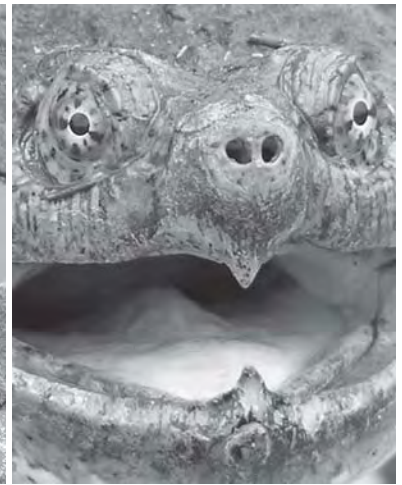


ANNUAL REPORT 2007



THE CENTER FOR
conservation biology

The College of William & Mary

The Center for Conservation Biology is a non-profit organization dedicated to discovering innovative solutions to environmental problems that are both scientifically sound and practical within today's social context. Established in the fall of 1991, the Center has been a leader in conservation issues throughout the mid-Atlantic region. In just a few short years, staff and students have conducted more than 350 research projects that have addressed a diverse array of questions. Many of these projects have set the standard within specific disciplines and resulted in better ways of managing sensitive ecosystems.

Center Mission

Our mission is the conservation of natural ecosystems within the mid-Atlantic region. We accomplish our mission by integrating the three complementary disciplines (research, education, management) that we consider to be the “cornerstones” of effective conservation. We use birds to make progress toward conservation goals because we believe that they are ideally suited to bridge the gap between research and public education. Without this link, the public will not respond to important conservation issues and research findings have limited impact on the course of our environment.

Research – We conduct basic and applied research focused on the functioning of mid-Atlantic ecosystems. We strive to select projects that not only fill information needs but also serve as catalysts to increase public awareness and stimulate related work in the region.

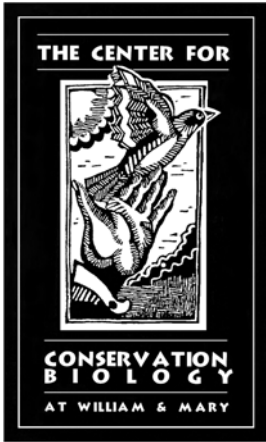
Education – We educate students and the public about the conservation and significance of natural resources. We also distribute significant research findings and information to assist resource planners and promote informed, responsible decision-making.

Management – We initiate and develop comprehensive strategies for the conservation and preservation of mid-Atlantic resources and ecosystems. In addition, we assist local, state, and federal agencies in identifying the condition and distribution of coastal resources.

Front cover photos by (left to right) Marian Urbi Watts, John DiGiorgio, Bryan Watts and Marian Urbi Watts.

Back cover photos by (left to right) John DiGiorgio, Bart Paxton, William Portlock and Marian Urbi Watts.

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Friends and Colleagues

On June 28, 2007 the U.S. Department of Interior formally removed the Bald Eagle from the federal list of threatened and endangered species culminating the greatest conservation success story in our nation's history. This declaration of recovery is a tribute to the generations of biologists and others who have worked toward this goal for more than 50 years. In less than 4 decades, eagles within the lower 48 states have increased by more than 20 fold reflecting the effectiveness of protection measures and the resiliency of our national symbol. Like individuals and organizations throughout the world, the Center for Conservation Biology marked this historic event with great celebration.



Over the past decade we have moved beyond the biological challenge of recovering this species into the more difficult social challenge of maintaining a recovered population on private lands. Here in the Chesapeake Bay, 75% of Bald Eagle nests reside on private lands and the market pressures to develop these lands have reached unprecedented levels. Our culture is locked in a philosophical struggle that has far reaching implications. How do we support imperiled species while respecting the rights of private landowners? We now know what eagles require and how to maintain them. As a collective society, will we maintain them? On 28 June we launched a cultural experiment that over the next decade will answer these questions and reflect our societal values.

Bald Eagles have been surveyed throughout the Chesapeake Bay for more than 50 years. The annual survey has documented in detail the history of the population and represents one of the most significant conservation databases of our time. With delisting there is an understandable urge to declare "mission accomplished" and to reduce funding for population monitoring. This urge is being followed widely. I believe that over the next 5-10 years the eagle survey will teach us more about eagle conservation and the more important issue of cultural choice than the previous 50 years. To be blind to how this struggle plays out is to turn our backs on the struggle itself. Join with us at this critical time by financially supporting the annual Bald Eagle survey conducted by the Center for Conservation Biology.

Bryan Watts, Director

RESEARCH PROGRAMS



Bald Eagle chicks in a nest along the shoreline of the James River. Virginia produced a record 737 chicks in 2007. Photo by Bryan Watts.



First-year Bald Eagle fitted with state-of-the-art GPS satellite transmitter. This technology will allow CCB researchers to gain unprecedented insight into the movement patterns of eagles throughout the Chesapeake Bay and beyond. Photo by Libby Mojica.

2007 was a great year for research within the Center for Conservation Biology (CCB). Research staff and associated field crews conducted 40 projects scattered across the mid-Atlantic region. As in years past, many projects were focused around 2 general themes including 1) how to manage bird populations within human-dominated landscapes and 2) defining the role that the mid-Atlantic region plays in the life cycle of species of conservation concern. Below is a partial listing of projects initiated or completed during the 2007 calendar year. These are listed within our three core research programs including the Threatened and Endangered Species Program, the Coastal Diversity Program, and the Bird Migration Program.

Threatened and Endangered Species Program

Virginia Bald Eagle breeding population continues to break records

The 2007 breeding season represents the 31st year that CCB biologists have systematically surveyed the Bald Eagle population in coastal Virginia. In 2007 the survey documented 560 occupied Bald Eagle territories in Virginia. This number represents a 15.5% increase over 2006. The number of active nests increased by 11.7% and 117 new nests were mapped. Occupied territories were located within 38 counties and 9 independent cities. The majority of known territories continue to be concentrated within the coastal plain with less than 5% of pairs occurring in the piedmont and mountains. A total of 737 chicks were counted during the productivity flight. This is the highest chick production recorded during the 31-year history of the survey. The Virginia population continues to have tremendous reproductive momentum. Of 7,505 chicks documented in the past 31 years, 9.8% were produced in 2006 and more than 60.6% were produced since 2000.

Tracking eagles throughout the Chesapeake and beyond

For the past year, CCB biologists have been trapping eagles on Aberdeen Proving Ground, MD within the upper Chesapeake Bay to learn more about their movement patterns. Aberdeen Proving Ground supports more eagles than any single government property along the Atlantic Coast. The land lies within the upper Chesapeake Bay Bald Eagle concentration area and supports a dense breeding population and migrant eagles from southern and northern populations. Captured birds have been fitted with state-of-the-art tracking devices that record GPS locations every hour, store the information in data files, and communicate the data to researchers via satellite. When completed, this will be one of the largest tracking studies of Bald Eagles ever conducted. The study is designed to provide information that will help to strike a balance between eagle management and military testing and training that is vital to national security. Understanding the specifics of

how eagles utilize the local landscape will lead to more effective integration of eagles into land management decisions.

Red-cockaded Woodpecker monitoring and management

CCB continues to work with partners The Nature Conservancy (TNC), the Virginia Department of Game and Inland Fisheries (VDGIF), and the U.S. Fish and Wildlife Service (FWS) to manage the small population of Red-cockaded Woodpeckers in Virginia's Piney Grove Preserve. This is the northernmost population throughout the species range. During 2007, 35 individuals were identified within the preserve including 19 birds that were hatched at Piney Grove in previous years, 9 chicks that fledged in 2007, 6 birds that were translocated to the site in previous years, and 1 bird that immigrated naturally from the Peartree-Palmetto Preserve in Tyrell County, NC. A modern record 6 breeding pairs produced 9 nestlings that survived to fledging age. Three of the breeding adults were replaced prior to the breeding season and a new recruitment cluster was used in 2007.

Evaluating biological benefits and social consequences of eagle management guidelines

Management guidelines intended to protect Bald Eagles on private lands must attempt to strike a balance between benefits to the breeding population and the burden imposed on society. The dramatic recovery of the population is placing a rapidly expanding burden on the regulatory agencies to implement current management guidelines and society to comply with guidelines. CCB used 31 years of eagle survey information to analyze trends relative to guidelines and societal burdens. Lands surrounding Bald Eagle nests that are considered under "management restrictions" have increased exponentially along with the breeding population and in 2007 had an estimated value of more than 4.5 billion dollars. The magnitude of this societal burden demands an effort to ensure that guidelines are both efficient and effective. Several lines of investigation within this study were used to recommend changes to protection standards.

Peregrine Falcon population and productivity monitoring

CCB biologists have led intensive management efforts since the late 1970s to recover the breeding population of Peregrine Falcons in Virginia. In 2007, the survey documented 20 resident pairs. Nesting structures included 10 peregrine towers, 6 bridges, 1 shack remnant on the seaside of the Delmarva, 1 high-rise building, 1 reserve ship, and 1 natural cliff face. Eighteen falcon pairs made breeding attempts producing 66 eggs and 52 chicks that survived to fledging age. Reproductive rate was 2.6 chicks/occupied territory and 2.9 chicks/active territory. Of 16 clutches that were followed completely from laying to fledging, 46 of 62 (74.2%) of eggs hatched. Of these 52 chicks, 52 (100%) survived to banding age and 52 (100%) fledged successfully.



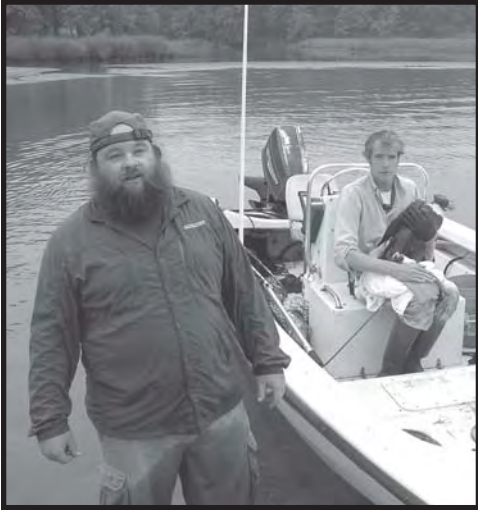
Red-cockaded Woodpecker recaptured at Piney Grove Preserve. This bird was originally banded in Tyrell County, NC and dispersed to Piney Grove late in 2007. Photo by Bobby Clontz.



Mike Wilson using peeper scope to examine a Red-cockaded Woodpecker cavity for eggs and condition. The use of this equipment allows CCB researchers to keep very close tabs on nesting activity. Photo by Bryan Watts.

RESEARCH PROGRAMS

Investigation of Bald Eagle concentration areas within the Chesapeake Bay



Fletcher Smith (l) and Sam Voss (r) with an eagle trapped on the Bush River. This location is within the Upper Chesapeake Bay Bald Eagle Concentration Area. Photo by Bryan Watts.

The Chesapeake Bay is an area of convergence for post-nesting and sub-adult Bald Eagles from breeding populations in the Southeast and Northeast. In late spring and early summer, eagles migrate north from Florida and other southeastern states to spend the summer months in the Bay. In the late fall, eagles migrate south from New England populations to spend the winter months on the tributaries of the Bay. Migrant eagles are not evenly distributed throughout the Bay but congregate within “concentration areas” that support sections of high-use shorelines and communal roosts. These areas have tremendous conservation significance for populations along the entire Atlantic Coast. In 2006 and 2007 CCB has conducted aerial surveys in the winter and shoreline surveys in the summer in collaboration with VDGIF to delineate concentration areas for active management.

