

**STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF FISH AND WILDLIFE**

Mute Swan Management Plan



Prepared
May 30, 2006

Rhode Island Mute Swan Management Plan

I. Introduction

The mute swan (*Cygnus olor*), an indigenous waterfowl species of Europe, was imported into North America in the late 1800s and sold to private estates, public parks, and zoos. Many of the 500+ birds imported between 1910 and 1912 had their flight feathers cut (Phillips 1928) to prevent flight capability. Owners of some birds failed to continue the practice of pinioning and small numbers of birds escaped into the wild and established a feral population. These early introductions to the wild are believed to have occurred along the Hudson River (1910) and on Long Island, New York (1912) (Bull 1964) and likely provided the nucleus for the current Atlantic Flyway mute swan population (Table 1).

Table 1. The spread of feral mute swans within the Atlantic Flyway is indicated by early reported sightings as follows: (from Atlantic Flyway Mute Swan Management Plan).

State/Province	Year	State/Province	Year
New York	1910	Quebec	1965
New Jersey	1919	New Hampshire	1967
Massachusetts	1922	West Virginia	1986
Rhode Island	1923	North Carolina	1989
Pennsylvania	1930s	Georgia	1989
Ontario	1934	Maine	1990
Virginia	~1950	South Carolina	1993
Maryland	1954	New Brunswick	1993
Connecticut	1957	Vermont	1993
Delaware	1958		

The first report of mute swans in Rhode Island occurred on Block Island in 1923, and the second on Quonochontaug Pond, Charlestown during 1938 (Willey and Halla 1972). Nesting attempts of the birds were first observed on Briggs Marsh, Little Compton in 1948. By 1962, wildlife biologists of Rhode Island’s Department of Natural Resources Division of Conservation (now Division of Fish and Wildlife) became concerned with the population growth of the mute swan in the state and conducted a population study of the bird. The report’s conclusion (Willey and Halla 1972) recommended that the RI mute swan population be managed at or near the then “current population” of 300 birds. However, control programs were not attempted until the mid 1970s and achieved limited success.

By 2005, the estimated population of mute swans residing in Rhode Island was 1,400 ± birds. During the last 30 years, mute swan nesting activities have expanded into most if not all coastal ponds along the south shore and within Little Narragansett Bay and up into the Pawcatuck River and it’s associated wetlands (Fig. 1).

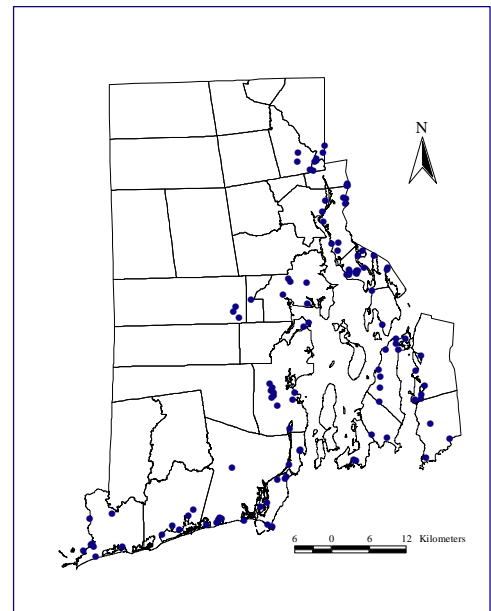


Figure 1. Statewide mute swan nest locations as identified via aerial survey, April 2005.

Additionally, swans have moved northward along the Narragansett Bay shoreline into Greenwich Bay and into the major rivers and wetlands that empty into Narragansett Bay. Birds are also found nesting on numerous inland freshwater ponds, lakes, reservoirs and associated rivers and streams. Nests have been found as far north as the City of Woonsocket and birds have been observed in the Scituate Reservoir. Mute swan nest observations have been made in 28 of the states 39 cities and towns. During the period of 1986 – 2002, RI’s mute swan population increased 147% exhibiting an annual population growth rate of 5.6 %, which would enable the population to double by 2015 (Fig. 2).

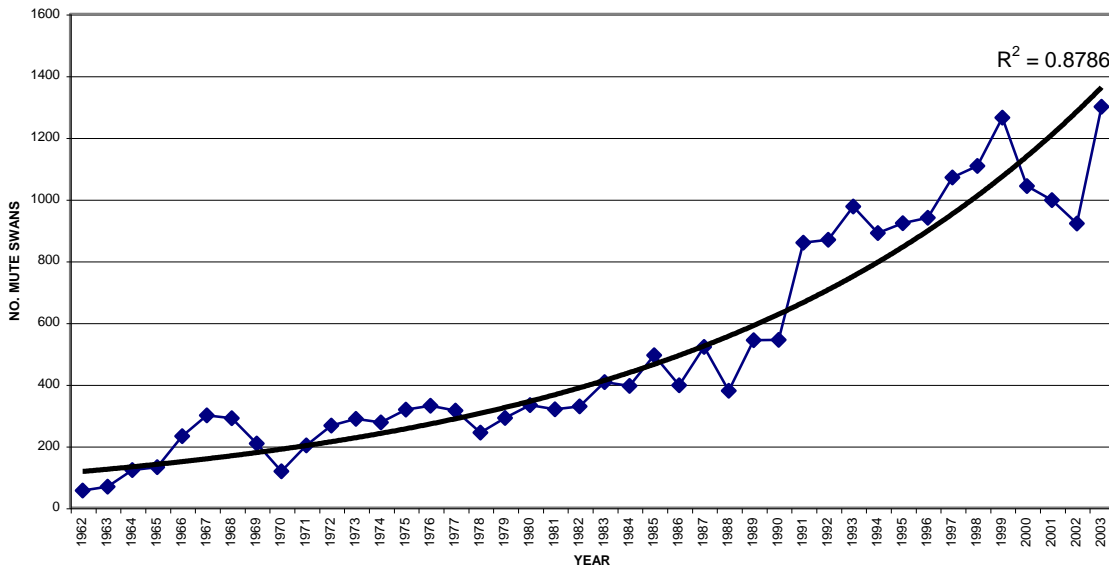


Figure 2. A three-year running average of the mute swan population growth in Rhode Island as indicated from Mid-Winter Waterfowl Surveys (1954-2003) showing an annual growth rate of 5.6%.

II. Population Trend

Mute swans were first reported on the Mid-Winter Waterfowl Surveys (MWS) of the Atlantic Flyway (AF) in 1954. As a result of the non-migratory status of mute swans, there was little interest in recording their numbers. During early 1960s, some birds were occasionally reported in the MWS. However, in 1966 the MWS count of 2,100 mute swans initiated concerns among Atlantic Flyway waterfowl biologists.

