

Mute Swans



Figure 1. Adult mute swan (*Cygnus olor*). Photo by USDA.

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Overview of Damage Prevention and Control Methods

Habitat Modification

- Modify shoreline habitat to impede movements onto land
- Eliminate emergent vegetation for nesting and submerged aquatic vegetation for feeding in and around ponds and lakes
- Allow ponds and lakes to freeze in winter

Exclusion

- Install fences along shorelines and around ponds and yards
- Install overhead wire grids on ponds

Frightening Devices

- Limited effectiveness has been reported with flags, mylar tape, balloons, automatic exploders, pyrotechnics, lasers, effigies, and dogs

Repellents

- Methyl anthranilate

Reproductive Control

- Nest and egg destruction may help to slow local population growth and may deter mute swans from a site

Toxicants

- None available

Shooting

- Shotguns and rifles by permit in some areas

Trapping/Live Capture

- Swim-in funnel traps
- Rocket nets and net launchers
- Alpha-chloralose (USDA-APHIS-Wildlife Services only)
- Hand capture and hand nets

Species Profile

Identification

The mute swan (*Cygnus olor*, Figure 1) is a member of the order Anseriformes and the family Anatidae, which includes ducks, geese, and swans. They are 1 of 6 species in the genus *Cygnus* (swans). Two of these species, trumpeter swan (*C. buccinator*) and tundra swan (*C. columbianus*) are native to North America.

Physical Description

Adult mute swans are easy to recognize due to their large size, all white feathers, and bright orange bills. Males typically weigh 20 to 25 pounds, and females are slightly smaller at 16 to 20 pounds. Wing spans typically are 7 to 8 feet for adult mute swans. They are distinguished from other white swans by their body size and bill color. Mute swans are larger than tundra swans, which typically are 13 to 15 pounds; however, body size cannot be used to distinguish them from trumpeter swans. The best characteristic to use is bill color, as both tundra and trumpeter swans have black bills. Mute swans have a prominent black knob at the base of the bill (Figure 2).

The young, called cygnets, are more difficult to distinguish among the swan species. Body sizes vary depending on age, and may overlap during the fledging stage. Juvenile swans of the three species vary in feather color as well, ranging from all gray to all white. During the early stages of fledging, all 3 species have gray-colored bills. As mute swans grow, bills begin to show shades of pink and eventually orange. The bills of tundra and trumpeter swans also may show shades of pink, but eventually turn to all black. The trained observer can use the shape of the bill to distinguish among species of swans, as the tundra and trumpeter swans are more wedge-shaped, compared to the sloping bill and small knob of the mute swan.



Mute Swan Trumpeter Swan Tundra Swan
Figure 2. Bill colors for North American swans (from Trumpeter Swan Society).

Range

Mute swans are native to Eurasia and were introduced into the United States in the late 19th and early 20th centuries for ornamental ponds and lakes, zoos, and aviculture collections. Feral breeding is believed to have first started among escaped mute swans in the lower Hudson Valley in 1910, and on Long Island in 1912. Mute swans have since expanded their range to many Eastern states, several Midwestern states, and portions of the western US and Canada (Figure 3). Established feral populations exist along the northern Atlantic coast, in the Great Lakes region, and the Pacific Northwest. Small localized populations of mute swans may be found in other locations throughout the US, due to intentional release for aesthetic purposes.



Figure 3. Range of the mute swan in North America (from Birds of North America).

Voice and Sounds

Although the name suggests mute swans make no sounds, this is not the case. The voice of the mute swan is much quieter, however, and does not carry far compared to the other swans. Mute swan vocalizations usually are limited to snorting or hissing when aggravated. They also

emit a quiet trill or bugle to communicate with their mates or young. During flight, their large wings make a distinctive whistling “who who” sound that is relatively loud compared to their voice.

Tracks and Signs

Due to their webbed feet, the tracks of mute swans are similar to other waterfowl except much larger than those of ducks and geese. Size is indistinguishable from trumpeter swans. Other signs include large droppings, large areas where aquatic vegetation has been removed and gathered into large mounds for nests, and presence of long white flight feathers during the molting period.

General Biology

Reproduction

Mute swans typically are monogamous but have been known to separate and find new mates, particularly when breeding fails. A mute swan also re-mates when its partner dies. The size of the breeding territory varies depending on the quality of habitat, density of other breeding mute swan pairs, and the aggressiveness of that particular pair. Non-breeding mute swans do not establish territories, but rather congregate with each other throughout the year.

