

ABSTRACTS - 2004 AFL/WOS MEETING, ITHACA, NEW YORK

Breeding ecology of sympatric Sharp-tailed Sparrows. W. GREGORY SHRIVER, James P. Gibbs, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210, Thomas P. Hodgman, Maine Department of Inland Fisheries and Wildlife, 650 State St., Bangor, ME 04401, and Peter D. Vickery, The Center for Ecological Conservation, Richmond, ME 04357.

Sharp-tailed sparrows inhabit wet meadows, marshes, and salt marshes of central and eastern North America. Presently, *A. n. subvirgatus* (Nelson's) and *A. c. caudacutus* (Saltmarsh) are sympatric in coastal Maine. To better understand many aspects of these conservation priority species and to estimate demographic parameters, we conducted an intensive breeding ecology study at Scarborough Marsh, Maine from 1998-2001. Our primary objectives were to estimate and compare the breeding ecology and demographic parameters of both species. We estimated; 1) home range size, 2) survival, and 3) population size for both species and sexes using multiple techniques. We used radio telemetry to estimate home range size (50% kernel) and we used mark-recapture to estimate survival, recapture probability, and population size. Male home ranges were larger than females for both species. Home range size was largest for Nelson's males ($20.1 \text{ ha} \pm 12.5 \text{ SD}$) and smallest for Saltmarsh females ($5.8 \text{ ha} \pm 8.3 \text{ SD}$). Female survival rates (F) were lower than males for both species. Saltmarsh sparrow F also differed among years. Based on mark-recapture data from 1998-2001 we estimated a 0.97 sex ratio (m/f) for Neslon's and a 1.77 sex ratio (m/f) for Saltmarsh. Considered the same species until 1995, these results and others from this study, indicate that these species differ not only in morphology and genetics but also in behavior, survival, and home range size.

***Home range of male and female Great Tinamous in a lowland tropical forest.** PATRICIA L. R. BRENNAN, Department of Neurobiology and Behavior, Cornell University, Ithaca, NY, 15840.

While studying the mating system of Great Tinamous (*Tinamus major*), I captured and radio-tagged 8 males and 24 females over 2 years at La Selva Biological Station in Costa Rica. Tags were glued to the back of the birds where they remained for an average of 3 weeks. Bearings were taken daily from points with known coordinates. After triangulation we assigned the centroid as the bird position. We used centroid coordinates and those of any sightings as input data in the Animal Movement Extension of ArcView software to conduct a site fidelity test and to obtain 50 and 95% Kernel for all birds. When the sample size was sufficiently large, all males (4/4) and half of the females (7/13) showed site fidelity (1000 replicates, $p > 0.95$). These females had the same home range as the males (50% kernel: $F = 0.54 \pm 0.24 \text{ ha}$, $M = 0.65 \pm 0.37 \text{ ha}$; 95% Kernel: $F = 4.7 \pm 2.0 \text{ ha}$, $M = 4.8 \pm 2.3 \text{ ha}$). The remaining 6 females showed no site fidelity but stayed in one area for several days, then sometimes dispersed and established a second activity area. These females had home ranges twice as big as the males (50% Kernel = $1.7 \pm 2.0 \text{ ha}$, 95% $F = 8.9 \pm 9.5 \text{ ha}$), which is consistent with females moving between males after laying a clutch since no lasting pair bond is formed in this species. It was also noted that there was extensive overlap in the home ranges of both sexes and that Great Tinamous do not seem to show any territorial exclusion.

***Bald Eagle nesting habitat use and responses to human presence in Minnesota.** JEREMY E. GUINN and James W. Grier, Department of Biological Sciences, North Dakota State University, Fargo, ND 58102, Joan Galli, MN Nongame Wildlife Program, MN DNR, St. Paul, MN 55155, Richard J. Baker, MN Natural Heritage and Nongame Research, MN DNR, St. Paul, MN 55155, and Jody G. Millar, Bald Eagle Coordinator, US Fish and Wildlife Service, Rock Island, IL 61201.

Removal of the bald eagle (*Haliaeetus leucocephalus*) from the Federal List of Threatened and Endangered Species has been proposed but delayed, pending consideration of comments including those addressing habitat needs and the need to modify implementing regulations under the Bald and Golden Eagle Protection Act. This project was conducted to evaluate the species' nesting habitat use in the state of Minnesota where a large population of bald eagles nests across several different ecoregions and in the presence of varying levels of human activity. Several habitat and potential human disturbance variables were measured at 120 active nest sites and 162 random sites across the state. Discriminant analysis separated nest sites from random sites primarily on the basis of nest tree diameter and distance from shoreline. Information-theoretic model selection was used to compare nest productivity to habitat and human presence factors.

However, productivity was not explained well by any of the variables we analyzed, that is, variation in productivity did not appear to depend on the observed variation among the independent variables. Thus, within the broad range of basic requirements (proximity to water bodies, substantial trees for nest support, and an adequate prey base), eagle nesting habitat in Minnesota is highly variable and not specialized. Our recommendations for nesting habitat management of the species include insuring the continued existence of large-diameter trees in close proximity to shorelines.

***Nesting ecology of the golden-winged warbler in three early successional habitats of central Pennsylvania.** JACOB E. KUBEL, and Richard H. Yahner, School of Forest Resources, The Pennsylvania State University, University Park, PA 16802.

Suppression of natural disturbances (e.g., wildfires) has coincided with decreases in early successional cover in the eastern United States during the past half-century. Hence, anthropogenic disturbances will be key to conservation of the golden-winged warbler (*Vermivora chrysoptera*), a declining species dependent on early successional habitats. Our objective was to compare habitat quality (via warbler density and reproductive success) among three anthropogenic habitats at State Game Lands 176 in central Pennsylvania: 1-ha regeneration stands, a wide (60-m) powerline right-of-way, and a narrow (20-m) powerline right-of-way. We observed 38 and 41 golden-winged warbler territories (11 and 19 breeding pairs) in 2002 and 2003, respectively. Density did not differ ($p > 0.100$) between the regeneration stands and wide right-of-way either year. However, warbler distribution was associated ($p = 0.000$) with aspen cover, where open patches of goldenrod (*Solidago rugosa*) commonly occurred within dense shrub thickets (oak cover lacked such patches). No warblers were detected on the narrow right-of-way, despite presence of goldenrod patches. Nest success (% nests fledging ≥ 1 young) was greater ($p = 0.020$) in the regeneration stands (60.0% of 25 nests) than in the wide right-of-way (21.4% of 14 nests) both years combined. Productivity (no. young fledged per breeding pair) also was greater ($p = 0.038$) in the regeneration stands (2.41) than in the wide right-of-way (0.94). Our results suggest that regeneration stands may provide better habitat for golden-winged warblers than do powerline rights-of-way, but success of habitat manipulation efforts can depend on forest cover type and predator abundance.

Adoption in Common Terns: benefits to the donor brood. MARGARET S. FRIAR, Department of Biological Sciences, University at Albany, Albany, NY 12222 and Ian C.T. Nisbet, I.C.T. Nisbet and Company, 150 Alder Lane, North Falmouth, MA 02556.

We characterized adoption behavior of a semi-precocial, colonial, ground nesting seabird in studies of the common tern (*Sterna hirundo*) conducted on Bird Island, Massachusetts yearly from 1987 through 1994. We define adoption in the larvae as a two-part process, (a) the wandering of a chick away from its natal brood followed by (b) its subsequent adoption into another brood. In this paper, we first describe characteristics of both parts in the process and then examine the consequences of adoption to the donor brood. Of the 414 chicks studied, 16% wandered away from their nests. While wandering proved to be a risky undertaking (only 26% of chicks that wandered survived to fledging, compared to 44% of all chicks studied), once adopted, wandering chicks survived nearly as well as their non-wandering counterparts. Most adoptions occurred during the window of opportunity before the onset of parent-offspring recognition. Also, non-wandering siblings remaining in donor broods had higher survival rates than chicks in control broods. We found that wandering chicks gained in both the direct and indirect components of fitness. Our study demonstrates that parents at donor nests gain direct fitness, thus they may be motivated to actively participate in the wandering part of the adoption process.

***Effect of proximity to forest edges on nestling growth and nest survival of Wood Thrush in southwestern Michigan.** SARA A. KAISER and Catherine A. Lindell, Department of Zoology, Michigan State University, East Lansing, MI, 48824.

Habitat degradation near edges may result in microclimatic changes, affecting the food supplies of forest-nesting birds. Nestling growth rates have been used as indicators of habitat degradation because growth rates have been positively correlated with food. However, no one has examined growth rates in the context of forest fragmentation. We investigated whether distance to forest edge influenced growth rates of wings, tarsi,

and mass of nestling Wood Thrush. We also examined whether extrinsic and intrinsic factors explained variability in nestling growth rates. To compare our results to previous studies, we also report Mayfield's daily nest survival rates, nest survival rates, and brood parasitism rates. The study was conducted in two forested landscapes in southwestern Michigan from May to August in 2002 and 2003. We located 175 Wood Thrush nests and measured nestlings from 58 nests. Distance to edge, edge type, and weather explained some of the variability in growth rates of wings, tarsi and mass. Tarsi growth was more rapid near edges and tarsi may have a greater functional role early in the nestling period, as opposed to wings. There was no relationship between distance to edge and nest survival rates. Brood parasitism rates were among the lowest reported for Wood Thrush nesting in fragmented forests of the Midwest. Our finding that proximity to edge influenced nestling growth rates but not nesting success suggests nestling growth rates may be better indicators of habitat degradation than nesting success when high regional fragmentation levels overwhelm potential edge-interior differences in local predation patterns.

Breeding dispersal in the Tree Swallow (*Tachycineta bicolor*). DAVID W. WINKLER, Peter H. Wrege, Paulo E. Llambías, and Valentina Ferretti, Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY 14853.

To study the patterns and determinants of breeding dispersal in *Tachycineta bicolor* we analyzed the records of 323 male and 773 female captures in more than one breeding season in our study areas near Ithaca, New York. Our study populations are split into six "Units" of concentrated nest-boxes, and we analyze dispersal as the change in breeding site both within and between Units in different years. No birds were ever found to disperse into or out of the Units to/from a more diffuse network of boxes and banders throughout the surrounding regions of New York State. Only 1 male was ever found to disperse from one Unit to another when boxes at his original Unit remained available. Of the 773 female records, 55 (7.1%) switched breeding Units between years. We present evidence that the probability of dispersing to a given Unit declines as the distance to that Unit increases, and we also find that females that failed to fledge any offspring are much more likely to disperse than are those females that were reproductively successful. We suggest that the spatial scale in which swallows gather and process information is much larger than that for passerines that defend all-purpose territories.

Repeated sampling affects Tree Swallow semen characteristics. MICHAEL P. LOMBARDO, Michelle L. Green, Patrick A. Thorpe. Department of Biology, Grand Valley State University, Allendale, Michigan 49401 and Matthew R. Czarowski, Graduate Program of Ecology and Evolution, Rutgers University, New Brunswick, NJ 08901.

Male Tree Swallows face intense sperm competition because mated pairs copulate frequently, extra-pair copulations are common, and females store sperm. We examined the effects of repeated sampling on the characteristics of Tree Swallow semen by manually expressing semen from 15 males immediately after capture (T_0) and then hourly for 4 hr (T_1 - T_4). The semen characteristics of individual males varied in response to repeated sampling. The total number of sperm cells we obtained from each male over the 4 hr sampling period varied from 10^4 - 10^7 . Semen samples lacking sperm increased from 6.7% of T_0 samples to 26.7-33.3% of subsequent samples. Forty percent of males provided at least one semen sample that lacked sperm. There were no significant differences among hourly samples in semen volume, sperm concentration, or in the total number of sperm cells obtained from each male. However, there were significant differences among males in each of these variables. Individual variation in responses to repeated sampling has important implications for the copulatory strategies of male and female Tree Swallows.

Tactics for coping with a variable environment: laying interruptions and extended incubation in Tree Swallows. DAVID J. T. HUSSELL, Ontario Ministry of Natural Resources, Peterborough, Ontario K9J 8M5.

During the breeding season, Tree Swallows face extreme day-to-day variation in the abundance of the flying insects that form their diet, as well as variability in weather conditions. In response to bad weather and low insect abundance, Tree Swallows delay clutch initiation, lay smaller clutches, interrupt laying, extend incubation, reduce growth of the young and delay fledging. In this presentation I focus on laying

interruptions and extended incubation. During a 27-year study at 4 sites at Long Point, Ontario, there was a dramatic demonstration of the swallows' response to poor conditions during laying and early incubation at one site in late May 1979. Most laying females added one or two eggs after the start of the bad weather on 25 May. Those that had then laid 5 or more eggs terminated their clutches. Those that had laid 4 either terminated or interrupted their laying. Those that had laid 1-3 eggs interrupted laying and completed their clutches when weather and insect abundance improved. No clutches were initiated or eggs laid on 27 May. Females that had completed clutches on or prior to 26 May abandoned their eggs, at least during daylight hours, and had incubation periods as much as 4 or 5 days longer than the normal 13-14 days.

The sound of incubation rhythms and bluebirds. CAREN B. COOPER and Harold Mills, Cornell Lab of Ornithology, Ithaca, NY 14850.

Recordings of temperature fluctuations in the nests of birds can be used to infer patterns of incubation behavior. Until recently, collecting large samples of temperature recordings was limited by the size and expense of data logger equipment. With new inexpensive, small, self-contained data loggers, we used a Citizen Science project (The Birdhouse Network) to collect temperature time series data from the nests of bluebird species across their ranges. To help simplify the analysis of hundreds of these temperature recordings, we wrote software that works in conjunction with Raven, a bioacoustical analysis program, to partially automate the measurement of incubation recess-session cycle duration, percent incubation constancy, and other statistics. This novel application of Raven combined with advances in data logger technology facilitates investigation in several areas of ecological and behavioral research.

***Courtship repertoire of Carola's Parotia in Papua New Guinea: a video-based ethological analysis.** EDWIN SCHOLLES III, Department of Ecology and Evolutionary Biology, Yale University, New Haven, CT.

The birds of paradise (Paradisaeidae) in the genus *Parotia*, have some of the most complex courtship repertoires and display choreographies of all the birds of paradise. Here I present the results of a video-based ethological analysis of two populations of Carola's Parotias (*P. carolae*) in Papua New Guinea. Carolas Parotias were found to have an extremely complex courtship repertoire, far surpassing what is known from other *Parotia* species, and making it the most complex courtships of all the known birds of paradise. The courtship repertoire is comprised of three displacement behaviors, four pre-display activities, six courtship displays, and one accessory display. The six courtship displays required partitioning into three sub-categories (version, phases, and elements) to adequately describe the observed complexity. Two of six displays have alternative forms, or versions, of the display and four of six have multiple phases, or stages. In addition, display choreography is extremely intricate, with a total of 33 distinct behavioral elements identified among the six displays. Behavioral description is a principal objective of ethology and serves as the primary data for comparative evolutionary ethology. The results of this descriptive analysis, combined with others of similar detail, will allow for future research aimed at understanding the evolution of the extraordinary diversity of courtship related phenotypes for which the birds of paradise are renowned.

