



September 27, 2005

United States
Department of
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Dear Steve:

The predator damage management project to help protect Threatened and Endangered (T&E) species on Cape Hatteras National Seashore in 2005 included the removal of 2 red fox (*Vulpes vulpes*), 18 gray fox (*Urocyon cinereoargenteus*), 54 raccoons (*Procyon lotor*), 7 Virginia opossums (*Didelphis virginiana*), 7 nutrias (*Myocastor coypus*), 4 free ranging cats (*Felis domesticus*), 1 muskrat (*Ondatra zibethicus*), and 1 free ranging dog (*Canis familiaris*). Animals removed were taken from both Hatteras and Bodie Islands during the dates March 16-26 and July 25 - August 5, 2005. Of the 20 fox, 17 were removed in March and 3 were removed in July - August. There were 19 fox removed from Bodie Island and 1 removed from Hatteras Island (Table 1).

Table 1. Fox removed from Hatteras and Bodie Islands, March - August 2005.

	Species	Age/Sex	GPS Location	Island
1	Red Fox	Adult Female	N 35.234520 W 75.556175	Hatteras
2	Red Fox	Adult Male	N 35.796440 W 75.541120	Bodie
3	Gray Fox	Adult Male	N 35.839740 W 75.561356	Bodie
4	Gray Fox	Adult Male	N 35.791310 W 75.538593	Bodie
5	Gray Fox	Adult Female	N 35.839710 W 75.561336	Bodie
6	Gray Fox	Adult Male	N 35.834670 W 75.559933	Bodie
7	Gray Fox	Adult Male	N 35.839750 W 75.561334	Bodie
8	Gray Fox	Adult Female	N 35.839690 W 75.561770	Bodie
9	Gray Fox	Adult Female	N 35.806320 W 75.545328	Bodie
10	Gray Fox	Adult Male	N 35.840120 W 75.561186	Bodie
11	Gray Fox	Adult Male	N 35.793480 W 75.539737	Bodie
12	Gray Fox	Adult Male	N 35.806210 W 75.545325	Bodie
13	Gray Fox	Adult Male	N 35.839550 W 75.561628	Bodie
14	Gray Fox	Adult Male	N 35.839730 W 75.561772	Bodie
15	Gray Fox	Adult Female	N 35.793480 W 75.539721	Bodie
16	Gray Fox	Adult Male	N 35.806210 W 75.545003	Bodie
17	Gray Fox	Adult Male	N 35.805090 W 75.546717	Bodie
18	Gray Fox	Juvenile Female	N 35.840490 W 75.561250	Bodie
19	Gray Fox	Adult Male	N 35.804330 W 75.546560	Bodie
20	Gray Fox	Adult Female	N 35.791470 W 75.538070	Bodie

USDA North Carolina Wildlife Services (NC WS) data shows a decline in the number of red fox removed compared to previous years; however, the number of gray fox removed has increased along the Cape Hatteras National Seashore (see Table 2). Gray fox, while not as large as the red fox, is still an opportunistic predator and may disrupt the nesting efforts of sea turtles and shorebirds. Gray fox prefer thick vegetative cover as opposed to the wide open expanses favored by red fox. However, evidence from tracks and locations where gray fox were removed are obvious indicators that gray fox are expanding their range as they roam the dunes and beaches on Bodie Island searching for food. Gray fox have only been found on Bodie Island so continued predator management efforts on Bodie Island will help decrease the chance of gray fox getting onto Hatteras Island.

An increased number of raccoons were removed during the predator damage management efforts in 2005 (see Table 2). Raccoon tracks and scat were found adjacent to the beaches in and around bird closures and turtle nests indicating the potential for increased predation of T&E species. Also, the increase in the population of raccoons could potentially pose a disease threat to humans (i.e. rabies) and to companion animals (i.e. rabies, canine distemper, parvovirus). Raccoons have been raiding trash cans and loitering around the fish cleaning stations. Without continued population management, the potential for conflicts between humans and raccoons will continue to increase.

The NPS and USDA were concerned about the potential threat to the public's health and safety after discovering evidence of a free ranging dog using the beach. On March 23, 2005 a free ranging dog was caught in a foothold trap (GPS coordinates: N 35.23553 W 75.55399). The free ranging dog had a collar but no tags and appeared to be in extremely poor condition. It was very thin, malnourished, covered with ticks, and had a sore on its side that was infected. The climate and minimal amount of food resources are likely the explanation for the condition of the animal, not the foothold trap the free ranging dog was caught in. Historically, free ranging dogs and cats have disturbed T&E species nests and enclosures. For safety reasons, park regulations require dogs to be on a leash at all times. Unfortunately, there was a multitude of misleading, inaccurate, and incorrect information that followed in the news media. Fortunately, we were able to get the free ranging dog to the Dare County animal shelter and after several days of rehabilitation the dog named APHIS by the animal shelter was adopted. Would APHIS have survived if it had not been caught?

