Pests Affecting The Ecosystems
on the Oak Ridge Reservation

Most wildlife species on the Department of Energy's Oak Ridge Reservation (ORR) are beneficial members of natural communities. Others, however, can be nuisances, causing problems for other animals or ecosystems. Some nuisance animals are nonnative species, while others are native ones that cause problems because their natural controls have been eliminated or greatly reduced.

Southern pine bark beetle outbreaks have resulted in the death of thousands of pine trees on the ORR. The first indication of beetle-caused mortality is often discolored tree foliage. Needles become yellowish, then change to a red color, and within 1 to 2 months become brown. Typically, pines are killed in groups ranging from a few trees to several hundred acres. The small beetles, about 3 mm (1/8 of an inch) long, leave tracks in the inner bark as they lay eggs. (Top, ORNL photo; bottom left © R. K. McConathy; center © Texas Agricultural Extension Service Archives, Texas A&M University, www.forestryimages.org; bottom right © Ronald F. Billings, Texas Forest Service, www.forestryimages.org.)

Pine stands that are stressed by drought, flooding, or overcrowding are susceptible to attack by the **southern pine bark beetle**. This native insect kills trees by laying its eggs in the living tissue just beneath the hard, corky outer bark and boring a characteristic series of S-shaped tunnels or galleries. These tunnels frequently meet or cut across one another and can eventually circle the tree. The insects also introduce another microorganism known as blue stain fungus, which blocks the sapwood, quickly killing the tree. Beetle populations are normally low, but at times they can build to epidemic levels for a 2- or 3-year period. The most recent large outbreak of pine bark beetles on the ORR occurred in 1999–2001. Some infested trees were harvested during salvage operations, while many dead pine trees have been removed to reduce hazards from falling trees and branches, improve aesthetics, and limit fuel for wildfires.

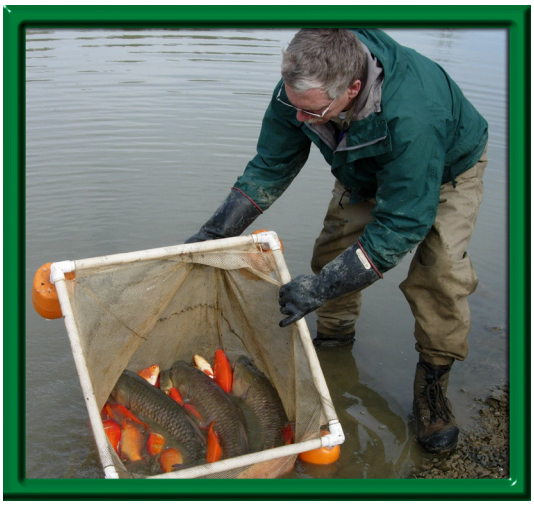
The ORR's first infestation of the **hemlock woolly adelgid** was detected in January 2008. Only 1/32-inch long, the adelgid is difficult to detect until early fall through winter, when it coats itself in a fluffy white wax resembling a cotton swab. This nonnative insect attaches itself to the base of individual needles and literally sucks the life from the tree, causing mortality within as few as 3 years. Regionally, the ecological impacts will compare to the loss of the American chestnut from the blight introduced from Asia in 1909. Oak trees have since replaced the chestnut, but no other evergreen tree can thrive in the habitat occupied by hemlocks. Many aquatic and plant communities depend on the cooling shelter of hemlock forests and will disappear along with the trees. Individually, high-value trees can be treated to resist the deadly effects of the infestation. Unfortunately, however, little can be done to prevent the spread of this insect through entire forests and the subsequent ecosystem impacts.

Imported fire ants and their mounds are well established on the ORR. Fire ants can inflict painful bites and stings to animals and people. They can also displace native species, resulting in detrimental ecological effects. The high reproductive rate of fire ants and their ability to easily disperse make control difficult. Combining chemical, biological, and cultural methods can increase success and may result in cost-effective and environmentally sound eradication in small areas. It is not feasible, however, to treat an area as large as the ORR for fire ants; thus, reservation-wide treatment is not being implemented.

Nonnative birds on the ORR, such as European starlings, English or house sparrows, and rock pigeons, compete with more desirable, native birds for food and nesting or roosting sites. The creation of forest clearings opens an area to the **brown-headed cowbird**, a species native to the Great Plains that expanded its range eastward as forests were cut down. Cowbirds parasitize the nests of forest birds, flying in from the edges of clearings to lay their eggs in the nests of other species. When their eggs hatch, the young cowbird is fed by the host parents at the expense of their own young. As more edges are created throughout the forest, cowbird penetration and associated nest predation on forest species such as the wood thrush increase.

The brown-headed cowbird's egg is larger than those of the unsuspecting hosts. The young cowbirds are also larger and eat food meant for the young of the host birds. (Photo @ http://en.wikipedia.org/wiki/Brown-headed_Cowbird)

The **nonnative fish** on the ORR with the greatest negative ecosystem impacts are grass and common carp and alewife. Other nuisance fish include goldfish, fathead minnow, striped bass, redbreast sunfish, and yellow perch. These species compete with native species for limited resources, such as breeding sites and food, and can reduce overall stream diversity. Some species root extensively in the substrate, increasing turbidity and producing silt that covers eggs of other species and reduces plant growth. Some nonnative species consume large quantities of aquatic vegetation needed for cover or food by native species; others eat the young or eggs of native species and thus interfere with their reproduction. Nonnative fish can be managed by using fish pesticides, trapping, netting, or electrofishing, as well as restricting the release of fish into ORR water bodies.



Grass carp and goldfish are commonly grown in small ponds. If they escape, they can cause damage to native aquatic plants and increase water turbidity. (Photo by M. G. Ryon)

While these animals are not the only cause of ecosystem-level impacts on the ORR (others include the spread of invasive plants, loss of habitat, and reduction of habitat quality), correcting or compensating for their impacts can be difficult. **Prevention** is often the best, or sometimes the only, solution. For example, managing disturbance within larger blocks of forest habitat limits creation of new edges and the disturbed conditions that allow cowbirds and fire ants to become established.

For more detailed information on ecosystem problems caused by nuisance animals on the ORR, contact Neil Giffen, the Oak Ridge National Laboratory wildlife management coordinator, at 865-241-9421 or giffennr1@ornl.gov.

For more information about the ORR National Environmental Research Park, contact Pat Parr, the Oak Ridge National Laboratory natural resources manager, at 865-576-8123 or parrpd@ornl.gov or check the National Environmental Research Park website at http://www.esd.ornl.gov/facilities/nerp/index.html.

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