National Park Service
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Fire Island National Seashore
Patchogue, New York

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Abstracts of Presentations

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Ecological Significance of Migratory Birds' Infestation by Deer Ticks at a Coastal Stopover Site

Models of the dynamics of Lyme disease depend on quantitative estimates of many variables concerning the host ecology of deer ticks (*Ixodes scapularis*), including densities, movement patterns, and tick recruitment rates specific to each of dozens of potential vertebrate hosts. We studied deer tick infestation in a sample of >10,000 individual birds of 115 species at Fire Island National Seashore, Long Island, New York – an important stopover site for migratory birds and a place where deer ticks exhibit relatively high rates of infection with *Borrelia burgdorferi*, the spirochete causing Lyme disease. For the first time ever, empirical evidence was obtained supporting the widespread assumption that body-burden data are a useful proxy for site-specific tick recruitment rates. Overall, 10% of individuals captured and 41% of species were infested with at least one deer tick, the mean number of ticks per bird across all birds was 0.31, and the mean number of ticks per infested bird was 3.24. Nymphal counts peaked in mid July, and larval counts in early August. Other major findings were that opportunities for coinfestation of individual birds by both larvae and nymphs were greater and more temporally protracted than expected; the total number of immature deer ticks hosted by birds at this coastal stopover site likely exceeded the number hosted by white-footed mice by at least an order of magnitude; and season-specific rates of infestation did not differ between coniferous and deciduous habitats. These results demonstrate that future modeling of the dynamics of Lyme disease must incorporate site-specific data regarding the roles of migratory birds as hosts for ticks.

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Monitoring Natural Resources in Northeast Coastal Parks

The National Park Service (NPS) Inventory and Monitoring Program (I&M) began in 1992 with two components: 12 basic inventories in all parks with "significant" natural resources (~270 park units) and long-term ecological monitoring in selected "prototype" monitoring parks distributed across the physiographic regions of the U.S. The inventories will be complete in the next few years but long-term monitoring is in the development stage. Beginning in 2000, the National Park Service (NPS) received funding through the Natural Resource Challenge with the primary goal of increasing NPS capability to manage National Parks using scientifically rigorous natural resource information and to share the information widely with the public and scientific community. For monitoring, NPS has grouped parks into 32 I&M networks which are developing long-term plans to monitor the "Vital Signs" of ecosystem health. Each network will develop specific vital signs and monitoring plans collaboratively with local partners and the scientific community. Networks are challenged to monitor vital signs for park management needs AND to contribute to knowledge of broader ecosystem and ecoregion natural resource trends. The Northeast Coastal and Barrier Island Network (CBN) includes eight coastal parks ranging over five states form Cape Cod National Seashore in Massachusetts to Colonial National Historic Park on the Chesapeake Bay in southern Virginia. Although the area is highly urbanized these parks protect a significant amount of natural resources and provide critical habitat for plants and wildlife. The Coastal and Barrier Network was one of the first five inventory and monitoring networks and has made significant progress towards meeting our monitoring goals. We are working to develop an issue-based monitoring program that will adequately address the needs of our parks. At present, we are concentrating on monitoring, Shoreline Change, Salt Marsh Habitats, Nutrient Enrichment, Contaminants, Visitor Impacts and Species and Habitats of Concern.

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Scales of Coastal Foredune Mobility

Coastal dunes are important parts of the dune-beach system. They are the products of interactions of beach processes and beach sediment budgets with processes that transport and accumulate sediment inland. Coastal dunes have a sediment budget that complements the beach budget, and their budget does not always agree in magnitude and direction with the beach changes.

Dunes are the manifestation of sediment accumulation, a positive sediment budget, on the dune-beach profile. They are composed of a mass of sand that has gains and losses through annual cycles and has trends that span decades and longer time periods. Long-term monitoring is needed to discern the trends and separate the signal from the noise. We are on the brink of accumulating an appropriate long-term data set, nearly 20 years of annual measurements, and a relatively dense temporal coverage of very large scale aerial photography, 1:1200 scale, to establish the dimensions of change, to interpret trends, cycles, and event responses. Recently, the existing data sets have been augmented by LiDAR surveys that have generated intensive topographic information that leads to additional profile comparisons and measures of volume changes.