Mute swans usually lay 1 egg every 2 days until the clutch is complete. The average clutch size varies in different regions, but an overall average is 5 to 6 eggs. Most males are highly territorial during egg-laying and some will assist in incubation by sitting on the nest throughout the nesting period to allow the female to feed. Nesting periods vary among regions, but typically begin in March, with hatching in May or June. Cygnets grow very quickly, and are able to swim once their down feathers dry, almost immediately after hatching. Adults protect cygnets from predators and other waterfowl, including other mute swans, and uproot vegetation on which the cygnets feed. By

August, cygnets usually are similar in size to adults and have lost all downy plumage.

Nesting Cover

Mute swan nests are similar in construction and placement to those of Canada geese, although they are about twice the size, averaging 5 to 6 feet in diameter and 1.5 to 2 feet high. Mute swans typically use emergent wetland vegetation to construct their nests. Nests usually are situated away from shorelines to minimize threats from predators. If emergent vegetation is lacking, they may nest on shorelines, islands, or floating debris.

Mortality

Cygnets mortality is difficult to study, due to variations in site characteristics, such as availability of food, density of other mute swans, presence of particularly aggressive mute swans, and predators. In one 20-year, mark-recapture study, cygnets mortality was estimated at 60 to 70%. Once mute swans fledged, the mortality rate decreased to about 30% for subadults, and 10% at breeding age.

Population Status

Mute swans are an introduced species and can be found throughout the US, because humans can purchase and place them on their property (with special permits), typically for aesthetic reasons. Feral populations of mute swans occur in 3 areas of the country: the northeastern coast, the Great Lakes region, and the northern west coast (Figure 3). Within these areas, mute swans vary in density from single swans or pairs, to over 1,000 birds. Several states have developed management plans to reduce numbers of feral mute swans breeding in natural habitats because of their population growth and potential competition with native waterfowl and colonial waterbirds.

Habitat

Mute swans are found in a variety of habitats where surface water is present. They typically

are not afraid of humans, which is a reason they were brought here originally and bred for ornamental purposes. They can be found in highly developed areas such as densely populated lakes, city parks, subdivisions, airport retention ponds, and marinas. As populations grew and swans became feral, however, they expanded into more natural habitats including lakes, emergent wetlands, rivers, and coastal areas of large waters (e.g., the Great Lakes and Chesapeake Bay).

Behavior

Mute swans are non-migratory, but they do make local flights during different seasons. During winter in northern climates, mute swans fly to areas with open water, often in large concentrations, depending on how much open water is available on the landscape. When the ice starts to thaw, mute swans begin returning to their breeding sites. Breeding adults remain at these sites until the fall when their cygnets are old enough to fly and fend for themselves. Non-breeding sub-adults disperse in spring to sites with suitable habitat. They may return to their birth site or go to a new area, depending on the competition and aggressiveness of adult birds in the area. Non-breeding subadults undergo a molt in July through August and typically move to large bodies of water nearby. Breeding adults remain with their cygnets and molt at their breeding site.

Food Habits

The main food source of mute swans is submerged aquatic vegetation. They prefer shallow waters where they can reach the bottom, but they can exploit deeper water because of their long necks. Mute swans consume small fish, insects, and other small animals incidentally along with plants and when plant materials are sparse. During winter in northern climates, mute swans congregate in areas of open water and may feed exclusively on small fish or algae if submerged aquatic vegetation is lacking. Mute swans eat

throughout the day, from sunrise to shortly after sunset. In the US, mute swans rarely feed on land, with limited instances of feeding on crop fields and grasslands near shore when aquatic vegetation is lacking. In areas with human development, mute swans readily habituate to artificial feeding. Begging behavior becomes more prevalent during periods of decreased aquatic vegetation. Artificial feeding has been responsible for maintaining populations in British Columbia and Traverse City, Michigan.

Legal Status

Some have questioned the status of mute swans as an introduced species, but multiple reviews by scientists and the US Fish and Wildlife Service (FWS) clearly support the conclusion that mute swans are not native to North America. The Migratory Bird Treaty Act (MBTA), therefore, does not protect mute swans, and management authority falls under jurisdiction of the states, provinces, and tribes. Before initiating any damage management actions, consult the state or provincial wildlife agency regarding the protection status of mute swans in your area. Management options may be limited and special permits may be required. This document encompasses a variety of management options. It is up to you to determine which options are available in your area.

