



KUDZU

Shannon Deaton was flipping through the channel listings on her television one evening earlier this year when a movie title practically screamed out to her. “Snakehead Terror” was on, and she knew she had to watch it. After all, in her job as Habitat Conservation program manager for the NC. Wildlife Resources Commission’s Division of Inland Fisheries, she had spent a lot of time talking to people about the air-breathing, land-walking Asian fish that was found living in a Maryland lake in 2002.

The movie was predictable—someone dumps human growth hormone in a lake in hopes of reviving the local fishing industry, and the snakeheads grow huge and begin eating teenagers—but it illustrated a common perception of what invasive species are all about. Newspapers and television were eager to cover the Hollywood-style story of the odd snakehead found two years ago, and again when a few more were caught by fishermen in the Potomac River this spring.

But despite the dozens of calls Deaton fielded from concerned North Carolina citizens who were sure they had reeled in snakeheads, there has been no confirmed catch of a snakehead in the state. All of the “snakeheads” snagged by anglers were ugly but harmless native bowfins, and there’s no telling what was seen by the person who called and claimed a snakehead was flopping across heavily traveled Wade Avenue in Raleigh.

THE PROBLEM WITH

invasives

Non-native fish, animals and plants are changing the way our natural systems look and function.

written by Greg Jenkins • photographed by Jody Duggins



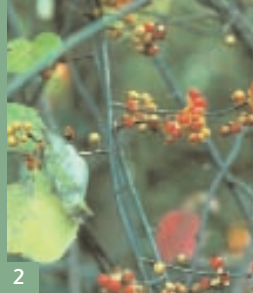
Forest stewardship biologist Kelly Hughes is concerned with the spread of invasive plants such as silvergrass in areas disturbed by timber management.

1 | Chinese silvergrass (*Miscanthus sinensis*): Tall, densely bunched perennial grass that infests disturbed areas, especially after burning. Disrupts successional process and becomes a fire hazard because of high flammability.



1

2 | Oriental bittersweet (*Celastrus orbiculatus*): Deciduous, twining woody vine that resembles grapevines. Invades forest openings and edges. Spread by animals that eat its scarlet berries and by humans that collect it for use in decorations.



2

3 | Tree-of-heaven (*Ailanthus altissima*): Large deciduous tree resembling hickories or sumacs. Forms dense thickets and spreads by root sprouts and by wind- and waterborne seeds.



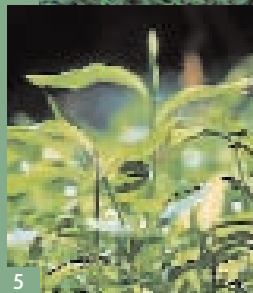
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4 | Sericea (Chinese) lespedeza (*Lespedeza cuneata*): Leafy, slender herb introduced to control erosion. Grows in nearly any type of habitat. Spreads slowly by root sprouts and seeds, which remain viable for decades.



4

5 | Japanese stiltgrass (*Microstegium vimineum*): Dense, shade-tolerant grass resembling small, delicate bamboo. Chokes out understory vegetation in moist forests and fields. Spreads at the slightest disturbance.



5

Despite the sensational appeal of the occasional exotic animal or fish sighting, the issue of invasive species in North Carolina is more subtle and more pervasive. Though several fish species cause problems in reservoirs and rivers across the state (see “Fishing Roulette,” page 20), and a few foreign animals wreck habitats and displace native species, the major alarm here is because of invasive plants.

KUDZU: TIP OF THE ICEBERG Nearly everyone who works outdoors for a living can tell you stories about strange plants that cover areas disturbed by road building, development, timber cutting or efforts to manage pastures and meadows. The invasive plants capable of quickly filling open areas are able to do so because their seeds are spread efficiently by wind, water or animals, especially birds. Many of them were brought to the United States from Asia for use as ornamentals. Because the climate and soil in east Asia and the American East Coast are similar, Asian horticultural plants thrive here and easily escape from landscape plantings.

Everyone is familiar with kudzu, the granddaddy of Asian invasive plants. The vine has been ubiquitous in the South for so long, it’s practically a given that anything left alone outside will eventually be covered by the stuff. Since the Civilian Conservation Corps paid farmers to plant kudzu in the 1930s, “the vine that ate the South” has spread without prejudice, growing along the ground, up trees and over any surface it encounters. In the process, it chokes and shades out native plants. But researchers are finding ways to control it. Goats, deer and cattle love to eat it, and it’s not terribly difficult to clear a small area of kudzu mechanically before it gets out of control.