Present analyses of profiles and volumes along Fire Island from Watch Hill to Fire Island Light point to the importance of episodic events that affect the coastal dune for alongshore lengths of 0.5-2.0 km that result in oscillating zones of foredune gains and losses. Under most conditions, the foredune form can persist, can migrate, can be eroded and recover, and can be an effective portion of the dune-beach profile while responding to long-term and short-term variations. A preliminary model of foredune development under alongshore migrating dune-beach cells offers an explanation to the spatial scale variability monitored on Fire Island.

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Monitoring Salt Marsh Development Processes at Fire Island National Seashore: Are Salt Marshes Keeping Pace With Sea-Level Rise?

Salt marshes are an important habitat type associated with barrier island ecosystems of the northeastern US. The geomorphic development and maintenance of these back-barrier salt marshes is controlled by many factors including sea level rise, estuarine circulation patterns, estuarine turbidity, and barrier island landward migration processes. In the vicinity of Fire Island NS (NY), sea level is currently rising at a rate of about 3-4 mm/yr and is predicted to accelerate in response to global warming. Some salt marsh systems in the US, and even within the New York region, are not keeping pace with this rise in sea level and are drowning. At Fire Island NS salt marshes must respond to sea level rise, and also respond to dynamic barrier island processes (e.g., overwash, island breaches). The purpose of this study is to determine if Fire Island marshes are currently keeping pace with sea level and to determine factors that are influential in controlling the development and maintenance of the salt marshes. Salt marsh sediment cores will be analyzed and dated with radiometric techniques to evaluate historic responses of Fire Island marshes to sea level rise and barrier dynamics. The present relationship between sea level rise and marsh development processes will be monitored using a surface elevation table. This paper will highlight the issue of marsh loss and discuss methods being used; however, no results are presented as the study was initiated less than 1 year ago.

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The Persistence Of A Remnant Maritime Holly Forest: Short And Long-Term Dynamics Of A Critically Imperiled Plant

We are examining the frequency, intensity and relative influence of disturbances on a rare maritime holly forest remnant located on Fire Island National Seashore, NY. Re-analysis of permanent plots over the past four decades within the Sunken Forest reveals changes in the diversity and cover of the herbaceous and shrub layers, though the composition of the canopy species remains similar. Diameter distributions of the main canopy species indicate that while *Ilex opaca*, *Sassafras albidum*, and *Nyssa sylvatica* are increasing in size and entering larger size classes, these species are not replacing smaller stems. We are examining the age distributions and radial-increment patterns of canopy and understory species to determine the mode of regeneration for this unique forest type. Dendroecological techniques will allow us to examine the historical effects of hurricanes and drought periods within the forest. A seed bank experiment and the establishment of exclosures are used to investigate the mechanisms preventing establishment of canopy species. We found an overall lack of establishment of any species since the 1970s, which coincides with the implementation of wildlife protection policies on the island. Initial slow radial growth for several *I. opaca* suggests that this species is capable of establishing beneath a closed canopy. Several *I. opaca* individuals are older than any other species aged in the forest and are well-distributed spatially throughout the forest indicating the lack of a stand-wide, catastrophic disturbance in the past two centuries. Herbivore exclosures were established beneath evergreen, deciduous, and mixed canopy to separate the influence of light and herbivory as mechanisms preventing establishment within the forest. Early results indicate that both factors are influential, with woody species germinating more frequently in fenced plots beneath deciduous canopy.

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Space Invaders: an Inventory of Invasive Exotic Plants at Fire Island National Seashore

There has been growing concern about exotic species in the United States in recent years and the need to control them is now being recognized. National Parks are home to a diverse array of native plant communities and exotic species are becoming an increasing threat to these resources. For these reasons, an invasive exotic plant inventory and mapping project was conducted by Fire Island National Seashore during the summer of 2002. A total of 15 species were found within the park, the most abundant of which were autumn olive (*Eleagnus umbellata*), nodding thistle (*Carduus nutans*), and spotted knapweed (*Centaurea maculosa*). The most heavily infested areas were found along the borders of communities, where some species have escaped cultivation, and in areas that experience frequent disturbance. This data will act as a baseline for further monitoring of exotic species within the Park and aid in their management.