Human-Wildlife Conflicts

Natural Resources

Mute swans can impact ecosystems by foraging on native plants and competing with native species for food and habitat. Mute swans forage primarily on submerged aquatic vegetation, and each swan consumes 4 to 8 pounds of vegetation per day. One study found that the diet of mute swans overlapped considerably with that of many native waterfowl species that stage and over-winter in

the Lower Great Lakes. While feeding, mute swans also use their feet to expose plant rhizomes for foraging and to help dislodge food for cygnets. This damages aquatic substrates and vegetation surrounding preferred foods. Mute swans typically consume less than 50% of the vegetation they remove.

Mute swans are known for their highly territorial behavior during breeding season and may compete with native wildlife for space and associated resources. Of particular concern are potential impacts on threatened and endangered species. During the breeding season, mute swans sometimes displace other native waterfowl from preferred nesting locations, and may kill adult and juvenile ducks and geese. In Maryland, a large molting flock of mute swans caused a colony of least terns (*Sterna antillarum*) and black skimmers (*Rynchops niger*) to abandon a nesting colony by trampling nests, eggs, and chicks. The mute swans also displaced nesting common terns (*Sterna hirundo*). In Michigan, a colony of 54 black terns (*Chlidonias niger*) was reduced to only a few black tern nests by a single pair of nesting mute swans.

Agriculture

Incidence of mute swan depredation on crops in the US are uncommon, but they cause damage to some crops, such as wheat and oilseed rape in Europe. Animal health professionals are concerned about the potential for mute swans to serve as a vector or reservoir for diseases of significance to poultry, such as avian influenza and Newcastle disease.

Human Health and Safety

While transmission of disease or parasites from waterfowl to humans has not been well documented, various studies indicate that the potential exists. Human diseases that may be transmitted through feces of mute swans include swimmer's itch, salmonellosis, and *E. coli* infections. Although people are concerned

about disease transmission from feces, scientists at the Centers for Disease Control and Prevention (CDC) estimate the risk of such infections is low. In worst case scenarios, infections may be life-threatening for immunocompromised people. Financial costs are associated with testing of water for coliform bacteria, regular cleaning of feces from beaches and other recreational areas, loss of business revenue associated with recreations sites that are closed because of fecal contamination, obtaining assistance from public health officials, and implementing non-lethal and lethal methods for managing conflicts with mute swans.

Damage to aircraft from bird strikes poses a substantial risk to human safety. Mute swan collisions with aircraft not only are a risk to human safety, but also can result in expensive damage to aircraft, loss of aircraft use during repairs, monetary losses due to cancellation and delays of flights, and erosion of public confidence in the safety of air travel. Eight mute swan strikes were reported in the US from 1994 to 2011. Although this number is low compared to other species, the size of mute swans makes them particularly hazardous to aircraft. Federal Aviation Administration regulations require aircraft engines to be designed to withstand the ingestion of a 4-pound bird into the engine without an uncontained fire or engine failure, but mute swans typically weigh over 20 pounds.

Mute swans defend their nests, nesting areas, and young from any perceived threats. Reports of attacks on humans and pets have become more frequent in areas with high numbers of mute swans. Mute swans are capable of inflicting bruises, sprains, and bone fractures. In at least 1 case in Illinois, a mute swan attack resulted in a human fatality. A man in a kayak ventured too close to a mute swan nest; the swan attacked and caused the man to capsize the kayak. The man was not wearing a personal floatation device and witnesses reported the swan continued to attack as the man tried to

keep his head above water. Mute swans that learn to expect food from people may become aggressive in seeking food. Most of the aggressive behavior involves bluffing, which is the displaying of dominant postures and making hissing noises without making physical contact.

Nuisance Problems

Most conflicts between swans and people result in less enjoyment of sites or recreational activities due to a local overabundance of mute swans. People often cannot use and enjoy their own property, public parks, and other areas because of aggressive swans or the presence of swan feces. Costs associated with mute swans include labor and disinfectants to clean and sanitize the areas, loss of property use and resale value, loss of aesthetic value of aquatic vegetation and areas where mute swans nest, loss of customers or visitors fearful of swimming in waters with swan feces or of being attacked by aggressive swans, loss of time contacting wildlife management agencies on health and safety issues and damage management advice, and implementation of methods to manage wildlife damage.