***Breeding behavior of Magellanic Woodpeckers (*Campephilus magellanicus*) in Argentine Patagonia.** VALERIA OJEDA, Zoology Department, Universidad Nacional del Comahue, 8400 Bariloche, Argentina.

I studied the breeding behavior of Magellanic Woodpeckers (*Campephilus magellanicus*) during the 2003-2004 nesting season in Argentine Patagonia by conducting dawn-to-dusk nest watches at four nests. This paper presents new information on the breeding behavior of pairs, and the first documented data on nestlings' diet. During the incubation period, males spent $47.5 \pm 16.26\%$ of the daytime in nests, and females spent $48 \pm 12.73\%$. Incubation bouts averaged $61.03 \pm 61.23'$. Eggs were attended 92.85-98.13% of time. At night, male (60% of observations) or female (40%) incubated. Brooding was consistently observed at all nests from week 1-3 of the nestling period. It decreased or ceased in the fourth week, and was not observed beyond week 5. The average feeding rate at four nests (weeks 5-7) was 1.23 ± 0.24 prey/h. At two nests, females brought more prey than males, while the inverse occurred at other two nests. Of 461 prey delivered to nestlings, 61.39% were wood-boring larvae, followed by arachnids (8.03%) and vertebrates (5.42%). Males contributed more to nest sanitation than females (10 and 4 observations, respectively). A considerable interindividual variability in the contribution of Magellanic Woodpeckers to nest care, coupled with small

sample sizes, rendered impossible to test for statistical differences in parental effort by sex. Nevertheless, the documentation of descriptive detailed data gathered systematically is an important step in the study of little known species.

***Geographic differences in the function of sexual ornaments: plumage coloration, not tail-streamers, is a sexually selected trait in North American Barn Swallows.** REBECCA J. SAFRAN, Dept. Ecol. and Evol. Biol., Cornell Univ., Ithaca, N.Y., Kevin J. McGraw Department of Animal Science, University of California-Davis, Matthew R. Evans, Centre for Ecology and Conservation, University of Exeter in Cornwall, Colby Rice Neuman, Ecol. and Evol. Biol., Cornell Univ., Ithaca, N.Y.

Sexual adornments often vary markedly across a species' range, which presumably is due to differences in local environmental conditions and the associated selection pressures, such as natural versus sexual selection or the relative signaling value of different ornamental traits. However, there are only a few reported examples where the information content of mating signals varies geographically, and even fewer where a set of secondary sexual traits serves different signaling functions in different populations. Classic studies of sexual selection in the European barn swallow (*Hirundo rustica rustica*) demonstrate that elongate tail-streamers provide several reproductive advantages to males and females and are used as reliable signals of mate quality. Here, we show that tail-streamers do not confer these same benefits in a population of barn swallows from North America (*Hirundo rustica erythrogaster*). Instead, ventral plumage coloration, which is more exaggerated in North American swallows compared to their European counterparts, predicts patterns of assortative mating and annual reproductive success in *H. r. erythrogaster*. These observations support the idea that ornamental traits can serve different functions among animal populations and suggest that geographic variation in different sexual signals may facilitate population divergence, which may ultimately lead to speciation.

Familial care-giving in American Crows. KEVIN J. MCGOWAN, Cornell Lab of Ornithology, Ithaca, NY 14850, Anne B. Clark and Douglas A. Robinson, Jr., Biological Sciences, Binghamton University, Binghamton, NY, 13902, and Carolee Caffrey, Audubon Science, Ivyland, PA 18974.

Care-giving to sick or disabled conspecifics is rarely reported in non-human animals, but is theoretically important. Anecdotal accounts exist for dolphins, great apes and elephants. Here we describe care-giving to individuals within family groups of the cooperatively breeding American Crow (*Corvus brachyrhynchos*). American Crows live in extended family groups, and offspring can remain with their parents for up to seven years. Family relationships can be important for the attainment of breeding status; budding of the parental territory and the helping of siblings are frequent. Family members participate in territory defense, predator mobbing, and the care of offspring. Several instances of sick or injured crows being defended and fed by family members were observed. Feeding of sick crows did not depend on begging by those individuals. Contact with sick family members presents a potential for the spread of diseases, especially that caused by West Nile virus (WNV). We observed crows dying of WNV to see if physical contact with family members was an avenue of disease transmission. We observed no direct contact with dying WNV-infected crows, but family members were present in most instances, and guarded or kept vigil on the moribund crows. Care-giving is not restricted to humans or a few highly social mammals, but occurs in complexly social birds as well.

***Differences in social mating system and parental care between Northern House Wren (*Troglodytes aedon*) and Southern House Wren (*T. musculus*).** PAULO E. LLAMBÍAS, Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY, United States 14853.

Avian monogamy is usually associated with the need for biparental care. When offspring can be raised by only one parent, selection should favor individuals who desert the brood in order to become polygamous. During 2003 I studied the mating system and parental behavior of the Northern House Wren (N-H) and the Southern House Wren (S-H) breeding in nest boxes in the U.S. and Argentina, respectively. Both species were double-brooded and had similar incubation and nestling periods. During the nestling period, S-H males made significantly more feeding trips per nestling per hour than N-H males, while females fed at similar rates. Brood desertion by one parent was common in the N-H: 75% of the nests were deserted

after nestlings were 7 days old. Brood desertion was the consequence of males switching to feed the nestlings of a primary or secondary female (polygynous males) or of females starting a second brood with another male (sequentially polyandrous females). In the S-H, brood desertion was very rare and no instances of polygamy were observed. Although populations differ in rates of brood desertion and parental care, nestling condition at day 12 was similar. If differences in mating system between N-H and S-H are to be attributed to the need for biparental care, biparental care in the S-H must be essential even when nestlings are already well developed. I discuss these data on parental care relative to the evolution of breeding systems in house wrens.

Thirty years of puffin restoration on the Maine coast, USA. STEPHEN W. KRESS and C. Scott Hall, Seabird Restoration Program, National Audubon Society, 159 Sapsucker Woods Rd., Ithaca, NY 14850.

A total of 1,904 puffin chicks were translocated from Great Island, Newfoundland to the Maine coast between 1973 and 1989. Of these, 940 fledged from Eastern Egg Rock (EER) and 892 fledged from Seal Island NWR (SINWR). This paper compares return rates and productivity to a native Gulf of Maine puffin population on Matinicus Rock. A total of 15.2% (n=143) and 22.0% (n=196) of the translocated chicks were resighted in the Gulf of Maine respectively from the EER and SINWR projects; none were observed returning to Newfoundland. This compares to a 67.6% (n= 455) return rate for native chicks fledged from Matinicus Rock. At both islands, the first nesting began eight years after the transplants began. Pioneering translocated pairs at EER and SINWR attracted native puffins from Matinicus Rock and Machias Seal Island, two increasing colonies in the Gulf of Maine. Both restored colonies are highly productive, respectively averaging 0.90 and 0.82 fledglings/pair at Eastern Egg Rock and Seal Island. Productivity at the restored colonies is similar to that achieved by the native puffin colony at Matinicus Rock (0.86). At SINWR, the nesting population steadily increased from 7 pairs in 1992 to 261 pairs in 2003. The EER colony increased slowly, leveled for fifteen years and recently increased to 59 pairs by 2003.

***The roles of rank, state and seasonal considerations on foraging behavior in Black-capped Chickadees.** EMILY MORSE and Margaret Voss, School of Science, Penn State Erie, The Behrend College, Erie, PA 16563.

Fat is the main energy reserve utilized by songbirds and is necessary to offset the energy expenditures throughout the day. Excessive fat though, can increase predation risk. Black-capped chickadees, *Poecile atricapillus*, experience two different environments through the year that may alter their behavior in order to optimize foraging strategies and minimize risks. I intend to explore the patterns associated with how chickadees obtain and balance fat reserves through foraging behavior and diet. Songbirds in winter face a critical trade-off; they should minimize fat reserves to decrease predation, but should maximize fat levels to avoid starvation. As a scatter-hoarder, chickadees store energy supplies outside their bodies by depositing caches of food among scattered locations for later consumption, which reduces the amount of body fat they need to maintain. In spring, chickadees become constrained in a different manner. Females must now allocate their time and energy in a way that maximizes their own reserves, reduces predation risk, and maintains optimal conditions within her nest. The challenge becomes foraging to increase the individual's chance of survival, while incubating her nest at temperatures that promote proper development, increasing the chance that her clutch will survive. In winter, dominance is predicted to be the main effector in determining patterns of energetic gain. During the nesting season, though, caching and foraging patterns may be predicted by environmental cues such as ambient temperature or prey density, not dominance.

Foraging behavior of Great and Snowy Egrets in relation to prey availability. ALAN D. MACCARONE, Biology Department, Friends University, Wichita, KS 67213, and John N. Brzorad, Biology Department, Forsyth College, Winston-Salem, NC 27103.

We sampled shallow-water fauna in May and August 2002 at two estuarine sites in New York City Harbor, and compared seasonal differences in prey biomass with changes in foraging behavior by Snowy Egrets (*Egretta thula*) and Great Egrets (*Ardea alba*). Total prey density increased from May to August, from 0.43 to 25.7 items/m³, with the greatest increase occurring among Mummichogs (*Fundulus heteroclitus*). Prey abundance differed between sites. Despite increases in prey biomass, both species had significantly greater foraging success in May than in August. Great Egrets demonstrated a higher strike success rate (41%) than Snowy Egrets (30%), and Snowy Egrets struck at prey more in August than in May. Snowy Egrets ambulated faster (0.13 m/sec) than Great Egrets (0.04 m/sec) supporting the notion that Snowy Egrets disturb prey that then become more accessible to Great Egrets. Snowy Egrets moved faster in August, but Great Egret foraging speed did not change in the same time period. Foraging speed did not vary with tide phase. Great Egrets had a more diverse diet, with Mummichogs comprising 72% of their diet, and Grass Shrimp (*Palaemonetes sp.*) and Atlantic Silversides (*Menidia menidia*) together comprising another 24%. Snowy Egrets had a more restricted diet, with Mummichogs and Shore Shrimp (47% each) and Silversides (6%) comprising their entire diet.

Foraging energetics of Great and Snowy Egrets during the breeding season. JOHN N. BRZORAD, Biology Department, Forsyth College, Winston-Salem, NC 27103, Alan D. Maccarone, Biology Department, Friends University, Wichita, KS 67213, and Kevin J. Conley, Physics Department, Forsyth College, Winston-Salem, NC 27103.

We used foraging observations in May and August combined with allometric measurements of Great Egret (*Ardea alba*) and Snowy Egret (*Egretta thula*) stride frequencies and strike mechanics to estimate the amount of energy used while foraging. We compared this to the amount of energy gained from captured prey. Birds experienced an average net gain of 227.0 W in May and 52.5 W in August. On a per-gram basis, striking at prey was more costly for Great Egrets (1.01×10^{-4} W/g) than for Snowy Egrets (9.92×10^{-5} W/g), but pursuing prey by ambulation was relatively inexpensive. Great Egrets spent more energy (0.06 ± 0.02 W) than Snowy Egrets (0.04 ± 0.01 W), and all birds spend more energy in August (0.05 ± 0.02 W) than in May (0.04 ± 0.02 W). A Snowy Egret reached its maximum neck extension in 0.27 sec, and its bill tip achieved a maximum speed of 4.6 m/sec. A Great Egret required only 0.17 sec to extend its neck, and its bill tip traveled at 8.2 m/sec. The nearly 2-fold increase in bill speed may explain why Great Egrets exhibit higher strike success than Snowy Egrets, and why Snowy Egrets may favor slower prey (smaller fish and shrimp).

***Does a shift in preen wax composition have antibacterial implications for breeding sandpipers?** AMY SCHNEIDER and Edward H. Burt, Jr., Department of Zoology, Ohio Wesleyan University, Delaware, OH, 43015, and Jeroen Reneerkens, Department of Marine Ecology and Evolution, Royal Netherlands Institute for Sea Research, Landsdiep 4, 1797 SZ Den Hoon, The Netherlands.

Recently Reneerkens discovered that the chemical composition of uropygial oil shifts from a monoester to a diester prior to breeding and remains a diester through incubation in nineteen species of sandpipers (Scolopacidae). Several explanations are possible, including enhancement of sexually-selected signals or olfactory camouflage. One unexplored possibility is that the shift is an adaptation to increased bacterial contamination on the breeding grounds. This paper explores the possibility that the diester uropygial oil, which occurs only during breeding and incubation, may have antibacterial properties different from those of the monoester uropygial oil secreted during the rest of the year. We collected plumage samples from five species of breeding shorebirds (*Arenaria interpres*, *Calidris alba*, *C. alpina*, *C. canutus*, *Charadrius hiaticula*) in Zackenburg, Greenland, and from migrating Red Knots in the Dutch Wadden Sea. We cultured the plumage samples to assess bacterial occurrence, identified bacteria using gram stain analyses, and determined preen wax composition using gas chromatography. We found no relationship between the chemical composition of uropygial oil and bacterial occurrence, and no increase in the bacterial prevalence between breeding and migrating Red Knots.

Chemical compositions of preen gland secretions of passerines: same goal achieved by different means. MEENA HARIBAL¹, André Dhondt¹, David Rosane² and Eloy Rodriguez², ¹Cornell Lab of Ornithology, Sapsucker Woods Road, Ithaca, NY 14850 and ²Plant Sciences, Biotech Building, Cornell University, Ithaca NY 14853, USA.

We investigated chemical composition of preen gland secretions of several groups of passerines and conducted bioassays to elucidate some their functions. We compared secretions of sparrows, finches, blue jays, thrushes and chickadees that occur in the temperate zone and also compared their composition with those secretions of several species of antbirds from Panama and mockingbirds from Dominican Republic. We analyzed compounds by GC-MS and LC-MS. GC-MS analyses showed that there is similarity in the composition of secretions of birds of temperate region and mostly contain esters of long chain fatty acids and alcohols. Although many comprise of compounds of identical molecular weights, but they are structural isomers and differ significantly in different groups of birds. Hydrolysis of some of these mixtures show that most of them differ in the structures of acid components of the esters and most of the alcohols are n-alcohols. We found that secretions of antbirds and mockingbirds were more complex in their nature and contained many more compounds other than longchain esters. Complex compositions of preen gland secretions of the antbirds and mockingbirds of tropics suggest that they may have many more functions in tropical environment.