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A Simplified Method of Abundance Estimation of White-Tailed Deer on Fire Island

Recent theoretical advances in distance sampling have given biologists a statistically reliable method for estimating wildlife population abundance and its associated uncertainty. Although the application of distance sampling is increasing, for many the complexity of the statistical theory and analysis software can be daunting. By analyzing the functional relationships between key variance components of abundance used in distance sampling, we derive an alternative, less complicated method of density estimation which is sensitive to changes in detection probability. Distance data were collected on 7 sub-populations of white-tailed deer (*Odocoileus virginianus*) on Fire Island, New York over a range of estimated population densities. Using linear regression we examined the relationship between cluster density and encounter rate for each sub-population. We found that this relationship varied directly with respect to general cover type and effective strip half-width, a component of the detection probability function. We quantified these variables using the average observed perpendicular distances pooled over each sub-population and used them to predict the slope values for each of the corresponding cluster density-encounter rate equations (R^2=0.98). The regression models were validated with data collected from 26 distance sampling surveys for white-tailed deer in 18 National Parks throughout the east and midwestern United States. Twenty four of the 26 predicted cluster density values obtained from the regression models fell within the 90% CI of the means computed using DISTANCE 3.5. These models indicate an effective, more accessible alternative to distance sampling for assessing deer abundance.

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Herpetological Inventory of Fire Island National Seashore Including the William Floyd Estate 2002: a Cooperative Agreement Between the National Park Service and the Wildlife Conservation Society

A cooperative agreement between the National Park Service and the Wildlife Conservation Society was created as an effort to document the current status, presence, absence, and distribution of amphibians and reptiles in several national parks in the northeast from spring 2000 through the fall 2002. As part of this inventory, Fire Island National Seashore, including the William Floyd Estate, was surveyed from April through September 2002. In addition to documenting common species, this inventory was also designed to identify threatened, endangered, or uncommon species, likely to appear in the park. Standardized searches and incidental encounters at Fire Island recorded a total of two frog/toad species, seven turtle species, and two snake species. Fowler's Toads and Eastern Box Turtles were the most common species encountered. Searches at the William Floyd Estate recorded one frog species, two salamander species, three turtle species, and three snake species. Eastern Red-backed Salamanders and Eastern Box Turtles were the most common species encountered.

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A Summary of Marine Mammal and Sea Turtle Strandings Recovered from Fire Island National Seashore for the Time Period 1998-2002

The Riverhead Foundation for Marine Research and Preservation is a not for profit organization entrusted with the operation of the New York State Marine Mammal and Sea Turtle Rescue Program. Designated as the state authority by the New York State Department of Environmental Conservation and the National Marine Fisheries Service, the Riverhead Foundation is responsible for the coordination of all activities involved with the rescue, rehabilitation, release and recovery or stranded whales, dolphins, porpoises, seals and sea turtles.

During the period of 1998 through 2002 a total number of 99 marine mammals and sea turtles were recovered from the Fire Island National Seashore shoreline. Pinnipeds were most frequently recovered with a total number of 52 animals. Of the 52 animals recovered 31 were harp seals (*Phoca groenlandica*), 6 were harbor seals (*Phoca vitulina*), 6 were gray seals (*Halichoerus grypus*), 8 were hooded seals (*Cystophora cristata*) and 1 was an unidentifiable pinniped carcass.

Sea turtles represented the second most frequently recovered animal with a total number of 30 animals recovered from Fire Island National Seashore. Strandings of sea turtle species were documented during the months of June through January with the majority of recoveries occurring during the months of June, July and August. The loggerhead sea turtle (*Caretta caretta*) was encountered most frequently with 15 followed by 7 leatherback (*Dermochelys coriacea*), 2 Atlantic green (*Chelonia mydas*) and 1 Kemps ridley (*Lepidochelys kempii)*.

