

**Mute Swan (*Cygnus olor*) in the Chesapeake Bay:  
A Bay-Wide Management Plan**



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**June 2004**

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## **Executive Summary**

Mute swan (*Cygnus olor*) are a non-native, invasive bird introduced to North America from Eurasia during the late 1800s. Unlike the native tundra swan (*Cygnus columbianus*), mute swans inhabit the Chesapeake Bay throughout the year, competing with native aquatic resources for food and habitat. A large mute swan population in the Chesapeake Bay threatens the protection and restoration of submerged aquatic vegetation (SAV) beds in areas of critical importance to the Bay's living resources. Furthermore, the mute swan's preference for SAV as a major food source, reduces the likelihood of achieving the Chesapeake 2000 objective of protecting and restoring 185,000 acres of SAV (Chesapeake Bay Executive Council 2003). Unlike other bird species that feed on SAV at only specific times of the year, mute swans feed on SAV throughout the year, impacting it during its growing season. Mute swans also compete with other native species for food and habitat and cause conflicts with people.

Adverse ecological impacts caused by a large numbers of mute swan in the Chesapeake Bay will continue to worsen if the population continues to grow in the absence of management. The mute swan needs to be managed at a level in which its impacts on SAV, native wildlife, and habitats are minimized. The management of mute swans in the Bay complements other efforts to protect and restore these habitats and should be viewed as part of a comprehensive Bay restoration effort.

The goal of this management plan is to manage the Chesapeake Bay population of mute swans to a level that a) minimizes the impacts on native wildlife, important habitats, and local economies; b) minimizes conflict with humans; c) is in agreement with Chesapeake 2000 Agreement goals for SAV and invasive species; and d) is in agreement with the Atlantic Flyway Mute Swan Management Plan.

Management actions in this plan include: increasing public awareness about mute swans and their impact on living resources in the Bay; utilizing a web based clearinghouse to improve regional coordination with regard to data collection for monitoring, research, and management of mute swan; developing federal and state regulatory language to facilitate effective population management; monitoring the size and distribution of the mute swan population and the effectiveness of management actions; reducing the mute swan population (based on individual state population objectives) as quickly and effectively as possible, consistent with activities to protect, restore, and enhance the Bay's resources; preventing the escape and reproduction of captive mute swans; and reducing conflicts between mute swan and people.

## **I. Introduction**

The mute swan was introduced to North America during the late 1800's as decorative waterfowl for parks, zoos and private estates. The mute swan was favored among captive owners and breeders of waterfowl for their beauty and grace. Over 500 mute swans were imported to the United States between 1910-1912. The flight feathers of many of these birds were cut, making them unable to fly (Phillips 1928). Small numbers of these birds, however, escaped into the wild. Initial introductions into the wild on the East Coast are believed to have occurred in the Hudson River (1910) and Long Island (1912) (Bull 1964).

There were early sightings of feral mute swan in the Chesapeake Bay watershed in Pennsylvania (1930s), Maryland (1954), Delaware (1958), and Virginia (mid 1950s). In the

Maryland portion of the Chesapeake Bay, a feral population of mute swan became established when five birds escaped from an aviculture collection along the Miles River in Talbot County in March 1962 (Reese 1969). In Virginia, a feral population of mute swans did not become established until the mid-1960s or early 1970s. Small numbers of free-ranging mute swans were first observed in southeastern Pennsylvania during the 1930s. These earliest birds are believed to have originated from feral populations in New Jersey.

Since 1986, the mute swan population has significantly increased in the Chesapeake Bay watershed. Maintaining a large population of mute swans in the Chesapeake Bay presents major challenges to the many stakeholders committed to restoring and protecting native aquatic plants and wildlife in the Bay. Although difficult to quantify, adverse ecological effects are occurring as a result of the large population of mute swans that inhabit the Bay throughout the year. Ecological effects include: driving out nesting native waterfowl, and in one case trampling nests and eggs in a nesting colony of least terns (*Sterna antillarum*) and black skimmers (*Rynchops niger*), both state threatened species in Maryland; the removal of SAV during the fall and spring when bay grasses are reproducing; and destruction of SAV restoration and replanting sites. Impacts on native aquatic resources will continue to worsen if the swan population is permitted to grow, and may significantly interfere with the Chesapeake 2000 Agreement goal of restoring 185,000 acres of SAV.

To better coordinate prevention and control efforts for aquatic invasive species on a regional basis, the Chesapeake Bay Program's Invasive Species Workgroup (CBP's ISWG) developed the following two goals for the Chesapeake 2000 Agreement: "By 2001, identify and rank non-native aquatic and terrestrial species, which are causing or have the potential to cause significant negative impacts to the Bay's aquatic ecosystem. By 2003, develop and implement management plans for those species deemed problematic to the restoration and integrity of the Bay's ecosystem." In September 2001, the ISWG developed a questionnaire that was sent to the CBP signatory jurisdictions and federal partners to identify six species that are causing or have the potential to cause adverse ecological effects in the Bay's ecosystem. Mute swan was identified as one of the six priority species in which a Bay-wide management plan would be written. In May 2002, the CBP in partnership with Maryland Sea Grant College, sponsored a workshop in Baltimore, Maryland aimed at developing draft management strategies for each of the six species.

In January 2003, the CBP ISWG convened a Mute Swan Workgroup comprised of researchers and federal and state natural resource managers, to develop a Bay-wide regional mute swan management plan. The goal of the plan is to manage the Chesapeake Bay population of mute swans to a level that (a) minimizes the impacts on native wildlife, important habitats, and local economies; (b) minimizes conflict with humans; (c) is in agreement with Chesapeake 2000 Agreement goals for SAV and invasive species; and (d) is in agreement with the Atlantic Flyway (AF) Mute Swan Management Plan (AFC 2003).

The management plan consists of an introduction, which summarizes our current understanding of the biology and ecology of this species, its invasion history, ecological impacts, current distribution and population estimates, current management efforts, and state and federal policies regarding management. A Management Actions section consists of the objectives and strategies that will work to meet the goal of the plan. Objectives and strategies were developed under four components, which include: (1) Leadership, Coordination, and Regulatory Authority; (2) Detection and Monitoring; (3) Prevention, Control and Management; and (4) Communication

and Information Access. Finally, an Implementation Section was developed to task appropriate cooperating agencies to lead implementation on specific strategies and includes a budget, source of funding, and a time line to accomplish the strategies.

The Bay-wide mute swan plan is unique from the other management plans being developed because the Maryland Department of Natural Resources (MDNR) and Atlantic Flyway Council (AFC) have already developed management plans for this species. Because the State of Maryland is included in this Bay-wide plan and all three of the states (MD, VA, and PA) are part of the Atlantic Flyway, management actions developed within this plan are consistent with the two existent plans.

Timing of implementation of many of the management actions in this plan, however, will depend on when the United States Fish and Wildlife Service (FWS) is able to issue depredation permits to the states for population control. The FWS published a Finding of No Significant Impact (FONSI) and Final Environmental Assessment (FEA) for the Management of Mute Swans in the Atlantic Flyway on August 7, 2003. The FWS is withdrawing those decision documents. After October 8, 2003, those documents were no longer used to support the issuance of depredation permits authorizing the take of mute swans under the Migratory Bird Treaty Act (MBTA). No new mute swan depredation permits will be issued pending completion of further review under the National Environmental Policy Act (NEPA). The FWS has indicated that they do not plan to conduct further environmental assessments on this issue (in Hogan, Assistant Director of FWS Dec. 16, 2003)

## **A. Summary of Biology and Ecology**

### **i. Habitat**

Mute swans utilize a variety of aquatic habitats, including ponds and lagoons and fresh to salt water marshes. In the northeast, mute swans prefer coastal ponds (salt, brackish, and freshwater), estuaries, backwaters, and tributaries of embayments. It occupies these habitats year round (Ciaranca et al. 1997). As the northeast Atlantic Coast population has begun to grow, some birds have begun to occupy inland freshwater wetlands, ponds, impoundments, and reservoirs (MDNR 2003). In the warmer months, mute swans spend most of their time in shallow water. As shallow water freezes they move to deeper water, but will utilize deep water throughout the year.

