

As a globular snail native to South America, these snails were also introduced for the aquarium trade. Coloration is pale to dark olive green, sometimes with a faint band. Dark spots are on the inside of their shell. While sometimes mistaken for *P. canaliculata*, these two can hybridize. Animals eat a large variety of aquatic plants. Sexes are separate, and females lay clusters of pink eggs above the water, containing over 2000 eggs. Snails cannot tolerate temperatures below 50 F, and have been found in the southern states as well as Asia.

CRUSTACEANS

- **Red swamp crayfish** - *Procambarus clarkia*

Native to parts of Mexico and the United States, this crayfish has been introduced throughout the world for commercial food harvest. In other areas, it has been introduced to prey on snails that carry human schistosomes. Animals are aggressive competitors with native crayfish, introducing the crayfish plague, and having negative impacts on agriculture and fishing. Dark red, adults grow to 2-5 in, and are fast-growing, reaching weights greater than 50g in 3-5 months. Females can produce 100-500 eggs, and carry the eggs or young until they have completed two molts. This maternal care strategy and high fecundity facilitates its success. Omnivorous with a preference towards plants.

- **Grey-speckled crayfish** - *Orconectes palmeri*

Native to the Lake Pontchartrain drainage of Louisiana, the Pascagoula River system of eastern Mississippi, and the Pearl River system of western Alabama, this species was also found in the Flint River in Georgia in 1999, probably introduced through bait buckets. This species uses up resources and displaces native crayfish. Grey or greyish tan, this animal has many greenish black speckles and spots on the pincers, carapace, and abdomen. A pair of large blotches are just behind the head, and another near the junction of carapace and abdomen. Fingers are often creamy-yellow at the tips. The carapace is not separated in the middle by a space (areola). Adults grow 1.5-2.5 in.

- **Rusty crayfish** - *Orconectes rusticus*

Native to the Ohio River basin and most likely introduced through bait buckets and aquaculture, adults can grow up to 5 in. The carapace usually has a pair of rusty colored spots and the claw tips have black bands. This species is an aggressive invader, feeding on native fish eggs and their young, displacing or hybridizing with native crayfish, and eating aquatic vegetation. Coloration is green grey to reddish brown.

REPTILES

- **Red-eared slider** – *Trachemys scripta scripta*

A popular pet, this animal has been introduced around the world. Able to live 40 yrs. or more, many owners aren't ready to handle them and set them loose. Characterized by yellow to red patches on the each side of the head, the carapace and skin are olive to brown with yellow stripes or spots. Males are smaller, with long, thick tails. Turtles can be found in brackish water to manmade canals, lakes, and park ponds. Generalist omnivores, turtles eat plants and animals, including algae, snails, snakes, and small vertebrates. Turtles displace native turtles, and can carry diseases or parasites.

Invasive Species Watch List

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MAMMALS

- **Nutria** – *Myocastor coypus*

A large, dark, semiaquatic rodent, nutria originated from South America and were brought to the US in the early 1900s for fur ranchers, to control undesired vegetation, and to enhance trapping. Animals were freed or escaped from captivity as well as being introduced intentionally. Their legs are short, but their bodies are arched and 24 in. long. Tails are round, 13-16 in. long, and scarcely haired. Weights average between 12-20 lbs. Their incisors are yellow-orange to orange-red. Nutria eat rice and sugarcane, costing thousands to millions of dollars. Nutria breed year-round and prefer freshwater marshes.

FISH

- **Bighead carp** - *Hypophthalmichthys nobilis*

Hypophthalmichthys nobilis - Non-native Bighead Carp

Native to China, animals were brought to the US in the 1970s for aquaculture, and may have escaped as bait fish or misidentification. They can now be found in 23 states. Fish are large-bodied, fast-growing, have a high fecundity, and have voracious appetites. They can jump out of the water, and the genus can be identified with their stout body, large head, small downward facing eyes, and large opercles. The bighead carp has a smooth keep between the anal and pelvic fins that does not extend anterior to the base of the pelvic fins. Individuals can weigh up to 1000 lbs. and grow 4 ft. long. With their large size and aggressiveness, fish outcompete natives and are opportunistic feeders of zoo and phytoplankton. Their large size also allows them to lay thousands of eggs at once.