***Effect of solar ultra-violet radiation on feather-degrading bacteria.** VINODKUMAR SARANATHAN, Department of Physics and Astronomy, and Edward H. Burt, Jr., Department of Zoology, Ohio Wesleyan University, Delaware, OH, 43015.

We investigated the effect of solar UV radiation on the degradation of feathers by *Bacillus licheniformis* that commonly occurs in the plumage of birds [Burt, E. H., Jr. and J. M. Ichida. 1999. Occurrence of feather-degrading bacilli in the plumage of birds. *Auk* 116:364-372.]. We assessed the degradation of domestic goose feathers inoculated with *B. licheniformis*, mounted in 5"x4" boxes and exposed to solar UV radiation daily for roughly three hours centered about solar noon, from Jun. 14, 2003 to Jul. 18, 2003. A box covered with a filter that was opaque to both UV and visible solar radiation served as the control and two other boxes, one with a UV opaque and the other with a UV transparent filter were our test boxes. High resolution SEM images of feathers from all three boxes showed no evidence of differential degradation. Tentatively, it appears that solar UV radiation has little effect in either the activation or inactivation of feather-degrading bacteria. However we are trying to come up with a way to quantify feather damage, such as measuring the resiliency (Young's modulus) of feathers [Bonser, R. Center for Biomimetics. <http://www.rdg.ac.uk/biomim/personal/richard/keratin.htm>]. Insufficient UV exposure and formation of spores by the bacterium could be some possible explanations for the lack of any apparent differential feather damage.

***Can habitat be sexually rather than ecologically prescribed?** ALEXANDER M. MILLS, Department of Zoology, University of Toronto, 25 Harbord Street, Toronto, ON, Canada M5S 3G5.

All birds demonstrate habitat preferences. Conventionally, these preferences are explained by behavioral and physical specializations for exploiting niches best offered by the preferred habitat. Chance, biogeography, history, and social factors can also influence habitat occupancy, although the prevailing view explaining community membership is niche-assembly, mediated by natural selection. Here I propose that sexual selection and sexual conflict may play a role in the development of breeding habitat specificity in birds, essentially independent of natural selection. These alternative forces result in a sexually prescribed habitat, designated here as a sexual habitat imperative. In this alternative view, rather than being valued for its ability to provide birds with appropriate niche variables, specific habitat is valued as a sexual currency or sexual environment. The mechanics of (a) direct models of sexual selection, (b) sensory bias, (c) species recognition, and (d) sexual conflict driven by optima differences between the sexes fail to generate a sexual habitat imperative. However, the mechanics of (e) indirect models of sexual selection and (f) sexual conflict driven by differences in mating effort can generate a sexual habitat imperative by making habitat specificity a sexual currency. Sexual relations thus may influence or determine the habitats birds select, at least during breeding periods.

Microhabitat monitoring in Leach's Storm Petrels. JOHN ANDERSON, College of the Atlantic, 105 Eden St. Bar Harbor, ME 04609, Alan Mainwaring, Intel Berkeley Research Lab, Joseph Polastre, U.C. Berkeley Dept. of Computer Sciences, Robert Szewczyk, U.C. Berkeley Dept. of Computer Sciences, David Culler, U.C. Berkeley Dept. of Computer Sciences.

Habitat monitoring has traditionally been performed at temporal and spatial scales that often better fit the observer rather than the organism or else required repeated visits by observers with the concomitant disturbance that such visits entailed. Recent advances in technology, particularly in terms of integrated wireless networks and microelectronics permit fine-grain real-time measurements of environmental parameters with minimal disturbance to study sites. During the summer of 2003 we deployed a network consisting of 74 wireless "Motes" capable of detecting temperature, humidity, PAR, and visible light on 10cm stakes in areas used for nesting by Leach's Storm Petrel on Great Duck Island, Maine, and 88 Motes in actual petrel nesting burrows. Results showed a dramatic buffering effect of the burrows in terms of both temperature and humidity when compared to surface measurements: Burrows rarely varied by more than 2 degrees C during a 24 hour cycle, in contrast to over 10 degrees C on the surface. In addition macro-habitat classifications (Forest, Edge, Meadow) revealed some buffering effects, although the mote network was able to demonstrate a high degree of environmental heterogeneity.

Habitat use by Cerulean Warblers in an oak-northern hardwoods transition zone: implications for management. SCOTT H. STOLESON, U.S.D.A. Forest Service, Northeastern Research Station, Irvine, PA 16329.

Widespread population declines in the Cerulean Warbler, *Dendroica cerulea*, have prompted considerable conservation interest and concern over the impacts of timber management on the species. Conservation planning has been hampered by a lack of knowledge of regional population status, habitat requirements, and threats. In 2003 we initiated a study in a transition zone between oak and northern hardwood forests in northwestern Pennsylvania to quantify Cerulean habitat use; and to assess the impacts of a shelterwood-prescribed burn treatment increasingly used in the region to regenerate oak forests. We surveyed for Ceruleans using tape-playback methods at 408 points across a range of forest types and topographic positions. We found no Ceruleans in Allegheny hardwoods, the dominant forest type in the region; all Ceruleans occurred in mixed oak stands or on sycamore-dominated river islands. Although Ceruleans were detected disproportionately on lower slopes and bottoms, this reflects the non-random distribution of oaks in the region. Eight of the 65 oak stands surveyed had been shelterwood-cut; these stands were significantly more likely to have Ceruleans present ($P = 0.028$), and had a higher density of Ceruleans when present (0.42 vs 0.71 birds/point; $P = 0.05$). We suggest that shelterwood cuts simulate the heterogeneous canopy structure of the uneven-aged mature forests preferred by this warbler. While the results of this pilot study are suggestive, our sample sizes are small. Future work will examine in greater depth the impacts of shelterwoods on Cerulean abundance and demography.

Are elevated mist nets required to adequately sample the avian community at a migration stopover site? DAVID BONTER, Cornell Lab of Ornithology, Ithaca, NY 14850, and Elizabeth W. Brooks, Braddock Bay Bird Observatory, Rochester, NY 14612.

We analyzed the height of capture for birds trapped in six elevated mist net rigs located at a stopover site on the south shore of Lake Ontario in an effort to assess the utility of standard ground-level mist nets for sampling the avian community. Each net rig consisted of two 12-meter mist nets (one above another) with the lower net sampling from approximately 0.5-2.5 meters above the ground and the upper net from 2.5-5.0 meters. Capture height was recorded for 14,083 birds banded during eight migration seasons (fall migration 1999-spring migration 2003). Capture rates were significantly greater in the lower mist nets for 26 species with $N \geq 30$ captures. Two species, Blue Jay and American Robin, were significantly more likely to be captured in the top nets of the rigs (paired t-test, $p < 0.05$). Tests for seasonal differences in capture heights revealed higher mean capture heights in autumn than spring for 13 of 17 species. Tests for sex-based differences revealed higher mean capture heights for males in 6 of 7 species in spring, but no obvious

differences between the sexes in autumn. No consistent age-related patterns were detected in either season. Implications of this research on studies using mist net sampling techniques will be discussed.

Avian community patterns in a northern New England urbanizing landscape. Carol R. Foss and PAMELA D. HUNT, Audubon Society of New Hampshire, 3 Silk Farm Road, Concord, NH 03301.

We surveyed breeding bird assemblages in 40 residential neighborhoods in southern New Hampshire during the 2000-2003 breeding seasons, and compared avian data to two measures of development intensity: mean lot size and percent impervious surface. Non-native species dominated sites with high percent of impervious surface, but rapidly disappeared with increasing vegetation. Native species richness was positively correlated with mean lot size and negatively correlated with percent impervious surface. Ground-nesting species were absent from all sites with mean lot size <1 acre and from most sites with mean lot size <2 acres. Bole-nesting species did not occur at sites with more than 30% impervious surface. Canopy nesters were rare in all but the least developed neighborhoods. Of the forest birds typical of this region, roughly a quarter nested successfully in the neighborhoods studied, and most "forest interior species" were either absent or occurred at low densities, even in large-lot subdivisions with substantial natural vegetation and numerous undeveloped lots. Metrics derived from these data may provide indicators of environmental quality in developed landscapes.

Demographic and aerographic fragmentation in distributions of North American birds. JEFFREY V. WELLS, Cornell Lab of Ornithology, Ithaca, NY 14850.

Simple Gaussian models of ecological limitations of ranges predict that species will be distributed in a "bull's eye" pattern with a single high center of abundance located within the geographic center of the species range. Much ecological and conservation theory has been developed based on this assumption without serious examination of its generality in birds or other taxa. I documented patterns in the distribution of abundance of North American birds from four map sets, each depicting ranges of 250-371 species. The mean number of disjunct populations per species (a measure of areographic fragmentation) among the four map sets varied from 2.35-4.83. The mean number of highest abundance class regions per species (a measure of demographic fragmentation) in the two map sets that depicted density was 1.76 in breeding season maps and 4.47 in wintering season maps. Neotropical migrants showed less demographic and areographic fragmentation than temperate migrants. Species breeding in deciduous forests of eastern North America showed less areographic fragmentation than species breeding in coniferous and mixed forest habitats. Species breeding in wetland/marine habitats exhibited more areographic fragmentation than species breeding in other habitat types. Patterns of distribution in North American bird species were more complex than those predicted by Gaussian models and provided no support for the generality of predictions of such models. The lack of support for these models has important implications for ecological theory and conservation biology.

Patterns in the geographic range sizes of New World Falconiformes. DAVID R. BARBER and Keith L. Bildstein, Acopian Center for Conservation Learning, Hawk Mountain Sanctuary, Kempton, PA 19529.

One of the dominant patterns in macroecology is the positive latitudinal gradient in species range sizes. Mechanisms postulated as determining or contributing to this gradient include climatic variability, competition and land area. However, behavioral mechanisms such as migration have not been studied. We used new world Falconiformes to investigate patterns of species geographic ranges and to determine if patterns differed with migratory tendency. The distribution of geographic range sizes was not strongly right skewed as predicted. Migratory raptors had larger geographic ranges than non-migratory species. Geographic range size did not vary with body size for either migratory or non-migratory species. Overall, range size did not vary with latitude, however range sizes of North American species increased with increasing latitude, showing a "Rapoport" effect. The opposite pattern was found for Falconiformes in South America, suggesting species range size may be influenced by land area. The implications of these results for our understanding of patterns in geographic range sizes will be discussed.

***Situation specific call use in Leach's Storm Petrel (*Oceanodroma leucorhoa*).** MICHAEL A. SHEPARD, 1109 Robert Young Rd., Starksboro, VT 05487.

The intriguing calls of Leach's Storm Petrel (*Oceanodroma leucorhoa*) were the impetus for this project examining the situation specific use of calls by *O. leucorhoa*. Calls were recorded between 2200 and 0200 hours throughout June and July 2002 and June and July 2003 using a Marantz model PMD430 tape deck and a Dan Gibson model P-650 18" parabolic microphone. Calls were digitized and then spectrographically analyzed using the Raven Bioacoustics Research Program (v. 1) developed by the Cornell Lab of Ornithology. Initial analyses lead to confirmation of the sexual dimorphism in call frequency described by Taoka *et al.* (1987, 1988, 1989a, 1989b, 1989c). During June and July 2003 experiments were carried out using sex specific calls in specific playback situations using a Marantz model no. PMD222 tape deck with a Radio Shack CAT no. 277-1008C mini amplifier-speaker. Subsequent numeric analyses of results obtained from spectrographic analysis lead to increased understanding of use of the major call types in specific situations. These include: the finding that the 'purr' call is used by both sexes in territorial situations as well as in mating situations and is possibly a nesting site quality indicator for conspecifics; the specific use of the 'flight' call in a variety of territorial and amorous contexts with specific meaning discernible by the situation in which it is given; and the exclusive use of the screech call in situations of extreme agitation and territorial conflicts.

Individual variation in songs of House Wrens. E. DALE KENNEDY, Katherine Niesen, and Douglas W. White, Biology Department, Albion College, Albion, MI 49224.

In organisms that learn their vocalizations, such as songbirds, there is often variation in specific types or arrangements of notes. House Wrens sing complex songs made up of two parts: a relatively low-amplitude introduction and a relatively high-amplitude terminal section. The terminal section generally consists of repeated syllables, or trills. We examined variation among songs of an individual male House Wren recorded over several months in 2003, including five sequential days in July, in Whitehouse Nature Center, Albion College. The bird was recorded both while unpaired and when paired; his mate was also recorded on several occasions when they were paired. We used a combination of Avisoft SASLab Pro and Microsoft Excel to examine variations in lengths of different parts of the songs of both members of the pair, including introduction, terminal, total length, and the interval between songs. The male sang different songs when paired and unpaired. Over five sequential days while unpaired, the male appeared to not vary the lengths of songs significantly, though he did vary the notes within his songs to sing different song types from day to day.

Directionality in acoustic communication: a field study on Red-winged Blackbirds. GAIL L. PATRICELLI, Marc S. Dantzker, Jack W. Bradbury, Macaulay Library, Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, NY 14850.

Studies of animal communication have examined the degree to which spectral and temporal properties of acoustic signals are adapted to their function, the environment in which they are used and the physiology of the communicating animals. An important component of vocal communication has been largely left out of these studies—the directionality of acoustic radiation—because measuring directionality is extremely difficult. The handful of successful studies indicate that directionality is highly variable across calls and across species, and that directionality has dramatic effects on the transmission of acoustic information. However, we know almost nothing about how directionality varies with signal function, sender morphology and behavior, and the environment in which the sound is transmitted. We have developed a system allowing detailed measures of directionality in animal vocalizations in the field, and we are using this system to test the hypothesis that the directionality of a bird's song is affected by its social and environmental context and by the bird's morphology and behavior. We will present the results of a study measuring the directionality of red-winged blackbird songs. We compare the directionality of different vocalizations in relation to their function in communication, and we examine mechanisms that may explain the observed differences.

High-speed video of wing-sound production in two species of manakins (Aves: Pipridae). KIMBERLY S. BOSTWICK, Ecology and Evolutionary Biology, Cornell University, Ithaca, NY 14850.

Hidden behind speeds that the unaided human eye cannot observe are a myriad of incredible avian behaviors that scientists are just beginning to discover. The Neotropical Manakins, Pipridae, have been known for decades to produce explosive wing sounds during their elaborate courtship displays, but how the males used their wings to produce sounds has been hidden by the speeds of these actions. Competing hypotheses have included wing-to-wing clapping, wings-beaten against the body, feather-to-feather collisions, and wings flicked into the air. High-speed video recordings of males displaying in the wild show that two species of manakins, *Manacus candei* and *Pipra mentalis*, use incredibly rapid wing motions to produce sounds in a diversity of ways, both within and between species, and none of the above hypotheses can be rejected. This mechanistic and acoustic diversity is evidence of the importance of sexual selection in generating diversity in this clade.

