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

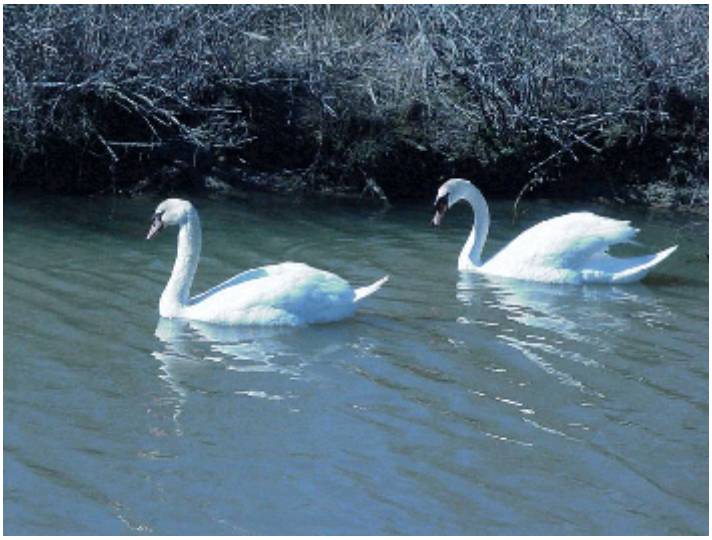

Photo by: Julie Thompson, USFWS

Prepared by:
The Chesapeake Bay Mute Swan Working Group

Chaired by: Julie A. Thompson
United States Fish and Wildlife Service, Chesapeake Bay Field Office

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Chesapeake Bay Mute Swan Working Group Members

Tom Bidrowski, Virginia Department of Game and Inland Fisheries
Gary Constanzo, Virginia Department of Game and Inland Fisheries
Doug Forsell, United States Fish and Wildlife Service
Ian Gregg, Pennsylvania Game Commission
Larry Hindman, Maryland Department of Natural Resources
Jonathon McKnight, Maryland Department of Natural Resources
Matthew Perry, United States Geological Survey
Julie Thompson, United States Fish and Wildlife Service

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Executive Summary

Mute swans are an invasive, non-native species that now inhabit the Chesapeake Bay in large numbers. Numbers of mute swans have drastically increased since 1986. 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 animals in the Bay. Adverse ecological effects are occurring as a result of the large population of mute swans and will increase if the population is allowed to grow.

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 *(Cygnus olor)* 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 2003, a Chesapeake Bay Mute Swan Working Group, was appointed by the CBP, comprised of many of the workshop participants, as well as other natural resource managers and researchers, to develop a final Bay-wide management plan.

This final management plan is a product of the draft management strategy developed for Mute Swan at the May 2003 workshop. Workshop participants developed a draft management strategy utilizing four different components: 1) Leadership, Coordination, and Regulatory Authority; 2) Detection and Monitoring; 3) Prevention, Control, and Management; and 4) Communication and Information Access. Participants identified specific actions for each of the components that should be taken to meet the goal of their management strategy. An implementation table was developed and included a time frame for completing the actions, identification of agencies responsible for leading actions, the partners that should be involved, the funding/cost share, and the source of funding. To insure that the draft Bay-wide management strategy developed at the workshop was realistic in terms of feasability of implementing actions, including agency leads and sources of funds available to implement actions, a Bay-wide Working Group was established to evaluate the draft management strategy, make changes if needed, and develop a final plan to be submitted to the Implementation Committee of the Chesapeake Bay Program for approval. 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.

The goal of this 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 Plan.

Timing of implementation of many of the management actions in this plan, however, will depend on when the United States Fish and Wildlife Service (USFWS) is able to issue depredation permits to the states for population control. The USFWS 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 Service is withdrawing those decision documents. Effective October 8, 2003, those documents will not be 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).

I. Introduction

Because mute swan are not native to the Chesapeake Bay, they have escaped predators, diseases, and other factors that keep the species in check in its native range. The mute swan is facing organisms that did not evolve in its presence and that may not be adapted to competing with it or escaping from it. The presence of a large population of mute swans in the Chesapeake Bay presents major challenges to the state and federal agencies committed to restoring and protecting native aquatic resources that inhabit the Bay through the Chesapeake Bay Program's Chesapeake 2000 Agreement.