A review of the history of mute swans in the Atlantic Flyway, Allin et al. (1987) predicted that the flyway population would double in 13 years (2000), based on the mean 5.6% annual growth rate indicated by the MWS (1954-1987). However, by 1999 the Atlantic Flyway mute swan population had more than doubled (2.2 times) to over 12,650 birds, indicating acceleration in the population’s annual growth rate.

In 1985, the Atlantic Flyway Council (AFC) established the Mid-Summer Mute Swan Survey (MSMSS) to better understand the status of this invasive waterfowl species. The survey is conducted every third year from mid-July through mid-August when only mute swans are present in the AF states (Fig. 3). The first MSMSS was completed in 1986 and thereafter

through 2005. From 1986 – 2002, the MSMS indicated an annual mute swan population growth rate of 5.8%, an increase of 148% to over 14,000 birds in 2002.

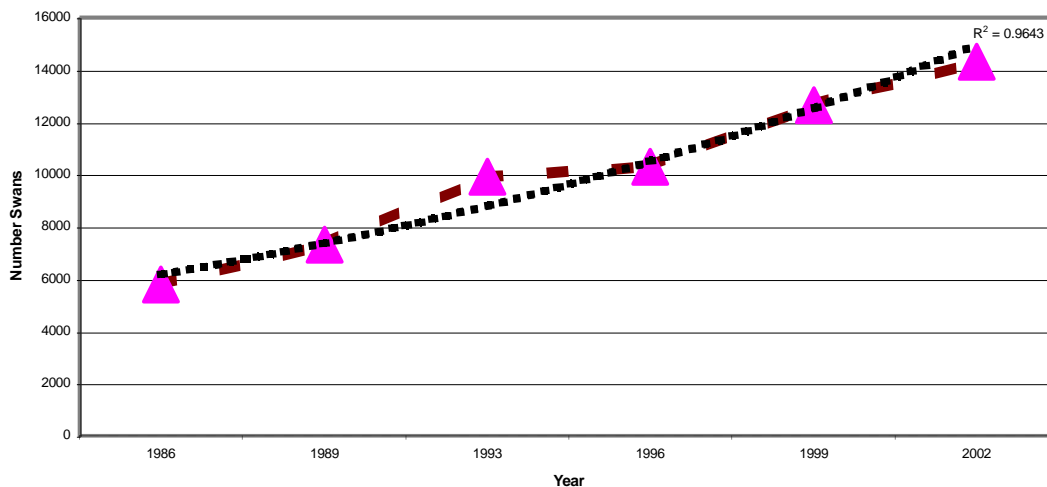


Figure 3. Mute swan population growth in the Atlantic Flyway as indicated by Mid-Summer Mute Swan Surveys, 1986-2002, and showing an average annual growth rate of 5.8%.

III. Damages and Conflict

Detrimental Impacts on Wetland Habitat

All waterfowl go through an annual molt to renew worn flight feathers. The molt period for mute swans occurs from mid-July through late August. Large concentrations of mute swans, whose numbers consist of immature sub-adults, unpaired adults and unsuccessful breeders, gather on large open shallow wetlands. These sites provide protection for the flightless birds and also provide submerged aquatic vegetation (SAV) for the swans to feed on. Molt concentrations as large as 500+ birds have been recorded in Briggs Marsh, Little Compton and as many as 400 birds have been observed on the Turner Reservoir, East Providence. Molt sites include Trustom Pond, NWR, South Kingstown (150+); Pawcatuck River, Westerly (220+); and in the Providence River from Occupessatuxet Cove, Warwick to Stillhouse Cove, Cranston (140+).

Wintering concentrations of mute swans, numbering between 200 and 400 birds, have been observed in the following areas since 1991: Quicksand Pond, Little Compton; Gaspee Point to Still House Cove, Providence River; Watchemoket Cove, East Providence; Warren River, Warren; Kickamuit River, Warren; and Green River, North Kingstown/Warwick.

Mute swans have the capability to bottom feed in water depths of 1.2 meters (Berglund et al 1963) however, they prefer to feed in shallower water, which requires less effort. Studies in Europe and America have noted that mute swans and waterfowl generally feed on the same SAVs (Gillham 1956, Jennings et al. 1961, Willey and Halla 1972, Mathiasson 1973, Charman 1977, Nierheus and Van Ierland 1978, Scott and Birkhead 1983, Perry et al 2003).

Conover and Kania (1994) reported that mated pairs of mute swans had little or no effect on native waterfowl and their herbivory. Others, however, disagree and have noted serious impacts of mute swans on habitat. Chasko (1986) observed significant reductions of SAV in small Connecticut ponds used by only breeding mute swan pairs. Reichholf (1984) found that about 20% of available vegetation was removed within breeding territories on these ponds. Previous European studies noted that mute swans could significantly reduce SAV (Gillham 1956, Jennings et al. 1961, Berglund et al. 1963, Willey 1968, Mathiasson 1973, Charman 1977, Nierheus and Van Ierland 1978, Scott and Birkhead 1983, Ryley and Bowler 1994), and that high concentrations of mute swans were capable of overgrazing and could potentially eliminate individual plant species from wetlands. Recent attempts to restore eelgrass beds in the Chesapeake Bay by Maryland Department of Natural Resources (MD DNR) has been met with increased mute swan feeding activity on those new SAV beds with major loss of the eelgrass plantings (M. Naylor, MD DNR pers. comm.).

Studies in the Netherlands by Nierheus and Van Ierland (1978) noted that of waterfowl feeding in eelgrass beds, mute swans were responsible for consuming 87 % of the vegetation. Fenwick (1983) found that mute swans could consume on average 43% (females) and 35% (males) of their body weight daily. The ability of mute swans to consume more than 8 pounds (wet weight) of SAV per day (Willey 1968), with approximately another 20 pounds (S. Petrie, Long Point Waterfowl and Wetlands Research Fund, pers. comm.) being uprooted during feeding can have devastating effects on plant beds. Assuming that on average 28 pounds of SAV (wet weight) is consumed and uprooted daily, then a population of 1,000 birds could potentially eliminate over 10 million pounds of SAV annually.

Recent research on the impact of mute swan concentrations on SAVs in a Rhode Island coastal pond (Allin and Husband 2003a) showed that although mute swans are capable of feeding in all water depths in the shallow coastal pond ($\leq 1.5\text{m}$), they preferred feeding in the shallower sites ($\leq 0.5\text{ m}$) reducing SAV biomass by up to 95%.

Detrimental Impacts on Native Waterfowl

The combination of competition for habitat, its large size (23-32 pounds) and aggressive nature make the mute swan a threat to native waterfowl. Swans will tolerate some waterfowl nesting within their territory. However, older breeding pairs are less tolerant. Due to their strong territoriality, some mated pairs will vigorously defend nest and brood sites from invasion by other swans, ducks or geese. Swans may even kill an intruding pair and/or their young (Stone and Masters 1970, Reese 1980, Kania and Smith 1986). However, if food and nesting habitat are readily available, swans may nest colonially (Bacon and Harild 1987, L. Hindman, MD DNR, pers. commun.).