***Vocal variation in the Green Violet-ear, a Neotropical hummingbird.** CÉSAR SÁNCHEZ, Branko Hilje, Rodolfo Jaffé and Gilbert Barrantes, Escuela de Biología, Universidad de Costa Rica, San José, Costa Rica.

The Green Violet-ear (*Colibri thalassinus*) reproduces in the highlands of Costa Rica from early September through March. During the breeding season, males sing continually for the most part of the day from overlooking perches in their territories. Because males do not defend food resources in their territories, it is possible that females choose males based on song characteristics. Hence, we expect large individual variation in song traits. We analyzed the structure for the complete song and for the first element (total time, frequency range, peak frequency, low and high frequency) as well as number of songs/time unit and number of elements per song, in territories of 19 neighbor males separated by 20 to 30 m, in an oak forest, Costa Rica. We found individual significant differences, using MANOVA analysis, for most of the variables analyzed for the song and for the first element. Individual differences were most notably when frequency range, low and high frequencies were compared. Number of elements/min (total song was constituted by 2 elements in 14 of the 19 individuals) ranged from 126 to 231. These results support our prediction that when female choice is based on song characteristics, this should show high individual variation.

Species conservation assessment in Mexico: national and continental priorities. EDUARDO E. IÑIGO-ELIAS, Cornell Lab of Ornithology, 159 Sapsucker Woods Rd, Ithaca N.Y. 14850, USA., Humberto Berlanga, NABCI-Mexico, CONABIO, Av. Liga Periférico-Insurgentes Sur 4903, Del. Tlalpan 14010 Distrito Federal, MEXICO., Hector Gomez de Silva Garza, Instituto de Ecología, UNAM, Ap. Postal 70-275, 04510 Ciudad Universitaria, D.F., MEXICO, and Arvind Panjabi, Rocky Mountain Bird Observatory, 14500 Lark Bunting Lane, Brighton, CO 80601, USA.

The recent “Partners in Flight North American Land Bird Conservation Plan” outlines continental priorities for land birds in Canada and the USA, and describes future plans to incorporate Mexico. We present here a progress report on the species conservation assessment for all birds in Mexico. The Mexican Committee for the North American Bird Conservation Initiative (NABCI-Mexico) has established a National Bird Species Conservation Assessment Working Group that has implemented the first national workshop to assign conservation scores for all bird species in the country, and has implemented a series of regional workshops allowing the participation of local ornithologists and bird experts from across Mexico. We present here preliminary data for the review of the conservation global scores in Mexico and the scores from two regional workshops. We also compare the results of this continental bird conservation assessment in Mexico (Partners in Flight –PIF) with the Mexican government’s 2001 national species assessment (Species Extinction Risk Assessment Method –MER). Continental and national assessments can provide complementary tools for decision makers in the conservation of birds across North America.

A shrub is not just a little bush: a review. JOHN CONFER. Biology Department, Ithaca College, Ithaca NY 14850-7044.

This review describes part of the consequence of forest removal followed by farmland abandonment followed by forest regeneration for eastern United States. This sequence moved sequentially from the northeast to the north central states. Pre-colonial disturbance ecosystems were dominated by fire and beaver lands and supported endemic plants, perhaps more ecologically significant to insects than birds. Most

anthropogenic shrublands are abandoned farmland or clear-cuts, which support different proportion of woody stems, bird species and rapidity of reforestation. Cover by anthropogenic shrublands in New York probably is less than the cover by disturbance ecosystems in pre-colonial times. Succession from shrublands into forest is now followed by succession within forests. Habitat preferences suggest that many forest species are declining because forests are maturing, while forest cover remains stable. The decline of shrubland ecosystems has generated a strong, but congenial, debate about conservation values. Shrublands, in comparison to forests, support a higher percentage but a lower total number of declining species. The rate of abandonment of farmland is declining. Consequently, proactive management for disturbance ecosystems in potentially forested natural lands will be needed to sustain shrubland species near current levels. Disturbances in largely forested landscapes, but not in agricultural landscapes actually help many "forest" species. Maintaining disturbance partially compensates for the 98% loss of grasslands to produce food for the northeast

Comparison of spring and fall bird population trends following the removal of cattle from the San Pedro River, Arizona. TERRELL D. RICH, U. S. Fish and Wildlife Service, Boise, ID 83709, David J. Krueper, U. S. Fish and Wildlife Service, Albuquerque, NM, 87103, and Jonathan Bart, USGS-BRD, Boise, ID 83706.

In late 1987, cattle were removed from the San Pedro Riparian National Conservation Area (NCA) in southeastern Arizona. Vegetation and birds were monitored during 1986-1991. Herbaceous vegetation increased four- to six-fold in riparian and mesquite grassland communities. We previously documented that 42 of 61 bird species, for which there were sufficient data, increased during the breeding season, many substantially. Among 51 species with adequate sample sizes during spring migration, 10 showed significant population increases, 7 significant decreases, and 34 no trend. In contrast, among 60 species with adequate sample sizes during fall migration, 37 showed significant population increases, 6 significant decreases, and 17 no trend. There was little relationship between spring and fall trends over all species or for just those with significant seasonal trends. For example, among the 37 species with significant fall increases, only 9 had significant spring increases and 3 had significant spring decreases. We propose that the dramatic difference in seasonal trends is a result of insect and seed production driven by late summer monsoons which greatly increased with the recovery of vegetation over the study period. Spring is typically much drier so that similar food resources were not available then despite the vegetation recovery.

***Effects of field characteristics on avian use and productivity in Conservation Reserve Enhancement Program fields and a comparison with hayfields.** KEVIN WENTWORTH and Dr. Margaret Brittingham, Department of Wildlife and Fisheries Sciences, Pennsylvania State University, University Park, PA, USA 16802.

In 2001, a federal program, the Conservation Reserve Enhancement Program (CREP), was initiated in 20 counties in south-central Pennsylvania to address problems with soil erosion and to provide habitat for wildlife. We compared CREP field use and nest success with hayfields and determined how avian density and productivity within CREP fields varied with field characteristics (e.g. size, edge type and vegetation). CREP fields were randomly selected in three size categories: 2.0 – 4.0 ha, 7.3 – 12 ha, and 16 – 28 ha. We located hayfields as near as possible to the CREP fields. We surveyed birds in all fields using distance sampling and searched for nests in about half of the fields. Between 2001 and 2003, we monitored 800 nests of 19 species in 64 CREP fields and 11 hayfields. Indigo Bunting, Field, Grasshopper and Song Sparrow had significantly higher bird density in CREP fields than hayfields, while Eastern Meadowlark, Bobolink and Red-winged Blackbird did not. Red-winged Blackbirds (only comparable species) were more successful in CREP than hayfields. All field characteristics entered at least one species multiple regression for bird density, nest density, and nest success ratio. All species showed a higher or equal density in CREP fields than hayfields and CREP fields were more successful. Field heterogeneity is important to attract multiple species to a field because they have different selection criteria.

First known specimen of a hybrid *Buteo*: Swainson's Hawk X Rough-legged Hawk from Louisiana.

WILLIAM S. CLARK, 2301 S. Whitehouse Circle, Harlingen, TX 78550, and Christopher C. Witt, Department of Biological Sciences and Museum of Natural Science, Louisiana State University, Baton Rouge, LA 70803.

A few hybrids have been reported for many species of birds, including a few cases between buzzards of the genus *Buteo* from Europe, Asia, and North America. Almost all of these report on hybrid pairs at the nest. Herein we report on a putative hybrid specimen between Swainson's Hawk *B. swainsoni* and Rough-legged Hawk *B. lagopus*, to our knowledge, the first hybrid specimen for the genus. It was collected in Louisiana as a Rough-legged and the specimen and a tissue sample were deposited in the LSU Museum collections. Mt-dna determined that the mother was a Swainson's, however, nuclear dna was unable to determine the father. As the tarsi were feathered, the father is most likely either a Rough-legged or Ferruginous Hawk *B. regalis*. The latter was eliminated by its larger feet, gape, and beak and plumage characters. Most of the characters of the hybrid were intermediate between Swainson's and Rough-legged, but the leg feather markings were not. The breeding range of Swainson's Hawk extends northward well into the open Taiga breeding habitat of the Rough-legged Hawk, albeit at a low density, which may be a factor in hybridization. Such hybrids, if they mate back with one of the parental species, would increase the genetic diversity of that species. In any case, such individuals present field identification problems to researchers, bird photographers, and birders.

Redefining *Wilsonia* and other unnatural groups of wood-warblers. IRBY J. LOVETTE, Laboratory of Ornithology, Cornell University, Ithaca, NY 14850.

DNA-based phylogenetic studies continue to revolutionize our understanding of bird diversity and overturn long-standing assumptions about avian relationships. A phylogenetic survey of nearly all the 100+ species traditionally placed in the Parulidae ("wood-warblers") demonstrates that most genera do not correspond to natural evolutionary groups (or "clades"). Instead, convergence in plumage and behavior has caused us both to group some relatively distantly species and to separate some closely allied taxa. *Wilsonia*, the genus that shares the namesake of the Wilson Ornithological Society, is just one example: the Hooded Warbler (*W. citrina*) falls within the *Dendroica* radiation rather than with the Wilson's (*W. pusilla*) and Canada (*W. canadensis*) Warblers. Here I will outline several similar phylogenetic novelties and discuss the sources and strength of support for these newly recognized relationships.

The effects of severe population bottlenecks and a reintroduction project on the genetic diversity of south Scandinavian Peregrine Falcons (*Falco peregrinus*). FRODE JACOBSEN, Lutz Bachmann and Jan T. Lifjeld, Zoological Museum, University of Oslo, P.O. Box 1172 Blindern, N-0318 Oslo, Norway and Marit Nesje, The Norwegian School of Veterinary Science, Oslo, Norway.

The peregrine falcon (*Falco peregrinus*) population in south Scandinavia almost went extinct in the 1970's. A successful reintroduction project was implemented in 1974, using captive breeding birds of north and south Scandinavian, Finnish and Scottish origin. We examined the genetic diversity in the pre-bottleneck population using eleven microsatellite markers and compared the data with the previously genotyped contemporary population. Between 48 and 130 years old museum specimens were analyzed. A significant heterozygosity excess indicated a genetic bottleneck already in the late 1800's. In spite of a 29% loss of historic alleles, the contemporary population shows a relatively high level of genetic variation. Our results suggest that the reintroduction project has had a strong impact on the genetic signature of today's population in the region. Yet, clear signs of a recent genetic bottleneck still exist in the south Scandinavian peregrine population through highly significant heterozygosity excess and linkage disequilibrium.

***High lineage diversity and host sharing of malarial parasites in a local avian assemblage.** MEGAN M. SZYMANSKI, Department of Ecology and Evolutionary Biology, Cornell Laboratory of Ornithology, Cornell University, Ithaca, NY 14850.

The introduction of a parasite to a novel species has the potential to shift the evolutionary course of that species by playing a selective role on the population. The virulence of a parasite varies when infecting a new species and may exhibit a strong selection for individuals with a certain phenotype resistant to the

parasite. The study of parasite-host interactions in avian species holds the potential to reveal the evolutionary history on the basis of parasitic host shifts between avian species and specificity to a certain species. It may also give insights into adaptive behaviors of the host species and effect of sexual selection (Rintamaki et al. 1998). I surveyed several local sympatric avian species and determine if they provide evidence of host specificity for the common malarial parasites, *Haemoproteus* and *Plasmodium*. I will determine whether these bird species have species-specific blood parasites and to what extent one bird species can be infected by different parasite species (Lovette 2001). This project will be based on phylogenetic analyses of mitochondrial DNA from both the hosts and their parasites. The degree of host specificity will be assayed by comparing the level of congruence of the parasite and their host trees (Bensch et al. 2000). A high level of tree congruence suggests host specialization and co-speciation, whereas low levels of congruence are likely to result from low host specificity or from repeated host shifts.

How well do removal models applied to count data estimate known densities from territory mapping?

TIMOTHY J. O'CONNELL, Department of Zoology, Oklahoma State University, Stillwater, OK 74075, Michael L. Lanzone and Robert S. Mulvihill, Powdermill Nature Reserve, Field Station of the Carnegie Museum of Natural History, Rector, PA 15677, Daniel W. Brauning, Pennsylvania Game Commission, Harrisburg, PA 17110, and Duane Diefenbach, Cooperative Fish and Wildlife Research Unit, Penn State University, University Park, PA 16802.

In 2004, Pennsylvania will commence field work for its 2nd Breeding Bird Atlas. We report on some of our preliminary work to develop a generalized abundance sampling scheme based on "mini-routes" of roadside point counts in over 4000 atlas blocks statewide. In June 2003, we conducted prototype mini-route counts at four sites in central Pennsylvania. At these same sites, we mapped territories of all breeding birds over a three-week period in June and July, including recording a GPS location for every nest in a 40-ha area. We applied count removal models to calculate density based on probability of detection for individual species. To gauge the benefit of using these models, we compared ranked densities of raw count data, count data incorporating detection probabilities, and known densities from territory mapping for the 10 most abundant species common to both datasets. For the ten most abundant species, both raw count data and count data that incorporated species-specific detection probabilities ranked species in roughly the same order as the known density determined by territory mapping. The mean absolute value for rank deviations was 2.73 for raw data and 2.42 for data incorporating detection probabilities. The application of removal models resulted in a slightly smaller and less variable mean deviation in ranks, indicating that applying the models did result in a rank order that more closely approximated known densities of breeding birds. We anticipate that the benefit of applying removal models will be more pronounced for less-detectable species.

Mycoplasmal conjunctivitis in wild House Finches: population structure, movement, and seasonal disease dynamics. CRISTINA R. FAUSTINO, and Evan G. Cooch, Dept. Natural Resources, Cornell Univ., Ithaca, NY 14850.

We are studying an emerging pathogen in a novel host as a model system for exploring disease dynamics in wild populations. In 1994, a bacterium identified as *Mycoplasma Gallisepticum* (MG) was isolated from wild house finches (*Carpodacus mexicanus*) with severe conjunctivitis. Since the initial observation of MG, the disease has spread rapidly throughout the eastern United States. We conducted an intensive mark-recapture study in Ithaca, NY from 2000-2003 to assess the dynamics of MG in the wild. Using a multi-strata analysis, we tested for differences in survival among birds with and without MG, and estimated the probability of movement between disease states as a function of sex, age, and temperature. We examined the effect of transients (birds that have been observed in the study area, and then have subsequently left the area permanently) on survival estimates. Since transients have a zero probability of apparent (local) survival after their first capture, estimates of apparent survival have the potential to be biased low. We investigated a method for evaluating the presence of transients with the added complication of pooled samples, multi-state models, and non-random sampling effort. There is strong evidence to suggest the presence of transients in our sample population. We will discuss whether this may be true transience or 'apparent transience', and how this may influence our understanding of MG dynamics in this system.

