

50 Years After Silent Spring: Conservation of the Midwest Driftless Area

Written by U.S. Fish and Wildlife Service
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September 2012 marks the 50th anniversary of the publication of Rachel Carson's *Silent Spring*, which warned of the dangers of DDT and helped launch the environmental movement. Fifty years after Rachel Carson raised a red flag about the extensive use of pesticides and their impacts, contaminants are so pervasive in our natural environment that any evaluation of threats to a species or ecosystem almost always includes some analysis of contaminants. A look at the work being done on the Midwest's Driftless Area paints a picture of the role that contaminants can play in efforts to assess and protect vulnerable ecosystems and species and the measures that researchers take to tease out contaminants as a factor affecting plants and animals.

The Driftless Area, located at the corners of Minnesota, Wisconsin, Illinois and Iowa, is a regional limestone plateau of bluffs and steep stream valleys. Continental glaciers during the most recent Ice Ages mostly flowed around and not over this plateau. Vegetation in the Driftless Area was tundra-like during Ice Ages, but as the glaciers retreated, boreal forests invaded the former tundra. Then, as the climate warmed, boreal forests gave way to the temperate forests and grasslands that we now see.

Within the Driftless Area is a network of rocky bluff habitats. Due to some unique geologic features of these bluffs, the soil surface temperature is in the 40° F to 50° F range, even during the heat of the summer. These cold producing areas are called "algific" slopes. The slopes replicate a boreal forest-like condition, and some plants and animals that lived around the Driftless Area during the Ice Age or in boreal forests continue to survive here on these cold air slopes. Disjunct populations of white pine, Canada yew and golden saxifrage are some of the plants found on algific slopes. There are also federally listed endangered and state-listed endangered landsnail species (i.e., Iowa Pleistocene snail, Iowa Pleistocene vertigo, Minnesota Pleistocene succineid, and Briarton Pleistocene snail) that were thought to have gone extinct after the Ice Age glaciers retreated, but were discovered living in the Driftless Area.

A work group of technical staff from government agencies, universities, and non-government organizations was formed to study algific slope ecosystems in the Driftless Area of Iowa.

Researchers expect that lessons learned will not only help conserve these unique biological assemblages of climate relict species, but will provide information to help us conserve other systems with similar threats. One of the research activities will be evaluation of the level of

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environmental contaminants in these habitats and how that affects ecosystem functions and the rare species.

A concern of the work group is that algific slope assemblages are vulnerable to global climate change. The cause of modern global climate change is related to emissions of carbon dioxide and other greenhouse gases from burning fossil fuels. In addition to carbon dioxide, these emissions can also contain the contaminants mercury and selenium, along with nutrients such as nitrogen compounds. The deposition of contaminants and nutrients from fossil fuel emissions can harm sensitive plants and animals that call the algific slopes their home. While many of these species survived during past interglacial warming periods, our modern landscape is so fragmented by farms, cities and roads that species may not be able to disperse and survive like they did during the past.

Algific slopes have very thin layers of soil formed by decomposition of plants and leaf litter over hundreds of years. Decomposition is aided by landsnails, and therefore they provide an important ecological service for this ecosystem. Input of contaminants and nutrients from atmospheric deposition can detrimentally change the natural chemical cycling that helped shape these ecosystems and expose landsnails to toxic contaminants. For example, nutrient enrichment caused by deposition of nitrogen compounds can allow invasive plants to outcompete native species, species that adapted to the thin soils and low availability of nutrients. Acidification of the slopes from carbon dioxide deposition can increase the toxicity of some contaminants. In addition, pesticides sprayed from aircraft on neighboring crop fields have the potential to drift onto the algific slopes, exposing plants and animals to more toxic chemicals.

After identifying potential sources of contaminants, avenues of exposure and impacts, contaminants biologists from the U.S. Fish and Wildlife Service are establishing methods to understand the effects of excess carbon and nutrients in these rare habitats and to determine the sensitivity of the climate relict species to modern-day contaminants. Technical teams are also developing protocols to monitor temperatures, biological diversity, and contaminant accumulation.

Rachel Carson was a Fish and Wildlife Service employee and the Service's Environmental Contaminants program continues in her footsteps. It's unfortunate, but environmental contaminants are found in almost all natural environments, even those habitats in remote areas many miles from pollution sources. The Service's Environmental Contaminants specialists work to identify those of most serious concern to fish, wildlife and plants; the extent of their effects, and how those effects can be mitigated. Contaminants investigations of the algific slopes of the Driftless Area will help conserve those ecosystems and provide lessons learned for conserving other systems with changes related to global climate change.

Rachel Carson worked for the U.S. Fish and Wildlife Service from 1936 to 1952 and is recognized as one of the world's foremost leaders in conservation. Her work as an educator, scientist and writer revolutionized America's interest in environmental issues. In addition to sounding the warning about DDT in "Silent Spring," she is remembered for her passion for the oceans and coasts, her inspiration as one of the first female scientists and government leaders,

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and her overall footprint on the history of conservation. To learn more, visit <http://www.fws.gov/Midwest/es/ec/SilentSpring/>

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