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### Authors

Beckerman, Scott F.  
McConnell, John E.  
Guikema, Aaron T.

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# USDA APHIS Wildlife Services Efforts to Protect and Restore the Great Lakes Region of North America

**Scott F. Beckerman**

USDA APHIS Wildlife Services, Springfield, Illinois

**John E. McConnell**

USDA APHIS Wildlife Services, Raleigh, North Carolina

**Aaron T. Guikema**

USDA APHIS Wildlife Services, Pittstown, New Jersey

**ABSTRACT:** In a time when fresh water is increasingly in demand, the Great Lakes region of North America contains approximately 20% of the globe's fresh water resources. The Great Lakes offer nearly an infinite number of recreational opportunities for residents of the region and helps support one of the largest economies in the world. Understanding this, U.S. President Barack Obama and 16 federal agencies have made restoring the Great Lakes a national priority by establishing the Great Lakes Restoration Initiative (GLRI). Congress appropriated \$300 million to \$475 million per year between 2010 and 2013 to implement the GLRI. An Action Plan describes how the GLRI is being executed from 2010 through 2014 and describes the most significant ecosystem level challenges for the Great Lakes. These challenges are categorized into 5 major Focus Areas for restoration including: combating invasive species; promoting nearshore health by protecting watersheds from polluted run-off; and habitat and wildlife protection and restoration, among others. To protect and restore the Great Lakes as part of the GLRI, the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services program (WS) is combating the spread of terrestrial invasive species, such as mute swans and feral swine; managing double-crested cormorants on sensitive islands; protecting native turtles from meso-predators; and enhancing native trout streams by removing beaver dams impeding stream flow to protect and enhance native fish/wildlife and their habitats. In addition, WS is managing overabundant populations of Canada geese and ring-billed gulls to promote water quality and improve nearshore health. This presentation highlights objectives, measurable ecological targets, and specific actions accomplished by WS during 2011-2013 to protect in-stream and riparian habitat and fish restoration through beaver damage management and efforts to protect aquatic habitat and native wildlife through mute swan management within the Great Lakes ecosystem.

**KEY WORDS:** beaver, beaver damage, *Castor canadensis*, *Cygnus olor*, Great Lakes Restoration Initiative, mute swan, mute swan damage

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## INTRODUCTION

In a time when fresh water is in increasing demand, the Great Lakes region of North America contains approximately 20% of globe's fresh water resources. The Great Lakes offer nearly an infinite number of recreational opportunities for residents of region and they help support one of the largest economies in world. In 2010, political leaders in the United States (U.S.) made restoring the Great Lakes a national priority by establishing the Great Lakes Restoration Initiative (GLRI). The U.S. Congress has appropriated between \$283,000,000 and \$475,000,000 per year from 2010 through 2014 to implement the GLRI (EPA 2010). The Great Lakes' most significant ecosystem challenges and efforts to correct them are identified within the GLRI Action Plan. The five major Focus Areas of restoration and protection within GLRI are: 1) Toxic Substances & Areas of Concern, 2) Invasive Species, 3) Nearshore Health and Nonpoint Source Pollution, 4) Habitat & Wildlife Protection and Restoration, and 5) Accountability, Education, Monitoring, Evaluation, Communication & Partnerships. Under the GLRI, the U.S. Environmental Protection Agency (EPA) is administering funding appropriated by the U.S. Congress individually and with 16 other Federal agencies to implement the initiative.

The USDA APHIS Wildlife Services (WS) program is collaborating with the EPA and other Federal agencies to implement the GLRI. WS is conducting restoration and protection activities in Illinois, Indiana, Michigan, New York, Ohio, and Wisconsin under the GLRI within the Invasive Species, Nearshore Health and Nonpoint Source Pollution, and Habitat & Wildlife Protection and Restoration focus areas. Here, we describe WS efforts during 2011-2013 to protect in-stream and riparian habitat and fish restoration through beaver damage management and efforts to protect aquatic habitat and native wildlife through mute swan management within the Great Lakes ecosystem.