Type E botulism caused waterbird mortality in the New York waters of Lake Erie and Lake Ontario, 2000-2003. Kenneth Roblee, Department of Environmental Conservation, Bureau of Wildlife, Buffalo, NY 14203; Ward Stone, Wildlife Pathology Unit, Delmar, NY 12054; and DAVID ADAMS, Nongame and Habitat Unit, Albany, NY 12233.

Department of Environmental Conservation (DEC) staff are familiar with outbreaks of type C botulism, which periodically cause heavy mortality. Type E botulism, and its devastating effect on migrating waterbirds, is a new phenomenon. The first observed outbreak in the eastern basin of Lake Erie occurred November 2000. To monitor and evaluate the impact of type E botulism on waterbirds, thirteen 500-meter transects were surveyed along the Lake Erie shoreline. This survey was replicated during fall 2001, 2002 and 2003. During 2002 and 2003, surveys were also conducted along the Lake Ontario shoreline. Forty-seven transects were monitored during the peak of Common Loon migration, 16 October to 14 November. Predicted mortality for the entire Lake Erie shoreline (NYS) was calculated. During 2000 an estimated 5,415 waterbirds died from type E botulism, while during 2001, 2,862 waterbirds were impacted. Waterbird mortality continued on Lake Erie during 2002 and was first documented on Lake Ontario. Total predicted waterbird mortality for 2002 was estimated to be 18,292 and for 2003 4,610. The single waterbird species with the greatest mortality differed each year. Red-breasted Merganser had a predicted mortality of 2,479 in 2000; Common Loon 1,149 during 2001; Long-tailed Duck 13,219 in 2002; and in 2003 Common Loon predicted mortality was 2,101.

Patterns of mortality from West Nile Virus in a marked population of American Crows in Ithaca, Tompkins Co., New York, 2002-2003. ANNE B. CLARK, Biological Sciences, Binghamton University, Binghamton, NY 13902, Kevin J. McGowan, Cornell Laboratory of Ornithology, Ithaca, NY 14850, Douglas A. Robinson, Jr. and Rebecca Serrell, Biological Sciences, Binghamton University, Binghamton, NY 13902.

Mortality rates from West Nile virus (WNV) in populations of American Crows (*Corvus brachyrhynchos*) apparently exceed those of most other bird species, but are hard to estimate on the basis of winter counts. In a unique, marked population studied for 15 years in Ithaca, NY, the impact of WNV has been local but dramatic over two years (2002-2003). In both years, 35-40% of well-known families died or disappeared during July-early October, WNV season. Most were found dead and tested positive for WNV. Mortality was unbiased by age or sex class. Both those roosting with family members on territory and those roosting communally off-territory died. Birds often moved while in initial stages of illness such that they could have spread the disease to new areas. Deaths also continued after the peaks of mosquito activity; additional routes of transmission could be involved. The sustained high mortality over two years suggests that few crows are surviving infection. Continued monitoring of social and population impacts are needed, together with studies of transmission routes.

***The price of the pecking order: how dominance status mediates immunity in wintering House Finches (*Carpodacus mexicanus*).** DANA M. HAWLEY, Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY 14853.

Parasites and pathogens are receiving renewed recognition as important ecological and evolutionary forces for their hosts, sparking considerable interest in the relationship between host behavior and susceptibility. Social organisms suffer higher rates of parasitism due to the ease of transmission and the impact of social stress on immunity. However, susceptibility to parasites and pathogens may not be equal across group members. I examined how social status influences immune responses to a novel antigen in captive flocks of wintering house finches (*Carpodacus mexicanus*). An individual's dominance status was a strong predictor of antibody response, with dominant individuals mounting significantly higher responses. Furthermore, experimental manipulations of dominance caused proportional changes in antibody response within the same individual. The relationship between dominance status and antibody response appears to be resource-mediated, as changes in dominance positively predicted changes in mass within individuals. My results underscore the importance of the social environment for individual immunity and the value of integrating behavioral ecology into studies of host-parasite interactions.

***The importance of incorporating encounter probabilities in estimates of disease prevalence: an example using the House Finch-*Mycoplasma gallisepticum* system.** CHRISTOPHER S. JENNELLE and Evan G. Cooch, Department of Natural Resources, Cornell University, Ithaca, NY, 14853.

Investigations of wildlife disease systems usually include estimates of disease prevalence, defined as the proportion of individuals in a population that are infected at a given point in time. Patterns of disease prevalence help investigators monitor the temporal and spatial dynamics of wildlife diseases. It is critical that estimation of prevalence be conducted with care, since hypothesized causal mechanisms driving the disease system may be inferred from patterns of prevalence. If prevalence is estimated incorrectly, then both the direction of an investigation and inferences made could be compromised. Estimating prevalence requires information about the numbers of infected and uninfected individuals in the population of interest. In many wildlife disease studies, the encounter probabilities of these two groups of individuals are not considered or are assumed to be 1.0. This assumption is seldom true, and we demonstrate the impacts of estimating prevalence without consideration of encounter probabilities of infected and uninfected individuals, both with real data and hypothetical examples. We show that both the magnitude and pattern of disease prevalence could be biased in studies where differential encounter probabilities are not considered. Based on our conclusions, we urge investigators to incorporate a statistical design that permits the adequate estimation of encounter probabilities in both small- and large-scale studies to avoid biased estimates of disease prevalence.

Predation risk, starvation risk, and radio transmitters in Downy Woodpeckers. JAMES S. KELLAM, Department of Biology, Ithaca College, Ithaca, NY 14850.

Attaching radio transmitters to small birds in winter could increase both starvation risk (through greater energy demand) and predation risk (through higher wing-loading) unless individuals adjust body mass to compensate. In my study of downy woodpeckers (*Picoides pubescens*; 28g), I predicted that relatively lightweight individuals, for whom starvation risk might be greatest, would gain weight after several weeks of wearing a 1.1g radio transmitter, while relatively heavy individuals, for whom predation risk might be greatest, would lose weight. These predictions were confirmed after statistically accounting for temporal patterns in the body mass data. However, the relationship was mostly due to a few unusually light and heavy individuals that gained and lost significant amounts of weight, respectively. In contrast, most downy woodpeckers maintained about the same body weight while wearing radio transmitters compared to their pre-transmitter weight. This resulted in higher wing-loading and presumably higher predation risk during the period. Overall, it appears that minimizing starvation risk was the most common strategy of woodpeckers wearing radio transmitters, even when predation risk was potentially elevated.

Wave molt of the primaries in Accipitrid raptors, and its use in ageing immatures. WILLIAM S. CLARK, 2301 S. Whitehouse Circle, Harlingen, TX 78550.

Primaries of Accipitrid raptors are replaced sequentially outward from the inner P1 to the outer P10, forming a wave. Many species in this family do not replace all ten primaries during the annual molt cycle. They begin the next molt cycle by continuing where the molt left off on the last cycle, AND, importantly, beginning a new wave of primary molt at P1. Knowledge of primary molt can be an important aid in ageing raptors that take more than one year to reach Definitive plumage, *e.g.*, eagles, and in determining the first adult plumage of species that usually do not replace all primaries in the first molt, *e.g.*, Red-tailed Hawk (*Buteo jamaicensis*) and Rough-legged Hawk (*B. lagopus*). Juveniles always show all primaries the same age. Many first adult plumage buzzards show one to three retained juvenile outer primaries. Basic I eagles replace fewer primaries and show from three to six new inner primaries and the rest retained faded juvenile outer primaries. Basic II eagles show new inner primaries (from one to four), some new primaries farther out on the wing, beginning where the last wave of molt left off, in many cases, new P6 to P8. They usually show retained juvenile outer primary P10. Basic III eagles show three waves of new primaries: inner, mid-primary, and outer new. I have noted wave molt in more than 75 species of Accipitrid raptors, including some as small as Broad-winged Hawk (*Buteo platypterus*) and Black-shouldered Kite (*Elanus caeruleus*).

New York State's second Breeding Bird Atlas. KIMBERLEY CORWIN, NYS DEC, 625 Broadway, Albany, NY 12203-4754 and Valerie Freer, Atlas Steering Committee, 686 Cape Rd, Ellenville, NY 12428.

ATLAS 2000, New York State's second Breeding Bird Atlas, is now in the fifth and final season of field work. About 370,000 records of 251 species have already been scanned into the database, and preliminary comparisons can now be made with the data from our first Atlas 20 years ago. The field protocols of the first Atlas have been followed in this second project, permitting direct comparisons of species distribution. Over 1,000 volunteers will do field work in all of the 5,334 5-km blocks in the state. Data management is greatly improved in the current Atlas: after checking by Regional Coordinators, field data are entered into the database using scanning technology, and species lists and maps are made available on the Atlas website (as are the data and maps from the first Atlas). Using the preliminary data from the first four years, we illustrate statewide or regional range expansions in some species, and contractions in others. Several new species are added to the breeding avifauna of the state, and a few found in the first Atlas have not yet been found in the current Atlas.

Trade of Neotropical migratory passerine birds: conservation implications across nations. EDUARDO E. IÑIGO-ELIAS, Cornell Lab of Ornithology, 159 Sapsucker Woods Rd, Ithaca N.Y. 14850, USA.

This research analyzed the international and domestic trade of live Neotropical migratory passerines in Latin America, with a case study in Mexico. Research explores dynamics of the trade including number of species and volumes harvested for both domestic and international markets in Mexico. For a number of species the impact of legal and illegal trapping for the international caged bird trade represents a potentially serious threat to global populations. For example the Painted Bunting (*Passerina ciris*), which has declined by 60% in the U.S. since 1966 is on the Partners in Flight (PIF) WatchList and bird trappers alone have legally taken an estimated 315,000 birds for the domestic trade in a 21 years period. Just in the 2000-2001 harvesting season, 6,000 Painted Buntings, mainly males, were taken for exportation to Europe. Mexico represents the primary wintering and migration grounds for more than 50 species currently on the PIF WatchList. Other 158 Neotropical migrant species share breeding habitats across the U.S.-Mexican border, including 41 species with more than 50% of their North American breeding range within Mexico. Fostering the development of a comprehensive conservation strategy for Neotropical migratory birds in Latin America and the Caribbean, as well as for its diverse resident and endemic avifauna, represents one of the most critical bird conservation needs in North America continent.

Short-term demography of the Veery in south-central New York. PETER T. FAUTH, Department of Biology, Hartwick College, Oneonta, NY, 13820.

The North American Breeding Bird Survey is an important tool for identifying population declines of migratory songbirds. Understanding the causes of these declines, however, requires detailed studies of breeding behavior, reproductive success, and survival rates of songbirds. Although there are many demographic studies of Wood Thrushes (*Hylocichla mustelina*), little breeding information exists for the closely related Veery (*Catharus fuscescens*), a species with negative population trends throughout much of its range. In 2002, I began studying the demography of Veeries in a 300-ha forested tract at Hartwick College's Pine Lake Environmental Campus in south-central New York. To date, I have color-marked 44 adults and monitored 38 nests (417 observation days). I have found no nests parasitized by Brown-headed Cowbirds (*Molothrus ater*). Nonetheless, the reproductive success of Veeries has been relatively poor. Mayfield nesting success was 10.5% and 42.3% in 2002 and 2003, respectively. Overall, the predation rate was 69.3%, 2.8 fledglings were produced per successful nesting attempt, and seasonal fecundity was less than 1 female fledgling per adult female per season. Unlike the reproductively persistent Wood Thrush and Hermit Thrush (*Catharus guttatus*), most Veeries appear to be single-brooded. The low seasonal reproductive effort of Veeries may make them particularly sensitive to the negative effects of forest fragmentation. By continuing to study the breeding biology of the Veery, I will determine how its life history influences population trends locally and perhaps regionally.

***Hoosier National Forest bird population trends: preliminary analyses.** John Dunning Jr., Alexandra Houston, Kathryn Lester, and DAN SCHEIMAN, Department of Forestry and Natural Resources, Purdue University, West Lafayette, IN 47907.

The Hoosier National Forest is embedded in the state's largest patch of contiguous forest. Bird conservation researchers have suggested that large habitat patches may play a critical role in maintaining regional bird populations. In particular, the Hoosier National Forest and surrounding state and private forest lands have been proposed as a source population for many bird species that are common in forest-interior habitats. To help assess the status of forest birds on the Hoosier, the U.S. Forest Service has sponsored point counts throughout the forest at selected monitoring sites. About 500 points are included in the monitoring, but not all points were surveyed in any given year, and monitoring was not done in all years. Using data accumulated from 8 years during 1991-2003, we conducted preliminary analyses of population trends for selected species. These analyses reveal that, of the 17 species examined, seven show significant negative trends, and six show significant positive trends. However, little variation was explained by the models (low r -values) in part because these preliminary analyses do not control for factors known to create variability in avian survey data (such as differences in observer ability). We are reducing variability using detection probabilities to adjust counts. We are estimating these detection probabilities using a closed-capture framework in program MARK. Future analyses will include population trends, as well as abundance at multiple spatial scales.

***Experimental analysis of the behavioral consequences of using nest platforms for management of Common Loons (*Gavia immer*).** JOHN N. MAGER, Department of Neurobiology and Behavior, Cornell University, Ithaca, NY 14853.

To assess the behavioral consequences of using floating nest platforms as a management tool for the Common Loon (*Gavia immer*), I examined changes in productivity and territorial behavior after adding platforms to 10 breeding territories in Oneida County, Wisconsin. Relative to 2002 (pretreatment year- no platforms), territorial males on platform lakes in 2003 exhibited an elevated vocal response to the same acoustic stimulus, suggesting a greater willingness to defend their breeding territories than males living on lakes of similar lake chemistry, territory size, and historical reproductive success, but not having added platforms. Additionally, though conspecific intrusion rates did not vary between groups or years, there was an abnormally high displacement rate (40%) of males on platform lakes compared to the controls (0%), suggesting a heightened competition for these territories. This subsequently led to a significant drop in the proportion of chicks hatched ($t=3.42$, $P<0.01$) and fledged ($t=2.79$, $P=0.02$) per egg laid on platform territories relative to the pretreatment year. These changes in the productivity were also significantly different (hatching success $t=4.25$, $P<0.01$; fledging success $t=-2.51$, $P=0.04$) from those on control territories, where there was no significant change in either (hatching success $t=1.34$, $P=0.22$; fledging success $t=0.43$, $P=0.68$) between years. These results not only support the belief that nest site availability and quality are critical environmental cues loons use to assess territory quality, but they also highlight the potential consequences of using such structures on lakes where reproductively successful pairs and suitable nesting habitat already exist.