Table 2. Animals removed by NC WS on Hatteras and Bodie Islands, 2002 - 2005.

Year	Red Fox	Gray Fox	Raccoon	Opossum	Feral Cat	Nutria	Feral Dog	Muskrat
2002	28	0	2	0	0	0	0	0
2003	15	0	4	6	1	0	0	0
2004	9	6	18	0	0	2	0	0
2005	2	18	54	7	4	7	1	1
Totals	54	24	78	13	5	9	1	1

Marcia Lyons mentioned that the overall results of the predator damage management efforts during the last four years have been successful. She also indicated that the assistance the NC WS provided has been both helpful and positive in reducing predation and improving the reproductive success of the T&E species and species of High Concern on the Cape Hatteras National Seashore.

In 2001, prior to any NC WS assistance, Marcia suspects that the Piping Plover (*Charadrius melodus*) nests at Cape Point and Bodie Island were lost due to fox predation because of the high fox activity in those areas. In 2002, she reported that there were several fox tracks early in the season at Hatteras Inlet but after we completed the predator damage management efforts no fox tracks were found near plover nests. In 2003, she reported fox tracks were observed only once at Hatteras Inlet. In 2004, she reported that no tracks were observed at Hatteras Inlet. In 2005, Karen Sayles reported that one nest was located south of Cape Point in the South Beach area which was the first nest in this area since 1999. The one nest in 1999 had four eggs with only one chick being fledged. This year's nest hatched all four eggs and within 24 hours of hatching the adults moved/walked their chicks 0.8 miles up the beach to Cape Point, where they remained until three of the four chicks successfully fledged. Karen also reported that Hatteras Inlet has had Piping Plover nesting activity over the past few years but no chicks had been fledged since 2001 when two chicks survived. The 2005 pair was able to fledge three of their four chicks. Karen also mentioned that there has not been a chick that has survived since 2001 but after four years of intensive predator management there were two successful nests on Hatteras Island that successfully fledged three chicks each with a total of six chicks surviving in 2005 indicating the money spent for predator damage management has been worthwhile.

In 2001, prior to any NC WS assistance, Marcia reported six screened turtle nests were lost or partially lost and five unscreened nests were tampered with by fox resulting in the loss of some young turtles due to fox predation on Hatteras and Bodie Island. In 2002 and 2003, she reported a single nest was lost each year. In 2004, she reported no nests were lost. All turtle nests lost were Loggerhead Sea Turtles (*Caretta caretta*). In 2005, Karen reported no turtle nests were lost or tampered with by fox.

The nesting success of the American Oystercatcher (*Haematopus palliatus*) has improved and benefited the most from our predator management efforts. Even though the American Oystercatcher is not a T&E species it is a species of High Concern under the US Shorebird Conservation Plan. In 2002, Marcia reported the hatching success on Hatteras Island was a dismal 12%. She recognized that many of the nests were lost due to fox predation, prior to NC WS assistance, which was one of the reasons for implementing predator damage management in 2002. In 2003, she reported the hatching success on Hatteras Island was 43%, the highest success rate ever recorded on Hatteras Island. In 2004, she reported one nest was lost to gray fox on Bodie Island but the hatching success on Hatteras Island was 71% which was another record. In 2005, Karen reported the hatching success was at 50% with no fox related nest losses. One nest was lost to cat predation, one to raccoons, and a crow killed one chick on Bodie Island. Hatteras Island had one nest lost to cats, two nests lost to raccoons, two chicks killed by

cats, and a new predator, a mink, killed three chicks. Karen mentioned while this number is a decrease from 2004, it still represents the second most successful hatching year on record since monitoring began. Karen also reported the hatching success has been at it's highest over the past three consecutive years (2003-2005) since predator damage management efforts were put in place in 2002.

The late winter trapping effort that took place during the month of March proved to be extremely productive. Reasons may be attributed to the limited natural food resources, reduced human activity along the beaches, lower temperatures, and the time of the season when wildlife are more active. The cooler temperatures also helped reduce trap site contamination that is often unavoidable in the summer months.

The monitoring of fox activity and locating of den sites by NPS staff again would be beneficial in managing fox populations on both Hatteras and Bodie Islands (see Table 3). Providing NC WS with this information allows personnel to spend more time setting traps as opposed to searching for sign.

Table 3. Fox dens located by NC WS at Hatteras and Bodie Islands during the predator damage management project in 2005.

Site	Den Status	GPS Coordinates	Location
1	Inactive	N 35.834620 W 75.559867	Bodie Island
2	Inactive	N 35.834690 W 75.559853	Bodie Island
3	Inactive	N 35.796500 W 75.541010	Bodie Island
4	Active	N 35.796470 W 75.541059	Bodie Island
5	Inactive	N 35.235680 W 75.555478	Hatteras Island
6	Active	N 35.236060 W 75.560872	Hatteras Island

We recommend the predator removal efforts be continued to reduce the potential for additional predation in 2006. Permitting fox to remain on Bodie Island will increase the potential for new fox coming onto Hatteras Island over the Oregon Inlet Bridge.

