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Chesapeake Bay Nutria Eradication Project: 2017 Update

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ABSTRACT: Nutria, a semi-aquatic, South American rodent, was introduced to Maryland during the early 1940s. Originally brought to the area for fur farms, the market never established and animals were released or escaped. Nutria thrived, destroying coastal wetlands which resulted in negative environmental and economic impacts to the Chesapeake Bay region. To preserve and protect valuable wetland resources, the Chesapeake Bay Nutria Eradication Project (CBNEP) was established in 2002 through a partnership between the United States Fish and Wildlife Service, the United States Department of Agriculture's Wildlife Services, Maryland Department of Natural Resources, and many state agencies and non-governmental organizations. Since inception, the CBNEP has removed and reduced nutria populations to near zero across ¼ million acres of wetlands throughout the Delmarva Peninsula (Maryland, Delaware, and Virginia). The CBNEP has aided in the protection of critical natural resources and provided assistance to over 400 private landowners. Throughout its history, the CBNEP has developed new detection techniques and modified existing methods as the nature of the eradication effort changed. We provide a project overview and detail several observer-based and device-based methods that were developed and used for detection of nutria including: shoreline and ground surveys, monitoring platforms, detector dogs, lure development and remote triggered cameras.

KEY WORDS: attractants, Chesapeake Bay, detection, detector dogs, eradication, invasive species, *Myocaster coypus*, nutria, rodent control, surveys

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INTRODUCTION

Nutria (*Myocaster coypus*), are semi-aquatic rodents native to South America that were first introduced into the United States in 1899 (Witmer et al. 2008) to promote creation of a fur market. Feral nutria populations became established in wetlands of Maryland's eastern shore through accidental and intentional releases from local fur farms during the early 1940s (Willner et al. 1979). Nutria did not evolve in Maryland's coastal wetlands and therefore had no natural mechanisms to regulate their populations. Consequently, populations expanded and their foraging behavior resulted in negative long-term impacts on native vegetative communities and systems (Witmer et al. 2008). Nutria tend to feed heavily in one area, causing open mud flats to form within contiguous marsh. These open areas can accelerate erosional processes resulting in marsh loss and permanent open water (Harris and Webert 1962, Foote and Johnson 1993, Linscombe and Kinler 1997). Research (Haramis and Colona 1999) conducted in Maryland during the mid-1990s documented a causal relationship between marsh loss and nutria populations, and it provided the stimulus for passage of the Nutria Control and Eradication Act of 2003.

To protect valuable natural and cultural resources of the Chesapeake Bay watersheds from nutria, the Chesapeake Bay Nutria Eradication Project (CBNEP) was formed in 2002 through a partnership of federal, state, and private organizations. This paper discusses project strategies and various monitoring techniques used to detect nutria on the Delmarva Peninsula.

METHODS

Study Area

The CBNEP's goal is to eradicate nutria from the entire Delmarva Peninsula which is comprised of Delaware and the eastern shore of Maryland and Virginia (Figure 1).

Project Structure

The CBNEP is cooperatively funded and consists of over 20 different partners from federal and state government and private organizations. Representatives from United States Fish and Wildlife Service (USFWS), United States Department of Agriculture (USDA), and Maryland Department of Natural Resources (MDNR) represent the core "Nutria Management Team" responsible for central decisions influencing project direction and strategies. Project funding is primarily secured through USFWS, while USDA Wildlife Services conducts field operations.

CBNEP operational staff levels and responsibilities have evolved with changing project needs and funding availability. All employees have been full-time (40 hrs/week all year) with exception of an administrative assistant. In 2015 the administrative assistant developed