Potential effects of climate change on Bicknell's Thrush habitat in the northeastern United States. J. DANIEL LAMBERT and Kent P. McFarland, Conservation Biology Department, Vermont Institute of Natural Science, Woodstock, VT, 05091.

Bicknell's Thrush (*Catharus bicknelli*) is a rare habitat specialist that breeds in montane fir-spruce forests of the northeastern United States and adjacent Canada. A warming climate may reduce availability of this forest type by allowing upslope encroachment of mixed and hardwood forests. We used two GIS modeling approaches to assess how elevated, growing-season temperatures could affect Bicknell's Thrush habitat in the U.S. Both methods rely on known relationships between forest type, temperature, and elevation. We measured the possible effect of 1-6 °C temperature increases on habitat area, number of habitat patches, and mean patch size. Results indicate that an increase in mean July temperature of 2 °C could result in a 90% loss of U.S. habitat and extirpations of Bicknell's Thrush from the Catskill Mountains, the Green Mountains, and the mountains of western Maine. The Adirondack High Peaks, the Presidential Range, and Mount Katahdin are most likely to maintain forest characteristics suitable for Bicknell's Thrush. The disappearance of Bicknell's Thrush from coastal locations in Canada and from small mountains in the U.S. may signal early effects of climate change. The actual pace and pattern of habitat loss will depend on

the rate of temperature change, the influence of stand-level attributes (slope, aspect, substrate), and the effect of climate on reproductive rates, resource competition, and natural disturbance.

***Spring and autumn migration timing changes in North American migrant passerines during a period of global warming.** ALEXANDER M. MILLS, Department of Zoology, University of Toronto, 25 Harbord Street, Toronto, ON, Canada M5S 3G5.

Analysis using spring first arrival dates (FADs) indicates that a majority of migrants now arrive earlier compared to the first half of the twentieth century, consistent with scenarios of global warming. Using FADs to characterize migration systems is problematic. They are data from one tail of distributions, they comprise a mostly male population, and they provide no information about autumn migration. I obtained a banding dataset from Long Point Bird Observatory in Ontario for 14 passerines for a period of global warming (1975-2000). I filtered the data to minimize effects of unequal netting effort, leaving 147,491 records. I then averaged for each season of each year the passage dates for the 1st, 2nd and 3rd quartiles. Only 2 of 13 species showed significantly earlier passage times, although the overall trend is towards earlier spring migration, especially among short-distance migrants. Autumn responses are more prevalent and in some cases more dramatic with 6 of 13 species showing delayed migration. Two long-distance migrants exhibit earlier autumn migration. Where earlier spring migration occurs, both sexes appear to contribute to the change. Where delayed migration occurs in autumn, both sexes and both adults and hatch-year birds appear to contribute in at least some cases. A spring FAD analysis of the Long Point data is consistent with other research, but when the whole migration is considered, change is far from universal in spring and is in fact more substantial and complex in autumn.

The influence of acid rain on the productivity of Purple Martins: a continent-wide, multi-year perspective. James R. Hill, III, Purple Martin Conservation Association, Edinboro, PA, USA 16412, SCOTT A. RUSH and Bridget J. M. Stutchbury, Biology Dept., York University, Toronto, Ontario, Canada, M3J 1P3.

Identifying and understanding the factors that affect productivity of a population is critical to its sound conservation. Many studies have suggested that populations of migratory songbirds breeding within North America have been experiencing human-driven declines. While a number of hypothetical reasons have been offered in explanation of these declines, acid rain has been proposed as an important additional culprit. The ionized affects of acid rain leaches calcium from the soil reducing the availability of this element for songbirds on their breeding grounds. While small-scale studies support this hypothesis no large-scale studies have quantitatively examined the impact of acid rain on the three key stages of songbird reproduction (number of eggs laid, number of young that hatch and the number of young that survive to fledge). Using demographic data collected from colonies of Purple Martins (*Progne subis*) as part of the Purple Martin Conservation's Project MartinWatch, and rainwater chemistry data obtained through the National Atmospheric Deposition Program we have modeled the effects of acid rain on purple martin productivity for the 5-year time period 1995-2000. Results of preliminary analysis suggest that the pH of the rainwater as well as the different compounds within the rainwater have significant, but differing effects on purple martin reproduction. We will discuss the significance of acid rain to the conservation of Purple Martins and how these results pertain to the conservation of other species of songbirds.

POSTERS

***Plumage variation and breeding behavior of the White-throated Jacamar (*Brachygalba albogularis*).** DANIEL J. LEBBIN, Department of Ecology & Evolutionary Biology, Cornell University, Ithaca, NY 14853.

The monotypic White-throated Jacamar (*Brachygalba albogularis*) is typically distinguished from other *Brachygalba* species by its white plumage on the throat and cheeks. Published illustrations and descriptions describe no variation in plumage for this species. Furthermore, nothing about the breeding behavior of the White-throated Jacamar is known, although it is presumed to nest in burrows as other jacamars do. Plumage variation in this species observed in wild birds and museum specimens is described.

Field observations related to breeding behavior and a probable first nesting record for this species are also reported.

***Changes in maternal time allocation over incubation.** SUSAN ELLIS and Margaret Voss, School of Science, Penn State Erie, The Behrend College, Erie, PA 16563.

Small, intermittently incubating songbirds, such as the house wren (*Troglodytes aedon*) must balance time allocations to both incubation and foraging. A particular consideration in this trade-off is the maintenance of optimal egg temperature for proper embryonic development. I used optimal foraging models based on maximizing the percent time devoted to incubation to explore how female house wrens balance these conflicting needs. The model predicted a different time allocation for foraging than actually observed from field data. Time allocation to foraging changed as incubation progressed. Each incubation bout consists of cycles when the female actively heats the eggs, holds the eggs at an equilibrium temperature near 37°C, and allows the eggs to cool while she is away foraging. The female tends to hold the eggs at the equilibrium temperature longer as embryonic development progresses, but actively heats the eggs for less time. I examined patterns of bouts within a day and across the incubation cycle to determine if there were changes in time allocation to self-maintenance and embryonic development. At day 5 the female house wren significantly shifts time allocation to development ($R^2=0.6273$) and away from self-maintenance ($R^2=0.6571$). Changes in the embryonic circulatory system and metabolism may allow eggs to heat more efficiently late in incubation; thus, allowing the female to readjust her time allocations. My results suggest time allocation to incubation is cued by changes in embryonic development as opposed to ambient temperature or parental energetic needs.

***The impact of noise disturbance on reproductive fitness in Black-capped Chickadees.** MELISSA PETERS, Kala Wolfe, and Margaret Voss, School of Science, Penn State Erie, The Behrend College, Erie, PA 16563.

Limited evidence suggests sound disturbance alters the breeding behavior and nest distribution of songbirds. Noise may interfere with a male bird's ability to advertise his social rank and attract mates. High-ranking male birds should prefer low noise territories to reduce song interference. Female birds should prefer these males and should therefore seek extrapair copulations on quiet territories. This should result in a pattern of few extrapair young in low noise nests, but increased extra pair paternity in noisy nests. We are interested in exploring this effect in Black-capped Chickadees (*Poecile atricapillus*) that nest in different levels of traffic noise. We are using a microsatellite analysis to assess paternity patterns on disturbed sites with those from reforested farmland lacking traffic or construction noise. These patterns of extrapair activity will be compared with the distribution of nests within our field sites and with morphometric data collected from offspring and young.

***Sex ratios in Golden-winged Warbler (*Vermivora chrysoptera*) nestlings: Is there evidence of a cost to hybridization?** Kate Neville, RACHEL FRASER, and Dr. Raleigh Robertson, Department of Biology, Queen's University, Kingston, ON, Canada K7L 3N6.

The primary sex ratio of a population of Golden-winged Warblers in Eastern Ontario was examined for potential bias. Although Fisher proposed that frequency-dependent selection should maintain a 50:50 ratio of males to females, recent studies indicate that sex ratio skews often occur. Haldane suggested that if one sex of a hybrid is inviable or infertile, it will be the heterogametic sex. Thus, in birds, if hybrid offspring suffer reduced viability, we would expect the heterogametic females to have lower survival and the sex ratio would be male-biased. As Golden-winged Warblers interbreed with Blue-winged Warblers, Haldane's Rule may apply. Conversely, if hybrid females perceive themselves to be of low quality, we would expect a female-biased sex ratio, based on the Trivers-Willard hypothesis that females in poor condition will produce more females (which have less variance in reproductive success). However, sex ratio skews could be attributed to other factors, including environmental factors and breeding systems, thus could illuminate selective pressures. The offspring sex ratio of the study population exhibited no deviation from unity, thus indicating that male and female young are equally viable. Moreover, there was no deviation from expected proportions of male and female offspring within nests based on the phenotype of mothers, social fathers, or

genetic fathers (hybrid/introgressed vs. pure Golden-winged Warblers). This study corroborates the power of Fisher's Principle, as an example of a population where the sex ratio is maintained at parity.

***Comparing the effects of multiple factors on nest-site selection and nesting success of Eastern Bluebirds (*Sialia sialis*).** KRISTIN NAPPER, Department of Biology, University of Akron, Akron, OH, 44325.

Eastern Bluebirds (*Sialia sialis*) are secondary cavity nesting species that are overcoming declines in their populations caused by habitat fragmentation and interspecific interactions with other native cavity nesting species, such as Tree Swallows (*Tachycineta bicolor*) and House Wrens (*Troglodytes aedon*), and invasive cavity nesting species, such as the House Sparrow (*Passer domesticus*). House Sparrows and House Wrens will compete fiercely with the bluebirds for nest-boxes and often harm the adults and/or young in the process. Tree Swallows will usually live harmoniously with bluebirds as long as there are enough available nest-sites to choose from. During the breeding season (March through August) of 2003, the effects of multiple factors, such as competitors (both native and invasive) and various nest-box characteristics, on nest-site selection and nesting success of Eastern Bluebirds were observed and compared. A total of 84 nest-boxes erected within the boundaries of the Bath Nature Preserve, Bath, OH, and the Metro Parks serving Summit County were used. Selection of a nest-box by all competitors was determined by the nesting activity observed within the box. A bluebird nest with at least one nestling fledged was considered successful. Results and conclusions from 2003's pilot study, which will be presented, were used as a basis for developing this year's study (2004). They were also used to develop curricula for local Akron City Schools, and will lead to a more concrete understanding of which competitors and/or which nest-box characteristics influence the nest-site selection and nesting success of Eastern Bluebirds.

***Reproductive performance of selected avian species breeding on Montreal-area golf courses and neighbouring green spaces – preliminary results.** MARIE-ANNE HUDSON, Department of Natural Resource Sciences, McGill University, Ste-Anne-de-Bellevue, QC, Canada H9X 3V9, and David M. Bird, Avian Science and Conservation Centre, McGill University, Ste-Anne-de-Bellevue, QC, Canada H9X 3V9.

Currently, habitat destruction is the single most important cause of species loss. The concept that already existing green spaces such as golf courses may provide wildlife with suitable habitat is therefore an option that merits further scrutiny. Considering that the average 18-hole course covers approximately 54 hectares, and that there are well over 2,000 golf courses in Canada and over 16,000 in the U.S., the potential for relatively undisturbed wildlife habitat is immense. Little work has been done to analyze the ability of breeding birds to reproduce and thrive on golf courses. This study addresses this issue by comparing the breeding productivity of open-cup nesting birds nesting on golf courses and those nesting on nearby reference sites. A computerized web camera monitoring technique was created, allowing high-quality images of over 200 nests to be captured and archived. Nest checks were efficient, limiting parental disturbance and potential predator attraction. In 2003, Red-winged Blackbird (*Agelaius phoeniceus*) nests were located and monitored on a golf course ($n = 21$) and on a control site ($n = 25$). Mayfield mortality rates did not vary between incubation and nestling stages on either the golf course ($z = 1.48, p > 0.1$) or the control site ($z = -0.06, p > 0.5$). Therefore, overall success rates for each site were calculated and compared. The nesting success rate on the golf course was not significantly different from the success rate on the reference site ($\chi^2 = 0.18, 1 \text{ df}, p > 0.05$).

Quantifying calcium-rich prey species available to nesting Wood Thrushes in regions with different amounts of acid rain. Ralph S. Hames and JAMES D. LOWE, Conservation Science, Cornell Laboratory of Ornithology, Cornell University, Ithaca, NY, 14850.

In previous work, we showed a pattern of declines in probability of breeding by the Wood Thrush (*Hylocichla mustelina*) with increases in wet acid deposition, after controlling for a number of other environmental influences. This suggests that acid rain may be one of the ultimate causes of declines in populations of this species, but begs the question of the proximal mechanisms. Other research suggests that declines of birds nesting in acidified regions is linked to declines in calcium-rich prey species. To address the process behind the observed pattern of declines in eastern North America, we used the Birds in Forested

Landscapes (BFL) protocol to sample for breeding Wood Thrushes at 40 sites in four regions of New York with different soils, parent materials, and amounts of acid deposition. At each site we also collected soil samples and used two different sampling methods to estimate the abundance of calcium-rich invertebrate prey species in the leaf litter. Our results show a strong, highly-significant, positive relationships between both soil pH and extractable calcium and the abundance of calcium-rich prey species. Total biomass of prey was significantly higher at sites where thrushes were present than at those where thrushes were absent. We describe using these results to develop and test a volunteer-based protocol for quantifying prey at study-sites.

***Avian Community Composition in Isolated Forest Fragments: a New Conceptual Model.** WILLIAM P. BROWN, Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE, 19716, and Patrick J. Sullivan, Department of Natural Resources, Cornell University, Ithaca, NY, 14853.

Deforestation, forest fragmentation, and associated edge effects, including increased rates of nest parasitism and depredation of eggs and young, are considered among the primary reasons for recent forest bird population declines. Forest birds do not respond equally to these effects, however: some species increase in relative abundance in small, isolated forest fragments, while others are not present in fragments that appear to be of sufficient quality and area to meet their ecological requirements. Accordingly, “forest fragmentation theory” is insufficient to predict how individual species will respond to deforestation. Based on published data representing 573 forest fragments, we examined the effects of deforestation on the relative abundance of birds in remaining forest fragments. We tested the prediction that species exhibit differential responses to deforestation based on their body mass. We found that forest bird communities in small, isolated forests can be generally predicted based on the area of the fragment and the average mass of individual bird species; mass may be an indicator of competitive abilities. Large and small species are not present, and medium-sized species may increase in relative abundance in small, isolated forests. The limitations and implications of this pattern are discussed.

***Associations, dispersal, and habitat utilization of juvenile Brown-headed Cowbirds (*Molothrus ater*).** SHANNON EHLERS, Department of Biology, University of Akron, Akron, OH 44325.