Recommendations regarding the scheduling for the removal of predator species in 2006 include another initial visit during late winter (January – March). The amount of available food and human activity are decreased during this time creating a need for predators to search more for food. The increased movement of predators during this time of the year will allow more opportunities for the predators to encounter our sets. The reduction in human activity during the winter months will also allow NC WS to conduct more extensive trapping activities during the day and shooting at night. A second visit should be planned during the peak of the nesting period. We recommend that predator damage management sessions include at least two wildlife specialists and last for a minimum of 12 days each. The cost for each 12 day visit with two wildlife specialists is \$9,000. NC WS has been contributing \$9,000 each year to assist the NPS with the predator damage management program. In the past, the NPS has only been paying \$4,500 for each 12 day visit which is half of the overall cost. Unfortunately, NC WS will not be able to continue to contribute due to our increased costs. We estimate a total of

\$18,000 will be needed to continue the predator damage management efforts at the same level as in past years. This assumes that lodging will continue to be provided by the NPS. We suggest initiating an \$18,000 interagency agreement early to obtain funds to avoid delays. If the 12 day visit in late winter is all that is needed any unused funds can be carried over into FY 2007.

This year NC WS utilized cage traps to remove raccoons, free ranging cats, and opossums. However, we noticed several problems with the use of these traps. The first issue is the size of the individual traps. A truck bed is completely full with 20 cage traps thus posing a problem when trying to haul traps and equipment to the site locations. On a similar note, the cage traps are bulky and cumbersome to transport into the field. Our personnel are easily able to carry 6 snares and 4 foothold traps compared to 2 cage traps. A second problem that we discovered with the cage traps was that animals appeared to be avoiding the traps. We are aware of efforts that have been made by NPS staff and private trappers to remove raccoons and free ranging cats using cage traps. We noticed that some predators have become educated and will not go into cage traps. We experienced places where free ranging cats walked past set cage traps that were heavily camouflaged and baited with the best attractors, scents, and lures but the free ranging cats showed no interest. The feral cats have learned to not enter cage traps likely due to the fact that they have witnessed others get caught. NC WS suggests that the use of foothold traps, conibears, and snares continue to be implemented in predator damage management efforts. Additional trapping efforts during colder temperatures would help the removal efforts.

NC WS found evidence of damage caused by nutria. The wetland habitat on Cape Hatteras National Seashore could experience negative consequences from the activity of nutria. The NPS may want to include a nutria eradication program as part of their overall wildlife damage management plan. NC WS is equipped with the knowledge and resources to conduct management activities to eradicate the population of nutria, a non-native species.

We also recommend the NPS obtain funding to complete an Environmental Assessment (EA). NC WS is available to complete an EA for the NPS which could also serve as the basis for developing a predator damage management plan. An EA will help define the need for action, proposed action, scope, issues, effect, impact, and alternatives. NC WS is available to complete an EA in it's entirety for the NPS at an estimated cost of \$25,000. This cost could be reduced if the NPS organized and conducted the public involvement, mailings, printings, etc. NC WS has experience and expertise in writing predator management EA's. NC WS would work closely with the NPS to be sure the EA follows NPS guidelines and regulations. We would also encourage the NPS to include all of the groups who have expressed interest, whether positive or negative, about the current predator damage management program during the EA process.

NC WS involvement in predator damage management with the NPS is closely coordinated with the North Carolina Wildlife Resources Commission and the removal of predators is authorized through a state depredation permit. An Integrated Wildlife

Damage Management (IWDM) approach is used to protect T&E species and species of High Concern. The IWDM strategy encompasses the use of practical and effective methods of preventing or reducing predation while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. NC WS continues to support the non-lethal techniques used for discouraging predation on the nests of sea turtles and shore birds. However, the affects of enclosures over nests to protect the eggs and young from predation is unclear indicating more research is needed. NC WS, with the help from the National Wildlife Research Center, is available to assist with this type of research.

We recommend the NPS conduct a strategic planning meeting to discuss the role that predator damage management activities can play in protecting T&E species and species of High Concern on the Cape Hatteras National Seashore. We suggest inviting the US Fish and Wildlife Service, the Pea Island National Wildlife Refuge, the Fort Raleigh National Historic Site, the Wright Brothers National Memorial, and the North Carolina Wildlife Resource Commission as well as any other groups who may have an interest in the project. A multi-agency cooperative service agreement could be developed as a part of this process.

We enjoyed working with the NPS staff and hope that our efforts met your expectations. Feel free to contact us with any questions and we look forward to seeing you next year.

Best regards,



Josh Biésecker
Wildlife Specialist



Todd Menke
Assistant State Director

cc: Marcia Lyons, National Park Service