Cliff-nesting bird survey concluded

Cliffs represent a unique and relatively rare resource within the southern Appalachians. CCB completed a systematic helicopter survey of a significant portion of this region to map, characterize, and survey cliffs for birds. A total of 242 exposed rock surfaces were surveyed with a combined length of 122.4 km. Eleven bird species were observed using cliff faces during aerial surveys. Nesting species included Common Ravens, Turkey Vultures, Peregrine Falcons, Red-tailed Hawks, and Great-horned Owls. The survey delineated 6 geographic areas that should be the focus of future Peregrine Falcon restoration activities. CCB produced a digital atlas of the cliff surfaces included in the survey.

Hacking of Peregrine Falcons in the mountains

Re-establishment of peregrines to their historic breeding range in the Appalachian Mountains continues to be an important conservation goal for CCB. In 2007, a total of 38 birds were translocated from the coast to mountain hack sites in Shenandoah National Park (9), New River Gorge (15), and Breaks Interstate Park (14). This is the largest number of birds ever translocated in the state representing more than 73% of the chicks produced. Thirteen of these chicks originated on bridges that have a history of poor fledging success. The remaining 25 chicks were from towers along the Delmarva Peninsula (20), a ship in the James River Reserve Fleet (3), an office building in Richmond (2). This effort would not have been possible without the tremendous partnership of the National Park Service.



Female Peregrine Falcon defending nest site. Photo by Bryan Watts.

Turnover rates and populations of origin for breeding Peregrine Falcons

For more than 20 years most states that are actively managing peregrine populations have banded birds with field-readable, alpha-numeric bands. A large portion of the falcon population within the Eastern U.S. is banded. However, relatively little attempt has been made to identify individuals within the breeding population. 2007 represents the fourth year that Shawn Padgett with CCB has used placed digital video recorders at nest sites to record adult activity and identify individuals. The objective of this effort is to quantify demographic parameters within the Virginia population and to examine dispersal patterns.



Peregrine Falcon adults as seen in nest box by digital video. Both adults are banded and were identified. Photo by Shawn Padgett.

CCB monitors eagle and heron populations in North Carolina Piedmont

Although survey work within coastal waters has shown that the Bald Eagle breeding population within the mid-Atlantic region has increased dramatically, there is very little information from interior locations. CCB has been working with ALCOA and Progress Energy to survey both Bald Eagles and Great Blue Herons on a series of hydroelectric reservoirs in the piedmont of North Carolina since 2001. During the 2007 breeding season, these reservoirs collectively supported 7 Bald Eagle territories. The reservoirs also supported 820 pairs of Great Blue Herons and 27 pairs of Great Egrets in 10 colonies.



Shawn Padgett with a brood of Peregrine Falcons in the doorway of a ship within the James River mothball fleet. The military has been a great partner in helping to manage this site. Photo by Bryan Watts.

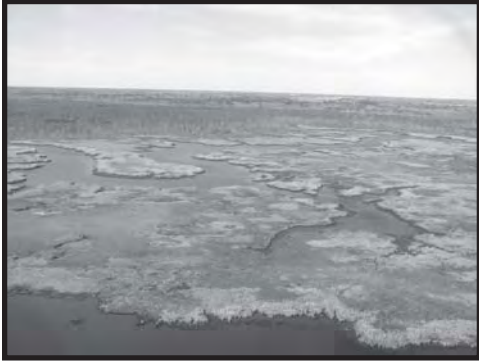
Bald Eagle shoreline surveys on Cat Point Creek

Cat Point Creek is one of the most pristine tributaries within the tidal-fresh reach of the Rappahannock River, a body of water that is known to be a core conservation area for the Bald Eagle and that has been targeted by Virginia as a significant management area for the species. In recent years, this creek has become increasingly important to three populations of bald eagles including 1) the Chesapeake Bay breeding population, 2) the southeastern breeding population that migrates up to the Bay to spend the summer months, and 3) the northeastern breeding population that migrates down to the Bay to spend the winter months. In the spring of 2007, CCB began a multi-year study in collaboration with VDGIF to investigate seasonal use of this tributary by Bald Eagles and the importance of human disturbance to patterns of use and distribution.



Bart Paxton and Libby Mojica surveying eagles along the upper reach of Cat Point Creek. Photo by Bryan Watts.

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Extensive tidal marshes such as these along the Delmarva Peninsula are the focus of Black Rail surveys. Photo by Bryan Watts.



Infra-red illuminators on video camera picked up this Great-horned Owl next to an oystercatcher nest on Fisherman Island.



Adult male Northern Harrier. The Virginia breeding population of Northern Harriers is less than 25 pairs. Harriers and many other species of conservation concern are the focus of the Avian Heritage Program. Photo by Zach Smith.

Coastal Diversity Program

Historic survey of Black Rails launched

The Black Rail is one of the most endangered and least studied birds along the Atlantic Coast and appears to have experienced a dramatic decline over the past 30 years. Status information is lacking over large portions of its breeding range. The Black Rail has never been systematically surveyed in Virginia and is generally believed to occur in only 10-20 breeding locations. The remote location of breeding habitat and the need to survey at night when birds are most active has made a population assessment logistically challenging. In the spring of 2007, CCB biologists with partners from the state of Virginia launched a two-year, systematic survey of Black Rails throughout coastal Virginia. The 2007 effort focused on the Delmarva Peninsula and established a network of 242 survey points distributed throughout available habitat. This historic survey will result in an assessment of the breeding population for the state and a digital atlas of breeding locations.

Video-monitoring oystercatchers on Fisherman's Island

Virginia is increasingly recognized as a stronghold for American Oystercatchers and Fisherman Island National Wildlife Refuge supports approximately 5-10% of the state's breeding population. However, reproductive rates have been chronically low within this site. In order to investigate possible sources of clutch loss, we used a video-monitoring approach to quantify disturbance events and causes of reproductive failure. We recorded 7,570 hrs of digital video footage that included interactions with 21 species. Oystercatcher response varied according to species and was considerably longer during the night hours. Reproductive performance for monitored nests was relatively poor. Pairs hatched all eggs laid and successfully moved chicks from the nest site in only 4 (16%) of 25 attempts. High tide events associated with coastal storms represented the largest source of nest loss. The second highest cause of loss was to predation by Fish Crows. Crows were documented to take 12 eggs during the course of 7 nesting attempts. Ghost crabs were documented to take 1 egg and 2 chicks. A Boat-tailed Grackle was observed taking a single egg. A raccoon predated a single-egg clutch.

Virginia Avian Heritage Program initiated

Virginia plays a significant role in the life history of many of the bird species in Eastern North America. The diversity of habitats available to birds during the breeding, wintering, and migratory periods combined with its geographic position combine to make it one of the most diverse physiographic regions in North America. Virginia was the site for the first European colony and so has a long history of ornithological documentation including the history of range expansions, population fluctuations, and changes in distribution for a wide range of

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bird species. This information serves as an invaluable tool for conservation because it provides historical benchmarks to the spatial and temporal patterns of declines for Virginia's imperiled species. Despite this rich history, there has never been an attempt to compile these archives. The objective of the Avian Heritage Program is to assemble historical records into a geographically referenced database and to develop an approach to capture new information as it is produced.

Food safety and the transmission of pathogens from wild birds to farm animals

Consumer protection from food-borne illnesses is an ever-growing concern for our society. Salmonella and E. Coli are among the most publicized culprits of these outbreaks and most often linked to the consumption of farm produce and undercooked meat. Although the potential impact of wild animals has been considered as a factor for food-borne pathogen contamination, no study has quantitatively assessed the risks of transmission from wild birds to farm livestock. CCB has entered into a 2-year collaborative study with food safety experts from Virginia State University and the University of Maryland Eastern Shore and funded by USDA to investigate pathogen links between wild birds and farm animals. The project integrates risk assessment with risk management by examining pathogens in wild birds and farm animals and evaluating the influence of farm hygiene on pathogen transmission.

Barrier island dynamics and beach-nesting bird habitat

The Virginia Barrier Islands contain some of the most naturally dynamic landscapes on earth. These islands contain unique habitats that are critical to the persistence of many colonial and beach-nesting bird populations. Many of these species occupy a range of disturbance/successional niches that are defined by the relationship between beach erosion (caused by storms) and recovery (via succession). Over the past 25 years, populations of several species have declined. We evaluated the influence of landscape changes on these declines by quantifying beach habitats over 7 decades using benchmark sets of aerial photographs. Photographs were scanned, orthorectified, and placed in a geographic information system. Both beach and landscape characteristics were evaluated. The amount of habitat for beach-nesting species has fluctuated widely over time and has increased in recent years. Species declines do not appear to be related to trends in habitat availability.

Developing a waterbird monitoring plan for the Chesapeake Bay

The Chesapeake Bay plays an important role in the life cycle of many bird species. Each year, the rich resources of the Bay attract millions of birds of 160 species from throughout the western hemisphere. Many species that depend on the Bay are of high



Over the past 30 years, Barn Owls have declined dramatically throughout the mid-Atlantic Coastal Plain due to the loss of idle grasslands. Information gathered from historic records will assist CCB in placing the current population within the appropriate historical context. Photo by David Whalen.



Pine stump in the active beach zone of barrier island. The Virginia Barrier Islands are reworked annually by storms and are migrating landward. The barrier island study sought to quantify habitat dynamics. Photo by Bryan Watts.

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Yellow-crowned Night Heron foraging along shoreline. This species and more than 100 other waterbirds are the focus of integrated monitoring program under development by CCB. Photo by Bryan Watts.



The Red-eyed Vireo is one of the more common species breeding within the MAPS study sites within Quantico Marine Base. Photo by Carla Schneider.



Shrub-dominated habitat within the southern Appalachians. This is the habitat condition preferred by Golden-winged Warblers. Photo by Bryan Watts.

international, national or regional conservation concern. Because many waterbirds are top consumers and collectively require a broad array of resources, they represent sensitive indicators of overall ecosystem health. Effective, timely information is needed for waterbirds that depend on the Chesapeake Bay. Such information informs the public and enables government agencies to meet their regulatory responsibilities. Long-term information provides the foundation to assess trends and formulate appropriate conservation objectives. Although a large number of government agencies, universities, NGOs, corporations, and private citizens participate in waterbird counts annually within the Chesapeake Bay, count objectives, time horizons, methodologies, geographic coverage, and species involved often vary from project to project producing a patchwork of information. CCB in collaboration with VDGIF is working on an integrated plan for monitoring waterbird populations.

CCB Completes eleventh year of participation in national MAPS program

Monitoring Avian Productivity and Survivorship (MAPS) is a continent-wide program designed to estimate demographic parameters for passerines using constant-effort mist netting. The program focuses on long-term productivity patterns and rates of return to breeding territories. Initiated in 1989, the program now has more than 500 stations scattered across the United States and Canada. CCB has operated 3 MAPS stations in cooperation with U.S. Marine Corps Base Quantico, in northern Virginia, since 1997. Two of the sites are within extensive hardwood forests with large populations of Wood Thrush, Ovenbird, Acadian Flycatchers, Hooded Warblers, and Worm-eating Warblers. The remaining site contains a mixture of pine forest and young clearcut. This site supports large populations of Yellow-breasted Chat, Indigo Bunting, White-eyed Vireo, and Common Yellowthroat.