- **Silver carp** - *Hypophthalmichthys molitrix*

Introduced to the US in 1973 from Asia, this fish was also intended for aquaculture and phytoplankton control. It takes up food that is required for native fish and mussel species. This species has also been found to transmit *Salmonella*. Swimming just beneath the water surface, fish are known for their ability to leap clear out of the water. Some instances of this fish's introduction is believed to be linked to a Buddhist ceremony where animals are released to lengthen the owner's life. Fish need freshwater with circulation for their eggs (up to 5000), and like bighead carp, they have specialized gill structures to catch plankton. They outcompete natives and alter communities.

- **Black carp** - *Mylopharyngodon piceus*

Native to Asia, fish entered the US in the 1970s as stowaways in imported grass crap, but were later introduced intentionally as food and a biological control. This species can now be found in the Great Lakes and Mississippi River. Fish prey on mussels and snails, many of which are endangered or threatened. Blackish brown to blackish grey, black carp have elongated and laterally compressed bodies. They can grow up to 5 ft. long and weigh up to 150 lbs. Individuals can live for up to 15 yrs. Juveniles feed on zooplankton and insects, while adults feed on benthic invertebrates, providing a wider scale of destruction of resources. They eat 20% of their body weight each day, and are explosive breeders, laying hundreds of thousands of eggs in one clutch.

- **Northern snakehead** - *Channa argus*

From China, Korea, and Russia, this fish showed up in the US as early as 1997. Preferring slow moving bodies of water and wetlands, it can survive in water temperatures from 32F-86F, even underneath ice. They can grow up to 60 in. and weigh 17 lbs. Snakelike heads have mouths with sharp teeth. The tail is truncated and adults are golden tan to dull brown or olive. Irregular dark spots occur along the sides and saddle-like spots along the back. Animals can live out of water for days, crossing mud to search for new homes, and can eat frogs, birds, and small mammals. This species preys on fish, crustaceans, invertebrates, and amphibians, taking a toll on natives.

- **Walking catfish** - *Clarias batrachus*

Native to Southeast Asia, they came to the US in the 1960s for the aquarium trade. They grow 14-24 in. long. Part of a family that is scaleless and has four pairs of barbels, this fish can breathe air with a labyrenthic organ. They can "walk" from one water body to another during wet seasons with their fins. It does not have an adipose fin. They are omnivorous, feeding on fish, invertebrates, mollusks, detritus, and aquatic weeds. Established in Florida, they devour anything in sight and given their ability to walk across land, pose a verifiable threat to biodiversity.

- **Asian swamp eel** - *Monopterus albus argentine*

From Asia, animals were found in 1994 in Georgia's Chattahoochee River drainage, and later that decade was found in Florida. Introductions were probably released pets or escaped animals from food-fish farms. Asian swamp eels do not have pectoral fins, and they have a simple V-shaped gill opening as well as teeth. Most Florida individuals are olive brown in color with yellow orange bellies. A few are brightly colored with orange, pink, and calico. Adults reach 39 in. and hunt at night, feeding on fish, crayfish, amphipods, fish eggs, insects, plants, detritus, mollusks, turtles, snakes, and frogs. As a sequential hermaphrodite, all eels are born as females and later turn into males. This, coupled with their wide diet, makes it difficult to limit the population. In addition, animals breathe air with an organ at the rear of their mouths.

- **Red shiner** - *Cyprinella lutrensis*

A homegrown invasive, this fish originated from the middle and southwestern US. It eats crustaceans and insects, but will prey on the eggs and juveniles of other fish. Olive green above and with silver sides, adults grow 3.5 in. and mature in 1-2 yrs. with a lifespan of 3 yrs. Males turn blueish with red fins during spawning. Females can lay up to 19 clutches per season, averaging over 500 eggs each. Introduced as a bait fish, shiners have the potential to increase their populations rapidly, displacing natives and possibly hybridizing with native *Cyprinella* spp.

- **Blue tilapia** - *Oreochromis aureus*

Native to North Africa and the Middle East, this fish is grey-blue with a lighter color towards the belly. Dark broken lines can run vertically along the body. The edges of the dorsal and caudal fins are red to pink. The spiny dorsal fin and soft dorsal fin are joined. Males can reach 20 in. long and are longer than females. Animals breed in fresh or brackish water. Females lay 160-1600 eggs and then carry them in their mouths until they hatch three days later and young are 0.4 in. long. Even after that, young remain by the mother for 5 days after that. Fish were likely introduced as food. Mostly herbivorous, some will eat zooplankton, and young will eat invertebrates. Given its maternal care and high fecundity, this species should be monitored.