### **ii. Breeding**

Mute swans breed by their third spring and continue throughout their life (Ciaranca et al. 1997). Pairs generally remain together until one member dies. Pairs will separate if their breeding attempts fail to produce young. Nesting begins in March or early April and pairs often use the same nest sites over multiple years. Nesting occurs close to the water on small islands, isolated shorelines or in shallow marshes. Mute swan appear to favor *Phragmites* and *Typha* for nesting material. However, nesting material can vary from salt marsh cordgrass (*Spartina* spp.), black needlerush (*Juncus* sp.) (L. Hindman, MDNR, pers. comm.), to woody vegetation (Berglund et al. 1963; Willey and Halla 1972; Reese 1980; Gelston and Wood 1982). Nests range from four to six feet in diameter. The female, or pen, does most of the nest building and is the principle incubator of the eggs. Unlike other waterfowl in the Northern Hemisphere, however, mute swan males have been observed incubating in the absence of a female (Witherby et al. 1952). Clutch

size in the Chesapeake Bay ranges from four to ten eggs with a mean of 6.2 (Reese 1996), while brood sizes range between 3.1 and 5.6 cygnets. Incubation continues for about 35 days after the first egg is laid, between mid-May and mid-June. Mute swan generally nest once a year, although if a nest is disturbed early in the nesting season and eggs are lost, a pair may attempt to nest a second time. Territory size of mute swans has been reported to range from between less than three acres in high quality areas to about 15 acres on large bodies of water and open rivers for nesting and brood rearing, and feeding (Birkhead and Perrins 1986; Ciaranca 1990; Ciaranca et al. 1997). Cygnets are precocious; they begin swimming within a day or two of hatching and are fully grown in less than six months. In the Chesapeake Bay, 49% of eggs laid survive to hatching and about 83% of hatching cygnets are able to fledge (Ciaranca et al. 1997).

### **iii. Molting**

Mute swan go through an annual molting process to renew worn flight feathers. Usually at this time, large concentrations of birds, consisting of immature, unpaired and unsuccessful breeders, gather on large open shallow water areas. These sites provide protection for flightless birds and a sufficient amount of SAV to feed them during this period. Molting occurs during mid-July to mid-September during peak SAV biomass production (AFC 2003). Molt concentrations as large as 600-1,000 birds have been reported in Maryland (MDNR 2003).

### **iv. Migration and Wintering Distribution**

Mute swan are non-migratory in North America but may undergo short local seasonal movements seeking open water and available food sources during winter weather (AFC 2003).

### **v. Predation**

Only a few animals prey upon mute swans. Large predators (raccoon, otter, fox, coyote, fish crow, and domestic dog) will take advantage of an unoccupied nest to eat the eggs or cygnets. Active nests are well defended and nest mortality is usually low. Snapping turtles will take cygnets during the first few weeks of life (AFC 2003).

### **vi. Longevity and Mortality**

Survivability fluctuates annually depending upon winter severity and available food sources (AFC 2003). Annual survival rates increase with age (Reese 1980). Life expectancy in the wild can be to over 25 years, however, the average is probably closer to 11 years (Ciaranca et al. 1997). Natural mortality is low and is usually less than 10% annually.

Humans have a limited impact on the mortality of mute swans due to the absence of a hunting season, although a few states have not provided them with "protected species" status in the past. However, intentional shooting of mute swan is now common. Accidental death resulting from collision with overhead wires and man-made structures is a common cause of mortality. In rare instances, territorial adult males may kill young cygnets (L. Hindman, MDNR, pers. comm.) and even rival males during territorial fighting (M. Ciaranca, pers. comm., in AFC Plan 2003). Lead poisoning from ingesting fish sinkers and spent shotgun pellets has been reported in North America (M. Ciaranca, pers. comm., in AFC Plan 2003). Flooding of nests is a major source of nest failure in Maryland (L. Hindman, MDNR, pers. comm.). Natural mortality does occur from various waterfowl diseases, parasitic infections, and starvation.

## B. Summary of Ecological Impacts

### i. SAV Habitat

Mute swan feed almost exclusively on SAV (Ciaranca et al. 1997; Fenwick 1983; Perry et al. 2004). Submerged aquatic vegetation is a vital component of the Chesapeake Bay ecosystem due to a number of valuable ecological benefits it provides in the Bay. The plants provide food for resident and migratory waterfowl and the beds provide habitat and shelter for a variety of fish, shellfish, and invertebrates. Submerged aquatic vegetation also contributes to chemical processes such as nutrient absorption and oxygenation of the water column. Submerged aquatic vegetation beds, when dense, can also aid in baffling wave energy and slowing water currents, which can reduce shoreline erosion and promote settlement of suspended sediments (Hurley 1991). Abundance and distribution of SAV in the Bay has drastically declined since the 1970s, and can be attributed to decreased light abundance and biofouling of the plant surface due to excessive loading of nutrients and sediments from the Bay watershed. Efforts to restore depleted populations of SAV and to protect remaining beds of SAV are greatly challenged by the population of mute swans that inhabit the Chesapeake Bay and its tributaries.

The mute swan's diet in the Chesapeake Bay consists of SAV (81.8%), algae (8.4%), emergent and terrestrial plants (8.3%), and animal matter (0.3%) (Fenwick 1983). Willey and Halla (1972) and Ciaranca et al. (1997) documented that mute swans will feed on at least 23 different species of SAV. Analyses of the gullet and gizzard of 34 mute swans in the Chesapeake Bay indicated that this species feeds on aquatic plants throughout the year. Widgeon grass (*Ruppia maritima*) constituted 56% and eel grass (*Zostera marina*) constituted 43% of the gullet food in mute swans. Corn (*Zea mays*) was found in some mute swan gullets and gizzards, but made up less than 2% of the volume. Invertebrates (including bryozoans, shrimp, and amphipods) comprised a much smaller amount of the food percentage and they are believed to have been selected accidentally within the vegetation eaten by swans (Perry et al. 2004).

Food habits of mute swans are different than the native tundra swan. Tundra swans most commonly feed in agriculture fields and also feed heavily on clams in late winter. Food habits of seven tundra swans revealed that the Baltic clam (*Macoma balthica*) comprised 96% of the diet in the Bay (Perry et al. 2004). Additionally, tundra swans are not present in the Bay during the summer when SAV is growing.

Studies conducted in both North America and Europe found that mute swans feed on the same species of SAV used by other waterfowl (Gilham 1956; Jennings et al. 1961; Willey and Halla 1972; Mathiasson 1973; Charman 1977; Nierheus and Van Ireland 1978; Scott and Birkhead 1983). Alternatively, Conover and Kania (1994) reported that paired mute swans had little or no effect on native waterfowl and their herbivory.

The MDNR (2001) cite reports of overgrazing by mute swans in local areas and the concerns of residents about the loss of SAV habitat and its impact on blue crab (*Callinectes sapidus*) and fish populations. Impacts upon SAV are not well quantified at this time, however, it is clear that maintaining a large population of mute swans poses a significant threat to the remaining beds and the establishment of new beds and is therefore an impediment to achieving the goals of the CBP Chesapeake 2000 Agreement. The Chesapeake Bay 2000 Agreement includes a commitment to restore 185,000 acres of SAV by 2010. Restoration efforts, particularly in the mid-Bay where the decline is most severe, are frequently obstructed by feeding mute swans.