Year round residence of mute swans on shallow wetlands can reduce SAV availability for native nesting and wintering waterfowl. Krementz (1991) noted that a reduction in black duck (*Anas rubripes*) numbers directly correlated with the decline of SAVs. Studies of canvasback ducks (*Aythys valisneria*) and redhead ducks (*Aythys Americana*) reduced wintering population numbers in the Chesapeake Bay appear to be the results of SAV reductions (Haramis 1991).

Detrimental Impacts on Agriculture

Although mute swans primarily browse on SAVs, they have been observed grazing in upland fields and agricultural crops in Europe and North America (Gillham 1956, Eltringham 1963, Minton 1971, Bacon 1980, Sears 1989, Scott 1984). Cranberry farmers in Massachusetts (H. Heusseman Massachusetts Division of Fisheries and Wildlife pers. commun) and New Jersey (P. Castelli New Jersey Department of Fish and Wildlife pers. commun) have complained about mute swans destroying cranberry plants as they browsed on other submerged plants within bogs. Observations of mute swans feeding uplands have not yet been recorded in RI. However, if food resources become limited due to SAV die off or mute swan population expansion, upland feeding could occur.

Detrimental Impacts on Other Species

A direct effect of mute swans impacting endangered or threatened species has been documented when a group of swans disrupted a nesting colony of black skimmers (*Rynchops niger*), least terns (*Sterna antillarum*), common terns (*Sterna hirundo*), and Foster's terns (*Sterna forsteri*) on a sand bar in Chesapeake Bay, Maryland (Therres and Brinker 2003). Mute swans crushed nests, eggs, and trampled young as they walked and loafed on the bar.

SAVs are critical for marine species habitat and are used as shelter and food of fish, shellfish, and macro-invertebrates (Krull 1970, Wilson et al. 1987, Hurley 1991). Loss or reduction of SAVs will have a direct affect on marine fisheries nursery habitats within shallow coastal waters.

Nuisance Problems

Although mute swans are personified as tranquil and peaceful creatures, its actual demeanor is not necessarily true to this image. There have been 11 recorded incidents of mute swan interacting with humans in Rhode Island (Table 2). Mute swans strike their wings when attacking, and a strike with their carpal wing joint is capable of breaking human arm bones and severely injuring a person. Swan attacks have been known to turn over canoes, kayaks, and small fishing boats thus potentially creating life-threatening situations.

Table 2. Reported mute swan attacks on Rhode Island residents and or their pets.

<u>Date</u>	<u>Location</u>	<u>Town</u>	<u>Attacked</u>
May 18, 1976	Gardiner Road	Exeter	Convalescing elderly man in back yard.
May 31, 1977	Gorton Pond	Warwick	3 yr. Old boy and father, dog chained to dog house and killed 10 ducks.
July 7, 1978	Willow Motel	Charlestown	3 women.
April 4, 1980	Woonasquatucket Riv.	N. Providence	3 women, dog, killed 6 domestic ducks.
July 22, 1980	Bonnet Shores Beach	Narragansett	children and adults on beach.
May 10, 1983	Melville Fishing Area	Portsmouth	Fly fisherman.
May 5, 1984	Pettasquamscutt Pond	Narragansett	Dog (German Shepard) in back yard.
June 6, 1984	Pausacaco Pond	N. Kingstown	2 fly fishermen in canoe.
June 30, 1986	Sprague Pond	Narragansett	2 people in back yard.
April 25, 1986	Mettatucket River	N. Kingstown	Man and son, care taker, tipped over canoe (2 fishermen) and boat (1 fisherman).
May 16, 1995	Apponaug Cove	Warwick	2 children, killed 5 domestic ducks and 7 geese (2 ads, and 5 goslings).
April 3, 2003	Sprague Pond	Narragansett	Women and 2 children

Attacks by mute swans have also been recorded in other states. North Carolina Wildlife Resources Commission (D. Luszcz, NCWRC, personal commun) had two reported incidents of mute swans attacking people during 2001, requiring one person to seek medical treatment. Connecticut Department of Environmental Protection (M. Huang, CT DEP, personal commun), received a report of an incident involving an attack on an 81-year old woman, resulting in 31 stitches and failed pacemaker. The following year, the same pair of swans attacked the elderly women again.

Potential Source of Pollution

Potential pollution problems by mute swans have not been well researched, therefore little is known. Waterfowl defecation can increase coliform bacteria counts. Although there has been no documentation linking of human illness and fecal coliform of these wild birds, there is general concern of the potential risk. Public health authorities use coliform counts to measure water quality to determine safety for human use. Nutrient loading of surface waters may stimulate algal blooms. Increased fecal coliform counts may cause closures of public drinking reservoirs, swimming beaches, or shellfish grounds. Similar concerns have been credited to resident Canada geese in RI. A recent study by the RI Department of Environmental Management (DEM; 2003) reported that of the multiple sources of bacteria in Green Hill Pond, Charlestown, RI, waterfowl (Canada goose and mute swan) were identified as important contributors of fecal coliform in site-specific locations where bird concentrations were noted.

IV. History of Management Efforts

Feral invasive species

Introduced wildlife species that have few natural predators and are capable of competing with native species for habitats, as well as an uncontrolled population growth warrant population control measures. Others (Weller 1969, McKnight and Hepp 1995) have described the negative impact of many non-indigenous species brought to North America, which escaped, and had successfully established feral populations. The results can be detrimental to native species of flora, fauna, and insects (Weller 1969, Mack et al. 2000). U.S. Executive Order 11987 (May 24, 1977), states that federal agencies shall encourage states, local governments, and private citizens to prevent the introduction of exotic species into the environment.

Mute swans have been classified as an exotic species by all state wildlife agencies and in 1998, the U.S. Fish and Wildlife Service issued a policy statement directing refuge managers on National Wildlife Refuges in Regions 1 – 7 to take effective steps to control mute swans and prevent destruction and degradation of wetland habitats. An editorial in the *Defenders of Wildlife Magazine*, Editor, R. Schlickelsen (1994) raised the question of controlling invasive species and pronounced, “States also are primarily responsible for controlling exotics” and “Many states have been lax about eradicating exotic species and preventing introductions.” More recently Executive Order 13112 (February 13, 1999) on Invasive Species stated that it was necessary “to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.”

Attempts at mute swan population control have occurred throughout North America. Most wildlife bird population management control efforts fall into two main categories that: (1) affect reproductive output or recruitment and (2) affect the survival rate of adult birds.

