UNITED STATES FISH AND WILDLIFE SERVICE
BLACKWATER NATIONAL WILDLIFE REFUGE

ENVIRONMENTAL ASSESSMENT

for the

Management of conflicts associated with non-migratory (resident) Canada geese

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1.0 INTRODUCTION

Blackwater National Wildlife Refuge (NWR) is located in Dorchester County, Maryland, about 12 miles south of Cambridge. It was officially established under the authority of the Migratory Bird Conservation Act on January 23, 1933 to provide habitat for migrating and wintering birds. The original size of the refuge was approximately 8,241 acres. Since that time, additional lands have been added to the refuge under the authorities of the Endangered Species Act (ESA), North American Wetlands Conservation Act (NAWCA), the Refuge Administration Act (RAA), and the Refuge Recreation Act (RRA) for the purposes of providing additional wetland habitats for migratory birds and for the bald eagle, the Delmarva fox squirrel, and other endangered species. The refuge, managed by the U.S. Fish and Wildlife Service (FWS) as part of the National Wildlife Refuge System, now totals approximately 24,000 acres of tidal marsh and open water areas, wooded wetlands, pine and mixed hardwood forests, and agricultural lands. The mission of the National Wildlife Refuge System is "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" as stated in the National Wildlife Refuge Improvement Act (October 9, 1997).

Management actions on national wildlife refuges are directed at achieving the purposes for which the refuge was officially established and the mission of the National Wildlife Refuge System. The enabling legislation defines the purposes which guide the subsequent development of specific refuge objectives. The purposes for which Blackwater NWR was established depend upon the authorizing legislation under which the property was acquired. Land for Blackwater NWR has been acquired under the authority of five different legislative acts. While each varies somewhat in emphasis, the consistent theme is the protection and enhancement of natural resources, in particular to protect, enhance, and restore wetlands and other habitats for the benefit of migratory birds, endangered and threatened species, and other wildlife, as well as providing for compatible fish and wildlife-oriented recreation. Given these authorities, the following primary resource management objectives have been established for Blackwater NWR:

1. Provide resting and feeding areas for migratory birds, primarily wintering waterfowl;

2. Provide protection and essential habitat for endangered species such as the bald eagle, Delmarva fox squirrel, and Arctic peregrine falcon;

3. Provide habitat for National Species of Special Emphasis, such as the black duck and wood duck;

4. Provide quality interpretive opportunities for refuge visitors; and

5. Provide a site for conducting scientific research leading to the enhancement of wildlife and natural resource management.

1.1 PURPOSE OF THE ENVIRONMENTAL ASSESSMENT

FWS is authorized and directed by Executive Order 13122 to protect native wildlife and their habitats on NWRs from damage associated with invasive and injurious species, including damage related to migratory birds.

Wildlife damage management, or control, is defined as the alleviation of damage or other problems caused by or related to the presence of wildlife. It is an integral component of wildlife management (Leopold 1933, The Wildlife Society 1990, Berryman 1991). The Wildlife Services program of the Department of Agriculture (USDA-APHIS-WS) uses an Integrated Wildlife Damage Management (IWDM) approach (sometimes referred to as Integrated Pest Management or IPM) in which a combination of methods may be used or recommended to reduce wildlife damage. FWS has adopted these methods which include the alteration of cultural practices as well as habitat and behavioral modifications to prevent damage. The control of wildlife damage may also require that the offending animal(s) be removed or that the population of the offending species be reduced through lethal methods.

Blackwater NWR proposes to conduct a wildlife damage control program on the refuge using the IWDM approach to manage conflicts associated with resident Canada geese. This environmental assessment (EA) documents the analysis of the potential environmental effects of the proposed program. This analysis relies mainly on existing data contained in published documents including the Animal Damage Control Final Environmental Impact Statement (U.S. Dept. Agri. 1994); the Animal and Plant Health Inspection Service, Wildlife Services' Environmental Assessment for Management of Conflicts Associated with Non-migratory (Resident) Canada Geese, Migratory Canada Geese, and Urban/Suburban Ducks in the Commonwealth of Virginia (U.S. Dept. Agri. 1999); and 10 years of observations and data collections by Maryland Department of Natural Resources and Blackwater Refuge staff.

Normally, according to Animal and Plant Health Inspection Service (APHIS) procedures implementing the National Environmental Policy Act (NEPA), individual wildlife management actions may be categorically excluded from the requirements to prepare an EA. FWS typically considers the normal issuance of migratory bird permits to be a Categorical Exclusion to NEPA [see NEPA's revised categorical exclusion 1.4(c)(1) as published in the Federal Register, January 16, 1997 (Department of the Interior, Vol. 62 (11): pp. 2380-2882, effective January 16, 1997)]. However, given broader responsibility within the NWR System, Blackwater NWR has decided in this case to prepare this EA to facilitate planning, enhance interagency coordination, streamline program management, and to clearly communicate the analysis of impacts.

1.2 NEED FOR THE ACTION

Resident Canada geese refer primarily to local breeding Canada geese which nest and raise their young in Maryland, and more specific to this proposal, in southern Dorchester County. Resident Canada geese do not migrate to northern Canada, but remain in southern Dorchester County year-round. All Canada geese, regardless of their migratory status, are technically classified as migratory birds, and are managed under the Migratory Bird Treaty Act (MBTA). The distinction between resident geese and migratory geese is often very confusing to the public, however, the nearest analogy is the comparison of the domesticated park or marina mallard and the wild migratory mallard; both being generally the same in appearance, yet behaviorally quite different. The MBTA recognized this distinct behavioral difference for mallards, and efforts are ongoing to amend the MBTA to recognize similar differences between resident Canada geese and migratory geese. At Blackwater Refuge, efforts have been underway for the past ten years to determine if geese are resident or migratory through banding programs conducted by refuge staff and staff from the Maryland Department of Natural Resources. Both neck collars and leg bands have been used, and investigations have verified that the birds at Blackwater are locally raised geese that subsequently stay year-round, raise their young, become breeders, and raise even more young. The resident Canada geese are currently adversely affecting the purpose(s) for which Blackwater NWR was established.

Blackwater NWR was established under the authority of the *Migratory Bird Conservation Act (16 U.S.C. 715 d)* for the purpose as "an inviolate sanctuary for migratory birds." The refuge's resident Canada goose population has increased from an estimated 350 in 1989 to more than 5,000 in 1998. Statewide, the resident Canada goose population has increased from 25,000 in 1989 to 90,000 in 1998. (Maryland's population objective for resident Canada geese is 30,000). The direct and indirect results of this population explosion are adversely affecting the primary purpose for which the refuge was established. Exclosures constructed by refuge staff in the spring of 1999 clearly demonstrate that resident geese are seriously impacting the refuge's natural marsh vegetation that is already stressed by sea level rise, salt water intrusion, and overgrazing by nutria (an exotic mammal introduced in the 1940's), and are contributing to the loss of wetlands important to the Chesapeake Bay ecosystem. Studies and investigations by researchers Haramis and Kearns in the Patuxent Marshes, Maryland; May and Kangas in Kenilworth Marsh, Washington, D.C., and Nichols on the Maurice River, New Jersey substantiate similar destruction of natural marsh vegetation by resident Canada geese. A study at Bombay Hook National Wildlife Refuge also statistically validated that resident geese are significantly affecting natural vegetation in moist soil impoundments. While not statistically validated at Blackwater, observations by refuge staff during scheduled vegetation transects also document impacts to moist soil vegetation in impoundment systems important for producing food resources for migratory waterfowl. Likewise, resident Canada geese are causing significant damage to agricultural crops planted to provide critical forage for migrating and wintering waterfowl. Increasing damage has been documented by refuge staff during the past ten

years throughout the refuge, but particularly on the 240 acres of crops within the Key Wallace corridor, the area from the Little Blackwater River to State Highway 335. In 1999, for example, refuge staff documented the total destruction of 47 acres, almost half, of the refuge's annual corn crop, and 126 acres of ladino clover. In addition, observations by refuge biologists validate that resident Canada geese concentrate around the remaining water during summer impoundment drawdowns. The resulting concentrations of fecal droppings in these stagnant pools, when the temperatures are high, create excellent mediums for degraded water quality, and increase the potential for human and avian diseases transmitted by fecal material. For example, during a survey conducted by the National Wildlife Health Research Center (NWHRC), 16% of 37 resident Canada geese studied from Blackwater NWR were DVE (duck virus enteritis or duck plague) positive. There is also increased concern regarding transmission of diseases such as cryptosporidiosis, giardiasis, and chlamydiosis. Because of this potential problem, the FWS (Northeast Region) funded investigations by NWHRC and New Jersey Division of Fish, Game and Wildlife in 1999 to evaluate threats to human health posed by resident Canada geese in Rhode Island, New Jersey, and Virginia.

Resident gosling production on the refuge in 1998 exceeded 2,000, and resulting damage to refuge habitats was significant as previously noted and documented despite the expenditure of at least one full staff year of effort and thousands of dollars for harassment/scare devices. When these habitats are destroyed and their productivity is significantly reduced, the refuge doesn't have enough wintering habitat to support its 35,000 migratory Canada geese, 7,500 snow geese, 1,500 tundra swans, and 25,000 dabbling ducks, and the refuge cannot achieve the purpose for which it was established. The refuge population of resident geese is also expanding to private lands, and it is not uncommon to see flocks of nonbreeding geese flying almost anywhere south of Route 50 during the spring and early fall. These nonbreeders join with breeders and their fledgling young in the early fall to cause extensive damage by overgrazing and polluting private agricultural fields, alfalfa and hay meadows, lawns, golf courses, and other areas.

Therefore, the U.S. Fish and Wildlife Service proposes to conduct a program on Blackwater NWR in which an IWDM approach will be employed to manage conflicts associated with resident Canada geese.

1.3 RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS AND OTHER ON-GOING FWS ACTIVITIES

The USDI, FWS has completed, in cooperation with State wildlife agencies and APHIS-WS, an EA that could turn over the management authority for resident Canada geese (from March 11 through August 31) to State Agencies via a depredation permit. This would greatly simplify the permit process, but really does not support a resident Canada goose management program. The FWS justification for this permit is... "These increasing populations of locally-breeding geese are resulting in increasing numbers of

conflicts with human activities, and concerns relating to human health and safety are increasing...". At this time, no State Wildlife Agencies have applied for this permit in Region 5.

The Service realizes that more management flexibility for Resident Population Canada geese is necessary. Because of the unique locations where large numbers of Canada geese nest, feed and reside, the Service believes that new and innovative approaches, and strategies for dealing with bird/human conflicts will be needed. In order to address these issues, the Service has recently begun the initial groundwork, with the full assistance of the Flyway Councils and APHIS-WS, to develop a long-term strategy to integrate our management of these birds into a more comprehensive Flyway Management Plan system. The Service believes that this approach should provide States with more management flexibility and authority to deal with Resident Population Canada geese within their state, while increasing commitment to establish population goals and objectives, management planning, and population monitoring. However, in order to properly examine alternative strategies for control and management of resident Canada geese populations, the Service believes the preparation of an EIS will be necessary. The Service initiated an EIS addressing these approaches in 1999, and will hold scoping meetings in February and March 2000 as part of this EIS process throughout the Country.

