

VIRGINIA INVASIVE SPECIES WORKING GROUP

TWELVE INVASIVE SPECIES OF HIGH CONCERN IN VIRGINIA





Photo credits:
cover: Emerald ash borer, David Cappaert, Michigan State
University, Bugwood.org
right: Rusty crayfish, Chris Lukhaup

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What are invasive species?

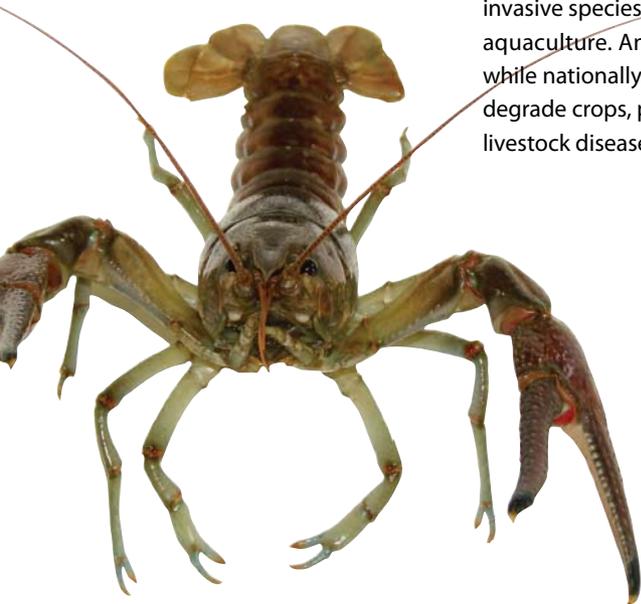
Invasive species are non-native (also known as alien, exotic or nonindigenous) plants, animals and pathogens that cause or are likely to cause ecological disruption, economic losses or harm to humans.

How did they get here?

Ever-increasing globalization and international trade have opened the floodgates for intentional and accidental introductions of invasive species to Virginia from all over the world. Intentional introductions include plants for gardens, erosion control, and food for both livestock and people. Accidental introductions can be found as “stowaways” in ship ballast water, hidden in shipping crates, mixed in with plant materials from other parts of the world, and attached as “hitchhikers” on travelers’ clothes, luggage and vehicles.

Why should you be concerned?

Invasive species spread aggressively and displace or destroy both native and commercially cultivated plants and animals. After habitat alteration, invasive species are the greatest threat to natural systems, agriculture and aquaculture. Annually, invasive species cost Virginia more than \$1 billion, while nationally the toll exceeds \$120 billion. Invasive species damage and degrade crops, pasture and forestlands, clog waterways, spread human and livestock diseases, and destroy urban street trees.



What is Virginia doing?

Across the state, numerous efforts are underway to address the threats posed by invasive species. In 2003, the General Assembly formed the Virginia Invasive Species Working Group. Its purpose is to coordinate state agency action to minimize economic, environmental and human harm from invasive species by acting on these seven goals: coordination, prevention, early detection, rapid response, control, research and education.

Specific actions taken by state agencies to date in Virginia include:

- The Department of Agriculture and Consumer Services, the Department of Forestry and Cooperative Extension programs are working to slow the spread of the emerald ash borer through ongoing quarantines, surveys and outreach throughout the state.
- The Department of Game and Inland Fisheries successfully eradicated the state's first and only known population of zebra mussels at Millbrook Quarry in Prince William County.
- The Virginia Institute of Marine Science is working with Chesapeake Bay watermen to monitor the rapa whelk.
- The Department of Conservation and Recreation continues to conduct surveys for and control stands of Phragmites on state parks, natural area preserves and targeted private lands.
- The Department of Agriculture and Consumer Services, Department of Forestry and the USDA Forest Service cooperate to conduct surveys and treatments designed to slow the spread of the gypsy moth.



What more can be done?