Chasko (1986) observed significant reductions in SAV in small Connecticut ponds used by



breeding swan pairs. A study conducted in the Netherlands by Nienhusi and Van Ierland (1978) noted that mute swans were responsible for 87% of consumption of eel grass beds by birds. Cobb and Harlan (1980) found that when mute swans are present in high concentrations, they can overgraze an area, after which they abandon it (Allin et al. 1987). An enclosure study conducted in Rhode Island (Allin and Husband 2000, in review) indicated that mute swans can overgraze SAV when water depths are shallow (0.5 m or 1.5 feet), reducing SAV biomass by as much as 92 to 95%. Fenwick (1983) found that mute swans could consume on average 43% (females) and 35% (males) of their body weight daily. Willey (1968) reported that mute swans can consume more than 8 lbs of wet weight daily. Additional losses of SAV can occur from foraging behavior. Mute swans have been observed pulling plants up by the roots or rhizomes or paddling vigorously to dislodge whole plants to consume or make available for cygnets (Owen and Kear 1972; Birkhead and Perrins 1986). Willey (1968) documented that mute swans can uproot up to 20 lbs daily during feeding activity. Mute swan can also use large amounts of vegetation for nest building (Gillham 1956). Foraging by mute swans during the SAV growing season reduces plant survival and the plant's ability to reproduce.

## **ii. Agriculture**

If the Chesapeake Bay mute swan population continues to grow and SAV habitat is further depleted, some resource managers believe that there is potential for this bird to include upland grazing in its feeding behavior. In British Columbia and Washington State, mute swans have been reported to feed on agriculture fields and cause damage to small grain crops (MDNR 2003). Mute swans have reportedly been responsible for several thousand dollars of damage to commercial cranberry crops in New Jersey and Massachusetts, the damage being inflicted while they were grazing on aquatic plants (Atlantic Flyway Technical Committee, unpublished data, in AFC 2003). Degradation of freshwater habitats in the Netherlands led to mute swan grazing in agricultural crops, leading to 3,000 of 15,000 birds being shot.

## **iii. Native Species of Fish and Wildlife**

Competition for habitat and their large size make mute swan a threat to native waterfowl. Some swans will tolerate other waterfowl nesting within their territory, however, older mated pairs are less tolerant (AFC 2003). Many swans will vigorously defend their nest and brood-rearing sites from intrusion by other swans or ducks or geese (Anderson and Titman 1992). Mute swan can attack and displace native waterfowl from breeding and staging areas (Willey 1968; Reese 1975; Ciaranca 1990; Ciaranca et al. 1997) and they may even kill the intruding pair or their young (Stone and Masters 1970; Reese 1980; Kania and Smith 1986). Territorial defense allows a mated pair to protect food resources needed to support offspring. If food and nesting habitat are readily available, swans may nest colonially (Bacon and Harild 1987; L. Hindman, pers. comm, unpublished report). In Maryland, mute swan breeding pairs have been documented killing mallard (*Anas platyrhynchos*) ducklings, Canada goose (*Branta canadensis*) goslings, and cygnets of other mute swan pairs (MDNR unpublished data).

As mentioned previously, mute swan consume large amounts of SAV that might otherwise be available for native waterfowl. Because mute swans are non-migratory and remain in coastal areas year round they continuously feed on SAV during the summer flowering and growing periods. Mute swan concentrations reduce the amount of SAV available for other species of

native waterfowl. Populations of several waterfowl species (e.g., redhead (*Aythya americana*), canvasback (*Aythya valisineria*), American wigeon (*Anas americana*), black ducks (*Anas rubripes*)) that depend upon SAV have declined in the Bay and remain well below population goals, these declines are attributed to the reduced abundance of SAV (MDNR, 2003).

Little is known at this time regarding potential conflicts between tundra swans (*Cygnus columbianus*) and mute swans. However, recent research conducted in Maryland demonstrated that paired mute swan will attack tundra swan decoys (C. Sousa, unpublished data). If mute swans were to adapt to upland feeding behavior, there may be a potential for further interaction with wintering tundra swans (AFC 2003).

There is a concern in Maryland that an increase in the mute swan population may be contributing to factors that have suppressed population growth among wintering tundra swans. They have declined 40% during the past 25 years while in Pennsylvania and Virginia populations have increased during the past decades. Mute swan pairs have been observed exhibiting aggression toward wintering tundra swan, driving them from foraging areas and protected covers used for wintering shelter (L. Hindman, MDNR, pers. comm.). Food habit studies show that tundra swans and mute swans do compete for limited SAV food resources, but tundra swans feed on invertebrates (especially clams) and agriculture foods to a greater extent (Perry et al. 2004).

Mute swan have been observed exhibiting aggressive behavior towards animals other than waterfowl. A few attacks have been reported on furbearers and small rodents (Ciaranca et al., 1997). Mute swans have impacted threatened species including a nesting colony of black skimmers, least terns, common terns (*Sterna hirundo*), and Foster's terns (*Sterna forsteri*) on sand bars in the Chesapeake Bay in Maryland (Therres and Brinker 2004). Mute swans used the sites as loafing sites and crushed nests, eggs, and young as they walked. Over a period of six years (1987-1993), an annual molt-gathering of up to 600 mute swans caused repeated reproductive failures in, and ultimately the abandonment of, the largest colony of least terns in the state (accounting for 49% of the state population) and one of only two known colonies of black skimmers in the Maryland portion of the Chesapeake Bay (Therres and Brinker 2004).

#### **iv. Conflicts With Humans**

Breeding mute swan pairs display aggressive territorial behavior towards humans if they approach their nest or young. This aggressive behavior can effectively prevent use of shoreline properties and riparian waters. The mute swan has a six foot wingspan and is readily capable of breaking bones and severely injuring humans (AFC 2003). Allin (1981) reported on mute swans attacking humans. There have also been reports of mute swan capsizing canoes and small fishing boats.

#### **v. Effects on Water Quality**

In large concentrations, mute swans and other waterfowl can contribute to water quality problems by defecating in the water (AFC 2003). Unlike other waterfowl, however, mute swan are year round inhabitants in geographic areas where they have been introduced and spend most of their time in the aquatic environment. On Long Island, New York, elevated counts of coliform bacteria have been detected where mute swans congregate. Public Health authorities are concerned about the impact of nutrient loading where waterfowl congregate because coliform counts are widely used to determine whether waters may be used for drinking, swimming, or shell

fishing. Nutrient loading can also cause dangerous algal blooms, especially in inland ponds where rooted SAV has been removed by mute swans (New York Department of Environmental Conservation 1993).

### **C. Positive Values**

#### **i. Aesthetic Values**

Swans have historically been considered a symbol of beauty, elegance, and tranquility by many people due to their large size, color, and gracefulness. Mute swans present in the Bay, provide enjoyment for many people because they are large conspicuous birds that are now widely distributed along tidal shorelines, including many areas occupied by waterfront residential homes. People are able to photograph, paint, and view mute swan courtship displays, nest building, brood rearing activities, and fledgling. Mute swans have little or no fear of humans perhaps because of their domestic origin. Some people also derive enjoyment from feeding waterfowl, including mute swans, and can become emotionally attached to birds that inhabit areas adjacent to their homes or neighborhoods (MDNR 2003).

#### **ii. Economic Values**

Mute swan are sold for display on ponds and lakes. They are also sold as biological control for removing unwanted filamentous green algae from small lakes and ponds. In some instances they are purchased to reduce nuisance problems associated with resident Canada geese. The purchase price of a single mute swan is about \$250 and a pair sells for \$400-\$500 (MDNR 2003 and AFC 2003).

### **D. Distribution and Population Estimates in Chesapeake Bay Watershed *Pennsylvania***

Numbers of mute swans are monitored by the Pennsylvania Game Commission (PGC) as part of the Atlantic Flyway Mute Swan Mid-Summer Survey (MSMSS) which has been conducted every three years since 1986. Total numbers of mute swans observed were similar for the 1986, 1989, and 1993 surveys, averaging 133 swans, but increased to 253 swans in 1996 and remained similar in 1999. The 2002 survey showed a population of 348 birds. The highest concentrations of mute swan (approximately 2/3 of the state's population) are found in the southeastern part of the state, with additional mute swans occurring in widely scattered locations statewide (AFC 2003).

### ***Maryland***

From their accidental escape in 1962 up until the mid-1980s, the mute swan population grew slowly and remained at less than 500 swans. Swan numbers increased from 264 in 1986 to 3,955 in 1999.