Moreover, the finalized FWS permit procedures and the Blackwater NWR program have similar justifications and proposed actions (e.g., use of applicable non-lethal methods, time period geese may be taken, donating of geese to charity, methods of take, etc.). The Atlantic Flyway Council (AFC) is developing a resident Canada goose management plan to support the future EIS. In addition, the AFC has approved an overall population objective for resident Canada geese, and is stepping this population objective down to appropriate state objectives.

Other on-going FWS activities include establishment of special hunting seasons in September and January/February to address control of the growing population of resident geese. Depredation permits are routinely issued to shoot limited numbers of Canada geese to improve non-lethal harassment of these birds from depredation sites, and depredation permits have been issued in Delaware, New York, New Jersey, Maryland, and Virginia over the past 5 years to trap and kill large numbers of Canada geese to reduce a local problem population.

1.4 RESIDENT CANADA GOOSE BIOLOGY AND STATUS

Present-day populations of resident (non-migratory) Canada geese on Blackwater NWR originated from birds that were released or escaped from private waterfowl collections or hunting clubs 40-50 years ago, and from birds that were moved to the refuge from other areas. These non-migratory stocks of geese probably include a mix of several different subspecies including the giant (*Branta canadensis maxima)*, western (*B.c. moffitti)*, North Atlantic (*B.c. canadensis)*, and interior (*B.c. interior)* races. The refuge's resident goose

population grew from only about 350 birds in 1989 to more than 5,000 in 1998, and increased by almost 70% in just the last breeding season. This increase may be the result of the exploitation of man-made food resources, i.e., clovers, corn, winter wheat, buckwheat, and other agricultural crops planted on the refuge resulting in improved nutritional health and thus better reproductive success and gosling survival; few predators; and almost complete protection from harvest by hunting except when birds fly to private lands. The resident Canada goose's feeding and breeding behavior, habitat preference, and adaptability to man-made environments create situations in which Canada geese and humans conflict. Resident Canada geese feed on clover, grasses, and cereal grains, exactly the types of crops that migratory Canada geese need to survive the winter. Resident Canada geese also favor short, manicured grass, particularly near a water source, for loafing and feeding. Refuge dikes, important for managing water levels for migratory waterfowl, shorebirds, and other marsh and water birds, provide just such feeding and loafing areas which resident birds quickly denuded of vegetation causing erosion and dike failure.

Another indicator of the increasing problems with resident Canada geese is the number of complaints received by USDA's Wildlife Services Office. In 1993, the Annapolis office received no complaints from Dorchester County residents. In 1994, 1995, 1996, 1997, and 1998, complaints increased to 3, 5, 4, 4, and 6, respectively. While the number of complaints is relatively low, it is interesting to note that while only $300 in economic damage was noted from 1993 through 1997, $34,000 in damages to private agricultural crops was noted in 1998. (Damages sustained by the refuge during these years were not included in these statistics.)

Resident Canada geese nest from March through June. Eggs take approximately 30 days to hatch. Parent geese are very protective and aggressive in defense of young and nest. This aggressive behavior can potentially lead to attacks on human visitors, particularly visitors along the refuge's wildlife drive where geese sometimes nest. The refuge is not open to the special Maryland September hunting season for resident Canada geese since waterfowl hunting would interfere with other management objectives and refuge purposes. However, even if the refuge were open to public waterfowl hunting, control of resident Canada geese would be extremely minimal based on the reports of harvest statistics obtained from E.B. Forsythe NWR in New Jersey and Tudor Farms, Inc., a 6,000-acre private hunting preserve adjoining the refuge. At E.B. Forsythe NWR, 762 hunters, hunting 3,866 hours during three consecutive state seasons, only killed 413 geese from the refuge's impoundment system. Despite considerable hunting pressure at Tudor Farms, Inc., very few geese were taken during the 10 day State season, and the landowner was forced to eventually acquire a depredation permit from the FWS.

1.5 WILDLIFE ACCEPTANCE CAPACITY

Human dimensions of wildlife management include identifying how people are affected by problems or conflicts between them and wildlife, attempting to understand people's reactions, and incorporating this information into policy and management decision processes and programs (Decker and Chase 1997).

Wildlife acceptance capacity is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations. Wildlife acceptance capacity is also known as the cultural carrying capacity. These terms are important because they define the sensitivity of a local community to a specific wildlife species. For any given damage situation, there will be varying thresholds by those directly and indirectly affected by the damage. This threshold of damage is a primary limiting factor in determining the wildlife acceptance capacity.

Biological carrying capacity is the land or habitat's limit for supporting healthy populations of wildlife without degradation to the animal's health or its environment over an extended period of time (Decker and Prudy 1988).

Based on observations by trained wildlife biologists and cropland managers at Blackwater NWR who have been monitoring the effects of resident Canada geese for the past 10 years, it appears that the affected environment is being significantly impacted when the resident Canada goose population exceeds 300 to 350 (1989 population levels). The wildlife acceptance capacity by the public is much higher than the biological carrying capacity, because the public is not affected directly and visitors to the refuge are particularly pleased to see and observe goslings and adult Canada geese year round in large numbers. This is exactly the opposite of urban situations where the acceptance capacity is 20-30 resident Canada geese in subdivisions and water front communities, or on golf courses where the acceptance capacity is 25-30 birds (Conover and Chasko 1985). The acceptance capacity, however, for adjacent private farmers is probably more consistent with the urban situations. When flocks of 20 to 30 resident geese are observed to be feeding in agricultural croplands for more than a couple of consecutive days, farmers will implement some type of control. This response is consistent with other situations in which the wildlife acceptance capacity is met or exceeded; people begin to implement population control methods, including capture and euthanasia, to alleviate property damage and human health or safety threats related to accumulation of fecal droppings. In past years when birds were relocated to areas that didn't have resident Canada geese, residents in the receiving area immediately phoned the refuge to complain about damage to their lawns and gardens, and the abundance of fecal droppings on sidewalks, lawns, and vehicles.

2.0 SCOPING/PUBLIC PARTICIPATION

2.1 INTERNAL SOLICITATION FOR INPUT, INFORMATION, AND ISSUES

2.1.1 Internal/External Scoping: Internal solicitation for input, information, and issues was conducted by biologists and managers on the refuge who first analyzed the data on resident Canada geese that had been collected since 1989, including the effectiveness of these actions. Staff also consulted with biologists, NEPA Coordinators, flyway representatives, and senior staff in the Washington and Regional Offices (Northeast Region), USDA-APHIS-Wildlife Service's staff in Maryland and Virginia, and staff in the Wildlife and Heritage Division-MDDNR. Informally, refuge staff also discussed the resident Canada goose problem with several adjacent landowners and farmers, particularly those experiencing similar damage problems.

From April 14, 1998 until May 19, 1998, the refuge conducted 17 public forums at locations in Talbot, Dorchester, Caroline, Wicomico, and Somerset Counties, Maryland, and sent issue workbooks to 3,800 people as part of the refuge's Comprehensive Conservation Planning effort. Injurious and invasive species management, and specifically resident Canada goose management, was a major topic during these scoping meetings. The problems with resident Canada geese were addressed with the public, and ideas, including the alternatives listed herein, were discussed.

2.1.2 Issues: Several issues were identified: Aesthetics, animal welfare, effects on human health and safety, biological impacts of management actions (i.e., impacts on resident Canada geese and migrant/wintering waterfowl, endangered species, non-target species, agricultural losses, natural resources, etc.), effects on economics, cost to implement control programs, effects on refuge purposes and natural resources, effects on the physical environment, and effects on recreational hunting opportunities.

Wildlife is generally regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Aesthetics is truly subjective in nature; dependent on what an observer regards as beautiful. Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g., wildlife-related recreation, observation, harvest), indirect benefits derived from vicarious wildlife related experiences, and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems. Positive values of wildlife would also include having enough wildlife to view, but also to enjoy the aesthetics of the local environment without excessive animal excrement or loss of habitat that adversely affects other wildlife. The same wildlife that is

enjoyed by many can also create conflicts with a number of land uses and human health and safety. Economic losses to agriculture and damage to property are widely recognized as problems resulting from overpopulations of resident Canada geese. Public reaction is variable and mixed because there are numerous philosophical, aesthetic, and personal attitudes values, and opinions about the best ways to manage conflicts between humans and wildlife. Some people have the view that resident Canada geese should be captured and relocated to a rural area to alleviate damage or threats to refuge habitats. Others feel that resident geese should be managed for their recreational enjoyment (hunting, wildlife observation) and should be allowed to exist unharmed and unmanaged, particularly when migrant populations are low and hunting has been suspended. Many people don't really understand the difference between resident Canada geese and migrant Canada geese; a goose, is a goose, is a goose. And still others believe that resident Canada goose numbers should be significantly reduced by agency control programs.

The issues of animal welfare, the killing of geese, and humaneness were identified and discussed. Views vary greatly about killing of resident Canada geese; from being totally opposed, to believing that population management is an important part of wildlife management. The issue of humaneness, as it relates to the killing or capturing of wildlife, was also an issue that can have different interpretations by different people. Humaneness is a person's perception of the impact of an action. Animal welfare groups and animal rights organizations have expressed concern about inhumane methods that expose the animal to unnecessary pain and suffering.

Effects on human health and safety were identified as an issue because of the public's concerns about excessive accumulations of resident Canada goose fecal materials. Although not a problem as yet for the refuge, except on the refuge wildlife auto drive and bicycle/pedestrian route, where geese often roost and literally leave the roadway covered in excrement, most concern about this issue has been expressed from geese being relocated to other areas and then taking up residence on lawns and sidewalks of private residents. The general public's perception is that excrement is the perfect medium for transmission of disease. However, there is little evidence to support this concern, at least at present.

Biological impacts of the proposed management actions were also identified as issues, including impacts on the resident goose population itself and impacts to non-target species. Impacts on migratory Canada geese and other waterfowl, agricultural losses, effects to natural resources such as affected water quality, and effects on the physical environment were identified.

3.0 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

3.1 NO ACTION

For the purposes of this EA, the No Action Alternative is a "no management" approach. Under this alternative, there would be no control program actions at Blackwater NWR directed at management of damage associated with resident Canada geese. The resident Canada goose population would continue to reproduce and expand unchecked.

3.2 NON-LETHAL PROGRAM ONLY (Essentially The Current Program)

Under this alternative, only non-lethal management approaches will be used. Approved, non-lethal methods *potentially* available to Blackwater NWR for management of resident Canada geese include habitat alteration/creation; physical exclusion through wire grids, perimeter fencing, and floating ball blankets; or frightening and harassment methods such as pyrotechnics, propane cannons, reflective tape, eye-spot balloons, flags, and chase dogs; and chemical repellents. Relocation and contraception are not approved methods of non-lethal control in Maryland.