Damage Identification

Most damage associated with mute swans is difficult to attribute to this species unless the birds actually are observed causing damage. Damage to submerged aquatic vegetation is difficult to observe because it occurs underwater. However, mute swans typically consume only about 50% of what they tear up during feeding, so disrupted vegetation can be observed floating in areas where mute swan have fed. Damage to submerged vegetation may become apparent as it accumulates along shorelines and beaches. Damage also may become visible during periods of lower water levels (Figure 4).



Figure 4. Area completely denuded of submerged aquatic vegetation along the Detroit River, MI (exposed when water levels dropped). Photo courtesy of the Friends of the Detroit River.

Damage to emergent vegetation typically occurs during the breeding season due to nest construction. The material is used for the nest itself, and often large mats of vegetation ripped up by mute swans can be found surrounding the nests (Figure 5).



Figure 5. Mute swan nest constructed of bulrushes with a large floating mat of ripped-up vegetation surrounding nest. Photo by Michigan DNR.

Mute swans feed and defecate on valuable turf associated with lawns, parks, and golf courses.

Wildlife Damage Prevention and Control Methods

Integrated Wildlife Management

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind integrated wildlife management is to implement the best combination of effective management methods in a cost-effective manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. An integrated approach may incorporate cultural practices (e.g., no feeding policies), habitat modification (e.g., exclusion), animal behavior modification (e.g., frightening devices), nonlethal or lethal removal of individual offending animals, local population reduction, or any combination of these. The course of action depends on the circumstances of the specific damage problem. Consider the biology and behavior of the damaging species and other factors when developing an integrated strategy.

Preventive Damage Management applies strategies before damage occurs, based on historical problems and data. Most preventive management techniques are non-lethal and most commonly applied by the resource owner or manager. An example is installing and maintaining a fence or overhead wire grid system to reduce access of mute swans to a retention pond.

Corrective Damage Management applies strategies to stop or reduce current losses. Both nonlethal and lethal methods may be used for corrective damage management. Examples include using pyrotechnics or border collies to chase away birds, removing breeding pairs of mute swans, or oiling eggs.

Habitat Modification

Habitat modification can include planting vegetation unpalatable to wildlife or altering

the physical habitat. Hedges, shrubs, and boulders can be placed along shorelines to impede movements of mute swans. Restricting a bird's ability to move between water and land may deter them from an area. This method is less effective than with other waterfowl species such as Canada geese, because mute swans do not feed on land and do not necessarily need to loaf on land. Another method of habitat alteration is to remove submerged aquatic vegetation (food source) and emergent vegetation (nesting materials). However, this impacts other species of wildlife and fish and may not be practical. During winter months, mute swans require open water, so removing aerators and allowing the pond to freeze will force the mute swans to leave. Again, this may impact other wildlife and fish at the site and may not be practical.

Exclusion

Electric Fence

Electric fences deter mute swans from using a site by preventing them from walking from water onto the shoreline. As with shoreline habitat modifications, this method is less effective than with other waterfowl species such as Canada geese because mute swans do not feed on land and do not necessarily need to loaf on land. The use of electrified fencing generally is limited to sites in developed areas that are not used for recreational purposes because of the risk of adverse human or pet encounters with the fence. Electric fences are prohibited in some municipalities for human safety reasons. Electric fences are not recommended for natural areas such as refuges, because of potential adverse impacts on nontarget species.

Barrier Fence

As with electric fences, the construction or placement of physical barriers has limited

application for mute swans. Barriers can be temporary or permanent structures. Lawn furniture and ornaments, vehicles, boats, snow fences, plastic hazard fences, metal wire fences, and multiple strand fences have been used to limit the movement of waterfowl. This method is limited to areas that can be completely enclosed and do not allow the birds to land inside enclosures. In addition, barrier fences should only be used in developed areas. Similar to most abatement techniques, barrier fences are most effective when deterring small numbers of breeding mute swans and their flightless young along small portions of wetlands and waterways. Unfortunately, situations have occurred in which barrier fences designed to inhibit waterfowl nesting has entrapped young and resulted in starvation.