A common means of decreasing waterfowl reproductive output (Category 1) is through egg and nest destruction. Addling eggs reduces the proportion of nests that successfully produce cygnets (i.e., hatching success). Egg addling, although widely accepted, is costly in person-hours and equipment use. Its effect is limited to that portion of the population with the greatest natural mortality rate and therefore has the least effect on population control or reduction (Cooper and Keefe 1997). Rockwell et al. (1997) noted that actions taken to increase the mortality rate (Category 2) of adult lesser snow geese would be the most effective way to reduce the size of an overabundant mid-continent population.

Maryland's DNR (Harvey 2000) constructed a mathematical model to determine cause and effect of population control methods on its mute swan population. Although Maryland's mute swan population is growing at a faster rate than RI's, it exemplifies what is needed to control this fast growing invasive species (Appendix B). 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 at least 80% just to stabilize the population. Harvey further noted that it only would require a 20 percent annual reduction of adult birds in a population to lower the population over time.

Removal and euthanasia of adult mute swans from the population would have an immediate impact on population reduction. Establishment of a hunting season would provide a low cost method of population reduction. However, it may require a longer time period and it may not be fully effective in reducing the population adequately. A combination of using all control methods available, egg addling, hunting, and removal/euthanasia would reduce the population to the desired population goal in a timely manor. Once the population goal is reached, regulated hunting could potentially be used to maintain that population level.

Management Efforts in Rhode Island

In an attempt to manage the state's mute swan population, the Rhode Island Division of Fish and Wildlife (DFW) initiated two population control programs in 1976 and 1978. The 1976 control efforts consisted of removing and euthanasing adult birds. Removal of birds was necessary and very successful in lowering the population size, but had little public support at that time. The two years following the removal program, the number of swan nesting observations remained at approximately 40 nests (Fig. 4).

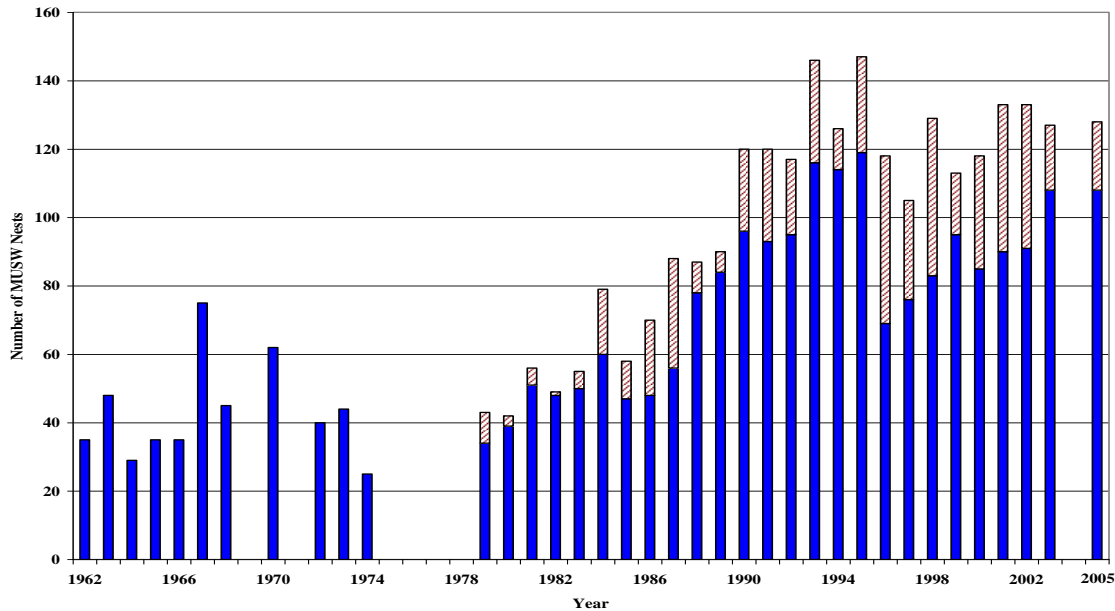


Figure 4. Estimated minimum number of mute swan nests in Rhode Island since 1962 and the number of nests managed and unmanaged (cross hatch) from 1979 to 2005. Note adult swan removal program occurred during 1976. In years of zero nests, no data were collected.

The capture of wild adult swans to provide them for adoption by the public was attempted during 1978. This program also met with failure because few people volunteered and those people that did participate were incapable of maintaining the captive birds. In 1979, the DFW established its current program targeting management of the reproductive segment of the mute swan.

In the past 26 years DFW personnel added over 11,000 eggs, or approximately 80% of the annual nesting attempts. However, the annual growth rate of Rhode Islands' mute swan population (5.6%) between 1986 and 2002, is only slightly lower than that of the AF (5.8%), despite efforts to maintain the population at its 1979 level.

It is believed the high annual growth rate in RI, despite its control program, is in part due to swan emigration from neighboring states. Since 1979, Rhode Island's mute swan population has grown 269% from 375 birds to approximately 1,400 swans (2005). Although egg addling is an acceptable control method, it is aimed at the portion of the population that contains the highest mortality rate. As a result, egg addling fails to meet long-term expectations for controlling a population with high annual growth rates. The long-term continuance of this single management tool has been ineffectual and costly (Allin and Husband 2003b).

Management Efforts in the Atlantic Flyway

Since the mid 1970s, many wildlife agencies have conducted some form of population control on mute swans in their respective states/provinces. Delaware, Pennsylvania, and Virginia considered mute swans as exotic unprotected birds. Pennsylvania and Virginia allowed mute swans to be shot by hunters and Delaware aggressively removed birds from state lands. New York established a mute swan policy in 1993 that allowed harassment, egg addling, prohibiting releases, and euthanasia of nuisance birds. In 1997, Vermont established a policy of total removal of all mute swans from the state. Vermont prohibits the importation and sale of birds, and also requires that all captive birds be pinioned, sterilized, and marked for identification.

Maryland, along with U.S. Fish and Wildlife Service Refuges in that state, used egg addling and removal of adult swans from state and federal properties. Maryland has recently taken their management efforts a step further by identifying sensitive habitats for the removal of swans. During the mid-1990s a New Mexico game breeder removed approximately 250 birds of a local flock that damaged a skimmer and tern colony. Local residents were allowed, by permit, to addle eggs, shoot problem swans (prohibited in 1998), and destroy nests.

In 1997, the Atlantic Flyway Council (AFC), consisting of state wildlife agency directors of the 17 Atlantic Coast states and 4 Canadian Provinces (Protected under Federal Canadian Laws), established a policy to encourage member wildlife agencies to control their respective state's mute swan populations. This policy was adopted as a result of the growing concerns for the impacts on habitats important to other migratory birds.