The most effective strategy against invasive species is to prevent them from being introduced. This requires better monitoring and regulating of the pathways by which invasive species arrive, such as major shipping ports and imports of live plants and animals. Because prevention is not always successful, we must also enhance early detection and rapid response programs designed to eradicate species before they become established. This involves monitoring for the introduction of invasive species and having a coordinated and effective response plan to control and eradicate the outbreak. Both preventive and rapid response actions require education, a strong commitment of financial resources and a well-coordinated approach among local, state, federal and private partners.

Specifically, citizens of the Commonwealth of Virginia can do the following to help prevent and slow the spread of new and existing invasive species:

- Learn how to recognize invasive species and avoid transporting or purchasing them.
- Learn how you might be unintentionally moving invasive species and take steps to prevent doing so. Two easy actions are to always buy and burn firewood that is indigenous to your outdoor activity and always clean boating equipment before transporting your boat to another waterway.
- Avoid purchasing invasive plants when landscaping and consider using native plants.
- Become part of an invasive species early detection network and report sightings of suspected new species invasions.
- Report suspected new invasive species infestations at www.vainvasivespecies.org.



Profiles of Twelve Highly Invasive Species

The following descriptions of 12 invasive species represent a diverse range of invasive organisms. It is important to note that these are in no way considered the priority species in Virginia. Rather, they were selected to describe the breadth of invasive species issues. The species included in this list meet one or more of the following criteria:

- are known to have significant economic impacts on agriculture, public infrastructure, natural resources or recreational activities.
- are widely recognized by biologists and resource managers to degrade natural ecosystems or negatively affect native species.
- have, or can have, harmful effects on human health.

The species described in this booklet have been divided into three categories based upon their current level of establishment in Virginia.



Keep out!

These invasive species are not yet established in Virginia. Preventing establishment is the key strategy.



Slow the spread!

Newly arrived, these species are now established in Virginia. *(See page 8 for strategies to help slow the spread of two invasive species.)*



Go away!

These invasive species are established in Virginia. Site-specific control and management are the only feasible strategies. Eradication of these species is unlikely, given current technology.

Keep out!



Zebra mussel

(*Dreissena polymorpha*)

What is it? A shellfish named for its striped shell, growing up to 2 inches long.

Where's it from? Native to Russia; spread to Western Europe in the 19th century.

How did it get here? First identified in the U.S. in 1988 in the Great Lakes region, it probably arrived in the ballast of a trans-Atlantic ship.

Where is it now? In less than 10 years, it spread to all five Great Lakes and the basins of the Mississippi, Ohio, Tennessee, Hudson and Susquehanna rivers.

What's the harm? Zebra mussels form dense colonies of as many as 1 million individuals per square yard on any hard surface, including boats, pipes, piers, docks, plants, clams and even other zebra mussels. The U.S. Fish and Wildlife Service has estimated a \$5 billion economic impact over a 10-year period from the costs of management activities, such as cleaning and maintenance of water intake pipes, removal of shell build-up on recreational beaches, and control efforts.

What's being done? Zebra mussel was discovered in one quarry pond in northern Virginia in 2003. The Virginia Department of Game and Inland Fisheries led successful eradication efforts. Early detection and response has thus far prevented zebra mussel from becoming established in Virginia.

How can I learn more?

Visit www.vainvasivespecies.org/species/zebra-mussel.htm

Keep out!



Sirex woodwasp

(*Sirex noctilio*)

What is it? A 1 to 1.5-inch-long wasp with a metallic blue-black body. Males have orange segments on their abdomens.

Where's it from? Europe, Asia and northern Africa.

How did it get here? It is frequently encountered at ports of entry in the wood of shipping crates.

Where is it now? Sirex woodwasp has become a serious pest in countries such as South Africa, New Zealand and Australia. In 2005, pest surveys in New York discovered Sirex woodwasp in mixed hardwood forests in more than 25 counties. It has since spread to northern Pennsylvania.