## In-Stream and Riparian Habitat and Fish Restoration through Beaver Damage Management

Beaver (*Castor canadensis*) is the largest rodent in North America. Beaver are physically adapted for life in an aquatic environment with dense fur, webbed hind feet, a horizontally flattened tail, and valves that close in both ears and their nose when submerged. Adult beaver weigh up to 40 kg (Schwartz and Schwartz 1981).

Beaver habitat occurs almost anywhere there are a year-round source of water and an adequate food source. Due to the beaver's ability to construct dams on water-

ways, beaver have the capacity to greatly alter the immediate landscape. Beaver modify their habitat by building dams to impound water to provide protection from predators and access to food sources.

While beaver ponds can be beneficial to some species of wildlife, beaver activities can also negatively impact critical habitat types depended on by other species (Collen and Gibson 2001). Beaver dams have been identified as a major cause of habitat degradation on a unique set of streams that drain into the south shore of Lake Superior in northern Wisconsin. These streams provide spawning and juvenile rearing habitat for several species of anadromous fish, including exotic steelhead (*Oncorhynchus mykiss*, an introduced anadromous rainbow trout), and introduced Coho and Chinook salmon (*Oncorhynchus kisutch* and *O. tshawytscha*, respectively). However, of special concern to fisheries biologists is the status of “coaster” brook trout (*Salvelinus fontinalis*). Brook trout, the only salmonid native to Wisconsin’s Lake Superior basin coldwater tributaries, historically occupied most of the available coldwater tributary habitat. Coaster brook trout exhibit an anadromous life history strategy, utilizing tributary streams for spawning and rearing as well as residing in Lake Superior as adults, where they grow much larger than inland brook trout (Hewitt et al. 2008, Huckins et al. 2008).

Many streams have been impounded affecting coaster brook trout migration and spawning (Hewitt et al 2008); strategies to enhance in-stream habitat include beaver dam removal (Schreiner et al. 2008). Beaver dams also increase sedimentation (Naiman et al. 1986, Collen and Gibson 2001), which may reduce or eliminate clear water and gravel stream bottoms (Collen and Gibson 2001) or block passage to these areas necessary for successful spawning and may be a factor in raising water temperatures beyond the point tolerated by coldwater ecosystem species (McRae and Edwards 1994). Beaver dams can reduce flow velocity and flood shoreline habitat which reduces shade, thus possibly increasing water temperatures (Avery 1983, Avery 1992, Collen and Gibson 2001, Rosell et al. 2005).

The goal of Wildlife Services in-stream and riparian habitat and species restoration efforts through GLRI focus area 4 was accomplished by the removal beaver dams that prevented native fish passage in selected Lake Superior Basin tributary streams in Wisconsin. While beaver were removed to reduce the likelihood of beaver dams being rebuilt, these efforts will be reported elsewhere.

#### **Aquatic Habitat and Native Wildlife Protection through Management of Invasive Mute Swans**

The mute swan (*Cygnus olor*) is an invasive species of waterfowl which was introduced into the U.S. from central Europe. Mute swans can have detrimental impacts on wetland habitat and native waterfowl populations (Atlantic Flyway Council 2003). Mute swans feed on submerged aquatic vegetation at a depth of up to 1.07 m, making it difficult for native dabbling ducks to feed in the same wetlands (Owen and Cadbury 1975). Mute swans also consume on average 39% of their body weight daily (approximately 4.5 kg of vegetation), which can have harmful effects on the viability of aquatic plant beds.

Mute swan herbivory has been shown to reduce the availability of aquatic vegetation (Tatu et al. 2007), which likely has negative indirect effects on native waterfowl and waterbirds. The home range of mute swans is a function of the quality and structure of habitat and the density of breeding birds. Territory size can range from less than 0.2 ha in high-quality habitat up to 6 ha in open-water situations, with an average territory size of 1.8 ha (Ciaranca et al. 1997). Reducing mute swan populations can yield multiple benefits for wetlands, native species, and rare and endangered species (Atlantic Flyway Council 2003, Petrie and Francis 2003, Therres and Brinker 2003). In the Tar Bay area of Maryland, a population of non-breeding, molting mute swans excluded black skimmers (*Rynchops niger*), least terns (*Sterna antillarum*), and common terns (*Sterna hirundo*) from using the oyster shell bars and beaches for nesting sites (Tatu 2006). Competition for nesting habitat may cause additional threats to native waterfowl.