Other green invaders may be less notorious, but people are just beginning to feel their impacts. With names that reflect their Asian origins, these plants are crowding out natives in many terrestrial habitats. Chinese privet, Japanese stiltgrass, Chinese silvergrass, Japanese honeysuckle, Oriental bittersweet, Chinese lespedeza—the list appears to be growing as quickly as these prolific exotic plants.

Kelly Hughes, the Wildlife Commission’s forest stewardship biologist for the Mountain region, is worn out from fighting invasive plants. Hughes helps landowners manage forests for timber production, wildlife habitat, recreation and water quality. She says that almost every landowner she assists is dealing with invasive plants. Invasives have made her job especially difficult, because they

literally create a barrier to her management efforts. “The presence of a dozen or so invasive plants has proven to be a real impediment to management here in the mountains,” Hughes said. “It’s thrown a wrench into the works.”

Invasive plants such as bittersweet, multi-flora rose and tree-of-heaven are lurking in the forest understory, waiting for their day in the sun. Once mature trees are removed and the canopy is opened, invasives are off to the races. And once they are established, it’s almost impossible to remove them mechanically. Landowners wanting to improve their woodlands must decide whether they will invest in the herbicide treatments and vigilant monitoring that are often necessary to control invasives. The time and expense involved can be discouraging.

But even leaving forested areas untouched might not prevent invasives from taking off. Disturbances such as storms or insect damage create canopy gaps that give exotics space and sunlight to flourish. Shade-tolerant plants such as stiltgrass and garlic mustard are able to grow in undisturbed areas. “These species are turning up in areas that were considered to be fairly unspoiled, and are taking the place of woodland wildflowers and ferns in the understory,” Hughes said. “They worry me because they may go unnoticed for years while they spread exponentially.”

That appears to be what has happened with silvergrass, which is especially invasive in the southern Mountain region. It is spreading down Interstate 26 toward Saluda and the commission’s 14,477-acre Green River Game Land. If it spreads east, silvergrass could become the fly in the ointment for anyone trying to manage their land for quail. In openings that are burned to create early successional habitat, silvergrass creates a grassy monoculture that halts the successional process. That is a critical problem, because quail thrive on regular burning and disturbance of their habitat. But so does silvergrass.

Hughes once took a group of biologists to a mountaintop area she considered unspoiled by invasives. The biologists hiked for miles to reach the top of a ridge near Mount Mitchell. There, in the middle of a narrow game trail surrounded by undeveloped land, was a clump of silvergrass. “It’s frightening how much acreage this one plant has impacted,” Hughes said. “This is a plant that is fairly easy to control if you catch it early, yet it has been allowed to spread extensively throughout

“THESE SPECIES ARE TURNING UP IN AREAS THAT WERE CONSIDERED TO BE FAIRLY UNSPOILED, AND ARE TAKING THE PLACE OF WOODLAND WILDFLOWERS AND FERNS IN THE UNDERSTORY . . .”

western North Carolina because no one recognized the damage it could do.”

Hughes fears that invasive plants will rank with development, exotic insects and tree diseases as significant problems in the mountains. She believes that the public is mostly unaware of the problem. “To the untrained eye, it’s all just green stuff. Until we can generate widespread public support for control efforts, we land managers are facing an uphill battle against some pretty overwhelming odds.”

The Interstate 40 corridor west of Asheville is flanked on both sides by princess tree, a gorgeous but highly invasive tree that claimed the roadside areas that were disturbed when the highway was built. “If it’s not paved in asphalt,” Hughes said, “it’s covered in invasive species. . . . I’d hate to think that in my lifetime, the incredible diversity in the southern Appalachians could be reduced to a few dozen dominant species of invasive exotics.”

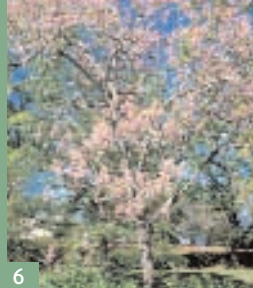
Chris Baranski, a wildlife technician at Butner-Falls of Neuse Game Land, sees similar issues developing in the Piedmont. Privet and Japanese stiltgrass blanket parts of the moist forests near Falls Lake and the various waterfowl impoundments. Baranski wonders what plant species are being forced out by the invaders. Tree-of-heaven is not a problem on the game land yet, but it has a serious foothold at William B. Umstead State Park just 15 miles away. He is alarmed every time he finds autumn olive half a mile deep in the

Wildlife technician Chris Baranski examines Chinese privet that has become established on Butner-Falls of Neuse Game Land. Chinese privet and purple loosestrife (bottom) are still used in landscaping despite their ability to invade surrounding areas.