Although the impact of the mute swan cannot be quantified at this time, it's potential impact on native waterfowl and habitat, it's dramatic growth in the Bay region since 1986, and a lack of evidence that natural causes will limit the population in the future, warrants the need to manage the mute swan in the Chesapeake Bay. 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 114,000 acres of SAV. Mute swans can also compete with other native species for food and habitat and can cause conflicts with people.

Adverse ecological impacts being caused by the large population 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 more comprehensive Bay restoration effort.

In January 2003, the CBP ISWG convened a Mute Swan Workgroup comprised of researchers and federal and state natural resource managers, to develop a finalized Bay-wide regional 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 Plan. 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.

A. Introduction History

The mute swan is not native to the Chesapeake Bay. It 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 (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.

B. Summary of Biology and Ecology

i. Description

Included in the family Anatidae with ducks, geese, and swans, mute swans are the largest bird found in the Chesapeake Bay. Adult males are larger than females, averaging 10.8 kg while females average 8.4 kg (Ciaranca et al., 1997). The average length of males and females is 1.27 to 1.52 m. Adults can have a wing span that ranges from 1.8-2.4 m. Adult birds are white and have orange bills with a characteristic black, basal knob and a black terminal nail. The legs and feet of adults range in color from black to grayish pink. Mute swan cygnets are grayish brown or white with slate gray legs and feet or pinkish/tan feet. Cygnets lack the basal knob present in adults. White morph cygnets have tan bills and grey morph cygnets have slate bills.

ii. 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 began 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.

iii. 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. Following the death of a mate the remaining member of a pair may or may not choose another mate. 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, personal communication in AF Draft Plan, 2003), 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).

iv. 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 late Aug during peak SAV biomass production (AF, 2003). Molt concentrations as large as 600-1,000 birds have been reported in MD (MDNR, 2003).

v. Migration and Wintering Distribution

The mute swan's wintering distribution is similar to its breeding range. 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 (AF, 2003).

vi. Predation

Only a few animals prey upon mute swans. Large predators (racoon, otter, fox, coyote, 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 (AF, 2003).

vii. Longevity and Mortality

Survivability fluctuates annually depending upon winter severity and available food sources (AF, 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. 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, personal communication, in AF Draft Plan, 2003) and even rival males during territorial fighting (M. Ciaranca, personal communication, in AF Draft Plan, 2003). Lead poisoning from fish sinkers and spent shotgun pellets has been reported in North America (M. Ciaranca, personal communication, in AF Draft Plan, 2003). Eggs and young can be eaten by predators and nests can also become flooded. Natural mortality does occur from various waterfowl diseases, parasitic infections, and starvation.

C. Summary of Ecological Impacts

i. SAV Habitat

Mute swan feed almost exclusively on SAV (Ciaranca et al., 1997; Fenwick, 1983). SAV 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. SAV also contributes to chemical processes such as nutrient absorption and oxygenation of the water column. SAV 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 mainly 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 swan 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. Mute swans have the capability to feed in water up to 1.07 m deep (Owen and Cadbury, 1975) but typically feed in shallow water requiring less energy.

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 mated pairs of 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 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 114,000 acres of SAV. 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 Irerland (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 exclosure study conducted in Rhode Island (Allin and Husband, 2000) 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 AF, 2003).

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 (AF, 2003). Many swans will vigorously defend their nest and brood 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, personal communication in AF Plan, 2003). 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 other 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 waterfowl. Populations of several waterfowl species (e.g., redhead, canvasback, American widgeon, black ducks, and Atlantic brant) 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 trumpeter (*Cygnus buccinator*) and mute swans and between tundra swans (*Cygnus columbianus*) and mute swans. Johnson (Kellog Bird Sanctuary, unpublished report) reported on four anecdotal conflicts between trumpeter swans and mute swans in Michigan during early spring, 1990-1996. In those incidents trumpeter swans prevailed. If mute swans were to adapt to upland feeding behavior, there may be a potential for further interaction with wintering tundra swans (AF, 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. The time period in which tundra swans have decreased in Maryland coincide with a rapid increase in mute swan. 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, personal communication, in AF Plan, 2003). Food habit studies show that tundra swans and mute swans do compete for limited SAV food resources, but tundra swans feed on invertebrates and agriculture foods to a greater extent.