Survey of Golden-winged Warbler completed

Despite the belief that the Appalachian Mountains are a stronghold for the declining Golden-winged Warbler, there has been no attempt to evaluate status and distribution in Virginia. CCB systematically surveyed for the presence of Golden-winged and Blue-winged Warblers across 40 counties in Virginia's Appalachian Plateau, Ridge and Valley, and Blue Ridge physiographic provinces. The effort included surveys of 932 points within 863 shrub patches. We detected 56 Golden-winged Warblers within 37 patches in 11 counties and 92 Blue-winged Warblers within 62 patches in 18 counties. The species occurred in the same counties, over similar elevations, but differed somewhat in habitat use. A comparison of results with historical records indicates that Golden-winged Warblers are continuing to decline in Virginia and are being replaced by Blue-winged Warblers in order of abundance. The low number of detections may justify regulatory protection within the region.

Potential impact of common reed on high-marsh bird communities

Tidal salt marshes are one of the most characteristic habitats within the mid-Atlantic region and are important to the regional avifauna. Several species are exclusive to this habitat type and others reach their highest densities there. Some of the most threatened bird species within the Coastal Plain of northeastern North America depend on the high marsh habitat for breeding. One of the most imminent threats to this community type is the displacement of native vegetation along the marsh-upland ecotone by the invasive form of common reed (*Phragmites spp.*). In order to investigate potential impacts of common reed on the bird community, CCB used remote sensing to map common reed along the seaside of the Delmarva Peninsula and compared the bird community in pristine and altered marsh patches. Eighty 250-m transects were established within 40 high-marsh sites. A total of 87,500 m of transects were surveyed, resulting in 2,950 detections of 81 species. Seaside and Sharp-tailed Sparrows were found in significant numbers within large high-marsh patches on the northern portion of Virginia Delmarva Peninsula, regardless of *P. australis* presence. However these species rarely, if ever, utilized *P. australis*.

CCB launches Nightjar Survey Network

In recent years, the ornithological community has grown increasingly concerned that nightjars (Whip-poor-wills, Chuck-will's-widows, and kin) have been declining. However, due to their nocturnal habits, we have had no monitoring program in place to confirm or refute such beliefs. In 2007, CCB launched a new and statistically powerful monitoring program called the Nightjar Survey Network designed to determine the status and population trends of nightjar species throughout North America. In 2007, the network was launched in 10 southeastern states with plans to expand in following years. The success of this program relies entirely on volunteer participation. In the first year, volunteers adopted 90 routes and counted 215 Whip-poor-wills, 591 Chuck-will's-widows, and 65 Common Nighthawks. Plans are in place to expand the network to include most regions of the United States in 2008. Those interested in participating in this new and important program should see details at www.ccb-wm.org.

Fish demand by breeding birds within the Chesapeake Bay

The Chesapeake Bay is one of the most productive aquatic ecosystems in the world. Commercial harvest of fisheries averages 3-500,000 metric tons/year. Fisheries models have included a number of processes including harvest rates but to date have never considered consumption by bird populations. In collaboration with Virginia Commonwealth University, CCB used a bioenergetics approach to estimate the amount of fish biomass consumed by breeding piscivorous birds within the tidal reach of the Chesapeake Bay. This



Saltmarsh Sharp-tailed Sparrow in hand on the Lower Delmarva Peninsula. Surveys conducted by CCB researchers defined the southern range boundary for this species. Photo by Fletcher Smith.



Whip-poor-will in hand. This is one of the target species of the Nightjar Network. Photo by Bart Paxton.



Pair of Brown Pelicans on nest. This species is one of 5 species included in metabolic demand models. Photo by Marian Watts.

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Box of turtle shells collected from below Bald Eagle nests in the Chesapeake Bay. Quantifying diet is a next step in understanding the implications of metabolic demand patterns. Photo by Bryan Watts.



Libby Mojica (l), Fletcher Smith (m), and Bart Paxton (r) setting up mist nets for night-time shorebird trapping in marshes of the Eastern Shore. One of many small projects conducted throughout the region. Photo by Bryan Watts.



Characteristic landscape of the lower Delmarva Peninsula. The forest patch configuration was ideal for an investigation of migrant emergence patterns with NPOL radar. Photo by Bryan Watts.

approach combined a multi-stage population model with a breeding model and applied allometric relationships between field metabolism and body mass to estimate annual demand across years and daily demand within years. Species-specific models were created for Bald Eagles, Osprey, Great Blue Herons, Double-crested Cormorants, and Brown Pelicans. Bay-wide survey data was used to parameterize the population model and 28 general, nesting, feeding, and demographic parameters were used to develop the breeding models. Population and community-wide projections were made in 5-y intervals over a 30-year period between 1975 and 2005. Estimated fish demand increased 10-fold during this period from 3 to 35 million pounds. Future work will focus on diet comparisons so that this demand may be stratified according to specific fish stocks.

CCB assists agencies/organizations with bird surveys

During 2007, CCB biologists and technicians conducted several bird surveys and other projects to assist agencies and NGOs with their information needs. Projects were conducted over several states in the mid-Atlantic region for a diversity of organizations.

Bird Migration Program

Use of NPOL Radar to identify stopover hotspots for migrant passerines

Weather surveillance radar has been used to map broad-scale patterns of bird migration for many years. However, the current network of weather radars used in the United States has design and operational constraints that impose limitations on the resolution of landscape features that may be evaluated on the scale of kilometers. The development of technologies that would allow for the mapping of migratory exodus on a landscape scale would have far-reaching ecological and conservation implications. In collaboration with TNC and other partners, CCB operated NASA's new polarimetric radar (NPOL) on the lower Delmarva Peninsula during the fall migration to evaluate its potential to resolve spatial variation in exodus at the patch and landscape scales. We compared mean reflectivity values for geographic areas (landscape scale) and habitat types (patch scale) that are known to support significantly different migrant densities. We conducted ground surveys and vegetation mapping to support radar work. Results suggest that this technology has the capacity to be a significant tool for mapping migration hotspots with a spatial resolution beyond the reach of previous radars.

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Aerial surveys of the Virginia Barrier Islands for migrant shorebirds

The Virginia Barrier Islands are the most pristine set of barriers remaining along the Atlantic Coast and represent a significant staging area for several migratory shorebirds. During the spring of 1994-1996, CCB in collaboration with TNC and other partners conducted weekly aerial surveys of the island chain to document the status, distribution, and phenology of migrant shorebirds. The surveys were the first to document the significance of the islands to Red Knots, Sanderling, Black-bellied Plovers, and Dunlin. Beginning in 2006, weekly surveys have been resumed to collect data for comparison. During the third week of May, 2007 a coast-wide survey was coordinated with other states along the Atlantic Coast to get a snapshot of Red Knot distribution and abundance.

Investigation of Red Knot stopover along the barrier islands using resight data

Over the past 20 years, the rufa population of Red Knot within North America has declined by approximately 80-90%. Concern for this species led to an application to the U.S. FWS for fast track consideration for federal listing under the Endangered Species Act. Most of the conservation efforts to date have focused on Delaware Bay where Red Knots depend on horseshoe crab eggs. In the mid-1990s, 3 years of aerial surveys documented that the Virginia Barrier Islands had more significance to the species than previously believed. However, little is known about stopover ecology within this location. In the spring of 2007, CCB worked intensively on 6 barrier islands to take advantage of the large number of knots that have been banded throughout their range to investigate stopover duration. A total of 18,770 Red Knots were detected on surveys. Of 12,580 birds that were scanned, 642 were banded. A total of 277 birds were individually identified and observed at least once.

Northern Saw-whet Owl migration study completes 14th year

In 1994 CCB began a study of Northern Saw-whet Owl migration on the lower Delmarva Peninsula. This study has been the first to document large number of migrant south of Maryland. During the 14-year study, 3,290 owls have been banded and more than 100 foreign retraps and returns have been recorded. We have recorded more than 500 same-year recaptures. During the fall of 2007, 460 owls were captured including 439 new owls and 21 foreign banded birds. The station was open during 45 nights and 8,588 hours of operation. Capture rate was the third highest ever and 20 times higher than 2006. The capture rate and pattern was comparable to the invasion years of 1995 and 1999.



Flight crew Bryan Watts (l), Barry Truitt (m), and Carter Crabbe (r) that have been surveying shorebirds along the Delmarva Peninsula since 1994. Photo by Libby Mojica.



Red Knot foraging on Hog Island (Virginia Barrier Island chain) with leg band from Argentina. Photo by Barry Truitt / TNC.



Northern Saw-whet Owl in hand on the Lower Delmarva Peninsula. Photo by John DiGiorgio / Nature's Art LLC

RESEARCH PROGRAMS



Alex Wilke with American Oystercatcher chick on the barrier islands. Photo by Matt Ramah.



Andy Glass weighing an Osprey chick on the Rappahannock River. Photo by Bryan Watts.



Elise Larsen shading woodpecker chicks in Piney Grove Preserve. Photo by Bryan Watts.

Graduate Students complete M.S. degrees

Alex Wilke successfully defended her M.S. thesis entitled *Status, distribution, and reproductive rates of American Oystercatchers in Virginia* during the fall of 2007. Alex entered the graduate program in the spring of 2002 after completing a biology degree at Bates College and working in avian conservation in various capacities. Her ongoing research with the Virginia population of American Oystercatchers has been some of the most productive throughout the species range. Understanding the factors contributing to reproductive rates is central to formulating management strategies.

Wilke, A. L. 2007. Status, distribution, and reproductive rates of American Oystercatchers in Virginia. M.S. Thesis, College of William and Mary, Williamsburg, VA. 74 pp.

Andy Glass successfully defended his M.S. thesis entitled *Spatial variation in Osprey provisioning, reproductive success, and population growth within lower Chesapeake Bay* during the fall of 2007. Andy entered the graduate program in the fall of 2005 after completing a biology degree at Berry College and working throughout North America on a variety of conservation projects. His work with Osprey in the Chesapeake Bay has given new insight into the ecology of this species that is emerging as the population expands into portions of the Bay where it has never been studied.

Glass, A. K. 2007. Spatial variation in Osprey provisioning, reproductive success, and population growth within the lower Chesapeake Bay. M.S. Thesis, College of William and Mary, Williamsburg, VA. 129 pp.

Elise Larsen successfully defended her M.S. thesis entitled *Effects of urban development on breeding bird diversity: The role of diet and migration* during the fall of 2007. Elise entered the graduate program in the fall of 2005 after completing a zoology degree at Michigan State and working to develop a national contaminants and wildlife database. Her work with the role of landuse in changing bird communities focused on one of the greatest conservation challenges faced by the conservation community.

Larsen, E. 2007. Effects of urban development on breeding bird diversity: The role of diet and migration. M.S. Thesis, College of William and Mary, Williamsburg, VA. 42 pp.

RESEARCH PROGRAMS

CCB welcomes new staff

Libby Mojica was hired in the spring of 2007 as a research biologist focused on raptor ecology and conservation. Libby received her M.S. in wildlife ecology and management from The University of Georgia. Her graduate research focused on migration and important use areas of Bald Eagles using satellite telemetry. Prior to graduate school, she worked as a raptor biologist for the Florida Fish and Wildlife Conservation Commission studying raptors in urban and suburban landscapes. Her research interests are in avian migration, communal roosting, satellite telemetry, contaminants, GIS, and prescribed burns.



Libby Mojica with young Bald Eagle fitted with satellite transmitter. Photo by Bart Paxton.