GREG COFFE, NCSU

6 | **Princess tree** (*Paulownia tomentosa*): Medium-sized deciduous tree with abundant, showy, pale violet flowers in the spring. Spreads by root sprouts and by wind- and waterborne seeds.



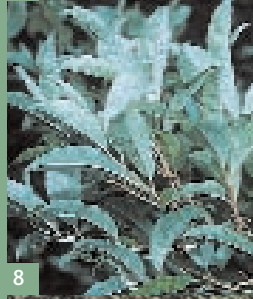
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7 | **Chinese privet** (*Ligustrum sinense*): Leafy, thicket-forming shrub that invades bottomland forests. Spreads by root sprouts and by animal-dispersed seeds.



7

8 | **Autumn olive** (*Elaeagnus umbellata*): Bushy, thorny shrub that crowds out native shrubs in uplands. Spread mainly by animal-dispersed seeds.



8

9 | **Hydrilla** (*Hydrilla verticillata*): Underwater plant that pushes a portion of its thick mat above the surface, giving the look of a flooded field. Clogs dam intakes, renders waterways impassable and changes game fish ecology in reservoirs.



9

10 | **Alligator weed** (*Alternanthera philoxeroides*): Floating weed that forms thick mats on small waterways, shading out native vegetation. Also creates obstructions that can cause flooding.



10

11 | **Common reed** (*Phragmites australis*): Tall grass that grows in swamps, marshes, stream banks and other wet areas. Overcomes native plants and creates a monoculture that stifles wetland diversity.



11

12 | **Giant salvinia** (*Salvinia molesta*): Floating fern that forms dense mats on lakes and slow-moving rivers. Shades out native vegetation and blocks waterways; grows very quickly.



12

PHOTOGRAPHS: CHINESE SILVERGRASS (BRITT SLATTERY, US FISH & WILDLIFE SERVICE); ORIENTAL BITTERSWEET AND COMMON REED (JILL M. SWABINGEN, USDI NATIONAL PARKS SERVICE); SERICEA LESPEDEZA AND PRINCESS TREE (JAMES MILLER); HYDRILLA (JAMES R. ALLISON, GA DEPT. OF NATURAL RESOURCES); ALLIGATOR WEED (USDA ARS ARCHIVES); GIANT SALVINIA (SCOTT ROBINSON, GA DEPT. OF NATURAL RESOURCES)

woods, because he realizes that in the next two to five decades, it will be everywhere. Fortunately, autumn olive makes good cover for rabbits and other small game, and birds and deer love to eat it.

Baranski believes that invasives will never be eliminated once they have become established. They can't be stopped, so technicians can only hope to contain them. "They will become components of habitats," Baranski said. "There's no way to get it back to pristine. We have to learn to deal with it in small, localized areas."

A FLOOD OF INVASIVES Fisheries scientists have dealt with invasive aquatic plants in specific areas for years now. Perhaps the best known of water non-natives is hydrilla, which showed up in Piedmont reservoirs more than a decade ago. Best known for clogging coves and tangling in boat propellers, hydrilla causes significant changes in lake ecosystems, especially for game fish. In Lake Gaston, which is managed by the Wildlife Commission in part as a striped bass fishery, hydrilla presents an interesting quandary. Fishermen chasing largemouth bass love fishing around weeds, because vegetation attracts bugs and crayfish that the largemouths feed on. Strippers eat shad and herring, which eat microscopic algae and zooplankton. Hydrilla outcompetes beneficial algae for nutrients, preventing shad from growing. The presence of hydrilla diminishes stripers; the removal of hydrilla diminishes largemouths. Commission biologists must find the proper balance between the two scenarios.

In a scary twist, Tom Murphy, an eagle specialist with the South Carolina Natural Resources Department, believes that naturally occurring toxic bacteria that grow on hydrilla may be responsible for a food chain reaction that kills bald eagles. The biotoxin causes an avian disease that results in brain lesions and central nervous system breakdown. Coots eat the bacteria and get sick. When the coots can no longer fly, swim or dive, eagles prey on them and contract the disease.