Surface Covers

Mute swans can be excluded from ponds using overhead wire grids. Wire grids have been demonstrated to be most applicable on ponds less than 2 acres, but they may be aesthetically unappealing to some people. Wire grids render a pond unusable for boating, swimming, fishing, and other recreational activities. In addition, balls about 5 inches in diameter can be used to cover the surface of a pond.

Frightening Devices

Visual Techniques

Use of visual deterrents involves installing objects such as reflective tape, flags, or similar objects to deter bird use of a given area. In Europe, high visibility tape has been reported effective at reducing mute swan damage to crops. This method is impractical in many locations, however, due to its cost and has met with some local resistance due to the negative aesthetic appearance on properties where it is used. Other studies have shown reflective tape to be ineffective. Although visual deterrents may sometimes be effective for short periods of time, reflective tape is likely to be only a short-term deterrent for mute swans.

Scarecrows and effigies depicting alligators, humans, and floating dead birds have had limited success for short periods in small areas. Mute swans typically are not afraid of humans, so scarecrows would be ineffective. As with most frightening devices, the efficacy of scarecrows may be improved and extended by reinforcing the threat through the occasional use of shooting and dogs. Reinforcement with shooting may not be an alternative for problems with urban and suburban mute swans.

Lasers have been evaluated as a non-lethal frightening device for several avian species. Waterfowl have exhibited avoidance reactions to lasers under low light conditions, and they have been effective in dispersing large flocks of waterfowl from lakes with nearly no acclimation to the technique. Wide scale public use of lasers is not recommended at this time, pending additional research. In some situations, such as neighborhoods, schools, and hospitals, use of lasers may be particularly useful in an integrated control programs since they are silent and do not fire a projectile.

Auditory Techniques

Pyrotechnics, such as screamer shells, bird bombs, and 12-gauge cracker shells have been used to repel many species of birds. The effectiveness of pyrotechnics is highly variable among different flocks of waterfowl. Some flocks in urban areas required continuous harassment throughout the day with frequent discharges of pyrotechnics. Waterfowl sometimes return within hours. Mute swans are not hunted in the US, so pyrotechnics may be less effective for swans than migrant Canada geese that are hunted. Studies have concluded that the efficacy of harassment with pyrotechnics is partially dependent on availability of alternative loafing and feeding areas. Safety and legal implications must also be considered. Discharge of pyrotechnics is inappropriate and prohibited in some urban and suburban areas.

Propane cannons generally are inappropriate for urban and suburban areas due to the repeated loud explosions, which many people consider an unacceptable nuisance and potential health threat (hearing damage). Although propane cannons may be effective in dispersing migratory waterfowl in agricultural settings, resident waterfowl in urban areas are more tolerant of noise and acclimate to propane cannons relatively quickly. Since mute swans are not hunted in the US, propane cannons may be less effective.

Biological

Dogs can be effective at harassing waterfowl and keeping them off turf and beaches. Around water, this technique appears most effective when the body of water to be patrolled is less than 2 acres in size. Although dogs can keep waterfowl off individual properties, they do not contribute to a solution for the larger problem of overabundant populations. This is one of the damage management techniques that requires an ongoing financial and personnel commitment to be effective. It is common that when harassment with dogs ceases, the number of birds return to pre-treatment numbers. Dogs are not recommended during the molting or fledging stages when birds are unable to fly.

Hazing

Hazing involves the repeated use of frightening to deter birds from using a site. Hazing reduces losses in those instances when the affected mute swans move to a more acceptable area. However, birds hazed from one area may also cause damage in the new area. Birds may acclimate, or become accustomed to and eventually fail to respond to frightening devices. In general, hazing is not used in projects to protect natural resources from birds because of the potential for adverse impacts on nontarget species.

Repellents

Methyl anthranilate (MA), an artificial grape flavoring food additive, is a registered repellent

for waterfowl, marketed under the trade names ReJeX-iT® and Bird Shield®. The chemical irritates the trigeminal receptors of birds, much in the same way that ammonia irritates mammals. Results with MA appear to be mixed. One study reported that MA repelled Canada geese from grazing on turf for 4 days. However, another study found it ineffective as a grazing repellent when applied at 20.2 and 60.5 pounds per acre, which is the label rate and triple the label rate, respectively. Most products are water-soluble, therefore moderate to heavy rain, daily watering, and mowing render MA ineffective. More recent formulation strategies have been developed to address some of the problems with water solubility. Methyl anthranilate can be applied to temporary pools of water (e.g., water on runways/taxiways) but may not be directly applied to permanent waters, such as lakes, ponds, streams and rivers

A potentially more cost effective method of applying MA is by a fog-producing machine. The MA fog drifts over the treated area and is irritating to the birds while being non-irritating to humans that might be exposed. The label states that a 1-gallon container of 40% MA applied by fog is sufficient to treat up to 16 acres, depending on airflow. Several treatments 1 to 4 days apart may be required to remove all nuisance birds. As with turf, additional applications likely will be required to address problems with locally migrating or non-resident birds.