- **Nile tilapia** - *Oreochromis niloticus*

A fast-growing species from Africa, this fish was introduced as a food but has escaped cultivation. It has distinctive, vertical stripes extending as far down the body as the caudal fin, with variable colors. Adults grow up to 24 in. long and can weigh 9.5 lbs. Living up to 9 years, it can tolerate brackish water and can survive temperatures 46-108 F. As an omnivore, it eats plankton and plants, and can become an invasive. Living in shallow waters and diurnal, populations can quickly overpopulate, and some may become nocturnal to find food. Like other tilapia, Nile tilapia are maternal mouth brooders.

- **Yellow bass** - *Morone mississippiensis*

First described in the Mississippi River, yellow bass may have yellow bellies. Unlike other temperate bass, the two lowermost stripes are distinctively broken just posterior to the middle. The second and third anal spines are approx. equal in length. Fish were introduced to the west, north, and east. Able to reach 18 inches, most grow to 11 in. and average half a pound. Foraging on invertebrates and small fishes, bass displace natives by eating resources. It's also possible it can hybridize with other bass.

MOLLUSKS

- **Zebra mussel** - *Dreissena polymorpha*

Native to the Caspian Sea, these mussels were introduced into the Great Lakes in the mid-1980s in ship ballasts. They've spread to 20 states and into Canada. Animals can live out of water for a month as long as they're not subjugated to heat or extreme dehydration. Tiny, they can be attached to hitchhiking aquatic plants, or as larvae in bilges, live wells, and other water or cooling systems. Adults are triangular in shape and about the size of an adult fingernail and up to 2 in. They threaten native wildlife by consuming food and smothering out natives. They can clog pipes and intakes, costing millions to fix.

- **Giant east African snail** - *Achatina fulica*

Native to – yes – Africa, they first arrived in Hawaii and the US in the 1900s. They were brought for the pet trade and might have stowed away on cargo. One of the top 100 most invasive species, adults grow around 3 in. tall and 8 in. long. The shell is conical, twice as high as broad, and is mostly right-handed (dextral). Coloration varies with diet, but most are brown and banded. Shells have the highest metal content of any snail sp. Snails eat plants, including fruits and vegetables. As hermaphrodites, a single female can form a colony. They can store sperm for up to two years, and a clutch can be made up of 200 eggs, laying 5-6 per year. In times of drought, animals can aestivate for up to three years by sealing its shell with a calcerous, quick drying compound. Snails can harbor a parasitic nematode that causes meningitis in humans.

- **Amber snail** – *Calcisuccinea dominicensis*

Introduced from Haiti and the Dominican Republic, these snails breed rapidly in greenhouses or nurseries, eating fruits and horticultural crops. The shell is succiniform (higher than wide and with a large mouth), obtaining a height of 10 mm and a width of 7 mm with 3.25 whorls. Coloration is tan to pale brown, smooth and glossy. Prolific breeders. Its shell is thicker than other species.

- **Chinese mystery snail** - *Cipangopaludina chinensis malleata*

From Southeast Asia, this species can to the US in the 1900s from releases or escapes, but was likely sold in the San Francisco Chinese food market in the late 1800s as well. Shells are large and globose with 6-7 whorls and an inner coloration of white to pale blue. Juveniles are lighter than adults, finally turning olive green, green brown, brown, or reddish brown. Juvenile shells have a last whorl that display a distinct carina, and the shell has grooves with 20 striae/mm between each groove. They also have a detailed pattern on their periostracum of 2 apical and 3 body whorl rows of hairs with hooks on the ends. Adults reach 2.5 in. Snails feed on organic and inorganic material as well as algae. It can tolerate stagnant waters near septic tanks. Females are ovoviviparous and give birth up to 102 young at a time. It has proven to be a host for an intestinal trematode and trematode larvae.

Invasive Marine Fauna priority list for coastal Georgia

Priority 1 Species that CISMA partners currently spend a significant amount of time and/or money on for some aspect of management or plans to spend on in the next five years.

FISH

- **Red Lionfish** *Pterois volitans* – Recognizable with its red and white zebra stripes, this fish has long, elaborate fins and venomous spines. Reaching 12-15 in. and living near rocky coral areas, this is still a popular pet in the aquarium trade. Native to the Pacific Ocean, this species entered the West Atlantic through ship ballasts or aquarium releases. Some animals have been recorded in bays, estuaries, and harbors. As a solitary predator, it feeds on small fish, shrimps, and crabs. Native species are in danger of being outcompeted or eaten by this predator.