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 (*Rynchops niger*), least terns (*Sterna antillarum*), common terns (*Sterna hirundo*), and Foster's terns (*Sterno foresteri*) on sand bars in the Chesapeake Bay in Maryland (MD Report, 2001). 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.

iv. Conflicts With Humans

Mute swans can 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 (AF, 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 (AF, 2003). 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 (NYDEC, 1993).

D. Positive Values and Use

i. Aesthetic Values

Mute swan are considered a symbol of beauty, elegance, and tranquility by many people due to their large size, color, and gracefulness. Mute swans 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 AF, 2003).

E. 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 feral population of 94 birds. The highest concentrations of mute swan (approx. 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 (AF, 2003).

Maryland

From their introduction 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 shows a population of 3,624 birds. The reduced rate of increase since 1993 can be attributed, in part, to 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 (AF, 2003).

Mute swans are commonly found throughout Maryland's Eastern Shore and a few 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 (MDNR, 2003).

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 (MDNR, 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 mute swans have 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 (AF, 2003).

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 (AF, 2003).

F. 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. Addling eggs reduces the proportion of nests that successfully produce cygnets and is widely accepted as a management strategy. However, it is very costly in person hours, equipment use, and time afield. Additionally, 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). 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 population. The model was run at different levels of hatching success to simulate various levels of egg addling effort. The simulations indicated that it is necessary to reduce hatching success by 80% just to stabilize the 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. Capture and removal of adult mute swans, however, has proven to be controversial among the public and could be costly during the short term to state wildlife agencies. In some areas, the establishment of a hunting season could provide a cost-effective means for population control. A more effective means of controlling adult survival rates could be to remove and euthanize adult birds during the molt. As long as mute swans are protected under the MBTA, any large scale population control would require authorization from USFWS.

G. 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 and relocation or killing of adult birds.

Pennsylvania

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

Maryland

MDNR along with personnel from USFWS 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 removed and exported 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 in 1998 (AF, 2003).

Maryland developed a statewide mute swan management plan which was approved by Governor Ehrlich in March 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, this may include lethal control in areas where ecological damage is occurring and 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 Service 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).

Virginia

Virginia permitted the capture and relocation of same sex pairs to inland waters. As an unprotected species, mute swans were open to hunting at any time of the year by hunters or landowners who could demonstrate that the swans presented a conflict or threat. A small number of mute swans were also taken incidentally during limited tundra swan seasons held in Virginia. 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 (AF, 2003).

H. Policy Background

i. Federal Policy

In December 2001 the mute swan became a federally protected waterfowl 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 Part10.13), which provides the USFWS 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 regulatory authority was designated to the states.

The USFWS instituted a mute swan policy in 2002 that allows 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, USFWS 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 (AF, 2003).

iii. State Policies

Pennsylvania

Currently, Pennsylvania does not have a formal policy in regard to 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 (AF, 2003).

Maryland

Prior to the recent federal status, in Maryland, mute swans were regulated as Wetland Game Birds (Natural Resources Article [NR], Section 10-101, see Appendix B). 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, it gave MDNR the authority to regulate the possession, sale, trade, exportation, and importation of mute swans in Maryland (NR Article Section 10-903, see Appendix B) (AF, 2003).

In 2001, Maryland Natural Resource Article, Section 10-211 (Appendix B) required the MDNR to establish a program to control the population of mute swans and authorized the Department to include the managed harvest of adult mute swans in this program. A Mute Swan Task Force appointed by the Department 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 DNR 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 Resolution15 (Appendix C) urging the USFWS 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 (AF, 2003).

Virginia

The mute swan was listed as an exotic species in Virginia and control efforts, which included egg addling and removal of adult birds was permitted in certain areas (AF, 2003).