Hydrilla is in reservoirs all over North Carolina: Lake Norman, Lake James, Mountain Island Lake and Gaston. Commission biologists assist the Division of Water Resources and the NC. Department of Agriculture by monitoring hydrilla so the other agencies can control it with herbicides.

"A small quantity of hydrilla is probably a good thing, but keeping it confined is difficult," said Mallory Martin, the commission's Mountain region fishery supervisor. The commission has experimented

Alligator weed is just one of several aquatic invasive plants that can render waterways uninhabitable for native species.

with stocking James and Norman with sterile grass carp, which eat hydrilla but also chow down on native vegetation. Martin described the carp experiment as "somewhat successful," but said it probably would not be a long-term solution for hydrilla because of the carp's voracious appetite for all things green.

In southeastern North Carolina, a group has formed to fight the newest contender for hydrilla's crown. The Northeast Cape Fear Giant Salvinia Task Force is made up of dozens of agencies determined to prevent the floating fern from becoming established. Giant salvinia has been found in small ponds and canals in Pender County, and initial efforts to kill the weed have proven labor-intensive but effective.

Unlike hydrilla, which grows underwater, giant salvinia grows on the surface, weaving into thick mats that can support a 10-pound cinder block for a short time. The plant can cover a waterfowl impoundment, hiding the water well enough to fool ducks into passing right by. As a sort of triple whammy, salvinia has no food value for fish or wildlife, and it shades out aquatic vegetation that provides nutrients. Decomposition of giant salvinia depletes water of oxygen, causing fish kills. If giant salvinia were to get into Pender County's game lands—Holly Shelter, Cape Fear River Wetlands or Angola Bay—it could change things.

Then there is alligator weed, which clogs waterways the same way hydrilla and giant salvinia do. However, alligator weed can also grow on dry land. Although some animals will eat alligator weed, it is toxic and reportedly can cause blindness and cancerous lesions in cattle. On stream banks or in wetlands, the common reed, also known as phragmites, can take over and crowd out native vegetation. Phragmites creates a reedy monoculture that reduces the plant diversity that is crucial to wetland functions.

In bodies of water where aquatic weeds are not a problem, humans are often the main source of invasive introductions. Anglers frequently move game fish and baitfish from one river or reservoir to another in an effort to create new fisheries. The Wildlife Commission has done it in the past, but biologists learned a valuable lesson after releasing flathead catfish in the Cape Fear River in the late 1960s. Flatheads expanded from a small stocking of less than a dozen individuals into a large, well-established population that has all but erased bullhead catfish from the Cape Fear basin. Redbreast sunfish populations are



F. EUGENE HESTER

FISHERIES PROS SPEAK OUT AGAINST SNAKEHEADS

Tar Heel fisheries biologists confirmed last year that they do not want to experience "snakehead terror" firsthand. The state chapter of the American Fisheries Society passed a resolution outlining four actions aimed at controlling the introduction of non-

native aquatic species in North Carolina.

The fisheries group stated that exotic species too often result in the degradation of native species and habitats. They

support recommendations made to the N.C. Wildlife Resources Commission to ban importation or further movement of 10 non-native fishes, including the Northern snakehead.

The chapter called for stringent evaluation of proposed introductions, better enforcement of existing laws, restoration of ecosystems damaged by invasive species, and better public education about the dangers of non-native introductions.

The resolution is posted at www.fisheries.org/html/IntroducedSppResolutionFinal.doc. ILLUSTRATIONS: SNAKEHEAD (U.S. GEOLOGICAL SURVEY); BOWFIN (DUANE RAVER/USFWS)



NORTHERN SNAKEHEAD



BOWFIN

**TWENTY, 50 OR 100 YEARS FROM NOW,
THE COMPOSITION OF NORTH CAROLINA'S FLORA
AND FAUNA COULD CHANGE CONSIDERABLY.**



F. EUGENE HESTER



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declining in eastern blackwater streams, and flat-head catfish are blamed for their disappearance, too. White perch, a fish native to coastal rivers and sounds, causes problems in Piedmont reservoirs by outcompeting crappies. The perch eat the same food as crappies and young game fish, possibly damaging several species.

“Introduced species can alter fish communities drastically through competition and predation,” said Christian Waters, the commission’s Piedmont region fisheries research coordinator. Waters said the top priority for the commission is assessing the numbers and size of game fish in a given system and maintaining their quality. That can be difficult: In some systems, impacts are measurable. In others, it is difficult to tell if introduced invasives are hurting native species.