I am investigating the development of species-specific behaviors in juvenile Brown-headed cowbirds (*Molothrus ater*) during nestling, fledgling, and post fledgling stages. The brown-headed cowbird lays her eggs in a variety of different species' nests, allowing the hosts to raise her young. The young cowbird associates primarily with its host for the first 2-3 weeks of life. During this period, a majority of species-specific behaviors develops in avian taxa. Therefore, juvenile cowbirds are exposed to a diversity of species-specific behaviors in their first weeks of life. How a juvenile cowbird develops into a functioning adult cowbird is unknown. However, by the time migration occurs juvenile cowbirds are associating in conspecific flocks and foraging in appropriate cowbird habitat. In an attempt to track this development, I will place radio transmitters on nestling cowbirds so that daily behavioral and location observations may be taken of individuals. From these observations, I will answer questions about the extent juvenile cowbirds associate with conspecifics during development, how juvenile cowbirds find appropriate habitat after independence, and the extent juvenile cowbirds use the appropriate habitat. Answers to these questions will provide a foundation for further exploration into the development of species-specific behaviors in juvenile Brown-headed cowbirds.

Migration Patterns and Wintering Range of Common Loons Breeding in the Northeastern United States: Preliminary Findings. DAVID ADAMS, New York State Department of Environmental Conservation, Albany, NY 12233; Kevin Kenow and Robert Kratt, United States Geological Service, La Crosse, WI 54603; David Evers, BioDiversity Research Institute, Gorham, ME 04038; Nina Schoch, Adirondack Cooperative Loon Program, Ray Brook NY 12977; Kate Taylor, Loon Preservation Committee, Moultonborough, NH 03254; and Andrew Major, United States Fish and Wildlife Service, Concord, NH 03301.

The Common Loon, *Gavia immer*, is found breeding throughout the northeastern United States. Several surveys have been undertaken to assess the abundance and distribution of summering loons, however, timing, patterns of migration and wintering range have not been adequately documented. During the summer

of 2003, four common loons, three adults and one juvenile, were tagged using implantable satellite transmitters. The transmitters were inserted subcutaneously on the backs of the birds. Data were received electronically. During late-August 2003 through mid-March 2004, we obtained 787 high quality locations (Argos Location Class 1-3), accurate to <1,000 m, from a total of 1,990 location determinations (40 %). The initiation date of migration, number of stopover locations utilized, and total migration-days recorded during fall migration differed significantly between the adult common loons and the juvenile bird. The adult birds wintered along the Atlantic coast of Maine and southern New Jersey, while the juvenile bird utilized Long Island Sound. We plan to tag and monitor additional birds during the 2004 field season. For location updates see: http://www.umesc.usgs.gov/terrestrial/migratory_birds/loons/migrations.html

Annual patterns of waterfowl diversity and abundance at suburban ponds and lakes on Long Island, New York: impact of winter freeze. BROOK LAURO, Department of Computer Science, Mathematics and Science, St. John's University, Jamaica, N.Y. 11439.

Results are presented for a study of waterfowl diversity and abundance at 16 suburban ponds and lakes on Long Island, New York. A characteristic bell shaped curve occurred for both seasons where overall peak diversity and abundance occurred during mid February in the 2000/2001 season and mid January in the 2001/2002 season. There was a positive correlation between pond/lake size and diversity, as well as abundance. Significantly fewer waterfowl were present during the winter of 2000/2001 compared to 2001/2002. This was related to significantly lower temperatures and significantly greater ice cover in 2000/2001 compared to 2001/2002. The discussion considers the importance of winter temperature and ice cover to waterfowl abundance in a suburban environment.

***Characteristics of Downy, Hairy and Pileated Woodpecker foraging sites.** ANNA SOMMO, Emily C. Arell, and W. Herbert Wilson, Department of Biology, Colby College Waterville, ME 04901.

In the fall of 2003 a study of Downy, Hairy and Pileated Woodpecker excavations was completed in the Perkins- Wilson Arboretum at Colby College, Waterville, ME. Information was collected about the different characteristics of wooded sites chosen for excavation by the three woodpeckers. All three species were used due the similarities between excavations made by Downy, Hairy and Pileated Woodpeckers. For the excavations chosen percent canopy cover was recorded, as well as the decay class of the tree (based on a Hunter's Decay Classification Scheme, where 1= live and 10=log) and the overall forest type. The excavations were found most often in 50% forest canopy cover, in broken and decomposing trees and in mixed forests. We speculate that these types of sites were the most common for excavations because of the protection afforded by the canopy cover, the ease of excavating decomposing trees and the opportunistic nature of the birds to excavate in a variety of trees.

***Characteristics of Downy, Hairy and Pileated Woodpecker foraging excavations.** EMILY C. ARELL and Anna Sommo, Department of Biology, Colby College, Waterville, ME 04901.

An assessment of Downy (*Picoides pubescens*), Hairy (*P. villosus*) and Pileated Woodpecker (*Dryocopus pileatus*) excavation sites was conducted in the Perkins Arboretum and Bird Sanctuary at Colby College (Waterville, ME). Trees were chosen at random based on the presence of rectangular foraging excavations and roosting excavations were excluded from the study. Data for the three types of woodpeckers were pooled due to an inability to distinguish the excavations without observing their construction. Aspect, volume and diameter at breast height were analyzed (n=108) to determine the characteristics of woodpecker foraging excavation sites. The data show a preference for excavations at 21-30 cm dbh (p<.001). The majority of trees studied contained multiple smaller excavations with the most common volume of woodpecker excavations in the range of 0-500cm³ (p>.001). The foraging cavity aspects were varied, but a non-significant orientation to the south was observed (p<.10). The study concluded that location and availability of wood-boring insects is likely the main determinant in the excavation characteristics.

Microhabitat monitoring with sensor networks. ALAN MAINWARING, Intel Research Laboratory at Berkeley, 2150 Shattuck Ave, Suite 1300, Berkeley, CA 94704, John Anderson, College of the Atlantic,

Joseph Polastre, U.C. Berkeley Dept. of Computer Sciences, Robert Szewczyk, U.C. Berkeley Dept. of Computer Sciences, David Culler, U.C. Berkeley Dept. of Computer Sciences.

Recent advancements in microelectronics have enabled the integration of microprocessors, low power radios, and diverse assortments of sensors into small, battery powered devices with lifetimes ranging from months to years. Collections of these devices, called *motes*, organize themselves into *sensor networks* capable of capturing continuous high resolution environmental and habitat data, and relaying this information to the outside world via the Internet. Sensor network represent a powerful new tool for biologists with the ability to measure at high spatial and temporal scales, to minimize and largely eliminate observer effects and habitat intrusions, to provide continuous real-time data access via the Internet, and to improve data quality while anticipating reductions in costs of long-term data collection possible with large scale manufacturing. As part of a collaborative research effort, we have deployed several generations of sensor networks on Great Duck Island, Maine to advance this technology while providing novel data to biologists (see Abstract #24). During the 2003 field season, 162 motes were deployed that operated continuously for more than 4 months and provided more than 500,000 sensor readings.

***Habitat selection by Northern Cardinals (*Cardinalis cardinalis*) in urban and rural riparian forests.** LIONEL LESTON and Amanda Rodewald, Terrestrial Wildlife Ecology Lab, School of Natural Resources, Ohio State University, Columbus, OH, 43210.

While many studies have documented general impacts of urbanization on bird communities, few studies have explicitly examined processes (e.g. habitat selection, demographics) responsible for increased numbers of a few urban-associated native bird species such as Northern Cardinals (*Cardinalis cardinalis*). We intend to identify cues used by cardinals to select habitats and evaluate if these cues are related to urbanizing landscapes and to the fitness of cardinals. Cardinals were surveyed within 2-ha areas at 10 riparian forest sites near Columbus, Ohio in 2003. Habitat cues (vegetation structure, floristics, and food resources) were measured within territories and random plots. We also surveyed for cardinals and their nests, monitored the fate of 86 nests, and recorded nest-provisioning rates at 24 of those nests. During fall and winter, we measured cardinal abundance, food availability (fruit abundance, foraging observations, number of bird feeders and ornamental fruit trees) and ambient temperatures. Preliminary results indicate that cardinals occurred at greater densities in urban rather than rural forests. Cardinals may be selecting for dense shrubs, especially exotic *Lonicera* spp., as shrub cover was also positively related to urbanization. No apparent reduction in nesting success, productivity, or nestling provisioning rates was observed in urban forests, suggesting that the urban forests do not constitute ecological traps. We will continue field work in 2004 with the ultimate aim of evaluating if urban riparian forests act as ecological traps.

Assessment of Black Tern Habitat Along Eastern Lake Ontario. DAVID ADAMS, New York State Department of Environmental Conservation, Bureau of Wildlife, 625 Broadway, Albany, NY 12233 and Irene Mazzocchi, Bureau of Wildlife, State Office Building, Watertown, NY 13601.

Six statewide censuses of known black tern (*Chlidonias niger*) breeding sites conducted between 1989 and 2001, throughout New York State, reveal a decline in the number of breeding pair from a high of 284 in 1991 to 155 pair in 2001. Habitat assessments were conducted at sites in which the greatest decline in black tern nesting pairs occurred during the 2002 field season. For comparison, several sites exhibiting relatively stable populations throughout the census period were sampled. Habitat assessment parameters were documented for 15 sites within 12 m and 4 m plots at 112 points along transects bisecting the wetland impoundments. Data collected were analyzed for differences between recently active and historic sites. Sites which had maintained a stable black tern breeding population had more plots with vegetation less than 50 cm in height; more plots with moderate density vegetation and fewer plots with very dense vegetation; more core plots with 3 m diameter pools; and more plots with muskrat activity than did declining sites. Management recommendations were formulated for each site. A statewide management strategy for the maintenance and enhancement of black tern breeding habitat will be developed.

Local impact of Double -crested Cormorant invasion on breeding Ospreys: possible "soft parasitism" on feeding Ospreys in the waters around Gardiners Island, NY. PAUL SPITZER, Cooperative Oxford Lab, 904 S. Morris St., Oxford, MD 21654

I have studied the famous Osprey colony on Gardiners Island., NY, intermittently since 1969. Post-DDT recovery reached a high point of 71 active nests in 1994-95. Since then, the colony has collapsed at a 10% annual rate, to 27 nests in 2003, with annual reproduction often well below replacement rate, and abundant evidence of brood reduction and nestling starvation. (This stands in stark contrast to the tremendous recovery of breeding Ospreys along the East Coast.) Beginning in the 1980's, Double-crested Cormorant (DCCO) colonized 3,000 acre Gardiners Island, with estimates of up to 3,000 birds present in the early breeding season (before annual production of abundant young) by the years of the Osprey collapse. The evidence for competition remains circumstantial. There is some feeding niche separation: Temporal, spatial, and by species and size of prey. However, there is overlap, and some of the observed separation may reflect DCCO success. I suggest DCCO may at times deplete osprey feeding areas after observing them, which I term "soft parasitism". Other fluctuations in Osprey prey base complicate this potential "bioindicator" story. The keystone menhaden (*Brevoortia tyrannus*) prey species has been in decline roughly coincident with the ascendancy of DCCO, but unrelated to DCCO. These events offer the chance for an important ongoing case study.

***Habitat associations, movement patterns, and modeled spread of three parrot (Aves: Psitticidae, Cakatuidae) species on Oahu Island, Hawaii – a preliminary study.** NICK KALODIMOS, Department of Geography/Ecology, Evolution and Conservation Biology, University of Hawaii at Manoa, Honolulu, Hawaii 96822.

Little is known about the habitat associations and movement patterns of naturalized parrot species in non-native semitropical and tropical environments from the initial time of establishment. The habitat associations of the Red-crowned parrot, *Amazona viridigenalis*, Red-masked parakeet, *Aratinga erethrogenys*, and Salmon-crested cockatoo *Cacatua moluccensis*, in their non-native ranges on the Island of Oahu, Hawaii are presented. Steep precipitation gradients, mountainous terrain and a variety of introduced flora on Oahu Island, Hawaii create a range of climate zones and habitat types in close proximity to one another that are utilized unevenly by these three species. Parrot ranges and movements were reconstructed from thirty years of bird observation records and personal observations. Over this time period the home range of *Amazona viridigenalis*, once shared with *Aratinga erethrogenys*, has shifted from a low rainfall suburban habitat to a higher elevation, inland, mesic forest/pasture habitat with less human development. *Aratinga erethrogenys* associate with low rainfall, coastal lowland suburban habitats containing Algaroba tree, *Prosopis pallida*. *Cacatua moluccensis* exclusively associate with lowland valley, closed-canopy rainforest. The three parrot species occupy habitat dominated by non-native flora. The future spread of the species using their respective current habitat associations was modeled using a geographic information system computer model. Habitat differences were characterized by elevation, annual rainfall, as well as dominant vegetation class type and land cover type. Further comparison of non-native habitat associations with native range habitat associations may be useful in future investigations.

Comparing roosting sites of sympatric Blue Jays (*Cyanocitta cristata*) and Gray Jays (*Perisoreus canadensis*) in Victory Bog, Vermont. STEPHEN JOHNSON, RYAN MOUNT, and William Barnard. Biology Department, Norwich University, Vermont 05663.

A colorbanded population of Gray Jays (*Perisoreus canadensis*) at Victory Bog, Vermont has been under study for 14 years. Intracellular blood parasites of the genera *Leucocytozoon*, *Haemoproteus*, and *Plasmodium* have not been found in 92 blood samples from Gray Jays, whereas the prevalence of infection of Blue Jays (*Cyanocitta cristata*) in this study area is 54%. Across North America, 31% of Gray Jays have been found to have blood parasites with prevalences as high as 71% in some studies, so the absence of infection in the Gray Jay in Victory is surprising. It is believed that transmission of blood parasites occurs primarily during periods when the individual bird is immobile, therefore roosting is thought to be when birds are vulnerable to vectors. During the summer of 2003, radio telemetry was used to determine roosting areas of both Blue Jays and Gray Jays. Quadrats within the roosting area were selected for vegetational analysis.

The Importance Value, a measure of relative density and dominance, did not vary significantly between roosting areas of the two species. The canopy height was significantly higher in Gray Jays than Blue Jays. Results of this study reveal potential physiognomic differences that might be related to vector abundance and infection rates in these two species.

***Avian saliva: a tool for controlling feather-degrading bacilli or a source of microorganisms.** ABIGAIL J. MALEY, LAUREN BLYTH, Nadinath N. M. Nillegoda, Edward H. Burt, Jr., Department of Zoology, Ohio Wesleyan University, Delaware, OH 43015, and Jann M. Ichida, Department of Botany/Microbiology, Ohio Wesleyan University, Delaware, Oh 43015.