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 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 Plan

I. Leadership, Coordination, and Regulatory Authority

Objective 1:

Improve coordination among the states in the Chesapeake Bay watershed with regard to data collection for monitoring, research, or management of mute swan.

Actions:

1.1: Maintain a database of monitoring, research, or 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 USFWS to develop federal regulatory language to facilitate efficient population management in the Chesapeake Bay.

2.2: 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 DNR 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 swans, 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 and European starling.

Pennsylvania????/Amend existing state law or create new law

Virginia????????/Amend existing state law or create new law

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.

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.

Pennsylvania

Staff from the Pennsylvania Game Commission (PGC) will continue to conduct ground surveys every three years as part of the Atlantic Flyway Mute Swan Mid-Summer Survey (MSMSS). At this time they do not conduct nest surveys but could look into utilizing citizen monitoring to accomplish this.

Maryland

An annual spring aerial survey will be conducted 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, and other population control efforts.

Virginia

Staff from the Virginia Department of Game and Inland Fisheries will continue to conduct **aerial???** surveys every three years as part of the Atlantic Flyway Mute Swan Mid-Summer Survey (MSMSS). At this time they do not conduct nest surveys but could look into utilizing citizen monitoring to accomplish this**??????**

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: Evaluate 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 acquired 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 efficiently as possible, consistent with activities to protect, restore, and enhance the Bay's Living Resources.

Actions:
1.1: DNR 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 to achieve the management goal. The DNR will make every effort to treat all swan nests located in public waters and on private property with landowner permission.
1.2: DNR will seek federal authorization (Depredation Order 50 CFR Part 21.41) to begin removing mute swans from Swan-Free Areas. The DNR will initiate activities to either prevent or remove mute swans from occupying Swan-Free Areas. No federal permit is required to scare mute swans. Recognizing that swans impacting SAV beds and other habitats classified as Swan-Free Areas may occur immediately adjacent, the scope of swan control efforts may be expanded to include these adjacent areas. If non-lethal methods to prevent mute swans from occupying Swan-Free Areas are ineffective or impractical, swans will be removed using lethal methods. Swans killed under this strategy may be donated to public museums or public scientific and educational institutions for scientific and educational purposes, or charities for human consumption.

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 DNR 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, USFWS, and Atlantic Flyway 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 growth and to maintain the total statewide population at a maximum of 250 birds, located only on lands that are not being managed for wildlife diversity and with no geographic expansion from areas currently occupied.
This level will provide for some recreational viewing opportunities for the public on areas not managed for biodiversity and where there is no threat to native plants and wildlife.

Actions:
1.1: Continue to exercise direct population controls on state and federal lands. If a depredation permit is granted by the USFWS to the PGC, agency employees will remove mute swans (up to 100 birds/year by roundup, euthanasia, or shooting) from public lands and from private lands with landowner permission.

Virginia

Objective 1:
Stabilize populations at current levels or reduced in areas where they are causing problems.

Actions:
1.1: If a depredation permit is granted by the USFWS to the Virginia Department of Game and Inland Fisheries, agency employees will remove mute swans from public lands and from private lands with landowner permission?????. Virginia workgroup members please comment on.

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.

Maryland

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

Maryland

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 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 DNR to secure a state permit. However, the DNR 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 DNR 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 ??????

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 (Appendix B) and federal regulations (50

CFR 21.41) authorize the DNR to resolve conflicts between mute swans and people by allowing either the capture or lethal removal of mute swans.

1.1: The DNR with the U.S. Department of Agriculture's 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 DNR 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 DNR 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 DNR 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 in 50 CFR Part 20, 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-????

Virginia- ??????