Adam Duerr was hired in the fall of 2007 as a research biologist focused on waterbird ecology and conservation. Adam received his PhD from the University of Vermont, where his dissertation focused on the population dynamics, foraging ecology, and management of Double-crested Cormorants on Lake Champlain. His research focused on aspects of cormorant ecology and biology that were directly pertinent to their management. While in Vermont, he expanded his analytical skills to include abilities to estimate demographic and energetic parameters from individually marked animals, construct population models from these parameters to help solve management problems, apply population models to assess influences of management actions and identify optimal decisions through decision analysis. Prior to working in Vermont, Adam worked as an environmental consultant in Arizona for 2 years and earned his Master's and Bachelor's degrees at the University of Arizona in Wildlife Science.



Adam Duerr with Brown Pelican chick on Smith Island. Photo by Bryan Watts.

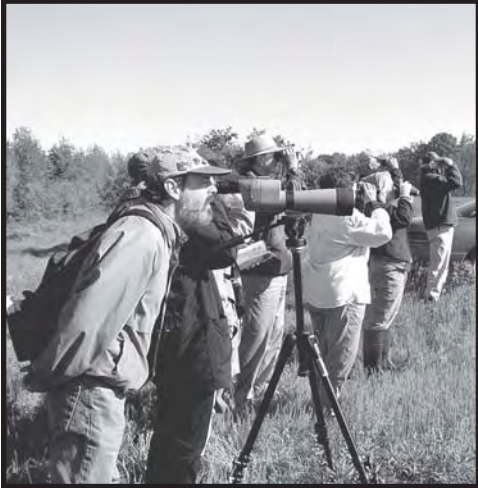
Carla Schneider worked for CCB for more than two years before starting as development and outreach coordinator in late 2007. Carla earned her B.S. in biology, with a concentration in Marine Science, from Fairfield University in Connecticut. She spent several years as an environmental educator and the internship coordinator for SoundWaters, a small non-profit educational organization, where she led hikes, canoe trips, and designed and taught outdoor and classroom curriculum about preserving ecosystems and conserving resources. Carla continues to seek opportunities for the general public to get involved in conservation efforts and participate in scientific research. Her professional interests include wetlands restoration, and invasive species mitigation, resource conservation, and wilderness medicine.



Carla Schneider at Mystic Seaport, CT.

OUTREACH AND EDUCATION PROGRAMS

CCB Continues Community Outreach



A group of birders watching grassland birds on the Wilna Tract of the Rappahannock River National Wildlife Refuge. CCB is increasing the number of opportunities for the public to see rare habitats and species. Photo by Marian Watts.

CCB continues to develop a broad community outreach program. The purpose of this program is to inform the general public about ongoing environmental problems while providing education about potential solutions and recent research findings. By interacting directly with the community we hope to advance the public debate and establish a forum for problem solving. Since 2000, CCB has participated in more than 600 newspaper articles, 55 magazine articles and over 250 articles published via electronic media. In addition, Center staff and /or associates have been featured in more than 30 television and 15 radio broadcasts. More than 200 presentations have been made to local, state, and national audiences.

CCB continues commitment to release of findings

Decisions that influence the future and health of sensitive populations and ecosystems are made on a daily basis. In order for land managers and planners to make the best use of our natural resources, it is important that they have direct access to recent research findings. CCB is committed to making research findings available as soon as possible. Below is a listing of recent publications produced by CCB.

Recent Research Publications

Watts, B. D. and M. A. Byrd. 2007. Impact of hurricane Isabel on Bald Eagle nests and reproductive performance in the lower Chesapeake Bay. *Condor* 109:206-209.

Watts, B. D., G. D. Therres, and M. A. Byrd. 2007. Status, distribution and the future of Bald Eagles in the Chesapeake Bay. *Waterbirds* 30:25-38.

Markham, A. C. and B. D. Watts. 2007. Documentation of infanticide and cannibalism in Bald Eagles. *Journal of Raptor Research* 41:41-44.

Erwin, R. M., B. D. Watts, G. M. Haramis, M. C. Perry, and K. A. Hobson [Eds]. 2007. Waterbirds of the Chesapeake Bay and vicinity: Harbingers of Change? *Waterbirds* 30: Special publication 1.

Blackwell, B. F., M. L. Avery, B. D. Watts, and M. S. Lowney. 2007. Demographics of black vultures in North Carolina. *The Journal of Wildlife Management* 71:1976-1979.

Watts, B. D. and B. J. Paxton. 2007. Ospreys of the Chesapeake Bay: Population recovery, ecological requirements, and current threats. *Waterbirds* 30:39-49.

Wilson, M. D., B. D. Watts, and D. F. Brinker. 2007. Status review of Chesapeake Bay marsh lands and breeding marsh birds. *Waterbirds* 30:122-137.



Videographer Yoke Bauer DiGiorgio on Smith Island. Yoke has recently produced an educational film with CCB entitled "Eagle Nesting Diaries" that has had great reviews. Photo by Marian Watts.

OUTREACH AND EDUCATION PROGRAMS

Wilke, A. L., D. F. Brinker, B. D. Watts, A. H. Traut, R. Boettcher, J. M. McCann, B. R. Truitt, and P. P. Denmon. 2007. American Oystercatchers in Maryland and Virginia: Status and distribution. *Waterbirds* 30:152-162.

Williams, B., D. F. Brinker, B. D. Watts, and R. M. Erwin. 2007. The status of colonial nesting wading bird populations within the Chesapeake Bay and coastal barrier island lagoon system. *Waterbirds* 30:82-92.

Brinker, D. F., B. Williams, B. D. Watts, and R. M. Erwin. 2007. Colonial nesting seabirds in the Chesapeake Bay region: where have we been and where are we going? *Waterbirds* 30:93-104.

Viverette, C. B., G. C. Garman, S. McIninch, A. C. Markham, B. D. Watts, and S. A. Macko. 2007. Finfish-waterbird trophic interactions in tidal freshwater tributaries of the Chesapeake Bay. *Waterbirds* 30:50-62.

Erwin, R. M., G. M. Haramis, M. C. Perry, and B. D. Watts. 2007. Waterbirds of the Chesapeake Bay region: An introduction. *Waterbirds* 30:1-3.

Watts, B. D. and M. A. Byrd. 2006. Status and distribution of colonial waterbirds in coastal Virginia: The 2003 breeding season. *The Raven* 77:3-22.

Williams, B., B. D. Watts, and M. A. Byrd. 2006. A census of a Cliff Swallow colony on the Benjamin Harrison Bridge. *The Raven* 77:35-40.

CCB Technical Report Series

Paxton, B. J., B. D. Watts, and F. M. Smith. 2007. Autumn migration of Northern Saw-whet Owls on the lower Delmarva Peninsula 1994-2006: Project report 2006. Center for Conservation Biology Technical Report Series, CCBTR-07-01. College of William and Mary, Williamsburg, VA. 16 pp.

Wilson, M. D., B. D. Watts, M. G. Smith, J. P. Bredlau, and L. W. Seal. 2007. Status assessment of Golden-winged Warblers and Bewick's Wrens in Virginia. Center for Conservation Biology Technical Report Series, CCBTR-07-02. College of William and Mary, Williamsburg, VA. 34 pp.

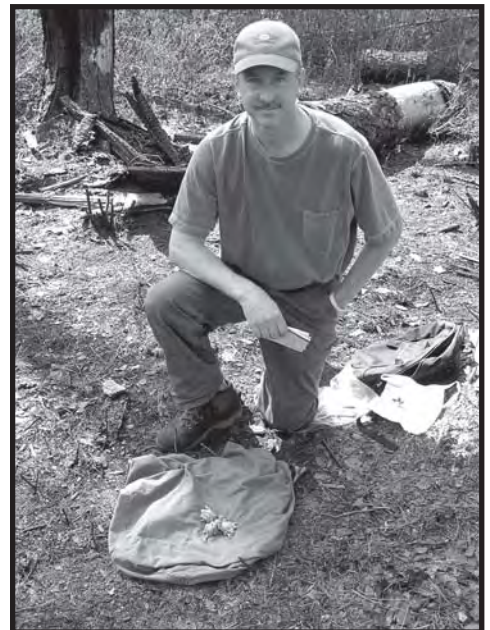
Paxton, B. J. 2007. Potential impact of common reed expansion on threatened high-marsh bird communities on the seaside: Breeding bird surveys of selected high-marsh patches. Center for Conservation Biology Technical Report Series, CCBTR-07-03. College of William and Mary, Williamsburg, VA. 19 pp.

Watts, B. D., M. D. Wilson, B. J. Paxton, F. M. Smith, D. S. Bradshaw, and C. Lotts. 2007. Investigation of Red-cockaded Woodpeckers in Virginia: Year 2006 report. Center for Conservation Biology Technical Report Series, CCBTR-07-04. College of William and Mary, Williamsburg, VA. 27 pp.

Smith, F. M. 2007. Summary of colonial nesting herons within the Colonial National Historic Park boundaries, 2007 breeding season. Center for Conservation Biology Technical Report Series, CCBTR-07-05. College of William and Mary, Williamsburg, VA. 13 pp.



Marian Watts with Peregrine Falcon chick. Photo by Bryan Watts.



Dana Bradshaw with brood of Red-cockaded Woodpecker chicks after a controlled burn. TNC has used fire effectively to greatly improve habitat quality within the Piney Grove Preserve. Photo by Bryan Watts.

OUTREACH AND EDUCATION PROGRAMS



Mitchell Byrd (l) and Bart Paxton (r) banding a Peregrine Falcon chick along the Delmarva Peninsula. Photo by Libby Mojica.

Wilson, M. D., B. D. Watts, and J. E. LeClerc. 2007. Assessing habitat stability for disturbance-prone species by evaluating landscape dynamics along the Virginia Barrier Islands. Center for Conservation Biology Technical Report Series, CCBTR-07-06. College of William and Mary, Williamsburg, VA. 47 pp.

Watts, B. D. and S. R. Harding. 2007. Virginia Red-cockaded Woodpecker conservation plan. Center for Conservation Biology Technical Report Series, CCBTR-07-07. College of William and Mary, Williamsburg, VA. 42 pp.

Watts, B. D. and Padgett, S. M. 2007. Virginia Peregrine Falcon monitoring and management program: Year: 2007 report. Center for Conservation Biology Technical Report Series, CCBTR-07-09. College of William and Mary, Williamsburg, VA. 19 pp.

Watts, B. D. 2007. An assessment of the Bald Eagle and Great Blue Heron breeding populations along High Rock, Tuckertown, Narrows, and Falls Reservoirs in central North Carolina: 2007 breeding season. Center for Conservation Biology Technical Report Series, CCBTR-07-10. College of William and Mary, Williamsburg, VA. 29 pp.

Smith, F. M., B. J. Paxton, and B. D. Watts. 2007. Autumn migration of Northern Saw-whet Owls on the Lower Delmarva Peninsula 1994-2007: Project report 2007. Center for Conservation Biology Technical Report Series, CCBTR-07-11. College of William and Mary, Williamsburg, VA. 17 pp.

Watts, B. D. 2007. An assessment of the Bald Eagle population along Claytor Lake, Virginia. Center for Conservation Biology Technical Report Series, CCBTR-07-12. College of William and Mary, Williamsburg, VA. 13 pp.

Paxton, B. J. 2007. Potential impact of common reed expansion on threatened highmarsh bird communities on the seaside: Wintering bird surveys of selected high-marsh patches. Center for Conservation Biology Technical Report Series, CCBTR-07-13. College of William and Mary, Williamsburg, VA. 21 pp.