Petrie and Francis (2003) observed the mute swan populations in the Great Lakes, particularly Lake Ontario and Lake Erie, were increasing at a rate of 10 to 18% per year. McGowan and Corwin (2008) estimated mute swan populations in the Great Lakes would double every 7 to 8 years.

Mute swans are not protected under the Migratory Bird Treaty Act. However, protection is afforded to the species in some states by natural resource management agencies (i.e., Illinois). Therefore, special permits may be required in some states to manage mute swans and/or their nests.

The goal of WS aquatic habitats and native wildlife protection through GLRI focus area 4 was accomplished by removing mute swans and their eggs to assist federal and state natural resource management agencies in Wisconsin, Indiana, Michigan, New York, and Ohio achieve their identified mute swan management goals. In some states, this included a goal of zero mute swans on public land and zero mute swan population growth on all other lands.

#### **METHODS**

##### **In-Stream and Riparian Habitat and Fish Restoration through Beaver Damage Management**

Streams were selected for treatment in cooperation with the Wisconsin Department of Natural Resources (WDNR) and U.S. Forest Service pursuant to the WDNR’s Wisconsin Lake Superior Basin Brook Trout Plan and management objectives for Wisconsin’s south shore anadromous fishery. Tributaries were also selected for treatment in cooperation with two Native American tribes consistent with tribal habitat restoration objectives. Project streams were located in northern Wisconsin on the southwest shore of Lake Superior. The majority of streams were located on or near the Bayfield Peninsula. A total of 26 streams in 4 northern Wisconsin counties were included in the project.

Surveys to identify the location of beaver and beaver dams on the streams selected for treatment were conducted from aircraft, on foot, and from vehicles. Beaver were removed by trapping and shooting, and beaver dams were removed by hand removal or with binary

explosives. Measurable benefits of this project were estimated by calculating kilometers of streams reopened for fish passage and by the number of fish passage barriers removed.

### **Aquatic Habitat and Native Wildlife Protection through Management of Invasive Mute Swans**

Bodies of water utilized by mute swans were selected for treatment in consultation with federal and state natural resource management agencies in each state. Within the Lake Michigan, Superior, Huron, Ontario, and Erie watersheds, WS acquired permission to manage mute swans from the owner/manager of bodies of water selected for treatment. During the spring nesting season, WS rendered mute swan eggs within nests inviable through the application of 100% food grade corn oil. In addition, mute swans were removed with firearms or by capturing flightless mute swans with nets or catch poles during their late summer molting period. While mute swan territories average approximately 1.8 ha, the measurable benefits of this project were calculated using a conservative estimate of just 1.0 ha of wetland habitat protected per mute swan removed to avoid overestimating the benefits.

## **RESULTS**

### **In-Stream and Riparian Habitat and Fish Restoration through Beaver Damage Management**

From 2011 through 2013, 179 beaver dams were removed from streams selected for treatment within Wisconsin. These efforts restored 1,178 km of streams to fish passage.

### **Aquatic Habitat and Native Wildlife Protection Through Management of Invasive Mute Swans**

From 2011 through 2013, 6,727 mute swans and 138 mute swan nests and all the eggs contained within the nests were removed to protect approximately 6,727 ha of sensitive aquatic habitats in Lake Michigan, Superior, Huron, Ontario, and Erie watersheds within Indiana, Michigan, New York, and Wisconsin.

## **DISCUSSION**

Wildlife management efforts conducted by WS are only a portion of the overall EPA administered GLRI, which incorporates participation from 17 Federal agencies, state governments, and universities, the public, and other stakeholders. In a time of shrinking fiscal resources and increased scrutiny of Federal budgets, measurable outcomes associated with cooperative endeavors are paramount. Although localized and relatively small in scale relative to the entire GLRI, WS efforts are noted for their ongoing contributions on multiple fronts towards Great Lakes restoration. Furthermore, WS efforts are measurable and conducted in collaboration with many stakeholder groups. Wildlife damage management efforts are an important component of multiple Focus Areas under the GLRI and are important to restoring and protecting the Great Lakes. Continuation of these types of cooperative endeavors is anticipated.

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