CRUSTACEANS

- **Asian Tiger Shrimp** *Penaeus monodon* – From the Indo-Pacific, this species has invaded the northern Gulf of Mexico and the western Atlantic Ocean. In its native range, it is heavily cultivated for food. Individuals grow 8-13 in. and weigh 3.5-6 oz. The carapace and abdomen are transversely banded with alternate red and white. Antennae are grey brown. Pereiopods and pleopods are brown with fringing setae in red. Color changes of dark brown and black are common. Animals threaten native shrimp industries with potential diseases and take resources intended for natives.

Priority 2 Species that the organization deals with infrequently or attempts to control in selected high-priority areas (because they are thought to be lesser threats, or because they are widespread and difficult to control).

NONE LISTED AT THIS TIME.

Priority 3 Species are those that are dealt with only in unusual circumstances, either because they represent minor threats or are essentially naturalized and impossible to control with current methods.

MOLLUSKS

- **Green Mussel** *Perna viridis* – Native to Asia, this species has been introduced worldwide on boat hulls and in ship ballasts. Shells are 3-4 in. in length and sometimes up to 6.5 in. The shell ends in a downward pointing beak. The periostracum is dark green and turns brown towards the umbo where it is lighter. Younger mussels are dark green, darkening with age. The shell interior has a blue sheen. Animals have a foot to climb vertically with should they be buried. Byssus is also produced for attachment. Mussels are fast-growing and are harvested in their native range for food, but can harbor a deadly Saxitoxin. Mussels clog water pipes and found marine equipment. Their waste can also accelerate the corrosion of copper-based pipes. It displaces natives and can introduce diseases and parasites.

- **Charua Mussel** *Mytella charruana* – From South America, this bivalve prefers shallow lagoons and mudflats in bays. Arriving by ship ballast, they have the capability to outcompete natives and foul equipment and pipes. Mussels are brown, light green, yellow, or black and can be uniform or banded. It doesn't have distinct exterior ribs or ridges and the inside of the shell is iridescent purple.

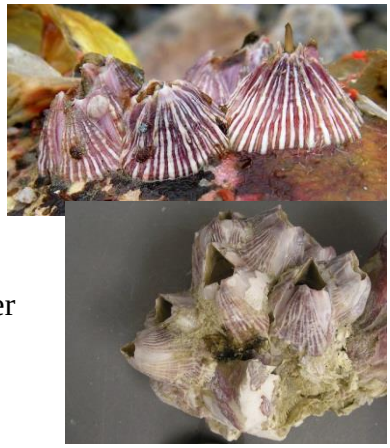
CRUSTACEANS

- **Titan Acorn Barnacle** *Megabalanus coccopoma* – Native to the Pacific Ocean and the west coast of the USA, this species has spread to the Atlantic. Capable of growing 2 in. wide and tall, acorn barnacles are a colorful pink. Specimens probably arrived on ship hulls or in ship ballasts. They use up food and space intended for natives and cause potential fouling issues, especially with their large size. With them comes the potential large cost of removing and maintaining them.

- **Green Porcelain Crab** *Petrolisthes armatus* – Native to South America, this crab occurs in subtidal and intertidal habitats and probably was introduced through ship ballasts or mollusk cargoes. It is a small, flat crab, usually orange-brown to dark brown as an adult with a speckled and somewhat lighter appearance as a juvenile. They can be olive to dark green in color. Mouthparts of adult crabs are a brilliant blue, and the chelae (pincers) each have a distinct orange spot visible when they are open. Particular to the family, the antennae are outside the eyes, not between them. Adults are 0.2-0.2 in. wide and weigh 0.3-0.6 g. Populations in South Carolina may be double that, but regardless, females can mature at 0.1-0.2 in. wide. Populations are proved to sky from tens or hundreds of individuals in the winter to thousands or tens of thousands in the summer. As plankton feeders, crabs take away resources meant for native species, and with their potential for large numbers, they may displace species entirely.

- **Striped Barnacle** *Amphibalanus amphitrite* – Origins are unclear since this animal is now worldwide, but fossils put this species in the Indian Ocean or southwestern Pacific Ocean. It is medium, cone-shaped, and sessile with distinctive narrow vertical purple or brown stripes. The surface has vertical ribbing. The operculum is diamond shaped and protected by a movable lid of two triangular plates. Diameter is around 0.8 in. It takes up space on hard and live structures (mangrove roots) as well as on manmade structures like boat hulls, pilings, and seawalls. Because of its ease of growth and captivity, and its tendency to foul equipment, it is considered invasive.