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 random 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

Objective	Tasks	Task Description	Task Duration	Cost	Funding Source	Lead Agency	Partners
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 2004 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**	**on-going?**	**none, in-kind services**		**MDNR, VDGIF, PGC**	**USFWS, International Association of Fish and Wildlife Agencies**

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

Objective	Tasks	Task Description	Task Duration	Cost	Funding Source	Lead Agency	Partners
	2.2	**Amend existing state law (NR Article, Section 10-101), which classifies mute swan as a Wetland Game Bird; amend NR Article, Section 10-101to add mute swan to the list of unprotected birds in Maryland**	**on-going?**	**in-kind**		**MDNR**	
	2.3	**Promulgate state regulations governing the possession and release of mute swans to the wild**	**on-going**	**in-kind**		**MDNR, VDGIF, PGC**	

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

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

Objective	Tasks	Task Description	Task Duration	Cost	Funding Source	Lead Agency	Partners
	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**	**USFWS, USGS, CBP**

B. Detection and Monitoring

Objective	Tasks	Task Description	Task Duration	Cost	Funding Source	Lead Agency	Partners

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 2004; then 6 months for development**	**in-kind**		**MDNR, VDGIF, PGC**	**USFWS, USGS**

B. Detection and Monitoring (con.)

Objective	**Tasks**	**Task Description**	**Task Duration**	**Cost**	**Funding Source**	**Lead Agency**	**Partners**
2. Monitor the size and distribution if the mute swan population and the effectiveness of management actions							

	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**	**a. PGC - ground surveys every three years; b. MDNR-annual spring and summer aerial survey in tidal areas; c. VDGIF-aerial surveys every three years?? d. Citizen Monitoring-initiate by 2005, then states maintain database**	**a,b,c -in kind; d-to initiate and develop website-$20,000**	**Alliance for the Chesapeake Bay**	**PGC, MDNR, VDGIF**	**USFWS, USGS**
3. Conduct additional research that will increase understanding of the role of mute swanin the Chesapeake Bay ecosystem							

B. Detection and Monitoring (con.)

Objective	**Tasks**	**Task Description**	**Task Duration**	**Cost**	**Funding Source**	**Lead Agency**	**Partners**
	3.1	**Examine effects of herbivory on SAV**	**??? Larry-can you provide info. on this**				

	3.2	**Determine the role of interspecific competition between mute swans and native wildlife**	**??? Larry-can you provide info. on this**				
4. Investigate the use of non-lethal swan population control efforts							
	4.1	**Continue to evaluate nonlethal methods of controlling mute swan populations, including hazing, exclusion, and any other methods that become available**	**Larry-info?**				
	4.2	**Evaluate the effectiveness of sterilization of male swans as a method of reducing annual cygnet production at a local level**	**Larry-info?**				

C. Prevention, Control, and Management

Objective	**Tasks**	**Task Description**	**Task Duration**	**Cost**	**Funding Source**	**Lead Agency**	**Partners**

<u>Population Management and Resource Protection</u> ***Maryland*** **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%**	**annually**	**in-kind**	**MDNR**	**MDNR**	**USFWS, South River Federation**
	1.2	**Seek federal authorization to begin removing mute swans from Swan-Free Areas**	**initiate after an EIS is developed by USFWS and a depredation permit is granted**	**in-kind**	**MDNR**	**MDNR**	**USFWS**

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

Objective	Tasks	Task Description	Task Duration	Cost	Funding Source	Lead Agency	Partners
Pennsylvania **1. Manage for zero growth of mute swans and maintain the total statewide population at a maximum of 250 birds in areas not managed for wildlife diversity**							
	1.1	**Continue to exercise direct population controls on state and federal lands**	**initiate after an EIS is developed by USFWS and a depredation permit is granted**	**in-kind**	**PGC**	**PGC**	**USFWS**
Virginia **1. Stabilize populations at current levels or reduced in areas where they are causing problems**							

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

Objective	Tasks	Task Description	Task Duration	Cost	Funding Source	Lead Agency	Partners
	1.1	**Remove mute swans from public lands and from private lands with landowner permission**	**initiate after an EIS is developed by USFWS and a depredation permit is granted**	**in kind**	**VDGIF**	**VDGIF**	**USFWS**
Captive Mute Swan Management **1. Prevent the escape or reproduction of captive mute swans**							
Maryland	**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.**	**????**	**In-kind**	**MDNR**	**MDNR**	**USFWS**