Reproductive Control

Egg Treatments (Oiling, Addling, Puncturing, and Chilling)

Inhibiting reproduction is one way of reducing waterfowl populations. Given that mute swans are relatively long-lived, exclusive use of reproduction-inhibition methods may take years to reduce local populations. Consequently, this strategy will be more expensive and labor intensive compared to reducing the breeding population itself. One study evaluated alternative strategies for

controlling populations of mute swans and found reproductive rates would need to decline by more than 72% to achieve the same goal as reducing adult survival rates by 17%. However, egg addling, oiling, or puncturing can be effective in reducing recruitment into the local population. This method involves locating nests and treating eggs within the nest. Methods that leave the egg in the nest such as addling, oiling, and puncturing, may be more effective as a population control tool because birds generally continue to attempt to incubate the eggs for a period of time after treatment. Consequently, there likely will be a greater delay between treatment and attempts to re-nest than with nest destruction. Generally, nests are visited 2 to 4 times per year to treat eggs. Given the labor involved in locating and treating nests, and the time involved to reduce population of a long-lived species using reproductive control, this method is likely to be primarily used with small local populations and in situations where the goal is to maintain the local population at current levels.

Nest Destruction

Nest destruction can be used to reduce reproduction and as a method to discourage use of specific sites by mute swans. Locate the nests, destroy the eggs, and remove nest material from the site or dismantle nests and scatter the materials around the nest location. Birds may abandon the nest location and, depending on the timing of the nest and egg destruction, may attempt to re-nest at another site. This method generally is more useful as a means of relocating problem birds than as a population control method because of the tendency of birds to relocate and re-nest.

Toxicants

None registered.

Trapping and Live Capture

Birds may be captured with panel nets, rocket nets, drive traps, net guns, hoop nets, and by hand. Mute swans typically molt in late July through August or early September and during this time cannot fly, greatly facilitating capture by hand and walk-in traps. Rocket netting involves setting bait in an area that is completely contained within the dimensions of a manually propelled net. The launching of the rocket net occurs too quickly for the birds to escape. Net guns are fired from a shoulder-mounted gun or smaller hand-held launchers. Rocket nets and net guns may be used anytime during the year and are not restricted to the flightless period. Consult with your state or provincial wildlife agency to determine if mute swans can be captured, and released.

Alpha-chloralose is an avian sedative that may be used to capture mute swans. Use of alpha-chloralose is restricted to USDA-APHIS-Wildlife Services (WS) personnel and those under their supervision. Alpha-chloralose baits are hand-delivered to birds, so risks to nontarget species are extremely low. Pursuant to US Food and Drug Administration (FDA) restrictions, waterfowl captured with alpha-chloralose for subsequent euthanasia must be killed and buried or incinerated, or be held alive for at least 30 days, at which time the birds may be killed and processed for human consumption. Check with your state or provincial wildlife agency to determine if captured mute swans can be captured and released.

Shooting

Shooting mute swans can be highly effective in reducing or eliminating local populations and for supplementing harassment activities. Shooters must be trained in the safe and effective use of firearms, and differentiating between mute swans and native species of swans. Lethal removal of adult breeding mute

swans is the most effective method of reducing populations. In addition, shooting a few individuals from a larger flock can reinforce their fear of harassment techniques. Shooting may not be allowed or may require special permits, so consult with state or provincial wildlife agency personnel. In addition, you must consult with local ordinances, which may restrict the use of firearms or require special permits and notification.

The shooting of mute swans may not be an available option, due to public relations, even if it is legal and could be conducted safely. Mute swans are a highly charismatic species and are highly visible to the public. Often, people enjoy viewing and even feeding them. Shooting is considered inhumane by some, especially if a person has become emotionally attached to the swans. Consider these factors when determining if shooting is a viable option for control.