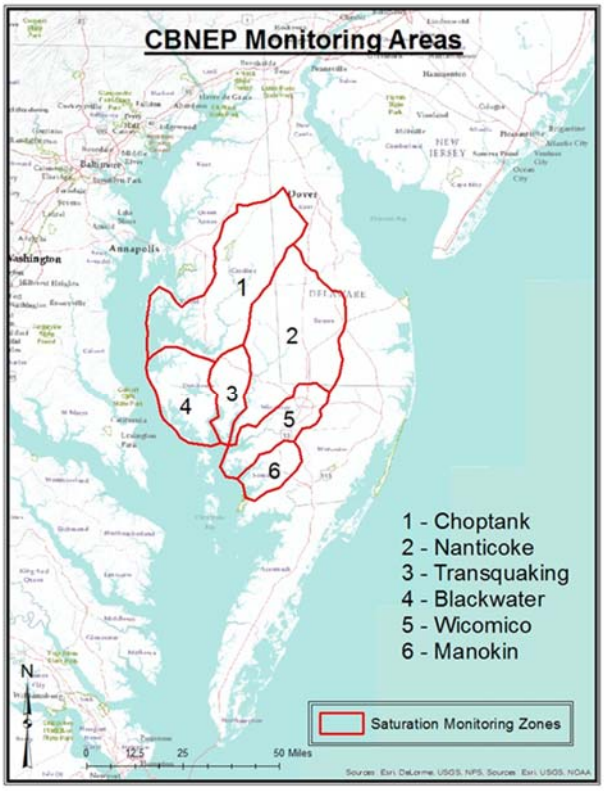

Figure 1. Map of the Delmarva Peninsula with monitoring areas outline and numbered. Each monitoring area was scheduled to be visited at least 3 times during 3 different seasons. If during the saturation monitoring effort nutria were detected, the whole process was reset.

into a full-time position and included GIS duties. Initially, the project included a project leader with 6 to 17 trapping specialists and a maintenance worker. As the project entered later stages of eradication, efforts required more planning and staff management. To address these needs, an assistant project leader was added in 2010. In 2017, the CBNEP staff consisted of a project leader, assistant project leader, administrative assistant, maintenance worker, 6 field staff (with 2 vacancies slated for hiring) and 5 canines.

Eradication Approach

The CBNEP adopted a systematic approach to removing nutria from the Delmarva Peninsula outlined in Kendrot (2011). The phases of eradication include: 1) Survey – delimited extent of the target population, 2) Knock-down – initial removal of population, 3) Mop-up – removing individual missed or repopulated after knock-down, 4) Verification – monitoring after removal phases to ensure population at zero, 5) Surveillance – landscape scale monitoring to ensure population at zero, and 6) Biosecurity – strategies implemented to avoid reinvasion (Kendrot 2011). The Delmarva Peninsula was broken up into monitoring areas (Figure 1). Areas outside established monitoring zones also received varying levels of survey intensity.

Detection Techniques

Ground Surveys

Ground surveys are conducted on foot by trained personnel. Staff focus search efforts in areas of the marsh where nutria would likely occur including locations with desirable food, prominent features, and/or natural areas/ structures that funnel movement. Each staff member uses a handheld Trimble Juno 5 Series GPS (Trimble, Sunnyvale, CA) to track the area covered.

Shoreline Surveys

Shoreline surveys are conducted via watercraft targeting smaller channels and creeks adjacent to main waterways. Dependent on navigability, staff use kayaks, canoes or jon boats (16 ft or 18 ft). When conducting surveys, employee cruise at/or near idle speed and search the bank for tracks and other nutria sign. Additionally, staff look for nutria scat, which can be often found floating in waterways.

Monitoring Platforms and Hair Snares

Nutria monitoring platforms (described in Pepper et al. 2017) are 60.96 centimeters square, with 1.27-cm waterproof oriented strand board fastened to a 5.08-cm-thick sheet of ethafoam. A 5.08-cm × 10.16-cm wood rim is positioned atop the platform to entrap vegetative material and nutria scat. An access point is created by cutting a 20.32-cm opening into one side of the platform. The opening also provides structure to mount a stabilizing block for a body gripping trap. A 5.08-cm-diameter hole is drilled into the platform base to allow a bamboo or fiberglass pole to be used to anchor the platform and allow it to rise and fall with the tide. To provide additional stabilization or for trap attachment, a 3.81-cm lag eye bolt is drilled into the platform's rim.

Monitoring platforms are either placed on land or in water to provide a stable surface for nutria to groom/loaf. They are set at creek intersections on points or other areas that nutria may frequent. Vegetation is placed on the platform along with nutria-specific lure to enhance attractiveness.