What's the harm? While there are native woodwasp species in North America, only the non-native invasive species aggressively attacks healthy trees. Tree mortality is brought about by the female wasp. As she lays her eggs in the host tree, she injects a symbiotic fungus along with toxic mucus. Together, the mucus and the fungus kill the tree. Wasp larvae feed on the fungus. Southern Hemisphere pine plantations infested by Sirex woodwasp have suffered tree mortality as high as 80 percent.

What's being done? Monitoring continues in order to detect the spread of the wasp.

How can I learn more?

Visit www.vainvasivespecies.org/species/sirex-wood-wasp.htm

Photo credits:

Zebra mussel, Randy Westbrook, U.S. Geological Survey, Bugwood.org
Sirex woodwasp, David R. Lance, USDA APHIS PPQ, Bugwood.org

Keep out!



Rusty crayfish

(*Orconectes rusticus*)

What is it? A crayfish up to 4 inches long with dark spots on its sides.

Where's it from? Native to lakes, ponds and streams of Ohio, Kentucky, Tennessee, Indiana and Illinois.

How did it get here? Used by anglers for bait and sold in the pet and biological supply industries, rusty crayfish were probably spread outside their native range by one or all of these pathways.

Where is it now? In the eastern U.S., it has been found in Maine, Massachusetts, New York, New Jersey, Pennsylvania and West Virginia where it has become an aggressive and destructive invader. In 2007, rusty crayfish was discovered in the Monocacy River, a Maryland tributary to the Potomac River.

What's the harm? Rusty crayfish out-compete native crayfish for food and territory and reduce aquatic plant abundance and species diversity. Their actions impact the habitat for other crayfish and fish species. They are associated with population declines of game fish such as bluegill, bass and northern pike.

How can I learn more?

Visit www.vainvasivespecies.org/species/rusty-crayfish.htm

Keep out!



Sudden oak death/Ramorum blight

(*Phytophthora ramorum*)

What is it? An emerging forest tree disease caused by the fungus-like organism Ramorum blight.

Where's it from? Unknown.

How did it get here? Unknown. Experts speculate that it was transported on plant material.

Where is it now? Ramorum blight is established in the natural landscape throughout parts of California's central coastal region and in Curry County, Oregon. The disease has also become established in ornamental landscapes in the U.K. and the Netherlands. In ornamental nurseries, the pathogen has been detected in Europe since the early 1990s and in North America since it was found in a California nursery in 2001. In 2003, Ramorum blight was found in nurseries in Oregon, Washington and British Columbia.

What's the harm? Ramorum blight could injure and kill oaks and other economically and ecologically important plant species in Virginia forests. Although this disease often causes only minor branch dieback and leaf blight in nursery stock, it has killed millions of oaks in California forests since the mid-1990s.

What's being done? In Virginia, the Department of Agriculture and Consumer Services conducts nursery surveys annually for Ramorum blight. The surveys safeguard our natural ecosystems and protect the state nursery and forest industries from the potential losses associated with a widespread outbreak of Ramorum blight.

How can I learn more?

Visit www.vainvasivespecies.org/species/sudden-oak-death.htm

Keep out!



Chinese mitten crab

Eriocheir sinensis

What is it? A burrowing crab with white-tipped, hairy-looking claws.

Where's it from? East Asia.

How did it get here? Unknown. It was possibly released accidentally in ship ballast water or deliberately to establish a fishery.

Where is it now? Chinese mitten crab became established in the San Francisco Bay in the late 1980s, where it has continued to spread and cause a range of problems. In 2006, it was found in the Chesapeake Bay. Since then, a number of individuals have been found around the bay, but evidence of the species having become established has yet to be found.

What's the harm? They harm fisheries by stealing bait from traps and fishing lines, clog power plant water intake pipes, cause stream bank collapse due to innumerable burrows and alter aquatic ecosystems by competing with native species.

What's being done? In the Chesapeake Bay region, efforts are underway to educate the public about Chinese mitten crab and encourage reporting any suspected discoveries.

