Swamp pink, a rare plant of non-tidal freshwater wetlands.

TOP RIGHT: Yellow lady's slipper is a rare orchid of the woodlands of the Piedmont of New Castle County.

Plant Species Rarity: Reflecting Delaware's Environmental Health

Story and photos by William McAvoy

Delaware's flora – the wild, native plant life found growing throughout the state – is an impressive 1,594 species. In the forests and fields, rivers and streams, marshes and bays, and beaches and dunes, there is an incredible diversity of plant life in Delaware. As the state's botanist, my job is to study the flora and their habitats. Understanding a plant's range and abundance – and how a species changes over time – can be a vital indicator in helping to measure the state's environmental health.

The important work of studying Delaware's plant life and how it reflects our environment is done several ways. The efforts of early botanists, who explored and documented Delaware's flora within the last 200 years, can be compared to what we see and know today. In addition to the studies published decades or centuries ago, plant specimens (or pressed and dried samples of plants) that these botanical pioneers collected and labeled, are carefully preserved and catalogued in a museum collection known as a "herbarium." Herbaria are critically important, irreplaceable sources of scientific information that provide evidence of our changing flora and environmental conditions.

For nearly 25 years, I have continued to add to these scientific collections and our knowledge of the flora by conducting field surveys statewide. Much of this work involves studying maps and aerial imagery to locate habitat for target species. We also take photographs and detailed field notes about

plant populations and the conditions of their habitats, and carefully evaluate evidence that might suggest why a particular population of a species is doing well or is in trouble.

Much of the more detailed field work to document the status of Delaware's flora is focused on less common and even very rare plant species. "Rare" species are those comprised of 20 or fewer populations in the state, and quite often fewer than five. In Delaware, more than 36 percent, or 574 species, of our flora is considered rare. These species are often rare because they are sensitive to changes to their habitat, or because they require very specialized environmental conditions.

For example, some species require specific soil types, nutrient levels and moisture conditions. Often, the right combination of specialized conditions required by some species occurs at just a few spots in the state. These species are usually the first to become threatened by human-caused changes to their habitats. Additionally, some plant species may be rare in Delaware because they are at, or near, the extreme northern or southern limits of their natural distribution in the eastern United States. It's critical that we protect these so-called "edge of range" species. By doing so, we will preserve genetic variation that may be necessary for the species' long term survival. Environments continually change. For a species to survive it must have genetic variability that allows it to adapt to changing conditions.

Of the 574 species considered rare in Delaware, 64 species are known from only a single population in the state. Many of these consist of only a few individual plants. Some of the more charismatic examples of our rare flora are the orchids and carnivorous plants (able to extract nutrients from insects that become trapped in the plant). There are 17 species of carnivorous plants and all but seven are considered rare. There are also 36 native orchid species in Delaware, and all but ten are rare in the state. Unfortunately, too many species are disappearing. Currently, the state has 139 species considered "historical," meaning they have not been seen or reported for 20 or more years. Fifty species are thought to be "extirpated," which means they are gone from the state very likely never to be found here again because their required habitat has been forever lost.

It has been estimated that Delaware has lost nearly 800,000 acres of forests since European settlement more than 300 years ago.

Purple fringeless orchid is threatened by deer grazing.

That's about a 70-80 percent loss of forest. Studies by the Delaware Forest Service show that 16,000 acres of our remaining unprotected forests were included in proposed housing developments from 2002 to 2009. These studies also estimate that more than 5,000 acres of forest land were lost to development since 1990. Of all our native plants that chiefly grow in forests, both wetlands and uplands, 184 species or 29 percent of all forest dwelling plants are considered to be rare in the state. Though the forest tree Eastern redbud is widely planted as an ornamental, naturally occurring populations of this species are historical. The last known population was growing in a forest that was later cut down for a golf course.

Results from research done by DNREC

The carnivorous purple pitcher plant.

and the U.S. Fish and Wildlife Service on the status of wetlands in Delaware, show that the state has lost well over 50 percent of its tidal and non-tidal wetlands over the last 200 years. The majority of wetland loss was to non-tidal freshwater wetlands. Between 1981 and 2007, nearly 5,000 acres of non-tidal freshwater wetlands were destroyed. Of all our native wetland plants, 88 percent occur in non-tidal freshwater wetlands, which make them hot-spots for biodiversity.