A number of factors could have led to this increase, including milder winters and reduced mortality from lead poisoning (lead shot for waterfowl hunting was prohibited in MD in 1991). The population increased at an annual rate of about 23% between 1986-99 and 12% between 1993-99. At the current observed rates of increase, and absent management, the swan population in the state is expected to reach 13,500 birds (at 12% growth/year) to 38,500 birds (at 23% growth/year) by 2010. The 2002 MSMSS showed a population of 3,624 birds. The reduced rate of increase since 1993 can be attributed, in part, to scientific collection by USGS and limited population control by the MDNR and Federal National Wildlife Refuges. The mute swan

population in Maryland is the largest and fastest growing population in the Atlantic Flyway (AFC 2003).

Mute swans are commonly found throughout Maryland's Eastern Shore and all western shore tributaries. They prefer nesting on the edges of tidal wetlands but the population has increased to the point that they are now nesting on inland reservoirs, ponds, managed impoundments, canals, and dredge spoil ponds. Breeding pairs can be found nesting on all tributaries of the Chesapeake Bay. Additionally, a small number nest in the coastal bays of Worcester County (Hindman and Harvey 2004).

The largest number of mute swans are located in the mid-Bay, from Taylor's Island (Dorchester County) to Rock Hall (Kent County) on the Eastern Shore. Large concentrations also occur in the vicinity of Hoopers and Bloodsworth Islands. Resource managers in Maryland believe that the number of breeding swan pairs in Maryland will increase rapidly as immature swans reach breeding age. In 1999, more than 82% of all the subadult and adult swans observed in MD were either nonbreeders or failed breeders (Hindman and Harvey 2003).

### *Virginia*

The mute swan population remained low in Virginia until the 1980s. The 1986 MSMSS showed a population of 60 mute swans, however by 1999 the population increased to over 500 birds. This increase can be attributed to a number of sources including escapees from private collections, progeny of these and other feral breeding swans, recent releases by landowners (collectors, homeowners, golf courses, etc.), and birds moving into the state from other areas, most notably from further north in the Chesapeake Bay (Costanzo 2004).

A fast growing segment of this population is located on the islands/marshes in the Chesapeake Bay near the Maryland border where groups of 30-50 mute swans have been counted in the past several years. Many of the swans are located on inland waters near areas where they have been released. However, swan numbers are increasing in coastal areas also (Costanzo 2004).

### **E. Management of Mute Swan**

Wildlife population management falls into two categories: 1) affecting reproductive output; and 2) affecting the survival rate of adult birds. In the first category, the most effective management strategy for affecting reproductive output in mute swans is by destroying their eggs and nest. Adding eggs reduces the proportion of nests that successfully produce cygnets and is widely accepted as a management strategy. However, it's effect is limited to that portion of the population with the greatest natural mortality rate and therefore has the least effect on population control and reduction (Cooper and Keefe 1997). It is also very costly in person hours, equipment use, and time afield. Additionally, using current demographic information, a mathematical model (MDNR 2003) for a mute swan population was constructed and allows a comparison of how changes to reproductive output or survival rates influence the growth rate and size of the Maryland mute swan population. The model was run at different levels of hatching success to simulate various levels of egg adding effort. The simulations indicated that it is necessary to reduce hatching success by 80% just to stabilize the Maryland population. In contrast, when annual adult survival rates in the model were reduced, it took just a 20% reduction to result in a population that will slowly decline over time. Rockwell et al. (1997) noted that actions taken to increase the mortality rate of adult lesser snow geese would be the most effective way to reduce

the size of an overabundant mid-continent population of the species. Actions to increase the mortality rate of adult mute swans, however, has proven to be controversial among a portion of the public. In some areas, the establishment of a hunting season could provide a cost-effective means for population control. The most effective method of controlling adult survival rates is to euthanize adult birds during the molt. As long as mute swans are protected under the MBTA, any population control would require authorization from FWS.

#### **F. Management Efforts in the Chesapeake Bay Watershed**

Prior to U.S. Court of Appeals ruling (*Hill vs. Norton*, U.S.D.O.I. et al. 2001), state wildlife agencies in the Chesapeake Bay watershed have attempted various population control measures for mute swan in the past, including egg addling, relocation, and shooting of adult birds.

##### ***Pennsylvania***

Mute swans were unprotected in Pennsylvania; they could be taken without a permit at any time of the year (AFC 2003). As such, mute swans have normally been destroyed by PGC personnel whenever found on public lands in Pennsylvania. While there has been no formal eradication program for private lands, landowners have been free to euthanize them at any time.

##### ***Maryland***

MDNR along with personnel from FWS National Wildlife Refuges have conducted egg addling and removal of adult swans from state and federal properties. In the mid 1990s, approximately 250 birds from a local flock that damaged a skimmer and tern colony, were captured and transferred to Asia by a game breeder based in New Mexico. Until 1998, local residents were allowed by permit to addle eggs, destroy nests, and shoot nuisance birds. Shooting was prohibited by MDNR policy in 1998 (AFC 2003).

MDNR developed a statewide mute swan management plan which was approved by Governor Ehrlich in April 2003. The plan's management strategies include excluding or removing mute swans from "swan free areas" to afford protection to habitats critical to the Bay's living resources. Control may include lethal control in areas where ecological damage is occurring and when non-lethal methods are ineffective and impractical; reducing the mute swan population as quickly and efficiently as possible, consistent with activities to protect, restore, and enhance the Bay's resources; preventing further mute swan population growth by continued egg addling; annual monitoring of the population; preventing mute swans' access to certain habitats in the Bay; and strictly regulating captive possession, sale, importation, breeding, and trade; and providing resolution to conflicts between humans and mute swans (MDNR 2003).

The FWS issued the MDNR a depredation permit in March 2003 for the take of 1,500 adult birds. In response to a court challenge, the Service requested on May 16, 2003, that the MDNR surrender the permit to allow the Service the opportunity to evaluate a range of alternatives for managing mute swans under the MBTA (USFWS 2003). Since June 5, 2003 MDNR has not employed any lethal control activities.

##### ***Virginia***

As a listed nuisance species in Virginia, mute swans were controlled when they caused conflict, imposed economic damage, or pose a threat to the environment. The Virginia

Department of Game and Inland Fisheries (VDGIF) conducted limited egg addling and removal of adult birds on National Wildlife Refuges, State Wildlife Management Areas, military installations, and private lands (AFC 2003). A small number of mute swans are incidentally taken during Virginia's tundra swan seasons.

## **G. Policy Background**

### **i. Federal Policy**

In December 2001, the mute swan became a federally-protected migratory gamebird species in the United States. The U.S. Court of Appeals (Hill vs. Norton, U.S.D.I. et al., 2001) ruled that since the mute swan belongs to the family Anatidae it therefore came under the jurisdiction of the Migratory Bird Treaty and Federal Protection (Title 50 Code of Federal Regulations Part 10.13), which provides the FWS with authority over any activity that directly impacts the birds, their eggs, or nests. Prior to this ruling, the USFWS did not consider the mute swan covered under the MBTA and the states had primary management authority for this species.

The USFWS instituted a mute swan policy in 2002 that allowed depredation permits to be issued to individual states for mute swan population control efforts. In February 2002 the Service prepared an information leaflet titled "Federal Protection of the Mute Swan" (Williams 2002). In this document, management options available to the Service are listed. The options are as follows: 1) development of management plans for the mute swan in cooperation with State agencies and the Flyway Councils; 2) establishment of hunting season frameworks for mute swans in cooperation with State agencies and the Flyway Councils [as a "swan" and a member of Anatidae, the mute swan is automatically a "game bird" as defined in the MBTA and the conventions]; 3) issuance of depredation permits to State agencies and others allowing the take of depredating mute swans; and 4) establishment of a depredation order allowing State agencies and others to take depredating mute swans without need of a federal permit. Federal permits are now needed to legally take, possess, transport, sell, purchase, barter, import, export, band, and mark mute swans.