If shooting can be conducted legally and safely, several other factors should be considered, including firearm and ammunition selection. A 12-gauge shotgun can be highly effective for shooting mute swans up to 50 to 75 yards, especially if several swans are to be removed in a quick manner. A mid-sized shot (Nos. 2 to 3) is recommended for head shots at stationary swans within 50 yards. A larger shot (BBB or T shot) is recommended if swans are in flight or farther than 50 yards. Rifles are more effective for long-range shots, and may have advantages if equipped with sound suppressors. A .22-caliber rifle can be used at ranges less than 30 yards for removing single mute swans (e.g. an aggressive male that has attacked people). Mid-size caliber rifles (e.g. .223 to .243) are recommended for shooting swans up to 300 yards.

All ammunition used for removing mute swans should be non-toxic (no lead). A wide variety of steel or "heavier-than-lead" alloys is available for shotguns, and is required by law for use in

areas with water. Although not necessarily required by law, use of non-toxic rifle bullets (e.g., copper) is highly recommended. To reduce the risk of ricochets on water, use a highly frangible bullet. Availability of highly frangible non-toxic rifle ammunition is currently limited to a few sources. The Varmint Grenade® by Barnes Bullets and the Controlled Chaos by Lehigh Defense, LLC are 2 options.

Handling

Relocation

Release of captured mute swans in their original home range does little to reduce the local population. In certain instances when mute swans must be relocated, they should be surgically sterilized to inhibit reproduction. In addition, if the birds are used for exhibition, the primary feathers should be clipped for temporary elimination of flight or the tip of the wing pinioned for permanent elimination of flight. Such birds should only be released on privately owned land with permission of the landowner.

Translocation

Check your local and state or provincial regulations regarding translocation of mute swans. Even if it is legal to translocate mute swans, it is not recommended, because they are a non-native invasive species, that may cause damage in the translocation area. In certain instances when a mute swan must be translocated, consider the same recommendations for relocation.

Euthanasia

Conduct euthanasia of mute swans in a safe, humane, and effective manner. All euthanasia methods should be approved by the American Veterinary Medical Association (AVMA). Refer to the AVMA guidelines for euthanasia, available online at:

<https://www.avma.org/kb/policies/documents/euthanasia.pdf>

Disposal

Mute swans that are captured and euthanized or killed by shooting must be buried, disposed of in landfills, composted, or incinerated according to state or provincial regulations. Check your local and state or provincial regulations regarding carcass disposal.

Economics of Wildlife Damage Prevention and Control

Little has been published on the economics of damage caused by mute swans. The primary damage is the consumption of submerged aquatic vegetation, and destruction of habitat that is a valuable resource to other wildlife and fish. Mute swans also directly compete with other waterfowl species for food and breeding habitat and may act aggressively towards them, sometimes even killing them. These impacts are not easy to quantify. Furthermore, threats to human safety from aggressive swans, and disease risks due to fecal contamination, are subjective. Costs are incurred when sites must be cleaned or closed because of the presence of mute swans, and the accumulation of mute swan feces.

Aircraft strikes could be costly for repairs or even replacement of aircraft, not to mention the threat to human safety. Limited data exist on mute swan strikes to aircraft. Eight mute swan strikes reported in the US from 1994 to 2011 (FAA Wildlife Strike Database). No data were recorded on the specific costs for damage incurred for any of the strikes. One strike report from New York noted a flap skin was punctured and the plane was taken out of service for replacement of the flap. Another strike report from New York included comments that 5 mute swans crossed the flight path of an airplane immediately after takeoff and the pilot used

evasive maneuvers to avoid collision. Bird remains were subsequently recovered from the runway.

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Key Words

Aggressive birds, *Cygnus olor*, Invasive species, Mute swan, Waterfowl,

Glossary

Cygnets: Juvenile swan.

Disclaimer

Implementation of wildlife damage management involves risks. Readers are advised to implement the safety information contained in the Manual of the National Wildlife Control Training Program.

Some control methods mentioned in this document may not be legal in your location.

Always use repellents and toxicants in accordance with EPA-approved labels and your local regulations. Wildlife control operators must consult relevant authorities before instituting any wildlife control action.

Mention of any products, trademarks, or brand names does not constitute endorsement, nor does omission constitute criticism.

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