Smith, F. M., A. E. Duerr, B. J. Paxton, and B. D. Watts. 2007. An investigation of stopover ecology of the Red Knot on the Virginia Barrer Islands. Center for Conservation Biology Technical Report Series, CCBTR-07-14. College of William and Mary, Williamsburg, VA. 35 pp.

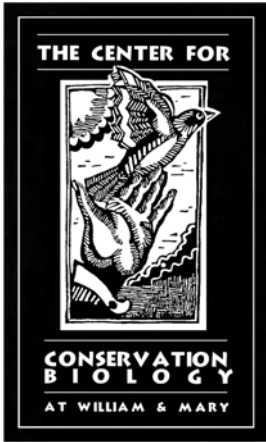
Watts, B. D. and M. A. Byrd. 2007. Virginia Bald Eagle nest and productivity survey: Year 2007 report. Center for Conservation Biology Technical Report Series, CCBTR-07-15. College of William and Mary, Williamsburg, VA. 39 pp.



Bald Eagle banded with aluminum USGS band and field-readable, alpha-numeric band. CCB has been using field-readable bands on Peregrines Falcons for years and more recently for Bald Eagles. Photo by Bryan Watts.

Outreach/Education Publications

Watts, M. U. 2007. Community outreach programs: Media coverage and public presentations (2007). Center for Conservation Biology Education Document CCBED-07-01. College of William and Mary, Williamsburg, VA.



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Friends and Colleagues

On June 28, 2007 the U.S. Department of Interior formally removed the Bald Eagle from the federal list of threatened and endangered species culminating the greatest conservation success story in our nation's history. This declaration of recovery is a tribute to the generations of biologists and others who have worked toward this goal for more than 50 years. In less than 4 decades, eagles within the lower 48 states have increased by more than 20 fold reflecting the effectiveness of protection measures and the resiliency of our national symbol. Like individuals and organizations throughout the world, the Center for Conservation Biology marked this historic event with great celebration.



Over the past decade we have moved beyond the biological challenge of recovering this species into the more difficult social challenge of maintaining a recovered population on private lands. Here in the Chesapeake Bay, 75% of Bald Eagle nests reside on private lands and the market pressures to develop these lands have reached unprecedented levels. Our culture is locked in a philosophical struggle that has far reaching implications. How do we support imperiled species while respecting the rights of private landowners? We now know what eagles require and how to maintain them. As a collective society, will we maintain them? On 28 June we launched a cultural experiment that over the next decade will answer these questions and reflect our societal values.

Bald Eagles have been surveyed throughout the Chesapeake Bay for more than 50 years. The annual survey has documented in detail the history of the population and represents one of the most significant conservation databases of our time. With delisting there is an understandable urge to declare "mission accomplished" and to reduce funding for population monitoring. This urge is being followed widely. I believe that over the next 5-10 years the eagle survey will teach us more about eagle conservation and the more important issue of cultural choice than the previous 50 years. To be blind to how this struggle plays out is to turn our backs on the struggle itself. Join with us at this critical time by financially supporting the annual Bald Eagle survey conducted by the Center for Conservation Biology.

Bryan Watts, Director

RESEARCH PROGRAMS



Bald Eagle chicks in a nest along the shoreline of the James River. Virginia produced a record 737 chicks in 2007. Photo by Bryan Watts.



First-year Bald Eagle fitted with state-of-the-art GPS satellite transmitter. This technology will allow CCB researchers to gain unprecedented insight into the movement patterns of eagles throughout the Chesapeake Bay and beyond. Photo by Libby Mojica.

2007 was a great year for research within the Center for Conservation Biology (CCB). Research staff and associated field crews conducted 40 projects scattered across the mid-Atlantic region. As in years past, many projects were focused around 2 general themes including 1) how to manage bird populations within human-dominated landscapes and 2) defining the role that the mid-Atlantic region plays in the life cycle of species of conservation concern. Below is a partial listing of projects initiated or completed during the 2007 calendar year. These are listed within our three core research programs including the Threatened and Endangered Species Program, the Coastal Diversity Program, and the Bird Migration Program.

Threatened and Endangered Species Program

Virginia Bald Eagle breeding population continues to break records

The 2007 breeding season represents the 31st year that CCB biologists have systematically surveyed the Bald Eagle population in coastal Virginia. In 2007 the survey documented 560 occupied Bald Eagle territories in Virginia. This number represents a 15.5% increase over 2006. The number of active nests increased by 11.7% and 117 new nests were mapped. Occupied territories were located within 38 counties and 9 independent cities. The majority of known territories continue to be concentrated within the coastal plain with less than 5% of pairs occurring in the piedmont and mountains. A total of 737 chicks were counted during the productivity flight. This is the highest chick production recorded during the 31-year history of the survey. The Virginia population continues to have tremendous reproductive momentum. Of 7,505 chicks documented in the past 31 years, 9.8% were produced in 2006 and more than 60.6% were produced since 2000.

Tracking eagles throughout the Chesapeake and beyond

For the past year, CCB biologists have been trapping eagles on Aberdeen Proving Ground, MD within the upper Chesapeake Bay to learn more about their movement patterns. Aberdeen Proving Ground supports more eagles than any single government property along the Atlantic Coast. The land lies within the upper Chesapeake Bay Bald Eagle concentration area and supports a dense breeding population and migrant eagles from southern and northern populations. Captured birds have been fitted with state-of-the-art tracking devices that record GPS locations every hour, store the information in data files, and communicate the data to researchers via satellite. When completed, this will be one of the largest tracking studies of Bald Eagles ever conducted. The study is designed to provide information that will help to strike a balance between eagle management and military testing and training that is vital to national security. Understanding the specifics of

how eagles utilize the local landscape will lead to more effective integration of eagles into land management decisions.

Red-cockaded Woodpecker monitoring and management

CCB continues to work with partners The Nature Conservancy (TNC), the Virginia Department of Game and Inland Fisheries (VDGIF), and the U.S. Fish and Wildlife Service (FWS) to manage the small population of Red-cockaded Woodpeckers in Virginia's Piney Grove Preserve. This is the northernmost population throughout the species range. During 2007, 35 individuals were identified within the preserve including 19 birds that were hatched at Piney Grove in previous years, 9 chicks that fledged in 2007, 6 birds that were translocated to the site in previous years, and 1 bird that immigrated naturally from the Peartree-Palmetto Preserve in Tyrell County, NC. A modern record 6 breeding pairs produced 9 nestlings that survived to fledging age. Three of the breeding adults were replaced prior to the breeding season and a new recruitment cluster was used in 2007.

Evaluating biological benefits and social consequences of eagle management guidelines

Management guidelines intended to protect Bald Eagles on private lands must attempt to strike a balance between benefits to the breeding population and the burden imposed on society. The dramatic recovery of the population is placing a rapidly expanding burden on the regulatory agencies to implement current management guidelines and society to comply with guidelines. CCB used 31 years of eagle survey information to analyze trends relative to guidelines and societal burdens. Lands surrounding Bald Eagle nests that are considered under "management restrictions" have increased exponentially along with the breeding population and in 2007 had an estimated value of more than 4.5 billion dollars. The magnitude of this societal burden demands an effort to ensure that guidelines are both efficient and effective. Several lines of investigation within this study were used to recommend changes to protection standards.

Peregrine Falcon population and productivity monitoring

CCB biologists have led intensive management efforts since the late 1970s to recover the breeding population of Peregrine Falcons in Virginia. In 2007, the survey documented 20 resident pairs. Nesting structures included 10 peregrine towers, 6 bridges, 1 shack remnant on the seaside of the Delmarva, 1 high-rise building, 1 reserve ship, and 1 natural cliff face. Eighteen falcon pairs made breeding attempts producing 66 eggs and 52 chicks that survived to fledging age. Reproductive rate was 2.6 chicks/occupied territory and 2.9 chicks/active territory. Of 16 clutches that were followed completely from laying to fledging, 46 of 62 (74.2%) of eggs hatched. Of these 52 chicks, 52 (100%) survived to banding age and 52 (100%) fledged successfully.



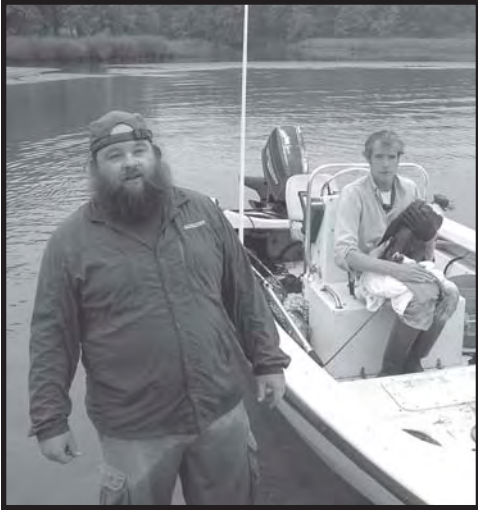
Red-cockaded Woodpecker recaptured at Piney Grove Preserve. This bird was originally banded in Tyrell County, NC and dispersed to Piney Grove late in 2007. Photo by Bobby Clontz.



Mike Wilson using peeper scope to examine a Red-cockaded Woodpecker cavity for eggs and condition. The use of this equipment allows CCB researchers to keep very close tabs on nesting activity. Photo by Bryan Watts.

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Investigation of Bald Eagle concentration areas within the Chesapeake Bay



Fletcher Smith (l) and Sam Voss (r) with an eagle trapped on the Bush River. This location is within the Upper Chesapeake Bay Bald Eagle Concentration Area. Photo by Bryan Watts.

The Chesapeake Bay is an area of convergence for post-nesting and sub-adult Bald Eagles from breeding populations in the Southeast and Northeast. In late spring and early summer, eagles migrate north from Florida and other southeastern states to spend the summer months in the Bay. In the late fall, eagles migrate south from New England populations to spend the winter months on the tributaries of the Bay. Migrant eagles are not evenly distributed throughout the Bay but congregate within “concentration areas” that support sections of high-use shorelines and communal roosts. These areas have tremendous conservation significance for populations along the entire Atlantic Coast. In 2006 and 2007 CCB has conducted aerial surveys in the winter and shoreline surveys in the summer in collaboration with VDGIF to delineate concentration areas for active management.

Cliff-nesting bird survey concluded

Cliffs represent a unique and relatively rare resource within the southern Appalachians. CCB completed a systematic helicopter survey of a significant portion of this region to map, characterize, and survey cliffs for birds. A total of 242 exposed rock surfaces were surveyed with a combined length of 122.4 km. Eleven bird species were observed using cliff faces during aerial surveys. Nesting species included Common Ravens, Turkey Vultures, Peregrine Falcons, Red-tailed Hawks, and Great-horned Owls. The survey delineated 6 geographic areas that should be the focus of future Peregrine Falcon restoration activities. CCB produced a digital atlas of the cliff surfaces included in the survey.

Hacking of Peregrine Falcons in the mountains

Re-establishment of peregrines to their historic breeding range in the Appalachian Mountains continues to be an important conservation goal for CCB. In 2007, a total of 38 birds were translocated from the coast to mountain hack sites in Shenandoah National Park (9), New River Gorge (15), and Breaks Interstate Park (14). This is the largest number of birds ever translocated in the state representing more than 73% of the chicks produced. Thirteen of these chicks originated on bridges that have a history of poor fledging success. The remaining 25 chicks were from towers along the Delmarva Peninsula (20), a ship in the James River Reserve Fleet (3), an office building in Richmond (2). This effort would not have been possible without the tremendous partnership of the National Park Service.