### **ii. Atlantic Flyway Policy**

The Atlantic Flyway Council (AFC) is an administrative body comprised of 23 state and provincial wildlife agencies that was organized in 1952 for the purpose of managing migratory gamebird populations, including waterfowl. The AFC established a policy in 1997 to control mute swan growth in the AF. The policy consists of the following actions: 1) state and provincial wildlife agencies obtain the authority over sale and possession of mute swans and their eggs; 2) the sale of mute swans, their young, or eggs should be prohibited; 3) elimination of all importing and exporting of mute swans without a special purpose permit issued by a state's wildlife agency; 4) mute swans captured due to nuisance complaints, sickness, or injury should be removed from the wild or euthanized; 5) where feasible, egg-addling programs should be established; 6) both states and federal wildlife agencies should institute programs to eliminate mute swans and prevent their establishment; 7) both states and provinces should seek to make the mute swan an unprotected species if this is not already the case; 8) states should strive to manage mute swan populations at a level that will have minimal impact to native wildlife species or habitat. In 1998, FWS issued a policy statement supporting the AFC's request for controlling mute swans on NWRs in Region's 1-7, therefore joining several states (RI, DE, MD, VT, NY, WI, and WA) with

existing control policies (AFC 2003).

### **iii. State Policies**

#### ***Pennsylvania***

Currently, the PGC does not have a policy for mute swans and has no regulations restricting their import, export, sale, or release. Historically, the Pennsylvania Game and Wildlife Code has followed the MBTA in classifying mute swans as a non-protected species (AFC 2003).

#### ***Maryland***

In Maryland, mute swans are regulated as Wetland Game Birds (Natural Resources Article [NR], Section 10-101). This law does not list native waterfowl species, but only identifies them as ducks, mergansers, brant, geese, and swans. The state law was promulgated prior to the accidental introduction of mute swans in Maryland. The law gave MDNR the authority to allow the taking of wetland game birds during an open hunting season, although no swan season has been opened in the state since 1918. Further, state law gives MDNR the authority to regulate the possession, sale, trade, exportation, and importation of mute swans in Maryland (NR Article Section 10-903)(AFC 2003).

In 2001, Maryland Natural Resource Article, Section 10-211 required the MDNR to establish a program to control the population of mute swans and authorized the MDNR to include the managed harvest of adult mute swans in this program. A Mute Swan Task Force appointed by the MDNR prepared management recommendations. The cornerstone of the Mute Swan Task Force recommendations was the protection of native species and their habitats from the effects of mute swans. The Task Force recommended that MDNR establish "Swan Free Areas" to exclude or remove mute swans from sensitive habitats and Bay resources. In 2002, the Maryland General Assembly adopted Senate Joint Resolution 15 urging the FWS to act with expedience to craft and conduct appropriate regulatory processes under the MBTA, which will allow Maryland to establish a method of controlling the mute swan population and to mitigate the mute swan population's impact permanently and statewide (AFC 2003).

#### ***Virginia***

Prior to the recent change in federal status, mute swans in Virginia were designated as a nuisance species (4 VAC 15-20-160) where upon there was a continuous open season for killing when causing or about to cause economic losses in the Commonwealth; becoming detrimental to public health and welfare; defacing or defiling public or private property, or otherwise creating a public nuisance (§3.1-1011 & §29.1-100). After the 2001 federal ruling, mute swans were removed from Virginia's nuisance species list. Since mute swans are not classified as a nuisance species or game bird. They have a closed season where it is unlawful to take, possess, transport, or sell without a state or federal permit.

## **II. Management Actions - Explanatory Text for the Implementation Table**

### **Goal:**

To manage the Chesapeake Bay population of mute swans to a level that a) minimizes impacts on native wildlife, important habitats, and local economies; b) minimizes conflict with humans; c) is in agreement with Chesapeake 2000 Agreement goals for SAV and invasive species; and

d) is in agreement with the Atlantic Flyway Mute Swan Management Plan

## **A. Leadership, Coordination, and Regulatory Authority**

### **Objective 1:**

Improve coordination among the states in the Chesapeake Bay watershed with regard to population monitoring, research, and management of mute swan.

#### **Actions:**

**1.1:** Maintain a database of monitoring, research, and management activities for mute swans in the Chesapeake Bay. This would include an inventory of available data and a description of current databases. A point person will be identified from each agency or academic institution involved with the monitoring, research, or management of mute swans to assist in obtaining the information for creation of the database.

### **Objective 2:**

Develop federal and state regulatory language to facilitate efficient population management in the Chesapeake Bay.

#### **Actions:**

**2.1:** Maryland, Virginia, and Pennsylvania wildlife resource agencies will work with other states, the International Association of Fish and Wildlife Agencies, and the FWS to develop regulatory language to facilitate efficient population management in Chesapeake Bay.

#### **2.2:**

##### ***Maryland***

Maryland strongly urges the Federal de-listing of mute swans as a migratory game bird. The MDNR will work with the Maryland General Assembly to amend existing state law (NR Article, Section 10-101), which classifies the mute swan as a Wetland Game Bird. The statute should be amended to include only native migratory game bird species. The MDNR will also encourage the Maryland General Assembly, consistent with federal regulations, to amend NR Article, Section 10-101, by adding the mute swan, Australian black swan (*Cygnus atratus*), and other invasive, non-native bird species to the list of unprotected birds in Maryland. Presently, the only non-native, unprotected birds listed in this law are the English house sparrow (*Passer domesticus*) and European starling (*Sturnus vulgaris*).

##### ***Virginia***

The VDGIF strongly urges the Federal delisting of mute swans as a migratory game bird. Prior to 2001 when mute swans were listed as a nuisance species in Virginia, VDGIF had the option to control mute swans as the state saw appropriate. If the USFWS offers a mute swan hunting season, Virginia would reclassify mute swans as a game bird to offer a hunting season on mute swans.

**2.3:** In 2003, promulgate state regulations or add conditions to all federal and state permits governing the possession of migratory birds, prohibiting the release of mute swans to the wild. Following capture of healthy swans and/or recovery of sick and injured swans, every effort will be



made by the states to place the swans in captivity at a facility permitted to possess mute swans. In the event that this is not possible, swan(s) will be humanely euthanized by a veterinarian authorized by the state wildlife agencies in accordance with a federal permit. States should encourage the FWS to develop a policy for regulating captive mute swan. No such policy exists now.

**Objective 3:**

Document monitoring, research, and management activities conducted to successfully implement the plan.

**Actions:**

**3.1:** Utilize a web-based clearinghouse to provide an exchange of information among the states to efficiently implement the management plan. This could include posting available databases, contacts for databases, current information on mute swan management and research, current state and federal laws and policies regarding management of mute swan, and outreach materials.

**B. Detection and Monitoring**

**Objective 1:**

Improve consistency among the states in the Chesapeake Bay in data collection and database management.

**Actions:**

**1.1:** Develop a standardized protocol for collecting data for surveys and creating and managing databases.

**Objective 2:**

Monitor the size and distribution of the mute swan population and the effectiveness of management actions.

**Actions:**

**2.1:** Conduct a Bay-wide survey to determine distribution and population size utilizing aerial surveys for the Chesapeake Bay and its tributaries and citizen groups to monitor inland areas. Determine frequency and time of year the survey is conducted.

***Pennsylvania***

The PGC will continue to conduct ground surveys every three years as part of the Atlantic Flyway Mute Swan Mid-Summer Survey (MSMSS).

***Maryland***

The MDNR will conduct an annual spring aerial survey in the tidal portions of the Bay to determine the locations of active mute swan nests and breeding pairs to facilitate effective egg addling and removal of swans from Swan-Free Areas. An annual summer aerial survey of mute swans on the tidal portions of the Bay will also be conducted to determine the size and

distribution of the swan population. This survey will also be used to measure the effectiveness of population control efforts and provide the locations of breeding pairs for removal of swans from Swan-Free Areas.

### *Virginia*

Virginia Department of Game and Inland Fisheries will continue participation in the Atlantic Flyway Mute Swan Mid-Summer Survey (MSMSS), which is conducted every three years. VDGIF also maintains a database of mute swan locations that are reported by field staff and the public throughout the year. These locations are verified during the MSMSS. Virginia also monitors the mute swan population through its annual mid-November and mid-Winter waterfowl surveys.