In Canada, mute swans are included under the federal Migratory Birds Convention Act (MBCA), which means that the possession of this species by aviculturalists is controlled, and the release of mute swans to the wild is prohibited. This also prevents wild mute swans from being taken by any means, except under a permit issued by the Canadian Wildlife Service (CWS). The CWS is currently issues permits to its staff to control mute swans on National Wildlife Areas. The Atlantic Region of CWS prepared a policy on mute swans in 1999 prior to any establishment of a feral mute swan population. This policy is now being extended to include all of Canada. There are no feral mute swan population in the Atlantic Region (which includes Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick) and any captive birds must be maintained under an Aviculture permit with strict guidelines which must be followed and periodically reviewed

Legal Actions

In 1999 President Clinton signed an Executive Order on Invasive Species (Executive Order 13112) "to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause". Furthermore, the order directs federal agencies to avoid actions that would increase invasive species issues.

As a result of legal action in 2002 the status of mute swans changed and they became a protected species under U.S. Federal Laws (Title 50 of Federal Regulations Part 10.13). In response to the change in status of mute swans, the USFWS issued a mute swan policy in 2002 which allowed for issuance of depredation permits to individual states for mute swan population control efforts. Former methods of population control used by individual states had to be modified or eliminated because of the mute swans new federally protected status. The Service noted in an Information Leaflet titled "*Federal Protection of the Mute Swan*" (Information Leaflet 2002) that "Appropriate management of migratory bird populations will still be possible in the short term". The change in mute swan status necessitated the establishment of the Atlantic Flyway Mute Swan Management Plan (July 2003) by the AFC. The Atlantic Flyway Mute Swan Management Plan (AF Plan) encourages individual states to initiate their own respective Mute Swan Management Plan and programs to meet the objectives of the AF Plan.

In mid-2003, the USFWS issued an Environmental Assessment (EA) for the Management of Mute Swans in the Atlantic Flyway. The EA addressed the means of response to applications for permits to take mute swans under the Migratory Bird Treaty Act (MBTA).

The most significant changes to the status of mute swans came in 2005 with the passing of the Consolidated Appropriations Act, 2005. Included within this appropriations bill was the Migratory Bird Treaty Reform Act of 2004 (70 Federal Register 12710). The passing of this legislation removed federal protection of non-native species previously receiving protection under the Migratory Bird Treaty Act (Code of Federal Register, Title 50, Part 10.13). USFWS was charged with developing a list of non-native species included under this new legislation. Mute swans were specifically included on this list relinquishing federal protection of this species.

V. Management Goals

Reduce the Rhode Island mute swan population to a level that minimizes negative ecological impacts to wetland habitat and native flora and fauna, while also preventing further expansion into unoccupied areas of the state and within the Atlantic Flyway.

Rationale: It is the mandate of the Division of Fish and Wildlife to preserve, protect, and maintain Rhode Island's native wildlife species through enlightened wildlife management techniques. Proper stewardship of native wildlife demands state wildlife agencies to control invasive species to prevent adverse impact on indigenous wildlife species sharing similar ecological niches. The mute swan is a non-native invasive species to North America. Unfortunately, introducers of this species in the late 1880's did not foresee the detrimental effects on native species of migratory waterfowl and other wildlife and aquatic life. These effects include, but are not limited to, direct territorial aggression and competition for habitat resources as well as destruction of habitat resources. Conflicts with native wildlife are in addition to those stresses caused by expanding human development in Rhode Island. Additionally, there is increasing potential for conflicts with agriculture, fisheries and other human uses.

This Management Plan recommends that populations of mute swans within Rhode Island be reduced to a level that minimizes negative ecological impacts to wetland habitat and native flora and fauna to an optimal number where impacts are considered negligible. The optimal number to sufficiently reduce mute swan populations to a level where impacts are negligible is unknown. However, when the state's mute swan population was less than 300 birds, it was thought that mute swans were not creating significant detrimental impacts to the environment. This plan recommends that the population of mute swans in Rhode Island be reduced to less than 300 individuals statewide.

The impact of the non-native mute swan has been quantified for shallow wetlands by a RI field study (Allin and Husband 2003a). Historic problems created by non-native species in North America (e.g., the mute swans' impact on native waterfowl and habitat, the populations current rapid growth rate, and a lack of evidence that natural causes will limit the population in the future) warrants the need to manage the mute swan population in Rhode Island in accordance with the Atlantic Flyway's Mute Swan Management Plan

Achieving a mute swan population level goal should be obtainable because mute swans are nonmigratory (although immigration from neighboring states does occur), concentrate in large flocks, and are conspicuous. Although the RI population has undergone considerable management efforts it still has maintained a 5.6% annual growth rate, similar to that of the AF population's growth rate of 5.8%. Rhode Island's Division of Fish and Wildlife requires the necessary tools to ensure that they can meet their objectives for a mute swan population goal within the state's borders.

Strategies for population reduction should include egg addling, removal/euthanasia of adult and sub-adult birds, and a limited hunting season. Although some control methods will be controversial, it should not prevent their use in an efficient control program. Egg addling has been conducted on RI's mute swan populations and shown to be acceptable by most local residents. However this technique requires substantial efforts, is costly, and is non-effective for achieving the desired population goal. Hunting would be an effective method to aid in population reduction in addition to capture and removal of adult birds from the wild.

Objectives and Strategies

A. Outreach

Objective:

Increase public awareness about mute swans and their impact on wetland ecosystems and other wildlife species.

Strategies:

1. Develop comprehensive communication programs to raise public awareness regarding the threats from mute swan to native wildlife, their habitat, and recreational use and appreciation.
2. Develop information releases to mass media and provide access to the Rhode Island and Atlantic Flyway Mute Swan Management Plans.

Discussion:

There is an obvious need to educate the general public informing them of the negative impacts of exotic invasive species; the impacts mute swans are having on aquatic habitat; and the need for controlling this invasive species. The development of a mute swan publication for statewide distribution as well as issuances of news releases by the DEM would be essential to achieve this objective.

B. Population Management

Objectives

1. To prevent the expansion of Rhode Island's mute swan population and reduce the population from its current level to a level that minimizes negative ecological impacts to wetland a level where impacts are considered negligible.
2. Prevent the establishment of breeding pairs within new areas of the state.

Strategies:

1. Remove adult and sub-adult mute swans.
2. Continue to reduce productivity of the Rhode Island mute swan population through an egg addling program, as necessary to achieve the desired goals.
3. Establish regulations to allow a limited sport hunting season on mute swans.
4. Prohibit relocation and release of any mute swans within Rhode Island.
5. Prohibit rehabilitation of sick and/or injured wild mute swans.

Discussion: Efforts to control the mute swan population have been ongoing since 1976. After 26 years of egg addling, the RI mute swan population continues to grow at 5.6% annually. Although the control efforts have remained constant, nest numbers have increased, resulting in a decrease in percentage on the estimated number of nest controlled from 80% to 68%. An evaluation of the 22 years of mute swan management in RI (Allin and Husband 2003b in press) concluded that without a broader effort, the program had only slowed the population's growth rate slightly below that of the AF's 5.8%. Annual cost of control is conservatively estimated at \$8,000.