In addition, 234 species, or 38 percent of all non-tidal wetland plants are considered to be rare in the state. The channeling of streams and rivers, and the ditching and draining of wetlands have proven to be quite damaging. It's been estimated that there are over 4,000 miles of drainage ditches in Delaware. The rare plant, Canby's dropwort, was new to science when William Canby, a 19th century botanist from Wilmington, discovered the species growing in a non-tidal wetland near Ellendale. The last reports of this species were in the 1890s. Sometime after that, the wetland was ditched, drained and tilled.

Grass pink orchid is a rare orchid of non-tidal freshwater wetlands, Atlantic white cedar swamps, peatland fens and inner-dune wetlands.

The opportunity for the establishment of non-native plant species is the result of disturbance and fragmentation of natural areas. To date, 707 non-native plant species have been documented in Delaware. That number tends to grow annually. Of these 707 non-native species, 77 are considered to be invasive. Invasive species are very aggressive and outcompete and displace native flora and fauna. The last remaining population in the state of the rare water horsetail fern has been eliminated by the displacement from several species of non-native plants, such as the yellow iris and reed canary grass.

Pollutants, such as pesticides, fertilizer, salt, motor vehicle oils and fluids, and pet waste, can contaminate groundwater and flow into streams and rivers. These pollutants can change water and soil chemistry to the point where only weedy plants will grow, since they are more tolerant of poor-quality habitat conditions. Water-quality studies by DNREC show that 78 percent of all perennial streams are of poor quality, and 90 percent of all intermittent streams are also of poor quality.

The National Resource Conservation Service has estimated that Delaware's Coastal Plain region loses about two tons of soil per-acre each year. A large portion of soil loss runs into wetlands where sedimentation is a major contributor to wetland degradation. Swamp pink (Helonias bullata) is a rare plant that grows in forested floodplain wetlands along streams. Historically, this species was found in New Castle County. But it now no longer exists due to soil erosion from the surrounding landscape and the lack of vegetated buffers. Similarly, the submerged aquatic plant eel-grass (Zostera marina var. stenophylla) was once widespread in the Inland Bay region of Sussex County, but it was eliminated by disease, nutrients, sedimentation, and poor water clarity. Native populations are now thought to be extirpated.

A relatively new issue that now threatens freshwater habitats and plants is saltwater intrusion from rising sea levels and extreme storms. Delaware's freshwater tidal marshes are rapidly disappearing due to saltwater intrusion. The diverse groups of plants that grow in freshwater tidal marshes are unable to tolerate even low levels of salinity. In time, freshwater species disappear and the marshes then convert to low diversity salt or brackish marshes. The rare Southern blue lobelia (Lobelia elongata) was once found in many locations in the tidal marshes of the Inland Bays. Now the species is found in only one location and is barely hanging on against the rising tide of saltwater.

Another serious concern that is threatening our rare native flora is the overabundance of deer in the state. Census data compiled by the Division of Fish & Wildlife in 2009 found that within 702 square miles of deer habitat in the state, there were 64 deer per square mile prior to the hunting season. After the spring fawning season in 2009, they estimated that there were about 45,000 deer statewide. With this many deer, grazing in woodlands and forests tends to be intense and rare plants seem to be a delicacy for the deer. The rare purple fringeless orchid (Platanthera peramoena) is known from only two populations in Delaware. Until plants were protected by cages, they were unable to reproduce and spread from seed because deer would eat the flower spike, and often the entire plant, before seed pods could mature.

The rarity of such a high portion of our native flora is telling us that all is not well with the health of Delaware's environment. However, through the efforts of state and federal agencies, as well as private conservation groups, well over 160,000 acres of land have been protected in the state. In addition, many acres of forest and wetlands are being restored. These efforts are encouraging, but more is certainly needed if we are to improve conditions for our state's flora and natural heritage. When our rare plant populations begin to rebound and become more robust, that will be a sign that we are making progress toward improving Delaware's environmental health. Though we like to think of rare plants as useful environmental indicators, we must also remember that they are inherently valuable because they contribute to our state's remarkable biological diversity, which should be a source of pride for all Delawareans. **OD**

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