#### **Objective 3:**

Conduct additional research that will increase understanding of the role of mute swan in the Chesapeake Bay ecosystem and their impacts on living resources. This research should contribute to achieving mute swan management goals and objectives.

#### **Actions:**

**3.1:** Investigate further the role of mute swan herbivory on SAV growth, biomass, plant survival, and regeneration and reproduction, especially as it relates to the availability of SAV to wintering waterfowl and the achievement of SAV restoration goals.

**3.2:** Determine the role of interspecific competition between mute swans and native wildlife, especially the impact of mute swans on wintering tundra swans and nesting species of concern such as black duck.

#### **Objective 4:**

Investigate the use of nonlethal swan population control methods.

**4.1:** Continue to evaluate nonlethal methods of controlling mute swans. Such methods shall include exclusion, hazing (e.g., harassment), and any other methods that may become available.

**4.2:** Assist in conducting research on the effectiveness of sterilization of male swans as a method of reducing annual cygnet production at the local level. The use of this technique as a future management tool is conditional upon the success of this research. This technique will not be used as a general population control method. Rather, sterilization may be used at specific sites where removal of breeding pairs may not be practical. Federal authorization (50 CFR 21.27) will be required to conduct this investigation.

### **C. Prevention, Control, and Management**

#### **1. Population Management and Resource Protection**

### *Maryland*

**Objective 1:** Exclude or remove all mute swans from Swan-Free Areas (Appendix A) to afford

protection to habitats critical to the Bay's Living Resources; reduce the mute swan population as quickly and effectively as possible, consistent with activities to protect, restore, and enhance the Bay's Living Resources. This will require reducing the swan population to pre-1986 levels (e.g., <500 birds).

**Actions:**

**1.1:** The MDNR will continue to implement an aggressive egg addling effort to reduce hatching success by at least 60%. Implementation of this strategy will slow the population growth rate and reduce the number of adult swans that would have to be removed by lethal methods to achieve management goals. The MDNR will make every effort to treat all swan nests located in public waters and on private property with landowner permission.

**1.2:** The MDNR will seek federal authorization (Depredation Order 50 CFR Part 21.41) to begin removing mute swans from Swan-Free Areas. The MDNR will initiate activities to either prevent or remove mute swans from occupying Swan-Free Areas. Recognizing that swans impacting SAV beds and other habitats classified as Swan-Free Areas may occur immediately adjacent to these areas, the scope of swan control efforts may be expanded to include these adjacent areas. If nonlethal methods to prevent mute swans from occupying Swan-Free Areas are ineffective or impractical, swans will be removed using lethal methods.

Federal guidance for permit issuance involving mute swans prohibits the release of mute swans into areas outside their existing range. With federal authorization, small numbers of swans may be captured, sterilized, and placed in existing captive waterfowl flocks. However, the MDNR will not authorize the relocation of swans, including same-sex pairs to natural habitats in Maryland. The relocation of mute swans into unoccupied habitats would increase the distribution of mute swan in Maryland.

The relocation of same-sex pairs does not prevent breeding if a bird of the opposite sex locates and enters the relocation site. The possibility of breeding with wild, opposite-sex birds is high and would contribute to expansion of the breeding population, which is contrary to Maryland, FWS, and AFC policies.

With federal authorization, mute swans may be captured and relocated to zoos where the birds would be used for scientific and educational purposes. However, the DNR will prescribe restrictive permit conditions for the possession of swans through the existing federal permit process (50 CFR 21.25). Any relocation of swans to other jurisdictions shall be done only with the approval of the USFWS and the government agency responsible for wildlife conservation in that jurisdiction and in accordance with that flyway, national, or international mute swan management plan, policy, law, or regulation.

***Pennsylvania***

**Objective 1:** The population objective for mute swans in Pennsylvania is zero free-ranging/feral mute swans and a maximum of 250 properly permitted birds in captivity.

**Actions:**

1.1: Continue to exercise direct population controls on state and federal lands. If a depredation permit is granted by the FWS to the PGC, agency employees will remove mute swans from public lands and from private lands with landowner permission.

*Virginia*

**Objective 1:**

A statewide population of less than 100 mute swans is desired for the state of Virginia. Efforts should be made to prevent mute swans from expanding their range in the state. In addition, mute swans should be removed or their numbers reduced wherever conflicts with wildlife populations, native habitats, or human populations may occur in Virginia. Efforts to control mute swans should include egg addling and removal of adult birds. Public desires to observe mute swans can be met by observing captive mute swans or the larger number of native tundra swans that spend the fall and winter in Virginia. Information and outreach programs should be enhanced to educate the public about mute swans and their impacts on the environment. Virginia is working with other states and organizations to monitor, evaluate, and control mute swan populations where necessary.

**Actions:**

1.1: If a depredation permit is granted by the USFWS to the Virginia Department of Game and Inland Fisheries, VDGIF would manage mute swan populations on public land and waters where mute swans cause conflicts with wildlife populations, native habitats, or human populations. The VDGIF would also assist private landowners in managing mute swans.

**2. Captive Mute Swan Management**

Captive swans that either escape or are released may be insignificant in terms of numbers, but they can dramatically affect distribution by introducing swans to new areas of the state. The possession of captive mute swans is now regulated by federal permit (50 CFR 21.25). Federal permits authorizing activities involving live mute swans will include restrictive conditions to ensure that permitted activities do not facilitate expansion of the range or population of mute swans, for example, prohibiting the release of live mute swans or their eggs into areas outside their existing range, or onto any federal lands.

**Objective 1:** Prevent the escape and reproduction of captive mute swans.

*Maryland*

1.1: In 2004, promulgate regulations and/or add conditions to federal and state permits that prohibit the sale, trade, barter, and importation of mute swans, or their eggs, in Maryland.

1.2: Persons possessing mute swans now must possess either a Federal Waterfowl Sale and Disposal Permit of a Federal Form 3-186. Persons possessing mute swans will be required by the MDNR to secure a state permit. However, the MDNR shall only permit the possession of mute swans at location where swans have legally been held in captivity prior to enactment of state

regulations. After this date, the MDNR will not authorize any additional state permits to purchase or import mute swans.

***Pennsylvania***

**1.1:** In 2003, promulgate regulations and/or add conditions to federal and state permits that prohibit the sale, trade, barter, and importation of mute swans, or their eggs, in Pennsylvania.

***Virginia***

**1.1:** A state permit from Virginia Department of Game and Inland Fisheries is required to possess, propagate, buy and sell any swan in Virginia (§29.1-412, §29.1-103, §29.1417) in conjunction with the necessary Federal Waterfowl and Disposal Permit Form 3-186. Currently, VDGIF is not accepting application for any new permits for mute swans.

**3. Relief of Human Safety and Nuisance Conflicts**

**Objective 1:**

Reduce conflicts between mute swans and people.

**Actions:**

***Maryland***

Natural Resources Article, Sections 10-205 and 10-206 and federal regulations (50 CFR 21.41) authorize the MDNR to resolve conflicts between mute swans and people by allowing either the capture or lethal removal of mute swans. However, any removal of nuisance mute swan will be done US Department of Agriculture (USDA), Wildlife Services.

**1.1:** The MDNR with the USDA Wildlife Services will continue to provide technical information and guidance to property owners who are experiencing nuisance, safety, and habitat depredation problems caused by mute swans. Wildlife Services and MDNR personnel may suggest the use of nonlethal, lethal, or a combination of techniques to resolve swan conflicts. The recipient of technical assistance is responsible for securing the required federal and state permits before implementation of recommended, lethal control actions.