Hair snares were developed in 2012 to aid in detecting nutria visiting monitoring platforms. Hair snares are 6-in lengths of 3/32-in-diameter 7 × 7 stainless steel aircraft cable with one end frayed and bent into an umbrella shape (Figure 2; Kerr and Dawson 2013). A single snare is affixed to each of the four corners of the platform. Each snare is supported and secured by a section of rigid stainless steel wire attached to the rim of the platform (Figure 2).

Canines

The CBNEP has used canines as hunting dogs and detector dogs. Nutria hunting dogs were trained to seek out and bay nutria for their handler (target the actual animal), whereas nutria detector dogs are trained to search for and respond to nutria scat.

Traps

Nutria removal involved use of traps and hunting (including with canines; Kendrot 2011). Traps used included rotating jaw body gripping traps, footholds,

Figure 2. Nutria monitoring platform designed by the Chesapeake Bay Nutria Eradication Project. These platforms represent a cleared, appealing area for nutria to loaf and groom. Vegetation or straw is added to help attract and encourage nutria to visit. Four hair snares (inset) drape over the platform designed to collect dorsal guard hairs of visiting nutria.

cage/box, and cable restraints/snares. For a comprehensive description of traps and trapping methods, see Kendrot (2011).

Outreach

The CBNEP relies on nutria sightings from other natural resources agencies and the public. Representatives from CBNEP routinely provide professional presentations and educational displays at local events to help educate and solicit sightings from various interest groups and the general public.

RESULTS

Eradication Approach

Since inception, the CBNEP has removed almost 14,000 nutria from the Delmarva Peninsula, resulting in the protection of almost ¼ million acres of wetlands. By the summer of 2015, all known nutria populations had been removed from the Delmarva Peninsula. All monitoring zones were then considered to be in 'verification' phase of eradication. To complete this phase, CBNEP executed "saturation monitoring" strategies.

The concept of saturation monitoring is to concentrate high intensity pressure in a single zone for a relatively short period of time. The ability to detect nutria likely varies by season. Therefore CBNEP intends to treat each monitoring zone a minimum of 3 times, in 3 different seasonal periods. As of fall 2017, all watersheds had been covered with the saturation approach at least once (Table 1).

Detection/Removal

Ground Surveys

Ground surveys are often conducted in areas with historical nutria captures. With the addition of detector dogs, most walking surveys are now conducted by canine teams.

Shoreline Surveys

Preliminary evaluations of shoreline effectiveness in detecting nutria were conducted during 2012 in areas containing known nutria populations on the Wicomico River. Results suggested that due to localized variations (tide, weather, etc.), multiple shorelines surveys were often required in order to detect nutria. Therefore, when possible, staff conduct multiple replications when using shoreline surveys.

Monitoring Platforms and Hair Snares

Platforms were first used by CBNEP in 2010 and initially relied on nutria depositing scat on platforms to determine presence. Preliminary data from remote sensing trail cameras suggested that a significant percentage of nutria did not leave scat when using a platform (Kerr and Dawson 2013). Pepper et al. (2017) found that relying on scat deposition was the least effective approach to determining nutria visitation on platforms when compared to trail cameras or hair snares. Trail cameras and hair snares faired equally in their detection rates (estimated detection probabilities by occupancy modeling of 0.73 and 0.71 respectively). However, the addition of hair snares may have reduced overall visitation or repeat visitation rates. Hair snares proved to be the cheapest, most reliable technique to detect nutria when they did visit a platform and so were affixed to all platforms in 2012.

Nutria visitation rates may also be influenced by platform positioning on land or in the water. Research on the Wicomico River (Wicomico County, MD) in 2012 indicated that platforms located on land were more likely to be visited by nutria versus water (Pepper et al. 2017). Therefore, when possible, CBNEP staff attempt to use land placement.

Nutria lure can also be added to platforms to increase the probability of nutria visitation. Personnel created unique olfactory lures attractive to nutria; however, given the extremely low densities of nutria remaining on the Delmarva Peninsula, these products could not be extensively tested in the field.

Prior to implementation of saturation monitoring in summer 2015, deployed platforms were inspected by CBNEP specialists biweekly during September-November and March-April, and monthly during remaining months. This sampling schedule coincides with perceived peaks in nutria movements (dispersal, foraging, etc.) as determined by observations of CBNEP staff.