From 1989 through 1998, the current resident Canada goose control program has focused entirely on non-lethal methods, including habitat alteration/creation and the extensive use of frightening and harassment methods (pyrotechnics, propane cannons, reflective tape, eye-spot balloons, and flags). Chemical repellents have also been investigated, but not used.

Habitat alteration/creation has been accomplished through the planting and/or mowing of winter wheat and clover to "lure" resident geese away from agricultural crops and moist soil impoundments. This practice of "luring" resident geese was largely ineffective. The lure crops reduced damage for only very short time periods, and once these acres were consumed, geese went immediately back to destroying more highly prized habitats. It is suspected that this practice also resulted in contributing to the health and vigor of the resident geese, increasing their survival and reproductive capabilities.

Physical exclusion methods are not feasible to use on 14,000 acres (See Section 5.2). These methods, such as wire grids, perimeter fencing, and floating ball blankets, are recommended for small areas only (two acres or less) because of the installation and maintenance costs. They have not been part of the current program, nor are they being recommended as part of this alternative.

Frightening and harassment methods have been the most frequently used practices for eliminating conflicts with resident Canada geese, and would be recommended for continued use in this alternative. A wide variety of auditory and visual stimuli have been extensively used in the current program. Pyrotechnics, propane cannons, flags, reflective tape, eye-spot balloons, and chasing have all been used, and will continue to be part of this alternative. Pyrotechnics (screamer shells, bird bombs, and 12-gauge cracker shells) have

been used repeatedly to repel resident geese, but as with most of these methods, the resident geese soon became habituated and would only leave to return a short time later and resume their damaging activities. More often than not, unless reinforced by someone physically chasing the birds, the resident geese would simply ignore these exploding and noise-making devices entirely. Pyrotechnics are extremely dangerous, require staff time to deploy, have started fires, and have caused serious accidents on Blackwater Refuge during the nine years they have been used. They are also extremely disturbing to other wildlife and to the public.

Also very annoying to the public are propane cannons which operate on gas, and are designed to produce loud explosions at controllable, several minute intervals, 24 hours a day. The cannons are used currently, and would continue to be used in this alternative. They are automatically set and do not require staff to be physically present. The repeated, loud explosions can be heard for miles, and many refuge neighbors have complained about the cannons being totally unacceptable, particularly at night. Additionally, the resident geese have become increasingly habituated to the noise.

Flags are currently being used, but are the least effective of the frightening/harassment methods. Reflective tape, red on one side and silver on the other, is also currently being used. The tape is strung at close intervals over the fields and impoundments (20 to 30 feet apart, 2 to 3 feet above the vegetation). The tape blows in the wind, and for short times does cause resident geese to avoid the specific area. But like many other non-lethal methods, geese soon habituate to the tape. The tape also is very costly, and is difficult and labor intensive to maintain. Deer frequently get caught in the tape at nighttime, and tear down two days work in a matter of hours. The tape then blows onto the highway, wildlife drive, and/or into the river and marshes creating additional work for litter removal.

Eye-spot balloons, balloons with holographic eyes that move up and down as balloons bob on spring loaded posts, accompany the reflective tape. Depending on the size of the area, as many as 20 to 30 brightly colored balloons, generally yellow or orange, have been positioned throughout each affected field or impoundment. The balloons, like the tape, are very costly and labor intensive to install and maintain. They are also effective only for a week or two before resident geese habituate to their presence. Aesthetically, the balloons, as well as the tape and flags, greatly detract from the visitor's "wildland" experience.

Chase dogs, while not used in the current program, are a potential nonlethal method of control. However, they have been found to have limited effectiveness, particularly in areas such as Blackwater where resident geese can seek refuge on adjacent water areas. The cost of trained chase dogs that would not affect the visiting public or other wildlife (e.g., deer or Delmarva fox squirrels) is very high (see 3.4.1).

Chemical repellents have been investigated for current use, but have not been used because of cost. Methyl anthranilate, a grape flavored food additive approved by FDA, is sometimes effective at repelling resident Canada geese from grazing on turf for four days,

but is rendered ineffective when rained on or mowed. This chemical costs approximately $137.00 per acre to use. The need for repeated applications, cost, number of acres to be treated, and relative ineffectiveness make use of this repellent questionable.

Relocation, the capture of resident geese and their translocation to other areas of the refuge, has been used repeatedly over the last four years. Over 1,000 resident geese have been live captured annually in each of the past two years and translocated to other parts of the refuge. When the juvenile resident geese are still flightless and the adults are in molt, generally from mid-June to mid-July, geese are herded into large funnel traps (drive-traps), individually placed in crates, transported to other areas on the refuge, and released back into the wild. During the past, Maryland DNR only authorized relocation of captured resident geese to other parts of the refuge. In the future, Maryland DNR will not allow resident geese to be relocated and released **anywhere** once they have been captured.

3.3 LETHAL PROGRAM ONLY

Under this alternative, only lethal direct control will be used. Approved lethal methods potentially available to Blackwater NWR for population reduction of resident Canada geese include hunting, nest/egg destruction, and live capture with humane euthanasia by certified processors only (see the following proposed action for further description of authorized lethal control methods). Chemical toxicants are not an approved method of lethal control.

3.4 INTEGRATED WILDLIFE DAMAGE MANAGEMENT PROGRAM (PROPOSED ACTION)

Under this alternative, a combination of nonlethal and lethal management approaches will be used. Consistent with APHIS - WS and Maryland DNR's resident Canada goose management policy, nonlethal methods will be given first consideration in the formulation of each damage management strategy, and will be implemented when practical and effective before implementing lethal methods.

At Blackwater, the IWDM approach would consist of implementing one or a combination of the following actions: (1) Resource management, defined as altering habitat; (2) limited physical exclusion (fencing); and/or (3) wildlife management (frightening methods and population reduction). Within each of the three actions, there are a number of specific methods or tactics that will be used singularly or collectively. Within any given year, the methods and/or sequence of methods will be tailored to meet the overall objective of reducing (subsequently maintaining) the refuge resident Canada goose population at the 1989 level. At no time will the collective use of methods result in actually taking more than 3.5% of the statewide resident goose population in any given year. In determining the sequence or combination of methods to be applied, preference would be given to practical and effective nonlethal methods. However, nonlethal methods will not always be applied as a first response to damage problems.

A logical annual sequence that is in accordance with the new Maryland DNR policy would include the following actions: Egg shaking/oiling/puncturing would be conducted in late March through April of the current year. Frightening/harassment practices and methods would be applied in May and early June consistent with current practices described in the nonlethal alternative, and supplemented by limited shooting of adult birds to reinforce these harassment techniques. Where feasible, limited physical exclusion (fencing) will also be employed during this time period. Live capturing of preflighted juvenile and molting resident Canada geese will be conducted in accordance with current "drive-trapping" practices beginning on or around mid-June thru mid-July (dependent upon the exact time of the molt, weather conditions, responsiveness of the resident geese, and availability of staff). Geese will only be live captured on overcast days and early in the mornings to keep geese from becoming overly stressed due to warm temperatures. Goslings, if captured, will be released on site. If necessary, additional resident geese will be live captured in late July until the August 21 deadline with rocket nets while they feed on baited areas. Once live captured, the juvenile and adult resident geese will be placed in properly ventilated transportation crates, and transported to a certified processor. The processor will humanely euthanize the geese in accordance with AVMA (American Veterinary Medical Association) and Maryland policies using agents and methods of euthanasia defined in the "1993 Report of the AVMA Panel on Euthanasia" (Journal of AVMA, Vol. 202, No.2). The processed meat will be donated to a charitable organization. In accordance with Maryland's policy, all captured birds must be donated for use as food; a state or USDA licensed meat processor must have agreed in advance of capturing the geese to process the birds according to guidelines developed by the Maryland DNR, Maryland Department of Agriculture, and the Maryland Department of Health and Mental Hygiene; and a charitable organization or agency must have agreed in advance to accept the meat. During processing, the birds will be examined to ensure that the meat is not contaminated with shot.

This general sequence will be followed each management year until the 1989 objective level of 350 resident Canada geese is reached. However, the sequence of methods will likely change annually depending on the population level, the location and amount of habitat being impacted, overall responsiveness of the resident geese once lethal control is implemented, and effectiveness of these efforts, etc. Certainly, as we progress towards achieving the population objective, there will be less need for lethal control. The IDWM methods used will be evaluated annually to determine effectiveness in relationship to achieving the program's objectives.

In implementing IWDM, the primary social issues relative to managing wildlife damage will be considered. These are humaneness, effectiveness, and ecological soundness. Effectiveness will be determined by how quickly, economically, and completely the methods resolve the problem. Effective damage resolution is often best attained through the integration of several methods, either simultaneously or sequentially. Methods or management strategies will be evaluated considering maximum damage resolution with minimal negative environmental impacts.

The proposed action will also incorporate education as an important element of the program's activities. In addition to dissemination of recommendations and information to individuals and other organizations sustaining damage, environmental education lectures to school groups and displays at the visitor center will focus on problems with resident Canada geese and other invasive and injurious species, their effects on native wildlife and their habitats, and the socio-economic impacts. The refuge will also provide technical assistance based on its experiences to other refuges, wildlife management areas, and adjacent landowners experiencing similar problems with resident Canada geese. The refuge will work closely with APHIS-WS and MDDNR personnel regarding distribution of literature and interagency coordination of educational activities. The refuge biologist will also monitor the program annually; collect information on types and effectiveness of various control techniques used; number and age class of birds removed; etc., and publish the results to better refine control measures in relation to humaneness, effectiveness, and ecological soundness. The biological information will also be used to determine a particular year's sequence and/or types of control measures.

3.4.1 IWDM Techniques Considered But Dismissed From Proposed Action:

Several techniques, normally associated with IWDM, were considered, but will not be used in the Proposed Action, at least at this time. These include use of wire grids, floating ball blankets, use of guard animals, use of distress calls, relocation, creation of alternative habitats, public hunting, and chemical toxicants. Evaluations will be performed at the end of each year to determine the effectiveness of control methods in relationship to the program's objectives and in relationship to other refuge activities and needs. Conditions may change which might make one or more of these methods applicable in the future.

Wire grids and floating ball blankets are only used on small waterbodies (approx. 2 acres or less) to keep resident geese from using these areas. They are only effective on small ponds, and costs for installation are $1,000 and $131,000 per surface acre, respectively. It would currently be inconceivable to use these techniques on 12,000 acres of marshland, 750 acres of cropland, and 600 acres of moist soil impoundments, but these methods may be applicable as the population reaches the 1989 level.

Guard animals may be used to frighten resident Canada geese from areas where damage is occurring. Dogs can have limited effectiveness at harassing geese, but are normally used on small areas without water where harassed geese must go elsewhere to seek refuge. Border collies have been trained to accomplish this work. A well trained border collie that will harass geese and not effect other wildlife (e.g. Delmarva fox squirrels, etc.) costs approximately $2,000 to $4,000 per dog. Several dogs would likely be necessary to be even somewhat effective. Therefore, because of their limited effectiveness on such a large area as the refuge and the cost, this method was dismissed from current use.