**1.2:** The MDNR shall seek a Federal Depredation Order that will authorize property owners, land or water management authorities, municipalities, and other responsible parties in Maryland to control or remove mute swans occurring on lands or waters in their jurisdiction. Such a depredation order will apply to situations where control or management of mute swans is necessary to protect personal property, human health, and safety, or native plant and animal resources. The depredation order will include guidelines to ensure, to the extent possible, that control measures used are safe and effective. No federal or state permit is needed to haze mute swans. Property owners will have primary responsibility for deciding, on a case-by-case basis, whether mute swans on their property are desirable and what control measures are acceptable. The MDNR will recommend that effective and practical nonlethal methods be used to resolve the problem where appropriate, before lethal control is initiated by the permittee. Prior to the

adoption of a Federal Depredation Order, property owners will be required to obtain a Federal Depredation Permit to control or remove mute swans occurring on lands or waters under their jurisdiction. Federal permits will be reviewed by the DNR and shall include conditions to ensure, to the extent possible, that control measures used are safe, effective, and practical. However, the permittee is responsible for implementation of any and all control options.

### *Pennsylvania*

**1.1:** U.S. Department of Agriculture's Wildlife Services and PGC staff will provide technical information and guidance to property owners who are experiencing nuisance, safety, and habitat depredation problems caused by mute swans as requested and as resources permit.

### *Virginia*

**1.1:** Virginia Department of Game and Inland Fisheries will continue to provide technical information and guidance to property owners who are experiencing nuisance, safety, and habitat depredation problems caused by mute swans. VDGIF encourages an integrated approach in resolving nuisance wildlife issues that include the use of nonlethal, lethal, or a combination of techniques to resolve conflicts. The VDGIF is seeking a Federal Depredation Permit that will authorize VDGIF staff or an authorized agent to control mute swans.

## **D. Communication and Information Access**

Implementation of mute swan management on a Bay-wide basis must occur concurrently with an effort to educate and inform citizens about mute swans. These programs should convey an understanding of the status of the mute swan population in the Chesapeake Bay, the impact of mute swans in the Bay's ecosystem, and the problems they create for people.

### **Objective:**

Increase public awareness about mute swans and their impact to the Bay's living resources.

**1.1:** Conduct a systematic survey of public knowledge, perceptions, and values regarding mute swans in the Chesapeake Bay.

**1.2:** Develop and implement a comprehensive mute swan communication program. Target programs to specific demographic groups, as well as shoreline owners and watershed community residents. There is a critical need to increase public awareness of the difference between mute swans and native tundra swans and the impacts that mute swans have on the Chesapeake ecosystem. Emphasis should also be placed on discouraging the winter feeding of mute swans because it increases their winter survival.

**1.3:** Develop a web based clearinghouse to provide an exchange of information among the states to efficiently implement the management plan. This could include posting available databases, contacts for databases, current information on mute swan management and research, current state and federal laws and policies regarding management of mute swan, and outreach materials.

### A. Leadership, Coordination, and Regulatory Authority

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
1. Improve coordination among the states with regard to data collection	1.1	Maintain a regional database of monitoring, research, and management activities in each state; identify point person in each state to obtain information and assist in creation of database	initiate in 2005 and then update annually	none, in-kind services		MDNR, VDGIF, PGC	USFWS, USGS
2. Facilitate efficient population control in the Chesapeake Bay	2.1	Develop federal regulatory language to facilitate efficient population management in the Chesapeake Bay	As soon as possible	none, in-kind services		MDNR, VDGIF, PGC, FWS	International Association of Fish and Wildlife Agencies

**A. Leadership, Coordination, and Regulatory Authority (con.)**

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
	2.2	<i>Maryland</i> Amend existing state law (NR Article, Section 10-101), which classifies mute swan as a Wetland Game Bird; amend NR Article, Section 10-101 to add mute swan to the list of unprotected birds in Maryland	under consideration	in-kind		MDNR	
		<i>Virginia</i> If the Service offers a mute swan hunting season, VA will reclassify mute swans as a game bird	dependent on USFWS	in-kind		VDGIF	
	2.3	Promulgate state regulations governing the possession and release of mute swans to the wild	on-going	in-kind		MDNR, VDGIF, PGC	



**A. Leadership, Coordination, and Regulatory Authority (con.)**

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
3. Document monitoring, research, and management activities conducted to successfully implement the plan							
	3.1	Utilize a web based clearinghouse to provide an exchange of information among the states to efficiently implement the plan	Initiate in 2005; update several times a year	in-kind		MDNR, VDGIF, PGC, FWS	USGS, CBP

## B. Detection and Monitoring

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
1. Improve consistency among the states in data collection and database management							
	1.1	Develop a standardized protocol for collecting data for surveys and creating and managing databases	Initiate in 2005; then 6 months for development	in-kind		MDNR, VDGIF, PGC, FWS	USGS, AFC
2. Monitor the size and distribution of the mute swan population and the effectiveness of management actions							

**B. Detection and Monitoring (con.)**

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
	2.1	Conduct a Bay wide survey to determine distribution and population size utilizing aerial surveys for the Bay and citizen monitoring groups for inland areas	<p>a. PGC - ground surveys every three years;</p> <p>b. MDNR-annual spring and summer aerial survey in tidal areas;</p> <p>c. VDCIF-aerial surveys every three years; field and public data throughout year; mid-November and mid-winter waterfowl surveys</p> <p>d. Citizen Monitoring- initiate by 2005, then states maintain database</p>	a,b,c -in kind; d- to initiate and develop website- \$20,000	Alliance for the Chesapeake Bay	PGC, MDNR, VDCIF	FWS, USGS
3. Conduct additional research that will increase understanding of the role of mute swan in the Chesapeake Bay ecosystem							

**B. Detection and Monitoring (con.)**

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
	3.1	Examine effects of herbivory on SAV	initiated in 2003, to be completed by 2005	140,000	MDNR	MDNR	FWS, West Virginia University
	3.2	Determine the role of interspecific competition between mute swans and native wildlife	started in 2003, to be completed by 2004	60,000	MDNR	MDNR	USGS-NY CWRU Cornell University
4. Investigate the use of non-lethal swan population control efforts							
	4.1	Assist in conducting research to determine the effectiveness of nonlethal methods of controlling mute swan populations, including hazing, exclusion, and any other methods that become available	On-going but at small scale		MDNR	MDNR	

**B. Detection and Monitoring (con.)**

<b>Objective</b>	<b>Tasks</b>	<b>Task Description</b>	<b>Task Duration</b>	<b>Cost</b>	<b>Funding Source</b>	<b>Lead Agency</b>	<b>Partners</b>
	4.2	Evaluate the effectiveness of sterilization of male swans as a method of reducing annual cygnet production at a local level	Pilot work initiated in 2000	in-kind	MDNR	MDNR	

**C. Prevention, Control, and Management**

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
<u>Population Management and Resource Protection Maryland</u> 1. Exclude or remove all mute swans from Swan Free Areas and reduce the mute swan population as quickly and efficient as possible							
	1.1	Continue to implement an aggressive egg addling effort to reduce hatching success by at least 60% in MD	Suspended by FWS in 2003	in-kind	MDNR	MDNR	USFWS, South River Federation, volunteers
	1.2	Seek federal authorization to begin removing mute swans from Swan-Free Areas in MD	Suspended by FWS in 2003	in-kind	MDNR	MDNR	USFWS

**C. Prevention, Control, and Management (con.)**

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
<p><i>Pennsylvania</i></p> <p>1. Achieve a population of zero free-ranging/feral mute swans and a maximum of 250 properly permitted birds in captivity.</p>							
	1.1	Continue to exercise direct population controls on state and federal lands	initiate after a depredation permit is granted	in-kind	PGC	PGC	USFWS
<p><i>Virginia</i></p> <p>1. Achieve a statewide population of less than 100 mute swans and prevent from expanding range in the state. Reduce numbers in areas where they are causing problems.</p>							

**C. Prevention, Control, and Management (con.)**

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
	1.1	If depredation permit is granted by USFWS, VDGIF will manage on public lands and waters where they are causing problems. VDGIF will also assist private landowners.	initiate after depredation permit is granted	in-kind		VDGIF	USFWS
	1.2	Remove mute swans from public lands and from private lands with landowner permission	initiate after a depredation permit is granted	in kind	VDGIF	VDGIF	USFWS
<b>Captive Mute Swan Management</b> 1. Prevent the escape or reproduction of captive mute swans							