Cetaceans were represented by 17 strandings and were composed of the following species; fin whale *(Balaenoptera physalus),* humpback whale *(Megaptera novaeangliae),* pilot whale *(Globicephala melas),* common dolphin *(Delphinus delphis),* harbor porpoise *(Phocoena phocoena),* and bottlenose dolphin *(Tursiops truncatus).*

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Ecology and Management of Vector-Borne Pathogens on Fire Island

Lyme disease is the most common vector-borne disease on Fire Island. Transmission of the Lyme spirochete is primarily by the nymphal stage of *Ixodes scapularis* ticks from late May through midsummer. Research showing that these ticks are most abundant in leaf litter in closed-canopy woodlands has led to recommendations to avoid tick habitat and to use appropriate self-protection precautions when needed. The difficulty of penetrating the leaf litter, and the extensive nontarget effects, compromise the value of broadcast pesticide applications (e.g., sprays). Targeted pesticide applications (permethrin-treated cotton balls), which are used in some communities, can contribute to tick management, but give variable results. Research on natural enemies of ticks (wasps, nematodes, fungi, and bacteria) has identified potential biological control agents for ticks (especially the fungus *Metarhizium anisopliae*), but research on application methods and possible nontarget effects is needed before biocontrol is feasible for this tick species. West Nile Virus (WNV) first appeared in North America in 1999 in New York City, and has subsequently been isolated from mosquitoes on Fire Island. A surveillance program has been established to assess the risk of WNV transmission and to apply appropriate interventions when needed to protect public health. Since WNV is so new in this area, the local transmission cycle is not well understood. Research is required to understand the natural transmission dynamics of this virus so we can develop accurate surveillance tools and efficient management techniques to protect public health while minimizing negative effects on natural communities.

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Monitoring Mosquitoes at Fire Island National Seashore: 1998-2002

In 1998, the National Park Service established a program to monitor and manage mosquitoes on Fire Island and at the William Floyd Estate. The goal of this program was to reduce the human health risk from mosquito-borne diseases while adhering to the National Park Service's legal mandate to protect the natural resources of Fire Island National Seashore. The program was developed in consultation with several federal, state and local agencies and scientists specializing in arboviral diseases. It continues to owe its successful operation to many individuals and agencies. The program is run according to guidance provided by key park planning documents. These documents provide instructions on all details of program operation, including how to assess the degree of public health risk and when to initiate control actions (which may include pesticide application). The documents also provide for a record of the program's progress. In 1998, the program focused on testing mosquitoes for Eastern Equine Encephalitis (EEE). All FIIS traps were set in the Otis Pike Wilderness and at the William Floyd Estate. The program started out with six CDC light traps, which capture blood-feeding species. In 1999, the same trapping protocol was followed, but with the emergence of West Nile Virus (WNV) in the region, the scope of trapping and testing was broadened to include mosquitoes (particularly *Culex* spp) that are vectors for WNV. In 2000 and 2001, five gravid traps, designed to catch egg-bearing female Culex, and 4-7 light traps were deployed in park areas along the length of Fire Island and at the Floyd Estate. In 2002 the number of gravid traps was increased to 6-7 and the number of CDC light traps reduced to 3. These changes reflected the continued absence of EEE from the Seashore and the increasing prevalence of WNV in the area. In 1998 and 1999, no mosquitoes in the park tested positive for disease, but in 2000 WNV appeared in a Suffolk County Vector Control trap at Saltaire. In 2001, WNV was found at Watch Hill and again in 2002, when WNV was also found in the Otis Pike Wilderness. Monitoring as a management tool is environmentally advantageous in that it's a targeted approach – control is used only where and when it's needed, but limitations in testing technology and park resources inhibit it's effectiveness. More knowledge is needed about how monitoring combined with targeted control compares with other management methods (such as routine application of pesticide) to reduce the human health risk from arboviral disease.