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

Objective	Tasks	Task Description	Task Duration	Cost	Funding Source	Lead Agency	Partners
	1.2	**Require a federal and state permit to possess swans in captivity. DNR will only permit possession of swans at locations were 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.**	**?????**	**In-kind**	**MDNR**	**MDNR**	**USFWS**
Pennsylvania	**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**	**???????**		**In-kind**	**VDGIF**	**VDGIF**	**USFWS**

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

Objective	Tasks	Task Description	Task Duration	Cost	Funding Source	Lead Agency	Partners
Relief of Human Safety and Nuisance Conflicts **1. Reduce conflicts between mute swans and people.**							**USFWS**
Maryland	**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 APHIS**	**MDNR, USDA APHIS**	**USFWS**

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

Objective	Tasks	Task Description	Task Duration	Cost	Funding Source	Lead Agency	Partners
	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 an EIS is developed by USFWS and a depredation permit is granted**	**in kind**	**MDNR**	**MDNR, USDA APHIS**	**USFWS**

D. Communication and Information Access

Action	Tasks	Task Description	Task Duration	Cost	Funding Source	Lead Agency	Partners

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

D. Communication and Information Access (con.)

Action	Tasks	Task Description	Task Duration	Cost	Funding Source	Lead Agency	Partners
	1.1	**Conduct a random survey of public knowledge, perceptions, and values regarding mute swans in the Chesapeake Bay**	**????**	**?????**	**MDNR**	**MDNR**	**VDGIF, PGC**
	1.2	**Develop and implement a comprehensive mute swan communication program.**	**?????**	**??????**	**MDNR**	**MDNR**	**VDGIF, PGC**
	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: Chesapeake Bay Program (CBP), Maryland Department of Natural Resources (MDNR), Pennsylania Game Commission (PGC), United

States Department of Agriculture - Animal and Plant Health Inspection Service (USDA APHIS), United States Fish and Wildlife Service (USFWS), United States Geological Survey (USGS)

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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).

APPENDIX B: Maryland Statutes Pertaining to the Management of Mute Swan

Statutes within the Annotated Code of the Public General Laws of Maryland that pertain to management actions identified in this plan:

Natural Resources Article (NR), Section 10-101 includes the definition of wetland game birds. "Wetland game birds" mean brant, coots, ducks, gallinules, geese, mergansers, rails, snipe, and swan or any part, egg, offspring, or dead body of any of them. This section also defines unprotected birds. "Unprotected bird," means any English sparrow and European starling or any part, egg, offspring, or dead body of any of them.

NR Article, Section 10-205 authorizes the Department of Natural Resources (DNR) to adopt regulations to enlarge, extend, restrict or prohibit hunting, possessing, purchasing, shipping, carrying, transporting, or exporting wildlife.

NR Article, Section 10-206 authorizes the DNR to reduce the wildlife population in any county, election district, or other identifiable area after a thorough investigation reveals that protected wildlife is seriously injurious to agriculture or other interests in the affected area. The method of reducing the population is at the DNR's discretion.

NR article, Section 10-211 requires the DNR to reduce the wildlife population in any county, election district, or other identifiable area after a thorough investigation reveals that protected wildlife is seriously injurious to agricultural or other interests in the affected area. The method of reducing the population is at the DNR's discretion.

NR Article, Section 10-903 provides statutory authority for the DNR to adopt regulations that prohibit or restrict the importation, exportation, sale, release, or possession of wildlife not native to Maryland on a finding that the wildlife is harmful to native wildlife or to natural ecosystems.

NR Article, Section 10-905 prescribes the Game Husbandry License. The license specifies which species of game birds, which can be bred, raised, protected, or sold and for what purpose, the type of fencing or other requirements necessary to prevent undesirable mixing of native wildlife and the captive gamebirds, and any other conditions necessary to ensure adequate protection of native wildlife.

NR Article, Section 10-908 prescribes the Wildlife Cooperator Permit. The permit allows any properly accredited person desiring to assist the DNR in the control of wildlife injurious to agriculture or other interests, or to provide care and treatment of sick or injured wildlife for rehabilitation and release back into the wild. The DNR may adopt regulations governing the issuance, revocation, terms, and conditions of the permit.