Female Peregrine Falcon defending nest site. Photo by Bryan Watts.

Turnover rates and populations of origin for breeding Peregrine Falcons

For more than 20 years most states that are actively managing peregrine populations have banded birds with field-readable, alpha-numeric bands. A large portion of the falcon population within the Eastern U.S. is banded. However, relatively little attempt has been made to identify individuals within the breeding population. 2007 represents the fourth year that Shawn Padgett with CCB has used placed digital video recorders at nest sites to record adult activity and identify individuals. The objective of this effort is to quantify demographic parameters within the Virginia population and to examine dispersal patterns.



Peregrine Falcon adults as seen in nest box by digital video. Both adults are banded and were identified. Photo by Shawn Padgett.

CCB monitors eagle and heron populations in North Carolina Piedmont

Although survey work within coastal waters has shown that the Bald Eagle breeding population within the mid-Atlantic region has increased dramatically, there is very little information from interior locations. CCB has been working with ALCOA and Progress Energy to survey both Bald Eagles and Great Blue Herons on a series of hydroelectric reservoirs in the piedmont of North Carolina since 2001. During the 2007 breeding season, these reservoirs collectively supported 7 Bald Eagle territories. The reservoirs also supported 820 pairs of Great Blue Herons and 27 pairs of Great Egrets in 10 colonies.



Shawn Padgett with a brood of Peregrine Falcons in the doorway of a ship within the James River mothball fleet. The military has been a great partner in helping to manage this site. Photo by Bryan Watts.

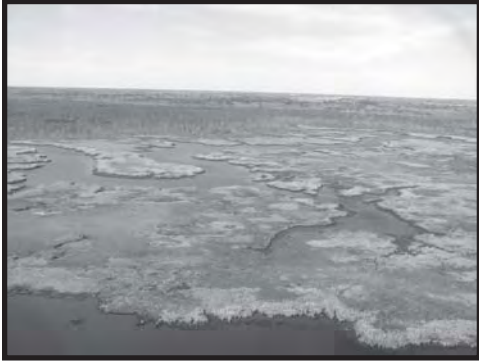
Bald Eagle shoreline surveys on Cat Point Creek

Cat Point Creek is one of the most pristine tributaries within the tidal-fresh reach of the Rappahannock River, a body of water that is known to be a core conservation area for the Bald Eagle and that has been targeted by Virginia as a significant management area for the species. In recent years, this creek has become increasingly important to three populations of bald eagles including 1) the Chesapeake Bay breeding population, 2) the southeastern breeding population that migrates up to the Bay to spend the summer months, and 3) the northeastern breeding population that migrates down to the Bay to spend the winter months. In the spring of 2007, CCB began a multi-year study in collaboration with VDGIF to investigate seasonal use of this tributary by Bald Eagles and the importance of human disturbance to patterns of use and distribution.



Bart Paxton and Libby Mojica surveying eagles along the upper reach of Cat Point Creek. Photo by Bryan Watts.

RESEARCH PROGRAMS



Extensive tidal marshes such as these along the Delmarva Peninsula are the focus of Black Rail surveys. Photo by Bryan Watts.



Infra-red illuminators on video camera picked up this Great-horned Owl next to an oystercatcher nest on Fisherman Island.



Adult male Northern Harrier. The Virginia breeding population of Northern Harriers is less than 25 pairs. Harriers and many other species of conservation concern are the focus of the Avian Heritage Program. Photo by Zach Smith.

Coastal Diversity Program

Historic survey of Black Rails launched

The Black Rail is one of the most endangered and least studied birds along the Atlantic Coast and appears to have experienced a dramatic decline over the past 30 years. Status information is lacking over large portions of its breeding range. The Black Rail has never been systematically surveyed in Virginia and is generally believed to occur in only 10-20 breeding locations. The remote location of breeding habitat and the need to survey at night when birds are most active has made a population assessment logistically challenging. In the spring of 2007, CCB biologists with partners from the state of Virginia launched a two-year, systematic survey of Black Rails throughout coastal Virginia. The 2007 effort focused on the Delmarva Peninsula and established a network of 242 survey points distributed throughout available habitat. This historic survey will result in an assessment of the breeding population for the state and a digital atlas of breeding locations.

Video-monitoring oystercatchers on Fisherman's Island

Virginia is increasingly recognized as a stronghold for American Oystercatchers and Fisherman Island National Wildlife Refuge supports approximately 5-10% of the state's breeding population. However, reproductive rates have been chronically low within this site. In order to investigate possible sources of clutch loss, we used a video-monitoring approach to quantify disturbance events and causes of reproductive failure. We recorded 7,570 hrs of digital video footage that included interactions with 21 species. Oystercatcher response varied according to species and was considerably longer during the night hours. Reproductive performance for monitored nests was relatively poor. Pairs hatched all eggs laid and successfully moved chicks from the nest site in only 4 (16%) of 25 attempts. High tide events associated with coastal storms represented the largest source of nest loss. The second highest cause of loss was to predation by Fish Crows. Crows were documented to take 12 eggs during the course of 7 nesting attempts. Ghost crabs were documented to take 1 egg and 2 chicks. A Boat-tailed Grackle was observed taking a single egg. A raccoon predated a single-egg clutch.

Virginia Avian Heritage Program initiated

Virginia plays a significant role in the life history of many of the bird species in Eastern North America. The diversity of habitats available to birds during the breeding, wintering, and migratory periods combined with its geographic position combine to make it one of the most diverse physiographic regions in North America. Virginia was the site for the first European colony and so has a long history of ornithological documentation including the history of range expansions, population fluctuations, and changes in distribution for a wide range of

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bird species. This information serves as an invaluable tool for conservation because it provides historical benchmarks to the spatial and temporal patterns of declines for Virginia's imperiled species. Despite this rich history, there has never been an attempt to compile these archives. The objective of the Avian Heritage Program is to assemble historical records into a geographically referenced database and to develop an approach to capture new information as it is produced.

Food safety and the transmission of pathogens from wild birds to farm animals

Consumer protection from food-borne illnesses is an ever-growing concern for our society. Salmonella and E. Coli are among the most publicized culprits of these outbreaks and most often linked to the consumption of farm produce and undercooked meat. Although the potential impact of wild animals has been considered as a factor for food-borne pathogen contamination, no study has quantitatively assessed the risks of transmission from wild birds to farm livestock. CCB has entered into a 2-year collaborative study with food safety experts from Virginia State University and the University of Maryland Eastern Shore and funded by USDA to investigate pathogen links between wild birds and farm animals. The project integrates risk assessment with risk management by examining pathogens in wild birds and farm animals and evaluating the influence of farm hygiene on pathogen transmission.

Barrier island dynamics and beach-nesting bird habitat

The Virginia Barrier Islands contain some of the most naturally dynamic landscapes on earth. These islands contain unique habitats that are critical to the persistence of many colonial and beach-nesting bird populations. Many of these species occupy a range of disturbance/successional niches that are defined by the relationship between beach erosion (caused by storms) and recovery (via succession). Over the past 25 years, populations of several species have declined. We evaluated the influence of landscape changes on these declines by quantifying beach habitats over 7 decades using benchmark sets of aerial photographs. Photographs were scanned, orthorectified, and placed in a geographic information system. Both beach and landscape characteristics were evaluated. The amount of habitat for beach-nesting species has fluctuated widely over time and has increased in recent years. Species declines do not appear to be related to trends in habitat availability.

Developing a waterbird monitoring plan for the Chesapeake Bay

The Chesapeake Bay plays an important role in the life cycle of many bird species. Each year, the rich resources of the Bay attract millions of birds of 160 species from throughout the western hemisphere. Many species that depend on the Bay are of high



Over the past 30 years, Barn Owls have declined dramatically throughout the mid-Atlantic Coastal Plain due to the loss of idle grasslands. Information gathered from historic records will assist CCB in placing the current population within the appropriate historical context. Photo by David Whalen.



Pine stump in the active beach zone of barrier island. The Virginia Barrier Islands are reworked annually by storms and are migrating landward. The barrier island study sought to quantify habitat dynamics. Photo by Bryan Watts.

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Yellow-crowned Night Heron foraging along shoreline. This species and more than 100 other waterbirds are the focus of integrated monitoring program under development by CCB. Photo by Bryan Watts.



The Red-eyed Vireo is one of the more common species breeding within the MAPS study sites within Quantico Marine Base. Photo by Carla Schneider.



Shrub-dominated habitat within the southern Appalachians. This is the habitat condition preferred by Golden-winged Warblers. Photo by Bryan Watts.

international, national or regional conservation concern. Because many waterbirds are top consumers and collectively require a broad array of resources, they represent sensitive indicators of overall ecosystem health. Effective, timely information is needed for waterbirds that depend on the Chesapeake Bay. Such information informs the public and enables government agencies to meet their regulatory responsibilities. Long-term information provides the foundation to assess trends and formulate appropriate conservation objectives. Although a large number of government agencies, universities, NGOs, corporations, and private citizens participate in waterbird counts annually within the Chesapeake Bay, count objectives, time horizons, methodologies, geographic coverage, and species involved often vary from project to project producing a patchwork of information. CCB in collaboration with VDGIF is working on an integrated plan for monitoring waterbird populations.

CCB Completes eleventh year of participation in national MAPS program

Monitoring Avian Productivity and Survivorship (MAPS) is a continent-wide program designed to estimate demographic parameters for passerines using constant-effort mist netting. The program focuses on long-term productivity patterns and rates of return to breeding territories. Initiated in 1989, the program now has more than 500 stations scattered across the United States and Canada. CCB has operated 3 MAPS stations in cooperation with U.S. Marine Corps Base Quantico, in northern Virginia, since 1997. Two of the sites are within extensive hardwood forests with large populations of Wood Thrush, Ovenbird, Acadian Flycatchers, Hooded Warblers, and Worm-eating Warblers. The remaining site contains a mixture of pine forest and young clearcut. This site supports large populations of Yellow-breasted Chat, Indigo Bunting, White-eyed Vireo, and Common Yellowthroat.

Survey of Golden-winged Warbler completed

Despite the belief that the Appalachian Mountains are a stronghold for the declining Golden-winged Warbler, there has been no attempt to evaluate status and distribution in Virginia. CCB systematically surveyed for the presence of Golden-winged and Blue-winged Warblers across 40 counties in Virginia's Appalachian Plateau, Ridge and Valley, and Blue Ridge physiographic provinces. The effort included surveys of 932 points within 863 shrub patches. We detected 56 Golden-winged Warblers within 37 patches in 11 counties and 92 Blue-winged Warblers within 62 patches in 18 counties. The species occurred in the same counties, over similar elevations, but differed somewhat in habitat use. A comparison of results with historical records indicates that Golden-winged Warblers are continuing to decline in Virginia and are being replaced by Blue-winged Warblers in order of abundance. The low number of detections may justify regulatory protection within the region.