Distress calls have been found ineffective at causing resident geese to abandon a pond

(Aguilera et al. 1991). Distress calls for Canada geese are not commercially available. The Av-alarm, a commercially available electronic sound generating device, is ineffective at repelling migrant Canada geese (Heinrich and Craven 1990).

Relocation of wildlife must be approved by the MDDNR for it to be a legal alternative. MDDNR and most, if not all, other states oppose relocation of resident Canada geese since the potential for damage is moved to the new location. This has clearly been the case in past at Blackwater when geese were relocated to other remote parts of the refuge only to immediately move to the lawns of private citizens destroying gardens and defecating on everything in sight. Relocated waterfowl have also caused epizootic and avian disease outbreaks in some areas. Furthermore, relocation attempts are extremely temporary, and unsuccessful. At Blackwater, molted (nonflying) geese and goslings relocated as far away as Martin National Wildlife Refuge (approx. 30 miles away) swam back to Blackwater within two weeks, even before they could fly. This has been the case for most of the 2,000 birds that have been captured and relocated to other parts of the refuge during the past two years as verified by neckbanded geese and recovery of leg bands. However, if policies change, trapping and relocation may be an acceptable control method.

Creation of alternative habitat would provide geese a place to live, but would create additional problems since these created habitats would only be of value until the population moved or outgrew the area. Created habitats would also probably serve as attractants, bringing more resident Canada geese to the refuge.

Contraception is not an available means of control since no contraceptive drugs are registered with the FDA for use in limiting reproduction of Canada geese or other waterfowl. Furthermore, contraception is not an approved method by MDDNR. Canada geese have been successfully vasectomized to reduce recruitment into future populations, however this may be effective only if the male remains mated and it only affects reproduction from that male's female mate. The ability to identify breeding pairs for isolation and to capture a male goose for vasectomization becomes increasingly difficult as the number of geese increase (Converse and Kennelly 1994).

Hunting may reduce resident Canada goose populations, but would currently conflict with other refuge objectives. (See Sections 1.4 and 5.3.1 for further discussion on hunting.) Hunting may be considered as an IWDM method in combination with other methods if future evaluations justify its use without conflicting with other refuge objectives. If hunting is recommended in the future, a separate EA, Hunt Plan, and Federal Register notice must be completed before hunting is authorized.

There are no toxic chemicals currently registered with the EPA for use in managing resident Canada geese.

4.0 AFFECTED ENVIRONMENT

The environment affected by the proposed action would be primarily the vegetation and wildlife resources; however some effect could occur on the physical resources of soils, hydrology, and air quality. Cultural, aesthetic, and socio-economic resources also could be impacted. Discussion of the affected environment and impacts will be limited to these resources, which have been identified as the most likely to be affected by the proposed action and its alternatives.

A. Physical Resources

In this section, information is presented regarding the physical resources that could be affected by or affect the control of resident Canada geese on Blackwater NWR. Specifically, this section will cover location, geology and soils, hydrology, and air quality.

1. Location

Blackwater NWR is located south of the Choptank River on the eastern side of the Chesapeake Bay, Maryland's Eastern Shore. Both areas are part of the Chesapeake Bay Ecosystem, the largest estuary in the United States. Isolated islands or small clumps of firm ground dot the vast marsh landscape. Surrounded by shallow sounds, marsh islands, and adjacent waters are the Bay's most productive estuarine areas. They produce the aquatic and emergent plant communities, which in turn provide optimum habitat for large concentrations of waterfowl, and nursery areas for small fish and crabs. Blackwater NWR is located in Dorchester County, Maryland, approximately 12 miles south of Cambridge. The refuge complex is comprised of three refuges: Blackwater NWR, which is the administrative center; Susquehanna NWR, located on Edmondson's Island at the mouth of the Susquehanna River in Hartford County, Maryland; and Martin NWR, located on Smith Island in Somerset County, Maryland approximately 15 miles offshore from Crisfield. Blackwater NWR is currently comprised of approximately 24,000 acres of tidal marsh and open water areas, wooded wetlands, loblolly pine and mixed hardwood forests, freshwater impoundments, and agricultural lands.

2. Geology and Soils

Blackwater NWR lies within the Mid-Atlantic Coastal Plain. The topography is flat with elevations ranging from 0 to 8 feet above mean sea level. Soils of the tidal marshes and other low-lying areas are either of the Bestpitch, Transquaking, Honga, or Sunken mucky silt loam series. The Bestpitch, Transquaking, and Honga soils are characterized by very deep organic deposits over clayey estuarine sediments, except Honga which overlies fluvio-marine sediments. All are poorly drained, with more rapid permeability in the organic deposits and slower permeability in the underlying deposits. Bestpitch and Transquaking soils are typical of the estuarine tidal marshes, while Honga soils are more typical of the submerged-upland tidal marshes. The Sunken mucky silt loam series, typical of lowland flats evolving into tidal marshes, are also very deep, slowly permeable and poorly drained, but are a mucky silt loam rather than organic deposits over fluvio-marine sediments. All four of these soil series are typical along

tidally-influenced rivers, bays, and drainage ways. These soils generally have a 0 to 1 percent slope (USDA 1997). Pendleton and Stevenson (1983) documented that marsh sediments averaged 58 percent organic matter.

Upland soils are typically silt loams of the Elkton, Matapeake, Mattapex, and Othello series. These soils formed in silty deposits overlying sandy fluvio-marine sediments. All are deep soils and are moderately slowly, to slowly, permeable. The Matapeake and Mattapex soils are well drained, while the Othello and Elkton soils are poorly drained. These soils are typical of the lowland flats, with Elkton also occurring in depressions and swales and Matapeake occurring on side slopes. Othello soils are often in association with the Kentuck soils, which are also very deep, slowly permeable, and very poorly drained. The Kentuck soils also formed in silty deposits overlying sandy fluvio-marine sediments and are typical of lowlands, depressions, and ancient floodplains. These soils generally have a 0 to 2 percent slope (USDA 1997).

Marsh deposits on Blackwater NWR began about 3,800 years ago. Many deposits are almost four meters thick in the oldest areas of the marsh, but average deposits are between two and three meters thick. Most of the material is loose, organic muck. The Blackwater and Little Blackwater Rivers are the major sources of inorganic sediments for most of the marshes on the refuge, with occasional storm deposition from Fishing Bay being important for marshes in the southeastern part of the refuge. The emergent marsh is noticeably being replaced by open water through erosion, subsidence, sea level rise, increasing salinities, and eat-outs from muskrats, nutria, and geese. In the last 100 years, effective sea-level rise (land subsidence added to sea level rise) has been 12 inches in the Chesapeake Bay area (Leatherman et al. 1995).

3. Hydrology

The Coastal Plain is underlain by unconsolidated sediments, which includes all of the estuarine wetlands. The area derives its ground-water recharge mainly through infiltration of precipitation. Discharge occurs through seepage to streams, estuaries, and the ocean. Coastal wetlands are in these discharge zones. These wetlands have complex hydrology, of which streamflow, ground-water flow, and tidal flow all play a part. Forested wetlands occur along the stream channels, and are sustained by local and regional ground-water flow and flooding during storm events. The poorly drained interior of the Delmarva Peninsula has a system of depressional palustrine wetlands, narrow bands of palustrine wetlands along rivers and ditches that drain from inland to the coasts. Extensive wetlands occur along the coasts and inland bays. In Blackwater NWR, brackish marshes grade into tidal freshwater marshes (Hayes 1996).

Surface water on the refuge is derived from local precipitation. Blackwater NWR has a relatively large and efficient watershed, and receives substantial runoff from Green Brier, Kentuck, Gum, and Moneystump Swamps and from the tidally influenced Blackwater and Little Blackwater Rivers, which empty into Chesapeake Bay. Water samples from the Blackwater River show that salinities in the river range from 0 ppt to 19 ppt depending upon time of year and tide, and most dissolved oxygen levels fall within the range of 60 to 90 percent. Storm tides associated with hurricanes or northeast winter storms can cause extreme flooding of refuge wetland areas,

inundating areas with saltwater, which results in salt-saturated soils and tree mortality.

4. Air Quality

Dorchester County is classified as a Class II area under the Clean Air Act, with air quality that is generally good. Dorchester County is in attainment for all criteria pollutants, which means that it meets the National Ambient Air Quality Standards for emissions. Visibility in the county is good, generally averaging three to five miles. Facilities within the county that could be sensitive to smoke include Dorchester General Hospital, 9 miles from the refuge; City of Cambridge, 8 miles; Dorchester Airport, 8 miles; and Eastern Shore Hospital Center, 8.5 miles. All of these facilities are north of the refuge.

B. Biological Resources

Both vegetation and wildlife resources would be affected by actions to manage the resident Canada goose population.

1. Vegetation

Blackwater NWR consists of approximately 13,320 acres of tidal marshes and open water areas, and approximately 9,214 acres of woodlands. Approximately 750 acres of the refuge are managed agricultural units. Crops are planted annually to provide winter food for migrating waterfowl. Corn, clover, millet, milo, buckwheat, and winter wheat are the main agricultural crops. Thirty freshwater impoundments, totaling approximately 600 acres, have been constructed since the 1940s, and these "moist soil management units" are managed intensively for migratory birds. Approximately 135 acres are refuge administrative lands, consisting of roads, building, and storage areas.

Blackwater NWR marshes, typical of Maryland's Eastern Shore, are tidal, brackish, estuarine marshes. Because these brackish marshes form a wide transition zone between the more seaward marshes to the inland marshes, they generally have a high diversity of plant species. Dominant plant species include extensive areas of black needlerush intermixed with saltmarsh hay, saltgrass, Olney three-square bulrush, and smooth cordgrass (Tiner and Burke 1995). At Blackwater NWR, these marshes have been managed through burning for years, resulting in the sub-climax species, Olney three-square bulrush being the dominant marsh vegetation, occurring in almost monospecific stands (Pendleton and Stevenson 1983). However, saltmarsh hay, smooth cordgrass, saltgrass, and black needlerush are commonly interspersed among stands of Olney three-square bulrush. Several small pine islands are also distributed throughout the marsh. When refuge populations of wintering Canada geese reached almost 100,000 in the late 1960's and early 1970's, geese caused extensive damage to these fragile marshes creating eat-outs that later enlarged and combined to result in marsh loss to open water.