How can I learn more?

Visit www.invasivespecies.org/species/chinese-mitten-crab.htm



Photo credits:

Rusty crayfish, Chris Lukhaup

Ramorum blight, California Department of Fish and Game

Chinese mitten crab, California Department of Fish and Game

Northern snakehead, Susan Trammell, Bugwood.org

Slow the spread!



Emerald ash borer

(*Agrilus planipennis*)

What is it? A small, wood-boring beetle.

Where's it from? Asia, including China, Korea, Taiwan and Japan.

How did it get here? Accidentally — inside wooden crates, pallets or other forms of wood packaging material.

Where is it now? Widespread in the northern Midwest, it has been discovered in the eastern United States, including Maryland, Pennsylvania, Kentucky, West Virginia and Virginia.

What's the harm? This insect has already killed more than 40 million ash trees in mid-western states, posing serious threats to the forest industry, natural areas and neighborhoods.

What's being done? Quarantines are in place to slow the spread of this pest. These quarantines, issued by the Department of Agriculture and Consumer Services, prohibit the transport of firewood, nursery stock, ash logs and other articles capable of transporting emerald ash borer. A monitoring program continues for emerald ash borer in Virginia.

How can I learn more?

Visit www.vainvasivespecies.org/species/emerald-ash-borer.htm

How can I help? Do not move firewood or other forest products out of the quarantine area. Get more details at: www.vdacs.virginia.gov/news/releases-a/071210eab.shtml

Learn how firewood can move invasive species like emerald ash borer into uninfested areas: www.dontmovefirewood.org/

Slow the spread!



Northern snakehead fish

(*Channa argus*)

What is it? A voracious predator that grows up to 4 feet long with sharp teeth and the ability to breathe air as well as use gills.

Where's it from? Northern China and eastern Russia.

How did it get here? Imported and sold as live fish food at some markets and in the aquarium trade, even in states where it is illegal to sell.

Where is it now? It is now found in the Potomac River and many of its tributaries.

What's the harm? Snakeheads have the potential to drastically alter freshwater ecosystems by out-competing native fish species, including many sport fish. It may also introduce yet another non-native species, a fungal disease that can harm native fish and stock in fish farms.

What's being done? Department of Game and Inland Fisheries monitors the population and its effects on native fish.

How can I learn more?

Visit www.vainvasivespecies.org/species/northern-snakehead-fish.htm

How can I help? If you catch a northern snakehead fish, kill it where you catch it. It is illegal to move live snakehead fish. Report your catch to the Virginia Department of Game and Inland Fisheries by calling 804-367-2925.

Learn more at: www.dgif.virginia.gov/fishing/snakehead-faq.asp

Go away!



Rapa whelk

(*Rapana venosa*)

What is it? A large predatory snail that has a stout gray to red-brown shell with black veined markings.

Where's it from? Native to the Sea of Japan, Yellow Sea, East China Sea and Bohai Sea.

How did it get here? Unknown — possibly ship ballast water.

Where is it now? Since it was discovered in 1999 by the Virginia Institute of Marine Science Trawl Survey Group, numerous reports have been documented in the lower James, Elizabeth and York rivers, Mobjack Bay and the lower Chesapeake Bay. One rapa whelk was collected at Tangier Island, the northernmost finding in the bay.

What's the harm? Rapa whelks feed on oysters, clams and mussels. Their presence in the Chesapeake Bay puts greater pressure on already stressed shellfish populations and the fisheries dependent on them.

What's being done? Until late 2009, the Virginia Institute of Marine Science ran a bounty program. Researchers continue to monitor and study the rapa whelk and its impacts on bay ecology.

How can I learn more?