Presently, Rhode Island's mute swan population is comprised of approximately 1400 birds (source: MWS). It is estimated that in order to manage the population at its current level, management efforts would need to be directed at 90-95% of all nests and cost would likely increase to over \$10,000 annually. It is unlikely that the DFW would be able to achieve this goal at current staffing levels.

Development and attainment of an allowable and manageable Rhode Island mute swan population level will require earnest commitments of RI DEM, federal wildlife agencies, and local wildlife conservation groups for its successful accomplishment.

C. Relief of Damage and Conflicts

Objective:

Maintain variable, effective, and efficient mute swan population control methods.

Strategies

1. Continue to reduce reproductive capacity and productivity of the Rhode Island mute swan population through an egg addling program as necessary.
2. Establish regulations to allow a limited sport hunting season.
3. Prohibit relocation and release of mute swans within Rhode Island.
4. Prohibit rehabilitation of sick and/or injured wild mute swans.
5. Develop an adult and sub-adult mute swan removal program on select wetlands, favorable of high concentrations of mute swans, as well as other habitat types containing sensitive species of flora and fauna.

Discussion: Rhode Island has maintained mute swan management control program since 1978 in an attempt to slow the state's population growth. Removal and euthanasia of adult mute swans must be conducted on wetland habitats, which are favorable to native migratory waterfowl and other native species. Removal would be conducted through capture and euthanasia as well as by firearm, where appropriate.

Hunting seasons would provide the most economical management tool for controlling Rhode Island's mute swan populations; however, if used as a sole method of management may not reduce levels adequately to achieve the desired population goal. Once population levels are reduced at or near the recommended level, hunting may be the only control method necessary. This option would potentially allow for the maintenance of a desired population level as well as provide economic relief to the DFW control operations.

D. Public Use and Enjoyment

Objective: Develop and implement guidelines and regulations for keeping captive mute swans by aviculturists, public zoos, and educational facilities.

Strategy

1. Review existing policy on mute swans and develop as needed changes to clarify possession requirements of mute swans in captivity. Zoos, educational and research facilities, private aviculturists, and other similar users have a legitimate need or desire to hold mute swans in captivity. A policy defining these legitimate users and establishment of stricter guidelines and requirements for ownership of mute swans may be necessary. Any mute swans kept in a free-range setting must be pinioned or otherwise rendered flightless and sterilized. Managers exhibiting mute swans need to inform the public of the negative aspects associated with introduced invasive species in the wild.
2. Consider stricter state penalties and improve enforcement for non-compliance with regulations for keeping mute swans in captivity and unlawful release of mute swans into the wild.

Discussion: Sectors of the public have generally ignored agency recommendations and regulations regarding unauthorized release and feeding of nuisance wildlife. Likewise, wildlife enforcement authorities have not vigorously enforced and prosecuted violations of permitting and nuisance wildlife regulations. The impacts of invasive and nuisance wildlife such as the mute swan are serious enough to demand a vigorous approach to managing public complicity in these impacts. Failure to take a firmer stand will result in failure to manage invasive species and will further violate Executive Order 13112.

E. Monitoring and Evaluation

Objective:

Monitor distribution and abundance of Rhode Island's mute swan population to assess effectiveness of management actions.

Strategies:

1. Monitor population size and distribution through various surveys.
2. Continue research efforts on population ecology, species conflicts, and impacts on SAV and other habitat.
3. Conduct surveys of public attitude to determine success of outreach efforts.

Discussion: Population monitoring programs are needed to evaluate specific progress and accomplishments of management goals and objectives. Population size and distribution will be assessed via MSMSS (every 3 years) and Rhode Island interests. Data from these surveys will assist the DEM in its management program's success, and necessary changes needed to meet Rhode Island's mute swan population objectives.

Continued documentation and assessment of potential habitat destruction is needed. As research efforts expand, support and assistance may be required. Surveys of public attitude would be helpful in determining success of management efforts.

Management and research programs will require funding sources and future long-term commitments.

Literature Cited

- Allin, C.C., G.C. Chasko, and T.P. Husband. 1987. Mute swans in the Atlantic Flyway: a review of the history population growth and management needs. Transactions of the Northeast Fish and Wildlife Conference 4:32-47.
- Allin, C.C. and T.P. Husband. 2003a. Mute swan (*Cygnus olor*) impact on submerged aquatic vegetation and macroinvertebrates in a Rhode Island coastal pond. Northeastern Naturalist. 10(3):305-318.
- Allin, C.C. and T.P. Husband. 2003b. An evaluation of 22 years of mute swan management in Rhode Island. Pages 19-23 in Mute swan and their Chesapeake Bay habitats: Proceedings of a symposium (M.C. Perry ed.). Chesapeake College, Wye Mills, Maryland, USA. June 2001.
- Bacon, P.J. 1980. Status and dynamics of a mute swan population near Oxford between 1976 and 1978. Wildfowl 31: 37-50.
- Bacon, P.J., and P.A. Harild. 1987. Colonial breeding in mute swans (*Cygnus olor*) associated with an allozyme of lactate dehydrogenase. Biological Journal of the Linnean Society 30: 193-228.
- Berglund, B. J., K. C. Lindahl, H. Luther, V. Olsson, W. Rodhe, and G. Sellerberg. 1963. Ecology studies on the mute swan (*Cygnus olor*) in southeastern Sweden. Acta Vertebratica 2:169-288.
- Bull, J. 1964. Birds of the New York area. Dover Publication Inc., New York
- Chasko, G. 1986. The impact of mute swans on waterfowl and waterfowl habitat. Wildlife Investigation: Waterfowl Research and Surveys W-49-R-10, Final Report
- Charman, K. 1977. The grazing of *Zostera* by waterfowl in Britain. Aquaculture 12:229-233.
- Ciaranca, M.A. 2000. The mute swan (*Cygnus olor*) of southeastern Massachusetts. Ph.D dissertation, Northeastern University, Boston, Massachusetts, USA.
- Conover, M.R. and G.S Kania. 1994. Impact of interspecific aggression and herbivory by mute swans on native waterfowl and aquatic vegetation in New England. The Auk 111 (3): 744-748
- Cooper, J.A. and T. Keefe. 1997. Urban Canada goose management: policies and procedures. Transactions North American Wildlife and Natural Resources Conference 62: 412-430.
- Eltringham, S.K. 1963. The British population of mute swan in 1961. Bird Study 10: 10-28.
- Fenwick, G.H. 1983. Feeding behavior of waterfowl in relation to changing food resources in Chesapeake Bay. Ph.D. dissertation, Johns Hopkins University, Baltimore, MD.