Portions of Blackwater NWR support one of the best examples of a complex of tidal saltwater wetlands, tidal freshwater wetlands, non-tidal wetlands, upland islands, and Delmarva Bays in Maryland. These wetland communities incorporate ten different major tidal types and approximately fifteen types of non-tidal wetlands. Both estuarine and palustrine wetlands are well represented. Within the palustrine wetlands, palustrine forested, palustrine scrub-shrub, palustrine emergent, and open water are the major types. The federally endangered swamp pink is believed to occur in bog-like habitats. Within the estuarine wetlands, estuarine emergent, intertidal forested, estuarine scrub-shrub, and aquatic bed are represented. The whole gamut of hydraulic regimes, ranging from seasonally saturated soils to permanently flooded areas, can be found in the palustrine wetlands, and the estuarine wetland regimes, ranging from tidal to irregularly flooded, are equally well defined. Tidal wetland communities within these parcels include salt marsh cordgrass, saltmeadow, saltbush, black needlerush, freshwater mixed, arrow arum-pickerel weed, cattail, narrowleaf cattail, yellow pond lily, and tidal mudflat, which make this complex extremely diverse.

Four forest cover types were delineated on the refuge by Whiteman and Onken (1994). These are loblolly pine, in which loblolly pine comprises at least 80 percent of the basal area of the stand; loblolly pine-oak, in which loblolly pine comprises 20-79 percent and oak species account for 20 percent or more of the basal area; loblolly pine-mixed hardwood, in which loblolly pine comprises 20-79 percent and hardwoods other than oak comprise at least 20 percent of the basal area of the stand; and mixed hardwoods, in which various hardwood species account for at least 80 percent of the stand. The most dominant tree species on the refuge is loblolly pine. The common hardwoods include sweet gum, swamp chestnut oak, willow oak, and white oak. In addition to these four forest types, Whiteman and Onken (1994) also delineated areas of blanket tree mortality generally associated with flooding and saltwater intrusion, with standing dead trees ranging from 50 to 90 percent.

The upland agricultural and forested areas of the refuge provide additional species diversity. Being dominated by non-wetland species and providing transition zones that usually are higher in diversity, they provide excellent pine tree nesting and perching sites for many of the more than 160 bald eagles and 10 golden eagles that winter on the refuge. The hardwoods, as well as the pines, also provide excellent habitat for the Delmarva fox squirrel, and numerous other species.

2. Wildlife

Blackwater NWR provides habitat for a rich diversity of wildlife. Over 257 species of birds, 30 species of mammals and 40 species of reptiles and amphibians occur on the refuge for at least part of the year. An additional 25 species of birds have occasionally been sighted on the refuge and an additional 8 species of mammals also could occur based on range maps. The most conspicuous bird species are the waterfowl, particularly during migration. Peak numbers of geese occur in January, and peak numbers of ducks can be seen in November. Waterfowl species nesting in the refuge wetlands include blue-winged teal, gadwalls, mallards, black ducks, wood ducks, exotic mute swans, and resident Canada geese. A breeding bird survey conducted on two tracts of the refuge in 1996 recorded 85 species of birds nesting in the refuge's forested wetlands. The shallow

waters and marshes of the refuge provide excellent feeding areas for numerous species of wading birds. Shorebirds, gulls, and terns also use the refuge for foraging and nesting, as well as numerous raptors, of which the most predominant is the bald eagle. Largest of the mammal species are the two species of deer: the native white-tailed deer and the exotic sika deer, both of which maintain healthy populations on the refuge. Both muskrat and the introduced nutria are thought to contribute to marsh loss through their foraging activities. Efforts to control these two species have been on-going on the refuge for many years. Commonly observed species of the secretive reptiles and amphibians include the painted turtle, red-bellied turtle, northern cricket frog, southern leopard frog, and occasionally, a copperhead. Blackwater also hosts a wide array of fish species, and its marshes and estuaries are a spawning and nursery ground for commercial and sport fin and shellfish. However, present knowledge of the fisheries resources is inadequate.

Blackwater NWR has also historically provided habitat and protection for three federally endangered species: the bald eagle, the Delmarva fox squirrel, and the peregrine falcon. The refuge's forests provide unique and important habitat for the largest aggregation and nesting population of bald eagles north of Florida, and the nation's largest protected population of Delmarva fox squirrels. Bald eagles and Delmarva fox squirrels are year-round residents, while peregrine falcons are occasionally observed migrating through the mainland marshes of Blackwater, but frequently visit Bishops Head Point and Spring Island from nearby nesting towers on Fishing Bay WMA, South Marsh Island Management Area, and Martin NWR. In 1996 and 1997, record numbers of eagles were produced in Dorchester County. In 1996 , a total of 80 eagles were produced, 19 of which were from 12 nests on Blackwater NWR. In 1997, 92 eagles were produced, 24 of which were from 14 eagle nests on the refuge. The Delmarva fox squirrel, which now only inhabits approximately 10 percent of its original range, appears to be stable on the refuge. The red-cockaded woodpecker, once found on Blackwater NWR, has not been sighted since 1976, and is now believed to be extinct in Maryland. The Northeastern tiger beetle is believed to have suitable habitat on Barren Island; however, no specimen has been found to date. Sea turtles such as the endangered Atlantic loggerhead, green, hawksbill, leatherback, and Atlantic ridley are occasionally found in the waters surrounding Barren Island, Bishops Head Point, and Spring Island. Several Species in Need of Conservation also occur on Blackwater NWR: the black rail, Henslow's sparrow, sedge wren, northern harrier, carpenter frog, rare skipper, and sweet-scented ladies-tresses. The adjacent Fishing Bay WMA provides important habitat for three federally endangered species, two federal candidate species, and six State-listed species in Need of Conservation.

C. Socio-economic/Cultural Resources

1. Socio-economic Resources

Dorchester County had a 1990 population of 30,236. Cambridge, to the north of the refuge, is the largest city in the county. While the county's economy has historically been based on agriculture and water-related industries, manufacturing currently provides 36 percent of the county's employment. Service and retail trade industries primarily provide the balance of the county's employment. Timber is one of the county's leading agricultural industries. Approximately

142,000 acres of commercial timber exist in the county, the majority (80%) of which is south of Route 50. Average household income for the County is $35,368 (Dorchester County 1997). Shellfish and finfish in the surrounding waters and furbearers in the marshes have always provided a source of livelihood since the time of the earliest settlers. Fur trapping is a major source of supplemental income to many Dorchester County residents, particularly watermen and farmers. Waterfowl hunting is a major recreational activity and industry around the Chesapeake Bay area. State and federal waterfowl refuges, including Blackwater NWR and Fishing Bay WMA, are important in maintaining and protecting the waterfowl resource. During the 1996 waterfowl season, over 140,000 ducks and 8,000 resident Canada geese were harvested by Maryland sportsmen. (The Canada goose season has been closed to taking migrant Canada geese throughout the Atlantic Flyway since the 1995 hunting season.)

The signing of the National Wildlife Refuge System Improvement Act of 1997 sanctioned hunting, fishing, environmental education, wildlife interpretation, wildlife photography, and wildlife observation as priority uses of the National Wildlife Refuge System. Recreational opportunities on and around the refuge will be continued so long as they are compatible with primary refuge purposes and are consistent with objectives and wildlife management programs. Refuge visitors account for approximately $12.5 million dollars to the economy of Dorchester County. Those who are engaged in wildlife observation and photography are a rapidly growing segment of the population whose contribution to the economy is also substantial. The refuge provided hunting opportunities for over 1500 deer hunters in 1997. Sportsmen contribute substantially to the economy of an area through local purchases of gas, food, lodging, and supplies. In an effort to control nutria and muskrat populations on the refuge, trapping is conducted on eighteen units, which are awarded by sealed bids. Over $9,400 were bid for 1997 trapping rights. Trapping income from the refuge in 1997 contributed approximately $30,000 to the local economy. Blackwater NWR also offers a comprehensive and structured wildlife interpretive and education program with exhibits and regularly scheduled public activities. Teachers workshops, field trips, interpretive foot trails, a five-mile interpretive tour route, interpretive exhibits, and demonstrations, etc., are used to increase public awareness of the area's natural resources. In fiscal year 1997, total visits to the refuge exceeded 142,700.

2. Cultural Resources

The entire Chesapeake Bay area has a long history, and prehistory, of human use. Both Indian occupation and the white man's settlement have been well documented since colonial times. The Staplefort cemetery at Blackwater NWR is considered to be historically significant. Prehistoric Indian sites exist on Barren Island. Brick foundation remnants of pre-refuge home sites occur in various wooded locations on Blackwater NWR.

5.0 CONSEQUENCES OF THE ACTION (See Table 1 for Summary Matrix)

5.1 NO ACTION ALTERNATIVE

5.1.1 Aesthetics: This alternative will likely invoke many different responses. Resource managers, adjacent landowners receiving and not receiving damages, the general public, and waterfowl hunters will all have different views and reactions to this alternative. Resource managers will continue to be plagued with increasing numbers of resident Canada geese, and the resultant proportional increase in damages to wildlife habitats. The wildlife acceptance capacity will be exceeded. Adjoining farmers, who currently are experiencing agricultural crop depredation, can be expected to be frustrated and will likely seek permits to control resident geese. Stakeholders not receiving damage, such as animal rights activists, and others who believe it is morally wrong to kill animals for any reason, will likely prefer this alternative. There certainly will be increased numbers of resident Canada geese to photograph and observe under this alternative, but at some point their numbers will definitely increase to the levels that the biological carrying capacity of refuge habitats is so greatly exceeded that the diversity and abundance of wildlife is reduced and the expansive marshlands are no longer aesthetically appealing. The uninformed and unaffected public would likely favor this alternative, but again, the aesthetic value would eventually diminish as more and more geese soil the wildlife drive, nature trails, lawns, parking lots, etc. A few waterfowl hunters may benefit from increased numbers of geese by taking less effort to fill the legally allowed daily bag in the early season. But generally, September goose hunting in Dorchester County is not an established tradition. Furthermore, many landowners are actively feeding pen raised and released mallards during this period on their Regulated Shooting Areas. Hunting of resident Canada geese, while feeding the free flying mallards, would be in violation of the Migratory Bird Treaty Act.

5.1.2 Animal Welfare: Since there would be no action taken to control the resident geese, there would be no concern for animal welfare expressed except by resource managers who would realize that no control would eventually lead to overpopulation, disease, malnutrition, and disregard to the health and welfare of the wide diversity of other wildlife that depend upon the refuge for food and shelter. While the general public and certain non-government organizations may assume that no control means no effect on animal welfare, no control will have adverse impacts on animal health. Migratory waterfowl would be the first to be impacted, since the uncontrolled population of resident geese would soon eliminate the production of moist soil plants and agricultural crops, and will eventually destroy the natural marshes used to supply nutrition for the refuge's thousands of migrating and wintering wildfowl.

High populations can devalue the species. This has happened to Canada geese in some areas. Several northern New Jersey communities have passed resolutions to 'delist' the Canada goose from the Migratory Bird Treaty Act. It is not unusual to encounter lake front property owners referring to Canada geese as flying rats. This disregard can lead to

citizens taking the law into their own hands, and implementation of actions that do not consider animal welfare, such as indiscriminate poisoning.