Potential impact of common reed on high-marsh bird communities

Tidal salt marshes are one of the most characteristic habitats within the mid-Atlantic region and are important to the regional avifauna. Several species are exclusive to this habitat type and others reach their highest densities there. Some of the most threatened bird species within the Coastal Plain of northeastern North America depend on the high marsh habitat for breeding. One of the most imminent threats to this community type is the displacement of native vegetation along the marsh-upland ecotone by the invasive form of common reed (*Phragmites spp.*). In order to investigate potential impacts of common reed on the bird community, CCB used remote sensing to map common reed along the seaside of the Delmarva Peninsula and compared the bird community in pristine and altered marsh patches. Eighty 250-m transects were established within 40 high-marsh sites. A total of 87,500 m of transects were surveyed, resulting in 2,950 detections of 81 species. Seaside and Sharp-tailed Sparrows were found in significant numbers within large high-marsh patches on the northern portion of Virginia Delmarva Peninsula, regardless of *P. australis* presence. However these species rarely, if ever, utilized *P. australis*.

CCB launches Nightjar Survey Network

In recent years, the ornithological community has grown increasingly concerned that nightjars (Whip-poor-wills, Chuck-will's-widows, and kin) have been declining. However, due to their nocturnal habits, we have had no monitoring program in place to confirm or refute such beliefs. In 2007, CCB launched a new and statistically powerful monitoring program called the Nightjar Survey Network designed to determine the status and population trends of nightjar species throughout North America. In 2007, the network was launched in 10 southeastern states with plans to expand in following years. The success of this program relies entirely on volunteer participation. In the first year, volunteers adopted 90 routes and counted 215 Whip-poor-wills, 591 Chuck-will's-widows, and 65 Common Nighthawks. Plans are in place to expand the network to include most regions of the United States in 2008. Those interested in participating in this new and important program should see details at www.ccb-wm.org.

Fish demand by breeding birds within the Chesapeake Bay

The Chesapeake Bay is one of the most productive aquatic ecosystems in the world. Commercial harvest of fisheries averages 3-500,000 metric tons/year. Fisheries models have included a number of processes including harvest rates but to date have never considered consumption by bird populations. In collaboration with Virginia Commonwealth University, CCB used a bioenergetics approach to estimate the amount of fish biomass consumed by breeding piscivorous birds within the tidal reach of the Chesapeake Bay. This



Saltmarsh Sharp-tailed Sparrow in hand on the Lower Delmarva Peninsula. Surveys conducted by CCB researchers defined the southern range boundary for this species. Photo by Fletcher Smith.



Whip-poor-will in hand. This is one of the target species of the Nightjar Network. Photo by Bart Paxton.



Pair of Brown Pelicans on nest. This species is one of 5 species included in metabolic demand models. Photo by Marian Watts.

RESEARCH PROGRAMS



Box of turtle shells collected from below Bald Eagle nests in the Chesapeake Bay. Quantifying diet is a next step in understanding the implications of metabolic demand patterns. Photo by Bryan Watts.



Libby Mojica (l), Fletcher Smith (m), and Bart Paxton (r) setting up mist nets for night-time shorebird trapping in marshes of the Eastern Shore. One of many small projects conducted throughout the region. Photo by Bryan Watts.



Characteristic landscape of the lower Delmarva Peninsula. The forest patch configuration was ideal for an investigation of migrant emergence patterns with NPOL radar. Photo by Bryan Watts.

approach combined a multi-stage population model with a breeding model and applied allometric relationships between field metabolism and body mass to estimate annual demand across years and daily demand within years. Species-specific models were created for Bald Eagles, Osprey, Great Blue Herons, Double-crested Cormorants, and Brown Pelicans. Bay-wide survey data was used to parameterize the population model and 28 general, nesting, feeding, and demographic parameters were used to develop the breeding models. Population and community-wide projections were made in 5-y intervals over a 30-year period between 1975 and 2005. Estimated fish demand increased 10-fold during this period from 3 to 35 million pounds. Future work will focus on diet comparisons so that this demand may be stratified according to specific fish stocks.

CCB assists agencies/organizations with bird surveys

During 2007, CCB biologists and technicians conducted several bird surveys and other projects to assist agencies and NGOs with their information needs. Projects were conducted over several states in the mid-Atlantic region for a diversity of organizations.

Bird Migration Program

Use of NPOL Radar to identify stopover hotspots for migrant passerines

Weather surveillance radar has been used to map broad-scale patterns of bird migration for many years. However, the current network of weather radars used in the United States has design and operational constraints that impose limitations on the resolution of landscape features that may be evaluated on the scale of kilometers. The development of technologies that would allow for the mapping of migratory exodus on a landscape scale would have far-reaching ecological and conservation implications. In collaboration with TNC and other partners, CCB operated NASA's new polarimetric radar (NPOL) on the lower Delmarva Peninsula during the fall migration to evaluate its potential to resolve spatial variation in exodus at the patch and landscape scales. We compared mean reflectivity values for geographic areas (landscape scale) and habitat types (patch scale) that are known to support significantly different migrant densities. We conducted ground surveys and vegetation mapping to support radar work. Results suggest that this technology has the capacity to be a significant tool for mapping migration hotspots with a spatial resolution beyond the reach of previous radars.

RESEARCH PROGRAMS

Aerial surveys of the Virginia Barrier Islands for migrant shorebirds

The Virginia Barrier Islands are the most pristine set of barriers remaining along the Atlantic Coast and represent a significant staging area for several migratory shorebirds. During the spring of 1994-1996, CCB in collaboration with TNC and other partners conducted weekly aerial surveys of the island chain to document the status, distribution, and phenology of migrant shorebirds. The surveys were the first to document the significance of the islands to Red Knots, Sanderling, Black-bellied Plovers, and Dunlin. Beginning in 2006, weekly surveys have been resumed to collect data for comparison. During the third week of May, 2007 a coast-wide survey was coordinated with other states along the Atlantic Coast to get a snapshot of Red Knot distribution and abundance.

Investigation of Red Knot stopover along the barrier islands using resight data

Over the past 20 years, the rufa population of Red Knot within North America has declined by approximately 80-90%. Concern for this species led to an application to the U.S. FWS for fast track consideration for federal listing under the Endangered Species Act. Most of the conservation efforts to date have focused on Delaware Bay where Red Knots depend on horseshoe crab eggs. In the mid-1990s, 3 years of aerial surveys documented that the Virginia Barrier Islands had more significance to the species than previously believed. However, little is known about stopover ecology within this location. In the spring of 2007, CCB worked intensively on 6 barrier islands to take advantage of the large number of knots that have been banded throughout their range to investigate stopover duration. A total of 18,770 Red Knots were detected on surveys. Of 12,580 birds that were scanned, 642 were banded. A total of 277 birds were individually identified and observed at least once.

Northern Saw-whet Owl migration study completes 14th year

In 1994 CCB began a study of Northern Saw-whet Owl migration on the lower Delmarva Peninsula. This study has been the first to document large number of migrant south of Maryland. During the 14-year study, 3,290 owls have been banded and more than 100 foreign retraps and returns have been recorded. We have recorded more than 500 same-year recaptures. During the fall of 2007, 460 owls were captured including 439 new owls and 21 foreign banded birds. The station was open during 45 nights and 8,588 hours of operation. Capture rate was the third highest ever and 20 times higher than 2006. The capture rate and pattern was comparable to the invasion years of 1995 and 1999.



Flight crew Bryan Watts (l), Barry Truitt (m), and Carter Crabbe (r) that have been surveying shorebirds along the Delmarva Peninsula since 1994. Photo by Libby Mojica.



Red Knot foraging on Hog Island (Virginia Barrier Island chain) with leg band from Argentina. Photo by Barry Truitt / TNC.



Northern Saw-whet Owl in hand on the Lower Delmarva Peninsula. Photo by John DiGiorgio / Nature's Art LLC

RESEARCH PROGRAMS



Alex Wilke with American Oystercatcher chick on the barrier islands. Photo by Matt Ramah.



Andy Glass weighing an Osprey chick on the Rappahannock River. Photo by Bryan Watts.



Elise Larsen shading woodpecker chicks in Piney Grove Preserve. Photo by Bryan Watts.

Graduate Students complete M.S. degrees

Alex Wilke successfully defended her M.S. thesis entitled *Status, distribution, and reproductive rates of American Oystercatchers in Virginia* during the fall of 2007. Alex entered the graduate program in the spring of 2002 after completing a biology degree at Bates College and working in avian conservation in various capacities. Her ongoing research with the Virginia population of American Oystercatchers has been some of the most productive throughout the species range. Understanding the factors contributing to reproductive rates is central to formulating management strategies.

Wilke, A. L. 2007. Status, distribution, and reproductive rates of American Oystercatchers in Virginia. M.S. Thesis, College of William and Mary, Williamsburg, VA. 74 pp.

Andy Glass successfully defended his M.S. thesis entitled *Spatial variation in Osprey provisioning, reproductive success, and population growth within lower Chesapeake Bay* during the fall of 2007. Andy entered the graduate program in the fall of 2005 after completing a biology degree at Berry College and working throughout North America on a variety of conservation projects. His work with Osprey in the Chesapeake Bay has given new insight into the ecology of this species that is emerging as the population expands into portions of the Bay where it has never been studied.

Glass, A. K. 2007. Spatial variation in Osprey provisioning, reproductive success, and population growth within the lower Chesapeake Bay. M.S. Thesis, College of William and Mary, Williamsburg, VA. 129 pp.

Elise Larsen successfully defended her M.S. thesis entitled *Effects of urban development on breeding bird diversity: The role of diet and migration* during the fall of 2007. Elise entered the graduate program in the fall of 2005 after completing a zoology degree at Michigan State and working to develop a national contaminants and wildlife database. Her work with the role of landuse in changing bird communities focused on one of the greatest conservation challenges faced by the conservation community.

Larsen, E. 2007. Effects of urban development on breeding bird diversity: The role of diet and migration. M.S. Thesis, College of William and Mary, Williamsburg, VA. 42 pp.

RESEARCH PROGRAMS

CCB welcomes new staff

Libby Mojica was hired in the spring of 2007 as a research biologist focused on raptor ecology and conservation. Libby received her M.S. in wildlife ecology and management from The University of Georgia. Her graduate research focused on migration and important use areas of Bald Eagles using satellite telemetry. Prior to graduate school, she worked as a raptor biologist for the Florida Fish and Wildlife Conservation Commission studying raptors in urban and suburban landscapes. Her research interests are in avian migration, communal roosting, satellite telemetry, contaminants, GIS, and prescribed burns.



Libby Mojica with young Bald Eagle fitted with satellite transmitter. Photo by Bart Paxton.

Adam Duerr was hired in the fall of 2007 as a research biologist focused on waterbird ecology and conservation. Adam received his PhD from the University of Vermont, where his dissertation focused on the population dynamics, foraging ecology, and management of Double-crested Cormorants on Lake Champlain. His research focused on aspects of cormorant ecology and biology that were directly pertinent to their management. While in Vermont, he expanded his analytical skills to include abilities to estimate demographic and energetic parameters from individually marked animals, construct population models from these parameters to help solve management problems, apply population models to assess influences of management actions and identify optimal decisions through decision analysis. Prior to working in Vermont, Adam worked as an environmental consultant in Arizona for 2 years and earned his Master's and Bachelor's degrees at the University of Arizona in Wildlife Science.



Adam Duerr with Brown Pelican chick on Smith Island. Photo by Bryan Watts.