In addition to monitoring, platforms are also designed to accommodate traps and are effective during trapping efforts. When saturation monitoring began, platforms within the targeted monitoring zone were checked every 7 days. A sentinel platform line throughout all monitoring

Table 1. Monitoring areas established by the Chesapeake Bay Nutria Eradication Project based on historical nutria occurrences on the Delmarva Peninsula. Starting in 2015, the Project began "saturation" monitoring of each watershed. The goal was to survey each monitoring area using all techniques and tools available. Each area was scheduled to be monitored 3 times in 3 different seasons. Staff levels, type, and amount of viable habitat impacted how quickly and area could be sufficiently covered.

Monitoring Area	Date Started	Date Ended	Season	Round	Acres of habitat in Watershed
Choptank	7/1/2015	9/15/2015	summer/fall	1	88,600
Blackwater	9/16/2015	3/14/2016	fall/winter/spring	1	99,300
Nanticoke	3/15/2016	5/31/2016	spring	1	139,000
Manokin	6/1/2016	8/20/2016	summer	1	29,500
Wicomico	8/21/2016	1/15/2017	summer/fall/winter	1	42,700
Transquaking	1/16/2017	6/16/2017	winter/spring	1	46,900
Blackwater	6/19/2017	12/1/2017	spring/summer/fall	2	99,300
Choptank	12/4/2017	–	winter/spring	2	88,600

zones is maintained through the year to help aid in detections in disjunct locations while staff focus on a particular monitoring zone. These platforms are checked less frequently and as time permits, but not to exceed 90 days.

Canines

Hunting Dogs

Staff first started using personally owned dogs to bay nutria during the winter of 2004. Nutria were plentiful and offered ample opportunities to train dogs to seek out and bay them for their handlers. It was quickly realized how effective dogs could be when nutria were at low densities after an area had been heavily trapped and few animals remained. Ease of training and the ability to detect and remove nutria when traditional trapping methods failed made hunting dogs crucial to the early successes of the CBNEP. Over the course of their use, hunting dogs assisted in the removal of approximately 867 nutria. Hunting dogs were used until 2013 when older dogs were retired and dwindling nutria populations inhibited training new dogs. Although the traditional hunting dog program model was highly successful in the early years of the CBNEP, methods had to be adapted to address the changing nature of the eradication effort.

Detector Dogs

In 2011, the CBNEP focus shifted from employee-owned hunting dogs to agency-owned and trained nutria scat detector dogs. There were several benefits associated with using agency-owned and trained dogs, including the ability to ensure dogs were consistently trained following specific protocols and met structured validation standards. Having systematic training procedures and a mechanism to certify canine teams provides greater confidence that a failure to detect nutria is meaningful.

In developing the detector dog program, CBNEP partnered with the National Detector Dog Training Center (NDDTC), an APHIS program that trains canines and handlers for agricultural detection work. Since this type of field project was novel to the NDDTC, it required a joint effort to determine an appropriate training curriculum and set standards and protocols for the program. Prior to the operational development of the dog program, NDDTC trained the first dogs to alert on nutria scat in 2011 as a "proof of concept" to determine if the training model was practicable.

Candidate dogs were procured from local shelters, rescues, and vendors. They were then temperament tested to determine suitability as a detector dog. Dogs needed to be between 1-3 years old, toy driven, and confident but not aggressive. Temperate tests evaluated the dog's behavior, toy drive, and ability to work in marsh environments. A comprehensive health exam was also required before a canine could enter the training program. Once officially acquired by NDDTC, canines that did not successfully complete the program were adopted to approved homes.

The handler training course was 7 weeks and included teaching detector dog handling as well as health, behavior, and skills for working as a team. The course was broken into two sections with initial instruction conducted at the NDDTC facility (Newnan, GA), and the second completed at the CBNEP office (Cambridge, MD).