5.1.3 Effects On Human Health and Safety: The potential threat to humans from contacts with fecal materials would increase correspondingly with a growing population of geese. People would be less willing to use recreational areas because of the increase in feces. As more geese try to find nesting sites, there will also be the likelihood of more geese nesting along the wildlife drive and along refuge marsh trails, thereby increasing the threat of attacks on children and adults by nesting geese. Most of the public would be frustrated that degradation of public facilities supported by taxpayer dollars would be allowed to continue, and that government officials would do nothing to minimize the potential for goose attacks on humans. Although not a problem at Blackwater, high populations of flightless geese can pose a threat to automobile traffic when they are drawn across public roads. High populations can also pose a serious safety hazard when they concentrate near airports.

5.1.4 Biological Impacts: Resident Canada geese would continue to increase in abundance over time in their protected environment, would continue to displace other wildlife, would eventually preclude the refuge from planting any agricultural crops to meet the nutritional needs of migrating and wintering wildfowl, and would exacerbate the loss of marsh that is already imperiled by sea level rise, land subsidence, and overgrazing by nutria. Water quality will be negatively impacted because of the increase in fecal droppings. Increased erosion from excessive grazing would negatively impact water quality and cause increased sedimentation and destruction of freshwater impoundment dikes.

The presence of large numbers of resident Canada geese certainly conflict with management of the wild, migratory Atlantic Population (AP) of Canada geese. From food production to wildlife surveys, the refuge's management programs are adversely affected by large populations of resident Canada geese. Food and habitat for AP geese become food and habitat for resident geese, making it more difficult to manage for migrant populations as a result of the growing resident geese which quickly degrade and decimate these resources that are important for the health and survival of wild geese. Even the accuracy of AP goose surveys is reduced because of the growing number of resident geese which, by winter, become indistinguishable from wild birds and therefore adversely affect population estimates. Left unchecked and uncontrolled, the resident Canada goose population would eventually keep the refuge from accomplishing the purpose(s) for which it was established, and would adversely affect other wildlife species diversity and abundance.

5.1.5 Economic Impacts: As populations increase, resultant habitat destruction and loss on the refuge will force geese to adjacent private lands causing increased damage to property. There will be increased damage to lawns and turf at homes, businesses, and golf courses. Agricultural losses to small grain, corn, soybeans, milo, and other crops will increase proportionate to the population increase. As populations increased off the refuge,

landowners will either accept the problems or be forced to pay private pest control or nuisance wildlife control companies to assist with damage management. While there would be no implementation costs since there would be "no action" to control populations, the refuge would experience approximately $40,000 annually in crop depredation. The refuge would also experience significant decline in the number of visitors, which would proportionately affect the $100,000 the refuge receives annually from entrance fees and book store sales.

5.1.6 Physical Environment Impacts: There would be increased erosion along shorelines and of dikes by increasing numbers of geese. There would be increased potential for long-term negative impacts related to fecal contamination, and there will be increasing number of complaints from visitors to the refuge complaining about smelling the odor associated with these overpopulations.

5.2 NON-LETHAL PROGRAM ALTERNATIVE (Essentially the Current Program)

Under this alternative, only non-lethal management approaches will be used. Approved methods potentially available to Blackwater NWR for management of resident Canada geese include habitat alteration/creation; physical exclusion through wire grids, perimeter fencing, and floating ball blankets; or frightening and harassment methods such as pyrotechnics, propane cannons, reflective tape, flags, and chase dogs; and chemical repellents. Relocation and contraception are not approved methods of non-lethal control in Maryland.

It should be noted that although wire grids, perimeter fencing, and floating ball blankets are methods *potentially* available, these methods are not feasible or practical. These methods are generally used on areas of two acres or less. Resident Canada geese currently occupy over 14,000 acres on the refuge (a majority which is marsh and open water), and even if it were feasible to use these exclusion methods, they would be cost prohibitive ($1,000 per acre for wire grids and $131,000 per acre for floating balls) and certainly would have significant impacts on other wildlife and the public. Guard animals or chase dogs may be used to frighten resident Canada geese from areas where damage is occurring. Dogs can have limited effectiveness at harassing geese, but are normally used on small areas without water where harassed geese must go elsewhere to seek refuge. Border collies have been trained to accomplish this work. A well trained border collie that will harass geese and not effect the public or other wildlife (e.g. Delmarva fox squirrels, etc.) costs approximately $2,000 to $4,000 per dog. Several dogs would likely be necessary to be even somewhat effective. Therefore, because of their limited effectiveness on such a large area as the refuge and the cost, this method was dismissed from use. Therefore, wire grids, perimeter fencing, floating ball blankets, and use of guard animals are techniques and methods that will not be used as part of this alternative.

5.2.1 Aesthetics: Resource managers and adjacent landowners who are receiving damage will experience high levels of frustration with this alternative. As proven at Blackwater for the past 9 years, these techniques work for short periods of time, do

nothing to reduce population growth, and geese soon learn that these methods will cause no harm to them. In addition, these techniques are often aesthetically unappealing to the 150,000 visitors who use the refuge (e.g. cannons exploding day and night, eye spot balloons floating over all the agricultural fields, mylar ribbon strung over all the fields and blowing in the wind, and staff shooting shell crackers and whistling bombs in areas where geese and the visiting public are in close proximity). In 1989, propane cannons were sufficient to keep the 350 resident Canada geese from damaging wildlife habitats and concentrating on public use areas. However, as the resident goose population increased and competition for food was more intense, geese quickly learned that an exploding cannon meant no harm. The progressive addition of other nonlethal harassment methods were still ineffective (shell crackers and whistling bombs, then mylar ribbon, and finally eye-spot balloons). More and more effort by refuge staff and the expenditure of more and more money for harassment devices only resulted in more and more geese. The wildlife acceptance capacity was exceeded.

Stakeholders not receiving damage, such as animal activists, might prefer this alternative since no animals would be killed. As for public not concerned with management actions, the uninformed and unaffected would likely favor this alternative. Refuge visitors would certainly prefer not to see such annoying visual detractors such as mylar ribbon and eye-spot balloons everywhere. The public will continue to observe geese in increasing abundance just as in the No Action Alternative. However, the aesthetics value would decrease as more people are affected by damage to their recreational areas and as feces accumulates on areas frequented by the public. Once the public is informed, they are likely to reject this alternative because of the ineffectiveness of methods and the fact that harassment and exclusion can move geese to private property. The public will also become increasingly critical of the refuge for spending appropriated funds on already demonstrated ineffective methods. Furthermore, as the population increases despite the use of these techniques, the refuge's purpose(s) will be impacted to the extent that the refuge's mission can no longer be achieved and objectives cannot be met.

Waterfowl hunters may benefit from increased numbers of geese by taking less effort to fill the legally allowed daily bag as geese seek to find alternative feeding and resting sites because of harassment. However, as previously discussed, few geese actually leave the refuge due to harassment, and additionally recreational hunting of resident geese is not a high priority on private land around the refuge. Harassment simply will not equate to more geese being killed by recreational hunters on private lands in numbers sufficient to alleviate damage (as proven during the last two hunting seasons).

5.2.2 Animal Welfare: The would be concern among resource managers, stakeholders, and the public if harassed adult geese became separated from goslings.

5.2.3 Effects on Human Health and Safety: Consequences would be the same as 5.1.3. Use of non-lethal methods may redistribute some waterfowl to other areas without financial resources to get rid of the waterfowl or to areas where waterfowl have become habituated to these methods.

5.2.4 Biological Impacts: Same as 5.1.4.

5.2.5 Economic Impacts: Generally, the same as 5.1.5, except that implementation costs would be much greater. Based on past experience, these efforts will require the annual expenditure of 1.0 to 1.5 staff years of effort and $2,000 to $3,000 in harassment materials and supplies. Yet, since the overall effect on refuge habitats and wildlife populations will be negligible, the refuge will still experience $40,000 annually in crop depredation and the loss of revenue (as much as $100,000 per year) from tourism (entrance fees and book store revenue).

5.2.6 Physical Environment Impacts: Same as 5.1.6

5.3 LETHAL PROGRAM ALTERNATIVE

For this alternative, only lethal direct control will be used. Approved lethal methods potentially available to Blackwater NWR for population reduction of resident Canada geese include public hunting, nest/egg destruction, and capture and euthanasia, and are all part of this alternative. Chemical toxicants are not an approved method of lethal control, and are not part of this alternative.

Implementation of this alternative would result in a definite sequence of the lethal control actions, beginning with egg addling/oiling/puncturing in March and April; followed by capture and euthanasia of goslings in May and June; drive trapping and euthanasia of molting adults and flightless juveniles in June and July; rocket netting and euthanasia of adults and flighted juveniles in August; and public hunting in September.

5.3.1 Aesthetics: Resource managers and adjacent owners who are receiving damage would favor this alternative since it would alleviate the most damage in the shortest amount of time if appropriately applied. However, some adjacent landowners might eventually question this approach as fewer and fewer geese were observed on their property (not all adjacent landowners who receive damage would want to see "all their geese" killed). Nearly all stakeholders not currently receiving damage would be very concerned with this alternative, since every goose, regardless of age or size, would be killed. Animal rights activists would be vigorously opposed to this alternative, and there would be fewer and fewer geese to view in future years. The public would not likely favor a program that **only** focuses on killing wildlife. Public ability to view and aesthetically enjoy resident Canada will be limited as fewer geese occupy the refuge, yet a reduced population will result in a higher level of wildlife acceptance capacity.

Public hunting will result in very mixed reactions by both the hunters and the general public. Because the majority of resident Canada geese concentrate in the agricultural units and fresh water impoundments immediately adjacent to the wildlife drive, implementation of this alternative would necessitate closing the refuge's wildlife drive to coincide with the State's early resident Canada goose hunting season in September. This action will eliminate

use of the wildlife drive for 10 consecutive days and two weekends during one of the refuge's busiest public use seasons. Approximately 2,400 visitors will be excluded from participating in wildlife observation, photography, interpretation, and environmental education in order to accommodate a maximum of 12 hunters per day (the number that can safely hunt in this area). Waterfowl hunters will be pleased because they are being afforded a new opportunity to hunt, however, they will not be pleased that other forms of lethal control are being used before and after their hunting season. Hunters will strongly oppose other lethal methods since they will most likely want a large, sustainable population of resident Canada geese to perpetuate their sport. Based on reports from E.B. Forsythe NWR and Tudor Farms, a private hunting preserve adjacent to the refuge, hunters are also very likely to be disappointed after the first day's hunt because the resident geese are quick to learn to avoid areas where hunting is allowed (particularly since the geese have abundant food resources outside the hunting area during that time of the year). According to their experiences and the experiences of other September goose hunters, geese normally will provide shooting opportunities only once (maybe twice) in the 10 day period in any given field. Hunting is also not a very effective or economical form of control as noted by E.B. Forsythe NWR where 762 hunters, hunting 3,866 hours in three years during state seasons, removed only 413 resident Canada geese from the refuge's impoundment system. Off-refuge hunters are also likely to be concerned because fewer geese are leaving the refuge due to the reduced population resulting from the combination of lethal actions.