Visit www.vainvasivespecies.org/species/rapa-whelk.htm

Photo credits:

Emerald ash borer, David Cappaert, Michigan State University, Bugwood.org

Northern snakehead, Susan Trammell, Bugwood.org

Rapa whelk, U.S. Geological Survey Archive, U.S. Geological Survey, Bugwood.org

Tree-of-heaven, Chuck Bargeron, University of Georgia, Bugwood.org

Go away!



Tree-of-heaven

(*Ailanthus altissima*)

What is it? A deciduous tree that grows up to 80 feet tall with compound leaves that resemble native sumac and walnut species. Although once used as an ornamental, the flowers, leaves and wood all give off an offensive odor similar to that of rotting peanuts.

Where's it from? China.

How did it get here? Deliberately introduced as an ornamental species.

Where is it now? It is found in 42 states and throughout Virginia. The plant grows in numerous habitats, from the interior of large national parks to the center of cities. Tree-of-heaven produces numerous wind-borne seeds that allow it to invade naturally disturbed sites in natural areas, parks and woodlands. It is one of the most widespread weed trees along roadsides and in Shenandoah National Park.

What's the harm? It is a fast-growing tree that can damage pipes and other structures in the urban landscape and out-competes native plant species in natural areas. It produces a chemical that inhibits the growth of other plants, giving it a competitive advantage. Tree-of-heaven aggressively colonizes roadsides and medians, increasing highway maintenance costs.

What's being done? Control with herbicides is effective and appropriate on a small scale, and in high priority areas, such as Shenandoah National Park. With much effort, tree-of-heaven can be locally eliminated. Promising biological controls are being explored and may one day become an effective means to control this species.

How can I learn more?

Visit www.vainvasivespecies.org/species/tree-of-heaven.htm

Go away!



Japanese stilt grass

(*Microstegium vimineum*)

What is it? An annual grass that grows vigorously in moist low-light habitats.

Where's it from? Asia.

How did it get here? It was introduced into the U.S. in Tennessee around 1919 and likely escaped as a result of its use as a packing material for porcelain.

Where is it now? It is now found throughout Virginia where it invades a diverse range of habitats, from lawns to forested wetlands.

What's the harm? Japanese stilt grass can carpet the ground-layer and suppress other plants, including the seedlings of tree species, making it of concern to foresters and woodland owners. It appears that Japanese stilt grass alters soil pH, raising the acidity of soils and reducing the ability of other plants to grow where it is established. It produces numerous seeds that are easily transported by animals, humans and waterways. Japanese stilt grass can establish itself well in a shaded forest understory and, as a result, can out-compete native flora, suppress tree seedlings and inhibit forest regeneration.

What's being done? Small infestations can be controlled by hand-pulling or herbicides, but no practical large-scale solution exists. Agencies are keeping track of its distribution and spread.

How can I learn more?

Visit www.vainvasivespecies.org/species/Japanese-stilt-grass.htm

Go away!



Imported fire ant

(*Solenopsis invicta*)

What is it? A prolific insect known for its painful sting and aggressive behavior. Black to reddish brown, they grow from 1/8 to 1/4 of an inch long and are difficult to distinguish from native ant species.

Where's it from? South America.

How did it get here? It was accidentally released in ship ballast in the 1930s.

Where is it now? They are found throughout the southern United States, including all or parts of Alabama, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, New Mexico, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas and Virginia.

What's the harm? In addition to stinging humans, imported fire ants are known to attack and sometimes kill newborn domestic animals, pets and wildlife. They destroy seedling corn, soybeans and other crops. Imported fire ants build mounded nests that disrupt cultivation of fields and create eyesores in lawns and parks. A single acre of infested land may support hundreds of mounds.

What's being done? In Virginia, imported fire ants are established in the Tidewater area, which is now under a quarantine prohibiting the movement of articles that may transport this species to uninfested areas of the state.

How can I learn more?

Visit www.vainvasivespecies.org/species/imported-fire-ant.htm

Go away!



Phragmites

(*Phragmites australis*)

What is it? A tall wetland grass species.