**C. Prevention, Control, and Management (con.)**

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
<i>Maryland</i>	1.1	Promulgate regulations and/or conditions to federal and state permits that prohibit the sale, barter, and importation of mute swans, or their eggs, in Maryland.	2004	In-kind	MDNR	MDNR	USFWS
	1.2	Require a federal and state permit to possess swans in captivity. DNR will only permit possession of swans at locations where swans have legally been held in captivity prior to enactment of state regulations. After this date, the DNR will not authorize any additional state permits to purchase or import mute swans.	2004 then annually thereafter	In-kind	MDNR	MDNR	USFWS

**C. Prevention, Control, and Management (con.)**

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
<i>Pennsylvania</i>	1.1	Promulgate regulations and/or add conditions to federal or state permits that prohibit the sale, trade, barter, and importation of mute swans, or their eggs, in Pennsylvania.		In-kind	PGC	PGC	USFWS
Virginia	1.1	Continue to require a permit to possess, propagate, buy and sell any swan in Virginia.		In-kind	VDGIF	VDGIF	USFWS

**C. Prevention, Control, and Management (con.)**

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
<u>Relief of Human Safety and Nuisance Conflicts</u> 1. Reduce conflicts between mute swans and people.							
<i>Maryland</i>	1.1	Continue to provide technical information and guidance to property owners who are experiencing nuisance, safety, and habitat depredation problems caused by mute swans.	on-going	in-kind	MDNR, USDA WS	MDNR, USDA WS	USFWS
<i>Pennsylvania</i>	1.1	Provide technical information and guidance to property owners who are experiencing nuisance, safety, and habitat depredation problems caused by mute swans as requested and resources permit.	on-going	In-kind	PGC, USDA WS	PGC, USDA WS	USFWS

C. Prevention, Control, and Management (con.)

<u>Objective</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
<i>Virginia</i>	1.1	Provide technical information and guidance to property owners who are experiencing nuisance, safety, and habitat depredation problems caused by mute swans.	on-going	In-kind	VDGIF, USDA WS	VDGIF, USDA WS	
	1.2	Seek a Federal Depredation Order that will authorize property owners, land or water management authorities, municipalities, and other responsible parties to remove mute swans occurring on lands or waters in their jurisdiction when control or management of swans is necessary to protect personal property, human health, and safety, or native plant and animal resources.	initiate after a depredation permit is granted	in kind	MDNR, USDA WS	MDNR, USDA WS	USFWS

**D. Communication and Information Access**

<u>Action</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
1. Increase public awareness about mute swans and their impact to the Bay's living resources	1.1	Conduct a random survey of public knowledge, perceptions, and values regarding mute swans in the Chesapeake Bay	one year; initiate in 2005	in-kind	MDNR	MDNR	VDGIF, PGC
	1.2	Develop and implement a comprehensive mute swan communication program	One year; initiate in 2005	in-kind	MDNR	MDNR	VDGIF, PGC

**D. Communication and Information Access (con.)**

<u>Action</u>	<u>Tasks</u>	<u>Task Description</u>	<u>Task Duration</u>	<u>Cost</u>	<u>Funding Source</u>	<u>Lead Agency</u>	<u>Partners</u>
	1.3	Establish and maintain a web based information clearinghouse	2 years	\$30,000	Sea Grant Nonindigenous Species Outreach Grant	CBP	CBP, USFWS, NPS, USGS, MDNR, VDGIF, PGC

**Agency Abbreviations:** Atlantic Flyway Council (AFC), Chesapeake Bay Program (CBP), Maryland Department of Natural Resources (MDNR), Pennsylvania Game Commission (PGC), United States Department of Agriculture - Wildlife Services (USDA WS), United States Fish and Wildlife Service (FWS), United States Geological Survey (USGS), United States Geological Survey Cooperative Wildlife Research Unit (USGS CWRU)

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## **APPENDIX A: Swan-Free Areas (from Maryland Mute Swan Plan, 2003)**

All mute swans will be either excluded or removed from the following areas:

**Important SAV Beds** - Submerged Aquatic Vegetation (SAV) is one of the most critical living resources in the Chesapeake Bay; not only do SAV beds support fish, crab, and native waterfowl populations, but they directly improve water quality through a variety of physical and chemical processes. SAV populations are already far below historic levels, primarily due to water quality degradation following increases in human population and land use changes in the Chesapeake Bay watershed. Although the consequences of the recent accidental introduction of mute swan to the Chesapeake Bay region have not been quantified, studies of mute swans in several areas of the world have shown that these birds can negatively impact SAV communities. Whether through direct consumption, interrupting reproduction, or even trampling, mute swans could potentially exert significant local pressure on SAV survival and thus on many living resources of the Bay. The continued growth and expansion of the mute swan population in the Bay is counter to the Chesapeake 2000 Agreement's Vital Habitat Protection and Restoration goals, in particular the goal to, "Preserve, Protect, and Restore those habitat and natural area vital to the survival and diversity of the living resources of the Bay and its rivers."

All species of SAV will receive equal protection, for all species provide physical and water quality benefits such as reducing sediment re-suspension, increasing dissolved oxygen levels, and absorbing and sequestering nutrients. For these reasons, there are clear ecological benefits to the presence of any species of SAV. Below are SAV beds that are critically important to the Bay's living resources and have been identified by the Chesapeake Bay Program as partial fulfillment of the goals and objectives of the Chesapeake 2000 Agreement. Submerged aquatic vegetation beds to be protected from mute swans are mapped and include:

- 1) SAV restoration sites
- 2) Areas vegetated less than 30% of the time since 1990 to current survey
- 3) SAV in areas that contain less than 25% of its historical acreage
- 4) SAV beds that are declining in size
- 5) SAV in the vicinity of large numbers of mute swan
- 6) Core SAV bed areas (areas that have the highest persistence of SAV coverage between 1984 and 2002). These sites are believed to be consistent seed and propagule source areas.

**Submerged Aquatic Vegetation Transplanting Sites** - These are plots that are transplanted in areas where SAV are completely absent or far below historic levels. Transplantings range from 1/16 to 1 acre in size. Only native SAV species are used for transplanting (e.g., redhead grass, sago pondweed, wild celery, and eelgrass). Fencing is often erected the first year to prevent grazing and uprooting by Canada geese and mute swans. The protection to SAV from fencing declines over time as the fencing is not maintained and deteriorates due to tidal action, etc.

**Publicly Owned Wetlands** - Wetlands on DNR Wildlife Management Areas, State Parks, and

Natural Resource Management Areas, U.S. Fish and Wildlife Service's Chesapeake Marshland National Wildlife Refuge Complex (Blackwater, Martin, Barren Island, Susquehanna, Bishops Head, and Spring Island) and Eastern Neck National Wildlife Refuge and the National Park Service's Assateague Island National Seashore and other publicly owned wetlands.

**Colonial Waterbird Nesting Sites** - These are known sites where black skimmers and terns (common, least, Foster's) nest on natural sand or oyster shell beaches where mute swans may loaf and cause either chick mortality or nest abandonment. Areas to be protected include the Chincoteague, Sinepuxent, and Assawoman Bays, where about 75% of the colonial waterbird colonies presently occur. Other nesting areas requiring protection from swans include Tar Bay and Barren, Bloodsworth, Smith, Coaches, and Poplar Island.

**Black Duck Nesting Habitats** - Black ducks use salt marshes, coastal islands and meadows, brackish and freshwater impoundments, and riverine marshes for nesting. Because of the black duck's aversion to human disturbance, most black ducks nest on uninhabited islands or remote marshlands and adjacent uplands. Known nesting occurs throughout the Chesapeake Bay area with the greatest densities thought to occur on the Eastern Shore of Maryland from the Chester River south to the Crisfield area. Known black duck nesting areas are mapped (Map 35 in S.L. Funderburk, S.J. Jordan, J.A. Mihursky, and D. Riley, editors. *Habitat requirements of Chesapeake Bay living resources*. Maryland Department of Natural Resources, Annapolis, USA).