- Gillham, M. E. 1956. Feeding habits and seasonal movements of mute swans on two South Devon Estuaries. *Woodland Birds* 3:205-221.
- Haramis, G.M. 1991. Canvasback (*Aythya valisineria*). Pages 17:1-10 in S.L. Funderburk, S.J. Jordan, J.A. Milhusky, and D. Riley, editors. Habitat requirements of Chesapeake Bay living resources. Maryland Department of Natural Resources, Annapolis, USA.
- Harvey, W.F. 2000. Mute swans in Maryland: Using a population model to help develop management strategies. Maryland Department of Natural Resources, Wildlife and Heritage Service, Wye Mills, USA.
- Hurley, L.M. 1991. Submerged aquatic vegetation. Pages 2:1-19 in S.L. Funderburk, S.J. Jordan, J.A. Milhusky, and D. Riley, editors. Habitat requirements of Chesapeake Bay living resources. Maryland Department of Natural Resources, Annapolis, USA.
- Information Leaflet. 2002. Federal Protection of the Mute Swan. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. February
- Jennings, A. R., E. J. L. Soulby, and C. B. Wainwright. 1961. An outbreak of disease in mute swans at an Essex reservoir. *Bird Study* 8:19-24.
- Kania, G.S. and H.R. Smith. 1986. Observations of agonistic interactions between a pair of feral mute swans and nesting waterfowl. *Connecticut Warbler* 6: 35-37.
- Krementz, D.G. 1991. American black duck (*Anas rubripes*). Page 16:1-7 in S.L. Funderburk, S.J. Jordan, J.A. Milhusky, and D. Riley, editors. Habitat requirements of Chesapeake Bay living resources. Maryland Department of Natural Resources, Annapolis, USA.
- Krull, J.N. 1970. Aquatic plant-macro invertebrate association and waterfowl. *Journal of Wildlife Management* 34: 707-718.
- Mack, R.N., D. Simberloff, W.M. Lonsdale, H. Evans, M. Clout, and F. Bazzaz. Biotic invasions: causes, epidemiology, global consequences and Control. 2000. *Issues in Ecology* No. 5.
- Mathiasson, S. 1973. A molting population of non-breeding mute swans with special reference to flight-feather molt, feeding ecology and habitat selection. *Wildfowl* 24:43-45.
- McKnight, S.K., and G.R. Hepp. 1995. Potential effect of grass carp herbivory on waterfowl foods. *Journal of Wildlife Management* 59:720-727.
- Minton, C.D.T. 1971. Mute swan flocks. *Wildfowl* 22: 71-88.
- Nierheus, P. H., and E. T. Van Ierland. 1978. Consumption of eelgrass, *Zostera marina*, by birds and invertebrates during the growing season in Lake Grevelingen. *Netherlands Journal of Sea Research* 12:180-194.

- Perry, M.C., P.C. Osenton and E.J. Lohnes 2004. Food habitat of the mute swans in the Chesapeake Bay. Pages 31-36 in M.C. Perry, editor Mute swans and their Chesapeake Bay habitats: proceedings of a symposium. U.S. Geological Survey, Biological Resources Discipline Information and Technology Report USGS/BRD/ITR—2004—0005, 60p.
- Phillips, J.C. 1928. Wild birds introduced or transplanted in North America. U.S. Department of Agriculture. Technical Bulletin 61.
- Reese, J.G. 1980. Demography of European mute swans in Chesapeake Bay. *The Auk* 97:449-464.
- Reichholf, V.J 1984. On the function of territoriality in the mute swan (*Cygnus olor*). *Verh. Orn. Ges Bayern* 24: 125-135 in German with summary in English.
- Rhode Island Department of Environmental Management. 2003. Identification of bacteria sources in Green Hill Pond using Polymerase Chain Reaction (PCR). Rhode Island Department of Environmental Management, Office of Water Resources, Providence, RI.
- Rockwell, R., E. Cooch, and S. Brault. 1997. Dynamics of the mid-continent population of lesser snow geese-projected impacts of reductions in survival and fertility on population growth rates. Pages 73-100 in
- Ryley, K. and J.M. Bowler. 1994. A change of molting site for mute swans *Cygnus olor* in Gloucestershire. *Wildfowl* 45: 15-21.
- Schlickelsen, R. 1994. Defenders view: role of the states. *Defenders Magazine* 4:5.
- Scott, D.K. 1984. Parent-offspring association in mute swans (*Cygnus olor*). *Z. Tierpsychol* 64: 74-86.
- Scott, D.K. and M. E. Birkhead. 1983. Resources and reproductive performance in mute swans (*Cygnus olor*). *Journal of Zoology London* 4:539-547.
- Sears, J. 1989. Feeding activity and body condition of mute swan *Cygnus Olor* In rural and urban areas of a lowland river system. *Wildfowl* 40: 88-98.
- Stone, W.B. and A.D. Masters. 1970. Aggression among captive mute swans. *N.Y. Fish and Game Journal* 17: 51-53
- Therres, G. and D. Brinker 2004. Mute swan interaction with other birds on Chesapeake Bay. Pages 43-46 in M.C. Perry, editor Mute swans and their Chesapeake Bay habitats: proceedings of a symposium. U.S. Geological Survey, Biological Resources Discipline Information and Technology Report USGS/BRD/ITR—2004—0005, 60p.
- Weller, M.W. 1969. Potential dangers of exotic waterfowl introductions. *Waterfowl* 20:55-58.

- Willey, C.H. 1968. The ecology, distribution, and abundance of the mute swan (*Cygnus olor*) in Rhode Island. Thesis, University of Rhode Island, Kingston, Rhode Island, USA.
- Willey, C.H., and B.F. Halla. 1972. Mute swans of Rhode Island. Rhode Island Department of Natural Resources. Div. of Fish and Wildlife. Pamphlet No. 8.
- Wilson, K.A., K.L. Heck Jr., and K.W. Able. 1987. Juvenile blue crab, *Callinectes sapidus*, survival: An evaluation of eelgrass, *Zoster marina*, as refuge. Fisheries Bulletin: 85 (1).

Appendix A

Natural History

The breeding range of mute swans occurs throughout their North American range in freshwater wetlands, coastal salt ponds and marine estuaries. Swans are capable of breeding by their third spring and will continue throughout their life. On average 1.8 hectare (range of 0.2-4.8 hectares) of habitat are required for nesting and brood rearing.

Average clutch size ranges from 4.8 to 6.5 eggs, while brood sizes range between 3.1 and 5.6 cygnets. The number of cygnets fledging per brood in October ranges between 1.9 to 3.0 birds, indicating a 59.7% survival rate for the first year of life (Allin et al 1987). In England, Minton (1971) reported a similar fledging rate in a rapidly expanding population.