Candidate canines were first trained on odor (nutria scat) at the NDDTC facility located in Newnan, GA. All canines were required to pass a proficiency test to determine their ability to seek out and respond to nutria scat before moving to the next stage of training. Handlers were then sent to NDDTC to study canine health, behavior and handling training (3 weeks). During that time, handlers were paired with their canine partners and began building rapport. Before completing the first portion of schooling at NDDTC, handlers had to pass two exams on canine behavior and health.

The second section (4 weeks) involved training canines in "live" or work environments found on Delmarva. Canine teams learned to work outside and use weather and field conditions to structure their surveys. Before completion of the second section, teams had to pass a validation test that involved locating 10 nutria scat targets at varying concentration levels in a series of 5 exercises. Once graduated, canine teams transitioned into operational work but are also required to complete annual proficiency testing to remain active. In 2014, two canine

teams graduated from the program, and an additional 3 teams were added in 2015, making a total of 5 canine teams dedicated to the project. Canine teams are used in conjunction with other monitoring techniques and often target areas that warrant ground surveys because of historical nutria presence or existing suitable habitat. All canines have Garmin 320 GPS collars (Garmin International, Olathe, KS) to aid in determining the area covered by the team.

Traps

Similar trapping and removal techniques have been used in all phases of the eradication effort. In his analysis, Kendrot (2011) determined that body gripping-traps accounted for most captures in the first knock-down stage of removal, whereas submerged footholds and hunting dogs were more effective in the mop-up stages.

Outreach

Nutria sightings from the public that merited site investigations or additional information from 2010-2017 ranged from 12 to 36 reports annually. Most reports were not nutria but rather similar species, with muskrat, groundhog, and beaver being the most common. Although during the last 3 years sightings were all determined not to be, or not likely to be nutria, it is still considered a valuable awareness and educational tool.

DISCUSSION

Eradication Approach

The CBNEP will continue saturation monitoring for the scheduled 3 rounds. It should be noted that if during the saturation monitoring effort nutria are detected, the whole process will be reset. Declaring eradication is a complicated challenge, especially across large landscapes like the Delmarva Peninsula. To understand and address the challenges faced in this final stage, the CBNEP has consulted with outside experts in the eradication field. Landcare Research is one of New Zealand's Crown Research Institutes and has consulted and developed predictive models for a number of eradication efforts of invasive species and diseases. Using bio-economic optimization of monitoring data, researchers can create models that will allow CBENP to quantify the probability of nutria eradication across the entire Delmarva Peninsula. The process will produce a risk assessment map and a systematic framework for evaluating success that incorporates not only probability theory but also biology and socio-economic constraints. The results will allow CBNEP to more clearly understand the status of eradication, better allocate resources, and develop realistic expectations.

Detection/Removal

The CBNEP will continue to use ground and shoreline surveys, monitoring platforms, hair snares, and trail cameras as part of their saturation monitoring plan. Each method has strengths and weakness and will be used in a complimentary fashion as part of a comprehensive monitoring strategy. Since no known nutria populations exist at the writing of this paper, trapping methodologies will not be further developed.

Canines

Hunting Dogs

Due to the lack of nutria on the landscape, there are no plans to use hunting dogs for the remainder of the project. Without nutria, the effort to train and maintain dogs is not feasible.

Detector Dogs

Nutria have not been detected since detector dogs were considered operational. With the probability of detecting nutria so low, CBNEP has no way to currently field test or confirm detector dog efficacy. Studies suggest that canines can be quite effective in detecting scat even when it is cryptic (Smith et al. 2001, Long et al. 2007, Long et al. 2008) and in many cases better than human surveyors (Smith et al. 2001, Long et al. 2008) and possibly with less sampling bias (Gorman and Trowbridge 1989, Long et al. 2008). Although not officially evaluated, CBNEP staff have observed canines successfully locate and respond to nutria scat when they have traveled to other states with existing nutria populations. The CBNEP will continue their partnership with the NDDTC and update the nutria detector dog program as necessary. The opportunity to work a detector dog not only increases the efficiency of the CBNEP, but also provides personal growth and skill development for employees.

Outreach

Public outreach will continue to be a valued resource as the CBNEP nears the goal of eradication. Public involvement supports the project and may lead to positive nutria detections. Additionally, public reports will likely play a larger role after eradication is declared and CBNEP staff is greatly reduced.

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