- **Triangle barnacle** *Balanus trigonus* – Conical in shape with six shell plates, this barnacle is pink. It is another potential contender for resources and may displace natives. Growing to 0.75 in. in diameter, its distinguishing features include its triangular shaped opening and the rows of small pits the internal plates that close the shell have. It can also foul boats, buoys, and other equipment, costing people thousands of dollars or more to fix.



- **A parasitic barnacle**, *Loxothylacus panopaei* – From the Gulf of Mexico, this species reached the eastern US likely through the transport of infected crabs in oyster shipments. Though it looks nothing like a barnacle, it infects newly molted mud crabs, sterilizing them, and producing a sac that protrudes from the crab's abdomen, where thousands of larvae are produced. This is the only visible sign of the parasite. Infected crabs have been found as north as the Chesapeake Bay. It's likely this will affect crab populations and predators further up the food chain.

POLYCHAETES

- **Australian tubeworm** *Ficopomatus enigmaticus* – Likely native to the Indian Ocean and the coasts of Australia, this species is now worldwide. It dominates and changes habitats, reducing water quality, using up resources, and playing a hand in biofouling. Usually 0.8-1 in. long but sometimes 1.6 in. They're topped by 20 branching gill plumes that are green, grey, or brown. The worms secrete their calcerous tubes that are usually 4 in. long by 0.8 in. wide. These tubes are white but turn brown with age, flared at the opening and with flaring rings along the length. The mouth can be sealed with an operculum. Individuals live in colonies, creating reefs. Tolerating a wide range of salinities, they prefer brackish and are sensitive to wave action. They can occur on rocks, shells, woody debris, reefs, oysters, docks, piers, and boats. Reports have surfaced of them growing on plants, snails, and clams. As protandric hermaphrodites, they start out male and then turn into females, living 4-8 yrs. One specimen has been found in Georgia.

Invasive Species Watch List
Species are considered to be future threats if (1) they are not known to be present in the state (and there is not a formal program to prevent their occurrence) but they have been documented in other southeastern states and have been shown to have significant ecological, economic, or health impacts where they occur; or (2) the species is present in Georgia and is currently not considered a serious pest, but may become one based on its history in other states.

CRUSTACEANS

- **Spiny hands crab, Indo-Pacific Swimming Crab** *Charybdis hellerii* –


Native to the Indo-Pacific, crabs were brought to the West Atlantic sometime in the 1980s by ship ballasts from eastern Mediterranean ports. Carapaces are hexagonal and convcave, with a mottled brown grey coloration. Much is still unknown, though it is accepted as an invasive, its direct effects beyond likely using up natives' resources are yet to be explored. It has been found in North and South Carolina as well as Florida. Males grow up to 3 in. (carapace).

- **Chinese mitten crab** *Eriocheir sinensis* – From the Pacific coast of China and Korea, his species is another that was likely introduced through ship ballast water and releases. Named for its furry claws that resemble mittens, these are covered with dark setae. Carapaces are 1-4 in. wide, the size of a human palm. Animals spend most of the time in freshwater, migrating in their 4-5th year to estuaries. After mating there, females go into the sea, overwintering there and returning in the spring to the estuaries with their eggs. Larvae gradually move into freshwater. Animals only breed once in their lifetime, but have large amounts of eggs. As omnivores, crabs eat worms, mussels, snails, organic material, and other fish. Listed as Injurious Wildlife, this crab has been known to interfere with fish salvage operations, fish passage facilities, and power and water treatment plants. Currently found in the Great Lakes and in the Chesapeake Bay.

- **Green Crab** *Carcinus maenas* – Introduced from Europe in the 1800s by sailing ships, and since then are believed to have caused dramatic declines in the soft shell clam fishery. Invaded as far north as Nova Scotia and the west coast, they fed on mollusks, crustaceans, green algae, and polychaetes, their dispersal aided with their floating larval stage. El Nino furthered their range, taking them up to Washington and the British Columbia estuaries. Young oysters are vulnerable to this predator, as one crab can dig down six inches and eat 40 half-inch oysters a day. Smaller shore crabs and clams are also predated upon. Coloration can vary from red to a dark mottled green, so the five spines on each side of the shell are distinctive. Three rounded lobes are found between the eyes, and the last pair of legs are flatter. The carapace is wider than it is long, 3.5-4 in. across.