5.3.2 Animal Welfare: Resource managers and the public would support humane capture when it results in no pain or a minimum of pain that would be measured as "sustaining physical injury" (e.g. bleeding, broken wings, heat stress, and overcrowding). Capture, where birds are made as comfortable as possible by feeding, watering, proper containment (no overcrowding), and cooling, would be acceptable to resource managers and the public. Euthanasia, in accordance with AVMA methods and Maryland policy, would generally be acceptable to this group. If geese were shot by hunters, resource managers and the public would expect clean kills. Resource managers and the public would support egg addling, oiling, and puncturing.

The concern among stakeholders not receiving damage would be similar to resource managers and the public, except for animal activists who would want no geese captured or killed regardless of the humaneness of methods and proper husbandry. Some animal activist would approve of egg addling, oiling, and puncturing.

5.3.3 Effects on Human Health and Safety: The threat of disease transmission from waterfowl to humans would decrease because humans would come in contact with fewer goose dropping from a decreasing waterfowl population. Potential attacks on children and adults from nesting pairs would decrease likewise for the same reason.

5.3.4 Biological Impacts: The resident Canada goose population will definitely be reduced on the refuge. As the refuge population is reduced, other resident geese from adjoining private lands and waters will be expected to fill the vacant habitat made available by management actions over time. From 1989 to 1998, the State resident Canada goose population increased from 25,000 to 90,000. Maryland's population objective for resident

Canada geese is 30,000. The maximum level of reduction authorized by the State of Maryland for the refuge will not exceed 3.5% of the statewide population in any given year. FWS has recognized that since Canada goose populations have demonstrated the ability to sustain annual harvest rates in excess of 20% there would be little to no cumulative impact of this action on the Statewide population. However, local populations would remain low, but stable in number if lethal management was conducted on a regular basis. Migratory waterfowl would benefit from this alternative.

All the lethal actions, except public hunting, will be accomplished by FWS personnel. There should be no indirect or direct impacts to non-target species from egg addling/oiling/puncturing; capture; or euthanasia (which will only take place in controlled environments). There might be some direct impact to non-target wildlife through hunting, but this should be minimized through education; Canada geese are very hard for the educated hunter to confuse with other birds. Indirectly, however, other wildlife will be adversely affected by goose hunting in the impoundments, marshlands, and croplands if for no other reasons than disturbance and harassment.

5.3.5 Economic Impacts: There would be significantly reduced habitat and property damage to affect resource managers and adjacent landowners. Agricultural losses would decrease proportionately with the decrease in population. The potential for health risks associated with goose droppings would be reduced thus reducing health costs. Implementation costs, while initially reduced, would increase significantly over the years as birds become lower in abundance, wiser, and harder to kill per staff day of effort.

5.3.5 Physical Environment Impacts: With this alternative there is the potential for reduced erosion of dikes due to overgrazing by excessive numbers of resident Canada geese during the growing season. There is also the potential for reduced long-term negative impacts related to fecal contamination of water sources which are populated with large numbers of geese, and the potential to reduce concerns related to airborne odor from goose droppings.

5.4 INTEGRATED WILDLIFE DAMAGE MANAGEMENT PROGRAM ALTERNATIVE (PROPOSED ACTION)

Proposed control methods and the timing/sequence of these methods have been discussed in Section 3.2 and 3.4. A combination of nonlethal and lethal methods will be used in this alternative. When lethal methods are used, all resident geese that are to be captured will be captured alive using drive traps or rocket nets. Drive trapping is conducted by simply positioning standers and drivers along a previously constructed fence and calmly herding geese towards a capture pen located in the middle of this funnel. Drive trapping is only effective from mid-June to mid-July when the juveniles are still flightless and the adults have molted their flight feathers. The success of drive trapping is highly dependent upon the geese being in the right place at the right time since the traps (fences and capture pens)

are stationary and cannot be easily repositioned once in place. Rocket nets, on the other hand, are more mobile, and are required to capture resident geese when they have regained their ability to fly. Rocket nets are shot over the geese when they come to feed on the bait that has attracted them to the rocket net site. As previously explained, the captured geese are individually placed into well ventilated crates, under the most humanely conscientious conditions, and subsequently transported to a certified processor. The processor, not refuge personnel, euthanizes the geese in accordance with AVMA procedures and in accordance with Maryland DNR and USDA policies. The processed meat is then required to be donated to a charitable organization for human consumption. One such organization that has been contacted is "Farmers and Hunters Feeding the Hungry" (consult www.fhfh.org).

5.4.1 Aesthetics: Resource managers favor this alternative beyond all others because it provides the most options to reduce damage, and the ability to choose among the most methods to craft solutions specific to balancing the social and economic needs and the wildlife acceptance values of the public. While there would be less geese for the visiting public to see, geese would still be available for wildlife observation and photography, and without mylar ribbon and eye-spot balloons in the background. This alternative is recognized as having the most potential for long-term positive impacts for wildlife managers and the general public. Impacts to stakeholders not receiving damage would be highly variable. Some stakeholders would see the need to let the refuge manage damage, and let the refuge choose the most appropriate method (nonlethal or lethal). Other stakeholders, particularly animal rights activists, would oppose the privilege of choosing any lethal management options. A minority of animal activists would also oppose all damage management involving wildlife management (harassment, etc.). Waterfowl hunters, who would like to hunt resident Canada geese on the refuge, will initially oppose this alternative since public hunting will not be allowed until the population has been reduced substantially, and only then when a separate EA has been prepared for this activity. A few waterfowl hunters may feel their hunting opportunities near the refuge would be less productive since lethal control will be implemented thereby reducing the numbers of resident geese utilizing adjoining private lands. Other waterfowl hunters may benefit by harassment activities that cause resident geese to avoid or leave the refuge.

5.4.2 Animal Welfare: Same as 5.2.2 and 5.3.2.

5.4.3 Effects on Health and Safety: Same as 5.2.3 and 5.3.3

5.4.4 Biological Impacts: Same as 5.3.4, except that recolonization will be slower because of the ability to use the available wildlife management methods. Since public hunting is not initially part of this alternative, there should be no impacts to non-target species. Furthermore, this alternative will not permit the use of sedating drugs such as alpha chloralose, and therefore, there will be no impact on non-targets from using this type of control methodology. Migratory populations of waterfowl will benefit from this

proposal as will the refuge's purpose(s) and objectives.

5.4.5 Economic Impacts: The overall economic effect would be a reduction in costs caused by damage and implementation of control programs. There would be a reduction in agricultural losses and in the threat to human safety as these threats diminish proportionately with the decrease in resident geese. The cost to manage damage would decrease.

5.4.6 Physical Environment Impacts: Same as 5.3.6.

6.0 THREATENED AND ENDANGERED SPECIES

Methods used in the proposed action will have no effect on any listed species.

Table 1. A Comparison of Impacts of Alternatives Considered in this Environmental Assessment.

IMPACTS	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2 (NONLETHAL PROGRAM ONLY)	ALTERNATIVE 3 (LETHAL PROGRAM ONLY)	ALTERNATIVE 4 (INTEGRATED WILDLIFE DAMAGE MANAGEMENT PROGRAM)
AESTHETICS				
To resource managers and adjacent landowners receiving damage	Would strongly oppose this management alternative due to increasing damage and population expansion. Adjacent landowners will eventually seek permits for control.	Would likely favor this alternative over a no action alternative, but most would prefer a more aggressive approach.	Resource managers would favor this alternative, however some adjacent landowners would not favor a large scale population reduction even though it would help to alleviate damage.	Would likely strongly favor this alternative. Alternative would be recognized as having the most potential for long-term positive impact because of the variety of control options available.
To stakeholders not receiving damage	Some stakeholders would likely strongly favor this management alternative, if it amounted to a"hands off" approach to wildlife. Some will object to adjacent landowners securing permits to kill geese.	Some stakeholders would likely favor this management alternative over lethal measures of wildlife management.	Would likely be strongly opposed to this management alternative, especially those with affectionate bonds. Generally, some strongly opposed to killing of wildlife.	Would likely be variable to this management alternative. Some not in favor of active management of wildlife would oppose this alternative.
To public not concerned with management actions	Uninformed public would likely favor this alternative. Once informed, not likely to favor this alternative. Public will continue to observe geese in increasing abundance. The wildlife acceptance capacity will eventually be reached and opinions will change.	Uninformed public would likely favor this alternative. Once informed, may or may not favor this alternative. Public will continue to observe geese in abundance.	Uninformed public would likely not favor this alternative. Once informed, likely to favor this alternative. Public ability to view and aesthetically enjoy resident Canada geese will be significantly reduced.	Uninformed public would likely not favor this alternative. Once informed, likely to strongly favor this alternative. Public ability to view and aesthetically enjoy resident Canada geese will be reduced, but not to the extent of Alternative 3.

IMPACTS	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2 (NONLETHAL PROGRAM ONLY)	ALTERNATIVE 3 (LETHAL PROGRAM ONLY)	ALTERNATIVE 4 (INTEGRATED WILDLIFE DAMAGE MANAGEMENT PROGRAM)
Impacts on others	A few waterfowl hunters on adjoining private land may benefit by the increased number of geese available for legal harvest, but early fall hunting is not very popular around the refuge.	Few waterfowl hunters would benefit by the increased number of geese available for legal harvest, because experience shows that harassed geese only rarely leave the refuge.	Resident goose hunters will likely see fewer geese available for legal harvest on areas immediately adjacent to the refuge..	Same impacts as Alternative 3.
ANIMAL WELFARE				
Concern among resource managers and adjacent landowners receiving damage	Concerned that no action will lead to overpopulation, malnutrition, disease, etc. Concerned about effects on other wildlife.	Concern if harassment actions separate adults from goslings.	Want geese captured in such a way which results in no pain or minimum of pain. Wants birds treated humanely during transportation, holding, and processing for human consumption.	Same as Alternative 3.
Concern among stakeholders not receiving damage	Same concerns as resource managers. Animal activists would oppose eventual killing of geese by adjacent landowners.	Same as Alternative 1.	Same concerns as resource owners except some animal activists believe capture and killing geese is inhumane regardless of methods used.	Same as Alternative 3.
Concern among the public not concerned with management actions.	Same as resource managers	Same as Alternative 1.	Same concerns as resource owners.	Same as Alternative 3.