Where's it from? With worldwide distribution, the invasive form in Virginia is thought to have come from Europe or Asia.

How did it get here? At least one Eurasian variety was introduced into the U.S., most likely in the 1800s. It is an aggressive and serious invader of brackish wetlands in eastern and midwestern states.

Where is it now? Over the last 50 years, the invasive Phragmites has become increasingly abundant along the East Coast. The Department of Conservation and Recreation has mapped more than 12,000 acres of Phragmites that has invaded wetlands in coastal Virginia. In Back Bay, 6,000 acres of Phragmites occupy 10,000 acres of wetland habitat.

What's the harm? Phragmites overwhelms other marsh plant species from above and below the ground. Tall stems with seeds may be 15 feet tall, and fast-growing underground stems form new shoots and a thick tangled root mat. By forming tall, dense stands with few other plant species, Phragmites creates a habitat that lacks value to wildlife. Phragmites also clogs drainage ditches, increases mosquito populations, invades agricultural fields and commercial forest lands, and reduces real estate values by blocking water views and increasing maintenance costs.

What's being done? Once established, it is very difficult and expensive to control. In Virginia, state and federal agencies have partnered with The Nature Conservancy, local governments and private landowners to control Phragmites at priority natural areas.

How can I learn more?

Visit www.vainvasivespecies.org/species/phragmites.htm



Photo credits:
Japanese stilt grass, Chris Evans, River to River CWMA,
Bugwood.org
Imported fire ant, Scott Bauer, USDA Agricultural Research
Service, Bugwood.org
Phragmites, Jill M. Swearingen, USDI National Park Service,
Bugwood.org

Where to find more information

Virginia Invasive Species website

www.vainvasivespecies.org

Mid-Atlantic Exotic Pest Plant Council (MA-EPPC)

www.ma-eppc.org

National Invasive Species Information Center (NISIC)

www.invasivespeciesinfo.gov

Mid-Atlantic Panel on Aquatic Invasive Species (MAPAIS)

www.midatlanticpanel.org

Alien Plant Working Group

www.nps.gov/plants/alien/index.htm

Invasive and Exotic Species of North America

www.invasive.org

Non-indigenous Aquatic Species

<http://nas.er.usgs.gov>

PLANTS Database

<http://plants.usda.gov>

The Nature Conservancy

www.nature.org/initiatives/invasivespecies

Virginia Native Plant Society

<http://vnps.org>

Virginia Cooperative Extension

www.ext.vt.edu



The Virginia Invasive Species Working Group

In 2009, the General Assembly passed legislation that established the state's commitment to addressing the invasive species that threaten the commonwealth. The commitment requires the cooperation and coordination of government agencies, the business community, conservation organizations, and public citizens. The legislation directs the Secretary of Natural Resources and the Secretary of Agriculture and Forestry to *"coordinate the development of strategic actions to be taken by the Commonwealth, individual state and federal agencies, private business, and landowners related to invasive species prevention, early detection and rapid response, control and management, research and risk assessment, and education and outreach."*

The legislation builds on work achieved through previous legislation and executive directives. The Secretary of Natural Resources serves as chair and the Secretary of Agriculture and Forestry serves as vice-chair of the Virginia Invasive Species Working Group (VISWG). Current members of the VISWG are listed below.

Department of Agriculture and Consumer Services

Department of Conservation and Recreation

Department of Environmental Quality

Department of Forestry

Department of Game and Inland Fisheries

Department of Health

Department of Transportation

Virginia Cooperative Extension Service

Virginia Institute of Marine Science

Virginia Polytechnic Institute and State University

The Nature Conservancy

MeadWestvaco

Virginia Green Industry Council

Dominion Power

United States Department of Agriculture – Forest Service

United States Fish and Wildlife Service



For more information, contact:

Department of Conservation and Recreation
Virginia Natural Heritage Program
www.dcr.virginia.gov/natural_heritage
804-786-7951 or visit:
www.vainvasivespecies.org