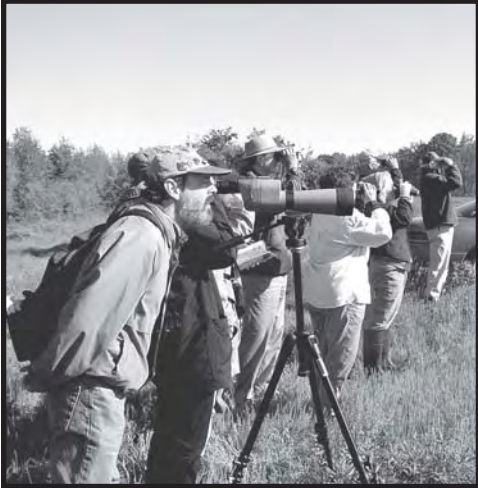
Carla Schneider worked for CCB for more than two years before starting as development and outreach coordinator in late 2007. Carla earned her B.S. in biology, with a concentration in Marine Science, from Fairfield University in Connecticut. She spent several years as an environmental educator and the internship coordinator for SoundWaters, a small non-profit educational organization, where she led hikes, canoe trips, and designed and taught outdoor and classroom curriculum about preserving ecosystems and conserving resources. Carla continues to seek opportunities for the general public to get involved in conservation efforts and participate in scientific research. Her professional interests include wetlands restoration, and invasive species mitigation, resource conservation, and wilderness medicine.



Carla Schneider at Mystic Seaport, CT.

OUTREACH AND EDUCATION PROGRAMS

CCB Continues Community Outreach



A group of birders watching grassland birds on the Wilna Tract of the Rappahannock River National Wildlife Refuge. CCB is increasing the number of opportunities for the public to see rare habitats and species. Photo by Marian Watts.

CCB continues to develop a broad community outreach program. The purpose of this program is to inform the general public about ongoing environmental problems while providing education about potential solutions and recent research findings. By interacting directly with the community we hope to advance the public debate and establish a forum for problem solving. Since 2000, CCB has participated in more than 600 newspaper articles, 55 magazine articles and over 250 articles published via electronic media. In addition, Center staff and /or associates have been featured in more than 30 television and 15 radio broadcasts. More than 200 presentations have been made to local, state, and national audiences.

CCB continues commitment to release of findings

Decisions that influence the future and health of sensitive populations and ecosystems are made on a daily basis. In order for land managers and planners to make the best use of our natural resources, it is important that they have direct access to recent research findings. CCB is committed to making research findings available as soon as possible. Below is a listing of recent publications produced by CCB.

Recent Research Publications

Watts, B. D. and M. A. Byrd. 2007. Impact of hurricane Isabel on Bald Eagle nests and reproductive performance in the lower Chesapeake Bay. *Condor* 109:206-209.

Watts, B. D., G. D. Therres, and M. A. Byrd. 2007. Status, distribution and the future of Bald Eagles in the Chesapeake Bay. *Waterbirds* 30:25-38.

Markham, A. C. and B. D. Watts. 2007. Documentation of infanticide and cannibalism in Bald Eagles. *Journal of Raptor Research* 41:41-44.

Erwin, R. M., B. D. Watts, G. M. Haramis, M. C. Perry, and K. A. Hobson [Eds]. 2007. Waterbirds of the Chesapeake Bay and vicinity: Harbingers of Change? *Waterbirds* 30: Special publication 1.

Blackwell, B. F., M. L. Avery, B. D. Watts, and M. S. Lowney. 2007. Demographics of black vultures in North Carolina. *The Journal of Wildlife Management* 71:1976-1979.

Watts, B. D. and B. J. Paxton. 2007. Ospreys of the Chesapeake Bay: Population recovery, ecological requirements, and current threats. *Waterbirds* 30:39-49.

Wilson, M. D., B. D. Watts, and D. F. Brinker. 2007. Status review of Chesapeake Bay marsh lands and breeding marsh birds. *Waterbirds* 30:122-137.



Videographer Yoke Bauer DiGiorgio on Smith Island. Yoke has recently produced an educational film with CCB entitled "Eagle Nesting Diaries" that has had great reviews. Photo by Marian Watts.

OUTREACH AND EDUCATION PROGRAMS

Wilke, A. L., D. F. Brinker, B. D. Watts, A. H. Traut, R. Boettcher, J. M. McCann, B. R. Truitt, and P. P. Denmon. 2007. American Oystercatchers in Maryland and Virginia: Status and distribution. *Waterbirds* 30:152-162.

Williams, B., D. F. Brinker, B. D. Watts, and R. M. Erwin. 2007. The status of colonial nesting wading bird populations within the Chesapeake Bay and coastal barrier island lagoon system. *Waterbirds* 30:82-92.

Brinker, D. F., B. Williams, B. D. Watts, and R. M. Erwin. 2007. Colonial nesting seabirds in the Chesapeake Bay region: where have we been and where are we going? *Waterbirds* 30:93-104.

Viverette, C. B., G. C. Garman, S. McIninch, A. C. Markham, B. D. Watts, and S. A. Macko. 2007. Finfish-waterbird trophic interactions in tidal freshwater tributaries of the Chesapeake Bay. *Waterbirds* 30:50-62.

Erwin, R. M., G. M. Haramis, M. C. Perry, and B. D. Watts. 2007. Waterbirds of the Chesapeake Bay region: An introduction. *Waterbirds* 30:1-3.

Watts, B. D. and M. A. Byrd. 2006. Status and distribution of colonial waterbirds in coastal Virginia: The 2003 breeding season. *The Raven* 77:3-22.

Williams, B., B. D. Watts, and M. A. Byrd. 2006. A census of a Cliff Swallow colony on the Benjamin Harrison Bridge. *The Raven* 77:35-40.

CCB Technical Report Series

Paxton, B. J., B. D. Watts, and F. M. Smith. 2007. Autumn migration of Northern Saw-whet Owls on the lower Delmarva Peninsula 1994-2006: Project report 2006. Center for Conservation Biology Technical Report Series, CCBTR-07-01. College of William and Mary, Williamsburg, VA. 16 pp.

Wilson, M. D., B. D. Watts, M. G. Smith, J. P. Bredlau, and L. W. Seal. 2007. Status assessment of Golden-winged Warblers and Bewick's Wrens in Virginia. Center for Conservation Biology Technical Report Series, CCBTR-07-02. College of William and Mary, Williamsburg, VA. 34 pp.

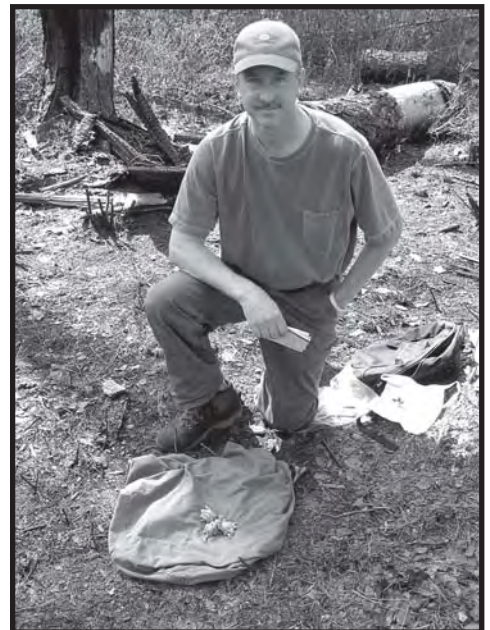
Paxton, B. J. 2007. Potential impact of common reed expansion on threatened high-marsh bird communities on the seaside: Breeding bird surveys of selected high-marsh patches. Center for Conservation Biology Technical Report Series, CCBTR-07-03. College of William and Mary, Williamsburg, VA. 19 pp.

Watts, B. D., M. D. Wilson, B. J. Paxton, F. M. Smith, D. S. Bradshaw, and C. Lotts. 2007. Investigation of Red-cockaded Woodpeckers in Virginia: Year 2006 report. Center for Conservation Biology Technical Report Series, CCBTR-07-04. College of William and Mary, Williamsburg, VA. 27 pp.

Smith, F. M. 2007. Summary of colonial nesting herons within the Colonial National Historic Park boundaries, 2007 breeding season. Center for Conservation Biology Technical Report Series, CCBTR-07-05. College of William and Mary, Williamsburg, VA. 13 pp.



Marian Watts with Peregrine Falcon chick. Photo by Bryan Watts.



Dana Bradshaw with brood of Red-cockaded Woodpecker chicks after a controlled burn. TNC has used fire effectively to greatly improve habitat quality within the Piney Grove Preserve. Photo by Bryan Watts.

OUTREACH AND EDUCATION PROGRAMS



Mitchell Byrd (l) and Bart Paxton (r) banding a Peregrine Falcon chick along the Delmarva Peninsula. Photo by Libby Mojica.



Bald Eagle banded with aluminum USGS band and field-readable, alpha-numeric band. CCB has been using field-readable bands on Peregrines Falcons for years and more recently for Bald Eagles. Photo by Bryan Watts.

Wilson, M. D., B. D. Watts, and J. E. LeClerc. 2007. Assessing habitat stability for disturbance-prone species by evaluating landscape dynamics along the Virginia Barrier Islands. Center for Conservation Biology Technical Report Series, CCBTR-07-06. College of William and Mary, Williamsburg, VA. 47 pp.

Watts, B. D. and S. R. Harding. 2007. Virginia Red-cockaded Woodpecker conservation plan. Center for Conservation Biology Technical Report Series, CCBTR-07-07. College of William and Mary, Williamsburg, VA. 42 pp.

Watts, B. D. and Padgett, S. M. 2007. Virginia Peregrine Falcon monitoring and management program: Year: 2007 report. Center for Conservation Biology Technical Report Series, CCBTR-07-09. College of William and Mary, Williamsburg, VA. 19 pp.

Watts, B. D. 2007. An assessment of the Bald Eagle and Great Blue Heron breeding populations along High Rock, Tuckertown, Narrows, and Falls Reservoirs in central North Carolina: 2007 breeding season. Center for Conservation Biology Technical Report Series, CCBTR-07-10. College of William and Mary, Williamsburg, VA. 29 pp.

Smith, F. M., B. J. Paxton, and B. D. Watts. 2007. Autumn migration of Northern Saw-whet Owls on the Lower Delmarva Peninsula 1994-2007: Project report 2007. Center for Conservation Biology Technical Report Series, CCBTR-07-11. College of William and Mary, Williamsburg, VA. 17 pp.

Watts, B. D. 2007. An assessment of the Bald Eagle population along Claytor Lake, Virginia. Center for Conservation Biology Technical Report Series, CCBTR-07-12. College of William and Mary, Williamsburg, VA. 13 pp.

Paxton, B. J. 2007. Potential impact of common reed expansion on threatened highmarsh bird communities on the seaside: Wintering bird surveys of selected high-marsh patches. Center for Conservation Biology Technical Report Series, CCBTR-07-13. College of William and Mary, Williamsburg, VA. 21 pp.

Smith, F. M., A. E. Duerr, B. J. Paxton, and B. D. Watts. 2007. An investigation of stopover ecology of the Red Knot on the Virginia Barrer Islands. Center for Conservation Biology Technical Report Series, CCBTR-07-14. College of William and Mary, Williamsburg, VA. 35 pp.

Watts, B. D. and M. A. Byrd. 2007. Virginia Bald Eagle nest and productivity survey: Year 2007 report. Center for Conservation Biology Technical Report Series, CCBTR-07-15. College of William and Mary, Williamsburg, VA. 39 pp.

Outreach/Education Publications

Watts, M. U. 2007. Community outreach programs: Media coverage and public presentations (2007). Center for Conservation Biology Education Document CCBED-07-01. College of William and Mary, Williamsburg, VA.

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CCB NEWSLETTER ONLINE

The Center for Conservation Biology is pleased to announce the launch of our new quarterly e-newsletter. Visit our website at www.ccb-wm.org to find out more.



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