APPENDIX C: Maryland Senate Joint Resolution

A Senate Joint Resolution concerning Natural Resources - Mute Swans- Federal Agency Control Measures for the purpose of urging the U.S. Fish and Wildlife Service to act with expedience to craft and conduct appropriate regulatory processes 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; urging the U.S. Department of the Interior to appeal a certain holding; and generally relating to certain federal agency measures to control the mute swan population.

Whereas, the bird species known as the mute swan is not native to the Chesapeake Bay; and

Whereas, surveys of the Chesapeake Bay indicate that the mute swan population is growing at an alarming rate, increasing from less than 100 birds in 1973 to nearly 4,000 in 1999; and

Whereas, mute swans negatively impact native species and habitats in parts of the Chesapeake Bay by displacing State-listed nesting waterbirds and removing large amounts of submerged aquatic vegetation which is vital to all life in the Bay; and

Whereas, mute swans have repeatedly disrupted efforts to restore submerged aquatic vegetation, obstructing progress toward the Chesapeake 2000 Agreement goal of restoring 114,000 acres of the vegetation by 2010; and

Whereas, the U.S. Court of Appeals for the District of Columbia ruled that mute swans are protected by U.S. Fish and Wildlife Service regulations governing activities involving direct contact with protected birds under the Migratory Bird Treaty Act; and

Whereas, the Maryland General Assembly passed House Bill 728 during the 2001 Legislative Session, requiring the Department of Natural Resources to establish a program to control the State's mute swan population; and

Whereas, the urgent need to plan an implement mute swan population control measures and to mitigate mute swan impacts increases exponentially each year; now therefore, be it

Resolved by the General Assembly of Maryland, that the U.S. Fish and Wildlife Service is urged to act with expedience to craft and conduct appropriate regulatory processes 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; and be it further

Resolved, that the United States Department of the Interior is urged to appeal the holding of the U.S. Court of Appeals for the District of Columbia that declared the mute swan to be a migratory bird protected under the international treaties; and be it further

Resolved, that a copy of this Resolution be forwarded by the Department of Legislative Services to the Honorable Parris N. Glendening, Governor of Maryland; the Honorable Thomas V. Mike Miller, Jr., President of the Senate of Maryland; the Honorable Casper R. Taylor, Jr., Speaker of the House of Delegates; the Honorable Barbara A. Mikulski, U.S. Senate, 709 Hart Senate Office Building, Washington, D.C. 20510; the Honorable Paul S. Sarbanes, U.S. Senate, 309 Hart Senate Office Building, Washington, D.C. 20510; the Honorable Wayne T. Gilchrest, U.S. Congress, 2245 Rayburn House Office Building, Washington, D.C. 20515; the Honorable Robert L. Ehrlich, Jr., U.S. Congress, 1632 Longworth House Office Building, Washington, D.C. 20515; the Honorable Benjamin L. Cardin, U.S. Congress, 2267 Rayburn House Office Building, Washington, D.C. 20515; the Honorable Albert R. Wynn, U.S. Congress, 434 Cannon Office Building, Washington, D.C. 20515; the Honorable Steny H. Hoyer, U.S. Congress, 1705 Longworth House Office Building, Washington, D.C. 20515; the Honorable Roscoe G. Bartlett, U.S. Congress, 2412 Rayburn House Office Building, Washington, D.C. 20515; the Honorable Elijah E. Cummings, U.S. Congress, 1632 Longworth House Office Building, Washington, D.C. 20515; the Honorable Constance A. Morella, U.S. Congress, 2228 Rayburn House Office Building, Washington, D.C. 20515; the Honorable Gale A. Norton, Secretary of the Interior, U.S. Department of the Interior, 1849 C Street NW, Washington, D.C. 20240; and Mr. Marshall Jones, Director (Acting), U.S. Fish and Wildlife Service, 1849 C Street NW, Washington, D.C. 20240; and Mr. Jon Andrew, Chief, U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 4401 N. Fairfax Drive, Arlington, VA 22203.