IMPACTS	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2 (NONLETHAL PROGRAM ONLY)	ALTERNATIVE 3 (LETHAL PROGRAM ONLY)	ALTERNATIVE 4 (INTEGRATED WILDLIFE DAMAGE MANAGEMENT PROGRAM)
EFFECTS ON HUMAN HEALTH AND SAFETY				
Disease threat	The threat of disease would continue to increase because waterfowl abundance continues to increase. Public anxiety about disease threat increases.	Public still anxious about disease threat but less so because action taken to alleviate threat.	Public anxiety about disease threat greatly reduced because of visible reduction of droppings due to fewer Canada geese.	Same as Alternative 3.
Potential for attacks on children and adults	Increased potential for attacks on people.	Same as Alternative 1.	Significant reduction or elimination of potential for attacks on people.	Significant reduction or elimination of potential attacks on people. Fewer geese would die under this alternative.
BIOLOGICAL IMPACTS OF MANAGEMENT ACTIONS				
On resident Canada geese	Resident Canada geese would continue to increase in abundance. Possible illegal action may be taken against birds.	Same as Alternative 1.	Other resident Canada geese will fill habitats over time made vacant by management actions. Populations would remain low locally if management actions conducted annually.	Same as Alternate 3, except that recolonization will be slower because of use of available wildlife management methods. No more than 3.5% of the statewide population of resident Canada geese will be killed with capture/euthanasia in a calendar year

IMPACTS	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2 (NONLETHAL PROGRAM ONLY)	ALTERNATIVE 3 (LETHAL PROGRAM ONLY)	ALTERNATIVE 4 (INTEGRATED WILDLIFE DAMAGE MANAGEMENT PROGRAM)
On non-target species	Would increasingly be vectors of disease to other waterfowl.	Same as Alternative 1.	Very remote possibility of incidental take by hunters. Also potential for other wildlife to be disturbed or harassed by hunters.	No adverse effect on non-target species.
Property loss	Increased damage to refuge and adjacent property including fecal droppings on recreational areas and feeding damage to lawns and golf courses.	Continued damage to property including fecal droppings on recreational areas and feeding damage to lawns and golf courses.	Significantly reduced property damage for affected resource owners.	Reduced property damage for affected resource owners.
Agricultural losses	Increased agricultural losses to farmers (and refuge) as a result of goose grazing and sprout pulling.	Continued agricultural losses to farmers (and refuge) as a result of goose grazing and sprout pulling.	Significantly reduced agricultural losses to farmers (and refuge) as a result of goose grazing and sprout pulling.	Reduced agricultural losses to farmers (and refuge) as a result of goose grazing and sprout pulling.
Natural resources	Increased potential for geese to negatively affect water quality.	Continued potential for geese to negatively affect water quality.	Reduced potential for geese to negatively affect water quality.	Same as Alternative 3.

IMPACTS	ALTERNATIVE 1 (NO ACTION)	ALTERNATIVE 2 (NONLETHAL PROGRAM ONLY)	ALTERNATIVE 3 (LETHAL PROGRAM ONLY)	ALTERNATIVE 4 (INTEGRATED WILDLIFE DAMAGE MANAGEMENT PROGRAM)
Damage management costs	There will be no implementation cost by FWS. Adjacent landowners would likely hire private pest control businesses. Damage costs would continue to increase ($40,000 refuge cropland loss and up to $100,000 in public use fees/tourism).	Implementation cost for FWS, based on past experience, would be a minimum of $45,000 per year. Damage costs would continue to increase just as described in Alternative 1.	Implementation costs, while initially reduced, would slowly increase significantly as birds become lower in abundance and harder to kill per staff day of effort. There would be significant reduction in damage costs and loss of tourism dollars.	Damage costs and loss of tourism dollars would be significantly reduced. Long-term implementation costs would decrease the most under this alternative because of integration of methods.
PHYSICAL				
Soil	Potential for increased erosion along dikes and certain shorelines due to excessive overgrazing.	Potential for continued erosion along dikes and certain shorelines due to excessive overgrazing.	Potential for reduced erosion along dikes and certain shorelines.	Potential for reduced erosion along certain shorelines due to grazing on shoreline vegetation by excessive numbers of Canada geese and ducks.
Water	Potential for increased long-term negative impacts related to fecal contamination of water sources.	Potential for continued long-term negative impacts related to fecal contamination of water sources.	Potential for reduced long-term negative impacts related to fecal contamination of water sources.	Potential for reduced long-term negative impacts related to fecal contamination of water sources which are populated with large numbers of Canada geese and ducks.
Air	Continued long-term concern related to airborne odor from Canada goose droppings.	Continued long-term concern related to airborne odor from Canada goose droppings.	Potential reduction in long-term concern related to airborne odor from Canada goose droppings.	Potential reduction in long-term concern related to airborne odor from Canada goose droppings.

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FINDING OF NO SIGNIFICANT IMPACT

A careful review of the Blackwater National Wildlife Refuge program EA indicates that there will not be a significant impact on the quality of the human environment as a result of this proposal. I therefore determine that an Environmental Impact Statement (EIS) will not be prepared. This determination is based on consideration of the following factors which are addressed in the EA:

1. The proposed activities will occur in isolated or localized areas only. The proposed activities are not national or regional in scope.

2. On balance, the impact of the program will be beneficial. However, the benefits will not be significant Statewide.

3. The proposed activities will not significantly affect public health and safety. While the threat of human disease associated with overpopulations of resident Canada geese is suspected, it has not been fully documented. The Service will be investigating the human disease issue in 1999. The methods used to control resident Canada geese are highly target specific, and are not likely to affect public health and safety.

4. The proposed activities will not have an adverse impact on unique characteristics of the geographic area such as historical or cultural resources, refuge and park lands, prime farmlands, wetlands, wild and scenic rivers, or ecological critical areas. However, like many other introduced, injurious species, resident Canada geese are seriously affecting wildlife habitats on these areas. Their control will help restore the integrity of these important natural resources. The methods proposed for alleviating damages will not impact these resources.

5. The effects on the quality of the human environment of the proposed activities are not highly controversial. Although some people are opposed to waterfowl damage management, the methods and impacts are not controversial among experts.

6. The possible effects of the proposed activities on the quality of the human environment are not highly uncertain, and don't involve unique or unknown risks.

7. The proposed activities do not establish a precedent for actions with future significant effects or represent a decision in principle about a future consideration. Other states and refuges are conducting similar Canada goose damage management programs, and have been doing so for years.

8. There are no significant cumulative effects identified by this assessment. Actual take from Blackwater NWR is estimated to be 3.5% of the statewide resident Canada goose population in Maryland. The Atlantic Flyway Council has set a population goal for resident Canada geese that is ½ the current population estimate, and the State of Maryland has established a goal within that objective.

Blackwater NWR's proposed action is supported by these population goals. As discussed in the EA, if resident populations on the refuge were reduced to 1989 levels, this would be expected to slow the overall population growth rate on the refuge, but not reduce the population statewide.

There are no national cumulative impacts to resident Canada goose populations because resident Canada geese generally live within 25 miles of where they were born, do not migrate except to adjacent states, and will only make short flights of a migratory nature only to avoid extreme winter weather which Maryland usually doesn't have. (Note: While resident geese do not migrate in Maryland, they do migrate in the Flyway. Basically, there is a Coastal Subpopulation of resident Canada geese that moves very little, and there is an Interior Subpopulation that migrates several hundred miles.)

This program has no national cumulative impact to Canada geese, since it is only directed to resident Canada geese on Blackwater NWR. A New York State Department of Environmental Conservation study has found extremely high site fidelity for the non-migratory segment of resident Canada geese.

9. The proposed activities will not affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, nor will they cause a loss or destruction of significant scientific, cultural, or historical resources.

10. The proposed activities will fully comply with the Endangered Species Act of 1973, as amended. The program will not affect Federally or State listed threatened and endangered species.

11. The proposed activities will not threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment. The proposed activity does not violate the Migratory Bird Treaty Act.

For additional information concerning this decision, please contact Glenn A. Carowan, Jr., Project Leader, Blackwater NWR, 2145 Key Wallace Drive, Cambridge, Maryland 21613.

Approved by:

Ronald E. Lambertson

Ronald E. Lambertson
Regional Director, Northeast Region
U.S. Fish and Wildlife Service

2.7.00
Date

FINDING OF NO SIGNIFICANT IMPACT

A careful review of the Blackwater National Wildlife Refuge program EA indicates that there will not be a significant impact on the quality of the human environment as a result of this proposal. I therefore determine that an Environmental Impact Statement (EIS) will not be prepared. This determination is based on consideration of the following factors which are addressed in the EA:

1. The proposed activities will occur in isolated or localized areas only. The proposed activities are not national or regional in scope.

2. On balance, the impact of the program will be beneficial. However, the benefits will not be significant Statewide.

3. The proposed activities will not significantly affect public health and safety. While the threat of human disease associated with overpopulations of resident Canada geese is suspected, it has not been fully documented. The Service will be investigating the human disease issue in 1999. The methods used to control resident Canada geese are highly target specific, and are not likely to affect public health and safety.

4. The proposed activities will not have an adverse impact on unique characteristics of the geographic area such as historical or cultural resources, refuge and park lands, prime farmlands, wetlands, wild and scenic rivers, or ecological critical areas. However, like many other introduced, injurious species, resident Canada geese are seriously affecting wildlife habitats on these areas. Their control will help restore the integrity of these important natural resources. The methods proposed for alleviating damages will not impact these resources.

5. The effects on the quality of the human environment of the proposed activities are not highly controversial. Although some people are opposed to waterfowl damage management, the methods and impacts are not controversial among experts.

6. The possible effects of the proposed activities on the quality of the human environment are not highly uncertain, and don't involve unique or unknown risks.

7. The proposed activities do not establish a precedent for actions with future significant effects or represent a decision in principle about a future consideration. Other states and refuges are conducting similar Canada goose damage management programs, and have been doing so for years.

8. There are no significant cumulative effects identified by this assessment. Actual take from Blackwater NWR is estimated to be 3.5% of the statewide resident Canada goose population in Maryland. The Atlantic Flyway Council has set a population goal for resident Canada geese that is ½ the current population estimate, and the State of Maryland has established a goal within that objective.

Blackwater NWR's proposed action is supported by these population goals. As discussed in the EA, if resident populations on the refuge were reduced to 1989 levels, this would be expected to slow the overall population growth rate on the refuge, but not reduce the population statewide.

There are no national cumulative impacts to resident Canada goose populations because resident Canada geese generally live within 25 miles of where they were born, do not migrate except to adjacent states, and will only make short flights of a migratory nature only to avoid extreme winter weather which Maryland usually doesn't have. (Note: While resident geese do not migrate in Maryland, they do migrate in the Flyway. Basically, there is a Coastal Subpopulation of resident Canada geese that moves very little, and there is an Interior Subpopulation that migrates several hundred miles.)

This program has no national cumulative impact to Canada geese, since it is only directed to resident Canada geese on Blackwater NWR. A New York State Department of Environmental Conservation study has found extremely high site fidelity for the non-migratory segment of resident Canada geese.

9. The proposed activities will not affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, nor will they cause a loss or destruction of significant scientific, cultural, or historical resources.

10. The proposed activities will fully comply with the Endangered Species Act of 1973, as amended. The program will not affect Federally or State listed threatened and endangered species.

11. The proposed activities will not threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment. The proposed activity does not violate the Migratory Bird Treaty Act.

For additional information concerning this decision, please contact Glenn A. Carowan, Jr., Project Leader, Blackwater NWR, 2145 Key Wallace Drive, Cambridge, Maryland 21613.

Approved by:

_____ _____

Ronald E. Lambertson
Regional Director, Northeast Region
U.S. Fish and Wildlife Service

Date