- **Asian Shore Crab** *Hemigrapsus sanguineus* – From Asia, this crab has invaded the Carolinas and further north through Rhode Island, probably through ship ballasts in the late 1900s. Crabs are found in the subtidal and intertidal rocky shoreline, and even seawalls and artificial reefs, tolerating a broad range of temperatures and salinities. As omnivores, crabs eat algae, mollusks, polychaetes, and small fish. Females can have 2-4 clutches per season, each having up to 50,000 eggs that hatch into planktonic larvae. Its aggressive nature allows it to outcompete native invertebrates and it can even feed on larval lobsters, which are important commercially. Carapaces are 2 in. wide with three teeth along the forward sides. Light and dark bands mark the pereiopods.

- **Oriental Shrimp** *Palaemon macrodactylus* – Native to Asia, this species was first recorded in the US in the 1950s on the west coast. Animals can tolerate large ranges in temperature, oxygen, and salinity. They also have a long breeding season and high reproductive capacity. Mostly carnivorous, shrimp will turn to each other when food is low. Oriental shrimp outcompete other shrimp for resources, and harm commercial harvests. Coloration is red to brown to green to blue-green or even grey or olive-green. Larvae are distinctive with a hook-like process on their third abdominal somite in the 2nd to 8th stage zoea that isn't present in any natives. This species spreads easily once introduced, even with fish and bird predators. Males grow up to 1.5 in. and females to 2.7 in.

- **Reticulated Barnacle** *Amphibalanus reticulatus* – Also called the striped barnacle or purple acorn barnacle, this species has distinctive narrow vertical purple or brown stripes. The test has vertical ribbing and a diamond shaped operculum. They grow to 0.78 in. in diameter. Origins are unknown, but fossils are in the Indian Ocean and southwest Pacific; this species is worldwide now. Purple acorn barnacles foul ships and other manmade structures such as pipes, costing money to remove and fix them.

MOLLUSKS

- **Asian Rapa Whelk** *Rapana venosa* – Native to the western Pacific ocean, this is another species that probably arrived through ship ballast water in the late 1900s. As a mollusk itself, it preys on clams, oysters, and mussels and has been found in the Chesapeake Bay. The shell is globose and heavy, with a large body whorl and a large ovate aperture. Smooth spiral ribs end in blunt knobs at both the shoulder and body whorl, and internally as small elongated teeth along the outer lip margin. Coloration is grey to red-brown, with dark brown dashes on the spiral ribs. Some individuals can have a distinctive black/blue vein pattern throughout the inner portions of the shell, usually starting at the individual teeth at the outer lip. The deep orange color in the aperture and on the columella is a diagnostic for this species. Shells can be 7 in. high. Tolerating low salinities, low oxygen levels, and water pollution, females can lay multiple egg cases each season, each with 200-1000 eggs. Their tough shell gives them protection against native whelk and sea turtles, leaving the latter to only prey on natives. This whelk can cause a decline in native mollusks and affects predators further up the food chain.

- **Brown Mussel** *Perna perna* – Originally from Africa, South America, and Europe, this mussel is harvested as a food source, but can contain toxins and foul equipment and structures. It was introduced through boat hulls and ship ballasts. Growing 3.5-4.7 in. Easily recognized by its brown color, the species also has a divided posterior retractor mussel scar. Its resillal ridge is pitted and also differentiates it. As a biofouling agent, it increases surface area and allows more biofouling organisms to settle.

COELENTERATES

- **Australian spotted jellyfish** *Phyllorhiza punctata* – Originating from Australia and the Philippines, this jellyfish was first found in the US in 1981 in California but now is on the southeast coast as well. It was likely introduced through the Panama Canal on the hulls of ships and ship ballasts. Spotted jellyfish preys on native zooplankton species and further impact the shrimp industry by clogging nets and damaging fishing equipment. The bell is clear or brown (the latter color resulting from symbiotic zooxanthellae), growing to 13.7 in. wide and sometimes twice that in Gulf waters, with many small white, refractive spots near the surface. The physical threat to humans is minor: stings are mild or unnoticeable. In tropical waters, this species may be reproducing year-round, lending the possibility of unexpected population blooms. They may be outcompeting natives and preying on important or threatened/endangered species.