Scott Van Horn, Habitat Conservation research and survey supervisor for the Wildlife Commission, cautions that even if a fish is native to one part of the state, it can still be an invasive species in another region. Some anglers think that aquatic invasives are additive — that the habitat can support existing fish plus new introductions. Van Horn said that is wrong. “There’s always a cost,” he said, comparing a lake system with a table set with a fixed amount of food. If a new diner comes to the table, everyone else must make room. “If the new guy is going to thrive, somebody’s got to give up their share.”

‘EXTRA’ TERRESTRIALS The same rule applies on solid ground. Coyotes are present in every county in the state now, and biologists believe the wild canines are pushing

aside red foxes in the competition for small game. Nutria, aquatic rodents from South America, are well established along the North Carolina coast, where they damage marshes and wetlands by eating more vegetation than would normally be consumed by muskrats and waterfowl. Nutria also live on small islands used by nesting waterbirds, which perceive large mammals as predators and abandon nesting sites if they feel threatened.

Feral cats threaten adult and fledgling songbirds, shorebirds and colonial waterbirds. On barrier islands, feral cats prey upon sea turtle hatchlings.



F. EUGENE HESTER



GREG COPE, NCSU

Zebra mussels are known for covering hard surfaces such as this submerged cinderblock with astonishing speed. Introduced in the Great Lakes region in 1988, the zebra mussel has been expanding southward. Biologists have yet to document the European species in North Carolina.

Randy Westbrook is the invasive plant coordinator for the U.S. Geological Survey.

Another domesticated animal turned problem species is the pig. Feral swine, which root up game lands, agricultural fields and wilderness areas, will eat almost anything. Wild hogs reproduce quickly and are difficult to trap or hunt.

A tiny terrestrial invasive, the fire ant, might be the worst. The biting insect is established in southeastern North Carolina and appears to be spreading north and west toward the Piedmont and upper Coastal Plain. “Fire ants are the number one invasive east of Raleigh,” said Vic French, manager of Holly Shelter Game Land. “There are millions of them. . . . Pender County is lousy with fire ants.” They affect quail hunting by building mounds in early successional habitat favored by bobwhites. A few painful fire ant bites might dissuade the hardest hunter from tramping on such property again. It’s also possible that fire ants invade the nests of ground-nesting birds such as quail, killing or paralyzing the chicks. Sea turtle nests have suffered a similar fate.

Birds aren’t just victims, though. European starlings are cavity nesters that will fight off bluebirds and occasionally red-cockaded woodpeckers for nesting sites. Cowbirds, originally from the Great Plains, lay their eggs in the nests of other species. Their big, aggressive chicks sometimes outcompete smaller birds for food. Baranski said a recent dove survey at Butner-Falls of Neuse Game Land trapped many more cowbirds than doves.

Whatever the result of invasive species — whether they prove to be a problem or not — they represent a change in the landscape. Twenty, 50 or 100 years from now, the composition of North Carolina’s flora and fauna could change considerably.

With very few exceptions, these invasives were introduced in the state by humans. Peter White, director of the NC. Botanical Garden and an acknowledged expert on invasive plants, calls invasive species “the least reversible of all human impacts.”

He spends his time traveling the country, helping biologists deal with green invaders. He compares the introduction of invasive species to “putting a screw into a watch.” Westbrook urges people to look beyond immediate needs and foresee what the landscape will look like years into the future. Ideally, in a couple of decades, people will ask before planting, Will this stay where I put it? Will it spread by wind, water or birds? More informed choices will limit the spread of invasive species.

Westbrook encourages those who see strange species to tell someone in natural resource management. Ultimately, humans are the cause of and the solution to most invaders — be they snakehead horrors or silently spreading exotic plants. “Invasive species is a people problem,” Westbrook said. “It’s a sociological ill.”

Opposite page: Invaders such as European starlings, English sparrows and nutria are problematic because they sometimes outcompete native species for food and habitat.



GREG COPE, NCSU

zebra mussel

MORE ON INVASIVE SPECIES

- North Carolina Exotic Pest Plant Council www.se-eppc.org/states/northcarolina.cfm
- National Invasive Species information www.invasivespecies.gov
- Invasive and Exotic Species of North America www.invasive.org
- The Nature Conservancy: Weeds Gone Wacky and Other Alien Invaders www.nature.org/wherewework/northamerica/states/northcarolina/initiatives/index.html
- National Park Service: Weeds Gone Wild www.nps.gov/plants/alien/index.htm
- Educational video by and for schoolchildren www.greeninvaders.org/