Longevity and Mortality

Average survival may fluctuate annually depending upon winter severity and available food sources. The percent of survival rates increases after year one. Reese (1980) reported a post-fledging survival rate average of 90% to year 1 and a 50% survival rate to age 7. Mute swans in Michigan had been reported to have a 12-16% annual mortality rate after fledging to their 3rd year, a 2-7% annual rate from 4 to 8 years, and only 2% annually after age 5 (Gelston and Wood 1982). Life expectancy in the wild may reach to over 25 years; however, the average is probably closer to 7 years (Reese 1980). Few animals prey on mute swans, primarily in the early stages of life. Large mammals such as raccoons (*Procyon lotor*), fox (*Vulpes fulva*), or coyote (*Canis latrans*) will take eggs from unoccupied nests. During the first couple of weeks of life, snapping turtles (*Chelydra serpentina*) will take cygnets. Disease and accidental deaths appear to be the main cause of deaths after their first year. Diseases, such as avian cholera, duck plague, lead poisoning, and salmonellosis are found to kill swans (Friends and Franson 1999). High concentrations of parasitic worms may cause a decrease in the immune system resulting in death through secondary infections (Friends and Franson 1999). Due to poor frontal vision, mute swans often collide with power lines stretched over or adjacent to wetlands habitat. These types of accidents can often cause a broken wing, neck, or damage to internal organs, resulting in death. Many times birds are found dead or injured along side adjacent roadways.

Migration and wintering distribution

In general, resident mute swans' are found in Rhode Island throughout the year. Mute swans are non-migratory, but may undergo short local seasonal movements seeking open water and available food sources during winter weather. Willey (1968) reported on the seasonal movement of Rhode Island banded mute swans into Massachusetts, Connecticut, and New York. Ciaranca (2000) further noted seasonal movement in southeastern Massachusetts was related to coastal configurations and the following of watercourses inland.

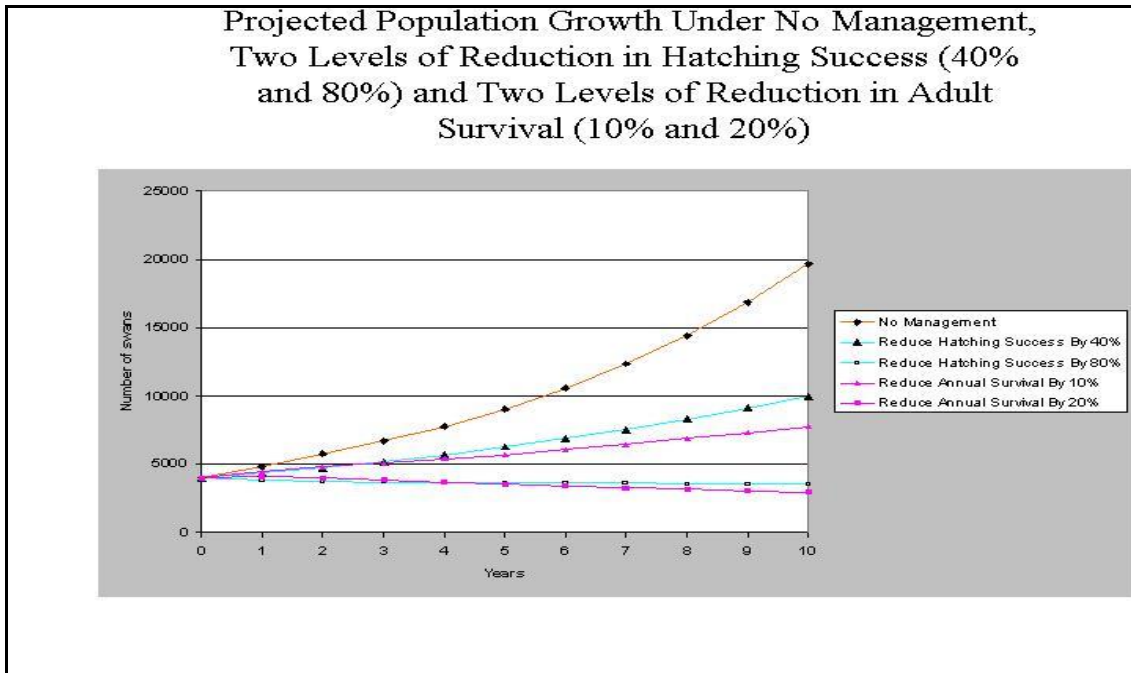
Positive Values and Use

Mute swans were sold for display on ponds and lakes. They were also sold as a biological control for removing unwanted filamentous green algae from small lakes and ponds. In some instances, they were purchased and leased as a method of reducing 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. The economic value of the commercial mute swan trade in RI is unknown but is believed to be insignificant.

Bibliography

- Allin, C.C. 1981. Mute swans in the Atlantic Flyway. Proceeding of the Fourth International Waterfowl Symposium. New Orleans, LA. Pp 149-154.
- Ciaranca, M.A., C.C. Allin, and G.S. Jones. 1997. Mute swan (*Cygnus olor*). *In* The Birds of North America, No. 272 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union, Washington, D.C.
- Ciaranca, M.A., C.C. Allin, and G.S. Jones. 1997. Mute swan (*Cygnus olor*). *In* The Birds of North America, No. 272 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union, Washington, D.C.
- Ciaranca, M.A. 2000. The mute swan (*Cygnus olor*) of southeastern Massachusetts. Ph.D dissertation, Northeastern University, Boston, Massachusetts, USA.
- Friend, M., and J.C. Franson, eds. 1999. Field manual of wildlife diseases. U.S. Department of Interior, Biological Resources Division, Information and Technology Report. 1999-001.
- Gelston, W.L., and R.D. Wood. 1982. The mute swan in northern Michigan. Myers Print Service. Grand Traverse Swans Inc., Traverse City.
- Minton, C.D.T. 1971. Mute swan flocks. *Wildfowl* 22: 71-88.
- Reese, J.G. 1980. Demography of European mute swans in Chesapeake Bay. *The Auk* 97:449-464.
- Willey, C.H. 1968. The ecology, distribution, and abundance of the mute swan (*Cygnus olor*) in Rhode Island. Thesis, University of Rhode Island, Kingston, Rhode Island, USA.

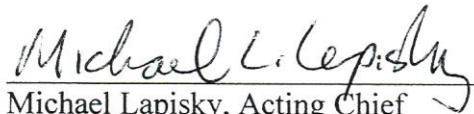
Appendix B



Projected Mute Swan Population Growth in Maryland Under Different Management Strategies (Mute Swans in Maryland: Using a population model to help develop management Strategies).

Management Plan Approval

The foregoing management plan – Rhode Island Mute Swan Management Plan, has been reviewed and approved as an appropriate action by the Rhode Island Department of Environmental Management.




Michael Lapisky, Acting Chief
Division of Fish and Wildlife



Date



Michael Sullivan, Director
Department of Environmental Management



Date