Birds spend large amounts of time caring for their feathers, the condition of which is critical to their survival. The presence and activity of feather degrading bacteria and fungi could be disastrous for a bird. However, maintenance behavior, which includes bathing, sunning, and preening, may have evolved to minimize microbial degradation of feathers. Birds draw feathers through their mounts when preening. If their saliva has antimicrobial properties, feather degradation could be reduced and the bird's chance of survival increased. Alternatively, if the mount spreads microbes around the plumage feather degradation could be enhanced. The mouths and saliva of wild caught birds were sampled using filter paper, which was then streaked on sterile tryptic soy agar. Colonies of spore forming, non-spore forming, and cocci bacteria were identified and counted. All of the samples yielded microbial colonies. This suggests that preening may not be a defense against bacterial degradation of the plumage.

***The relationship between social dominance and disease recovery in captive flocks of House Finches infected with *Mycoplasma gallisepticum*.** CHRISTOPHER S. JENNELLE*, Department of Natural Resources, Cornell University, Ithaca, NY, 14853, and Dana M. Hawley, Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY, 14853.

The ecological significance of social hierarchies in birds is well known and the published literature reports various advantages conferred to dominant individuals including access to potential mates, feeding areas, and breeding territories. There is little known about how social dominance influences disease dynamics in birds at the individual level. To address this need, we conducted an experimental inoculation of captive House Finches (*Carpodacus mexicanus*) with *Mycoplasma gallisepticum* (MG), an emergent infectious agent known to infect domestic poultry. We captured 22 wild House Finches in Ithaca, NY during the winter of 2001. All birds tested negative for MG infection using PCR and RPA diagnostics, and were quarantined for three weeks prior to the start of the experiment. Two groups of 11 finches with approximately equal sex ratios were housed in outdoor aviaries. We performed delayed-feeding trials to obtain baseline estimates of individual dominance in each group. We inoculated one index individual in each group and monitored the spread of MG infection from February to July 2002. Each week, we examined the birds and assigned an ordinal score for the intensity of infection. The data collected was analyzed using mark-recapture software MARK to determine if the probabilities of infection and/or recovery were related to the dominance status of a given individual. We found evidence that suggests that dominance status is positively correlated with recovery probability in male captive House Finches. This finding reveals the importance of social hierarchy in avian disease dynamics and the evolutionary consequences of social structuring in birds.

Daily survival probabilities of adult and juvenile cliff swallows vary with colony size and ectoparasite load. CHARLES R. BROWN and Mary Bomberger Brown, Department of Biological Sciences, University of Tulsa, Tulsa, OK. 74104.

One potential benefit of colonial nesting in birds is increased survival of breeding adults and/or fledged juveniles due to improved predator avoidance or better food finding in groups. The cliff swallow (*Petrochelidon pyrrhonota*) of western North America breeds in colonies ranging from a few pairs to thousands at a single site. It is unknown how the costs and benefits of coloniality interact to affect fitness components such as survival of birds in different sized groups. Using mark-

recapture data from 239 different colonies from 1983-2003 and a total sample size of 144,349 adults and 22,709 juveniles, we estimated within-season daily survival probabilities of adult and recently fledged juvenile cliff swallows at breeding colonies ranging in size from 15 to 3000 active nests in southwestern Nebraska, USA. Because transient swallows were present at some colonies, we used “age”-dependent models to estimate only the survival of resident birds. Colonies that had been fumigated to remove ectoparasitic bugs allowed us to investigate the effect of ectoparasitism on daily survival. Within-season daily survival probabilities increased with colony size for adults and juveniles in both fumigated and non-fumigated colonies, although the pattern was stronger for fumigated colonies and for juveniles. Birds in the parasite-free colonies had significantly higher daily survival probabilities than those occupying naturally infested colonies. The results reveal a previously unknown advantage of colonial nesting in this species and another cost of ectoparasitism, and represent the first measurement of daily adult survival during the breeding season in relation to colony size for any bird.

***Quantifying gull predation at a Maine tern colony.** CHRISTINA E. DONEHOWER and David M. Bird, Department of Natural Resource Sciences, McGill University, Ste. Anne de Bellevue, QC, Canada H9X 3V9, and Stephen W. Kress, Seabird Restoration Program, National Audubon Society, Ithaca, NY, 14850.

Depredation of tern (*Sterna* spp.) offspring and displacement from preferred breeding grounds have been used to justify nest destruction, harassment, and lethal control of gulls (*Larus* spp.) at seabird restoration sites in the Gulf of Maine. Despite widespread control, few studies have quantified the impact of gull predation on the reproductive success of terns, and none have examined the predatory behavior of gulls at these sites. In 2003, we recorded gull-tern interactions and monitored productivity at a managed, mixed-species colony of Arctic (*S. paradisaea*), Common (*S. hirundo*), and Roseate (*S. dougallii*) Terns located at Eastern Egg Rock, Maine. We estimate that over 31% of chicks and 15% of eggs were depredated by gulls. A small proportion of the total gulls residing on the island (<1%) were responsible for all losses. Laughing (*L. atricilla*), Herring (*L. argentatus*), and Great Black-backed (*L. marinus*) Gulls were seen consuming tern prey, but adults of the latter two species were the principal predators. These individuals (identified by unique color-mark or plumage characteristics) specialized upon tern offspring and maintained feeding territories within the colony, showing a high degree of fidelity to particular loafing and hunting areas. Herring Gulls were subordinate to black-backs of all ages and frequently lost kills to piracy. Predation rates were highest during the period of peak tern chick availability. Younger tern chicks within a brood were particularly susceptible to predation. We discuss the implications of these findings for gull control and seabird restoration efforts and suggest areas in need of further research.

Study of Overwinter Survival monitors seasonal mortality in feeder birds. DAVID BONTER, Cornell Lab of Ornithology, Ithaca, NY 14850.

The Study of Overwinter Survival is a research project seeking to answer questions about seasonal mortality in bird populations. Volunteers (citizens-scientists) make the study possible by monitoring color-banded birds at their own feeders during the winter. By combining resighting data from birds monitored at many feeder locations, survival (ϕ) and recapture (p) probabilities can be calculated to answer questions about overwinter survival. Are males or females more likely to survive? Do older birds have a higher likelihood of surviving than younger birds? How is overwinter survival related to weather? Surprisingly little research has been conducted to answer these questions for even the most common species visiting feeders in North America. A pilot study conducted in Tompkins County, New York is currently following over 700 color-banded individuals of four species. Results of mark-recapture analyses (Program MARK) will be presented, and the potential for the geographic expansion of the study will be discussed.

***A direct test of the sexually transmitted microbe hypothesis of avian copulation in Tree Swallows (*Tachycineta bicolor*).** JENNIFER BRINKS, Patrick A. Thorpe, and Michael P. Lombardo, Department of Biology, Grand Valley State University, Allendale, MI 49401.

We experimentally examined the sexually transmitted microbe (STM) hypothesis of avian copulation using female Tree Swallows. The STM hypothesis predicts that female birds may directly benefit from copulation if they receive a cloacal inoculation of beneficial STMs that can serve as therapy against present infection and/or vaccinate them from future encounters with pathogens. Females were captured during incubation days 7-10, swabbed, and inoculated with *Yersinia* or *Lactobacilli* spp. Fourteen days later, females were recaptured and swabbed again. Counts of bacteria in treated individuals increased after inoculation. However, inoculation had no effect on mass change or reproductive performance. These results suggest that a key assumption of the STM hypothesis is correct.

***The incidence and effects of ticks on migrating birds at a stopover site.** MIRANDA C. ERTEL, Department of Biology, Canisius College, Buffalo, NY, 14208; Mary P. Wright, Shoals Marine Laboratory, Cornell University, Ithaca, NY, 14853; and Sara R. Morris Department of Biology, Canisius College, Buffalo, NY, 14208.

Ticks are common ectoparasites on birds, but little work has examined the effects of ticks on migrating birds. In this study we examined the incidence of ticks on migrants during spring and fall migration on Appledore Island Maine. Because ticks are not indigenous to the island, birds carrying tick have transported them from elsewhere. During the spring 2.4% of migrants captured carried at least one tick, while during the fall 0.6% of migrants carried ticks. However the average number of ticks carried by individuals was higher during the fall than the spring. These trends occurred in several of the commonly captured species, although there was substantial variation among species. Males and females carried similar tick loads within most species. We did not find a consistent pattern of difference in condition (fat and mass) among birds that carried ticks compared to those that did not. Furthermore, comparison of birds carrying ticks with those that did not carry ticks indicated no significant difference in either the recapture rate or the stopover length among these two groups. Although parasites may greatly impact the fitness of individual birds, our results suggest that ticks are not impacting the species of migrant birds that use this stopover site.

***Not watching television (towers) can be hazardous to a bird's health.** COLLEEN E. BELL¹, Arthur R. Clark², Sara R. Morris^{1,2}; ¹Department of Biology, Canisius College, Buffalo, NY, 14208; ²Buffalo Museum of Science, Buffalo, NY, 14211.

Recent increases in the demand for communications towers have renewed interest in the impact of these towers on birds, particularly during migration. The objective of this study was to investigate the characteristics of avian kills at television towers from 1970 through 1999. Birds were salvaged over three decades at two television towers in Western New York during fall migration. Individual kills ranged from 1 bird to 1089 birds. With over 585 visits to these television towers, the majority of the kills were small, involving 10 or fewer individual birds. However, the majority of the individual birds were killed in larger kill events. The two towers differed somewhat in kill characteristics with median kill sizes generally being between 1 and 10 birds at the WGRZ tower and frequently slightly higher at the WKBW tower. The kill sizes varied across the three decades, with no very large kills (greater than 500 individual birds) occurring in the 1990s. The characteristics of these tower kills are consistent with normal avian migration events, in which the number of birds migrating varies substantially between nights. It is notable that the absence of large kills in the 1990s accounts for the previously published declines in birds salvaged at these towers.

Can assemblages of migrating birds be detected using SHEBI analysis? JERRY D. DUDZIAK, Jennifer M. Urbanski, and Sara R. Morris, Department of Biology, Canisius College, 2001 Main Street, Buffalo, NY, 14208; and H. David Sheets, Department of Physics, Canisius College, 2001 Main Street, Buffalo, NY, 14208.

Many species of migrant birds utilize temporary stopover sites between breeding and wintering grounds. Because birds are arriving and leaving continuously during the migratory season, temporary assemblages may form and change. By applying the SHEBI analysis method to bird banding data from Appledore Island, Maine, we investigated the use of this method to detect different assemblages of migratory birds. Additionally, we were interested in determining whether certain assemblages recurred across seasons and among years. Putative assemblages could be identified by detecting increases in a species evenness

parameter derived from species abundance data. For this study, we extended conventional SHEBI analysis by including bootstrap estimates of significance, variable boundary widths and pooling intervals, as well as reverse transect analysis. Our migration banding data did not show repeatable patterns of species assemblages using these methods. Although several putative assemblages were detected, they were not robust to changes in the procedure.

***Stopover ecology of Northern Saw-whet Owls in Pennsylvania.** MICHAEL S. HURBAN, Emily A. Caruana, Sarah M. Musilli, Department of Biology, Canisius College, 2001 Main St., Buffalo, NY, 14208; H. David Sheets, Department of Physics, Canisius College, 2001 Main St., Buffalo, NY, 14208, Scott Weidensaul, Ned Smith Center for Nature and Art, P.O. Box 33, Millersburg, PA, 17061; and Sara R. Morris, Department of Biology, Canisius College, 2001 Main St., Buffalo, NY, 14208.

Migratory Northern Saw-whet Owls (*Aegolius acadicus*) banded at the Ned Smith Center for Nature and Arts during the fall 1999 migration season exhibited low recapture rates (< 5%), with long minimum stopover durations (~7 days). Despite a sample size of nearly 700 individuals, there were only 12 same day recaptures and 21 recaptures on subsequent days, making use of sophisticated open population models impossible due to parameter inestimability. Examination of the data yielded some intriguing results, particularly with respect to the low recapture rate. One explanation of low recapture rates is trap shyness, but the evidence for this was not statistically significant. One concern about the use of the minimum stopover statistic is that recaptured birds may not be representative of the entire migrant population. An examination of measured indicators of condition revealed that the owls recaptured on the same day showed significantly higher fat scores than those owls that were never recaptured and those captured on later days. This indicates that owls with higher condition measures are more likely to be immediately recaptured perhaps due to a higher responsiveness to audio lures.

***Estimability and the utility of open population models.** MELISSA S. MUSTILLO, Kathryn E. Mattern, Kristen M. Covino, and Sara R. Morris, Department of Biology, Canisius College, 2001 Main Street, Buffalo, NY, 14208; and H. David Sheets, Department of Physics, Canisius College, 2001 Main Street, Buffalo, NY, 14208.

Open population models are powerful tools for studying natural populations by providing statistical models of behavior. These models can be applied to banding data of migrating birds to produce estimates of the rates of arrival, departure, and capture as well as estimates of stopover duration. However, the complexity of these models requires that many parameters be estimated from the data, typically using numerical maximum likelihood methods. Sparse or irregular patterns of banding observations may make it difficult to arrive at estimates of parameter values, a difficulty called parameter inestimability. We examined factors in capture histories that might contribute to parameter inestimability. Additionally, we examined these factors in relation to parameter inestimability in the computer simulations typically used to assess Goodness-of-Fit. These factors included sample size, capture history (e.g., the number of days in the capture history, the number of recaptures, and the recapture rate), and number of parameters estimated in an open population model. Discriminant function analysis was used to determine which factors could be used to predict when parameters were inestimable. Parameter inestimability in model fitting and in GOF could both be predicted using the discriminant functions with an accuracy rate of 77%.

***In males shape matters: age and sex dimorphism in the feather shape of Red-eyed Vireos.** KRISTEN M. COVINO, Joanna M. Panasiewicz, and Sara R. Morris, Department of Biology, Canisius College, 2001 Main St., Buffalo, NY 14208; and H. David Sheets, Department of Physics, Canisius College, 2001 Main St., Buffalo, NY, 14208.

Many aspects of avian ecology differ between males and females and between age groups. However, determining the age and sex of many live birds in the field, as well as in the laboratory, has proven difficult and often time-consuming or expensive. Previous studies have shown that the shape of primary feathers may differ among age and sex groups. Geometric morphometrics is a set of techniques that quantifies shape for statistical analysis. We used semi-landmark-based geometric morphometrics with both perpendicular projection and bending energy alignment to quantify the shape of Red-eyed Vireo (*Vireo olivaceus*) primary

feathers by placing landmarks on the periphery of a digital image of a feather and recording the x- and y-coordinates of all landmarks. The results indicated that dimorphism is exhibited in the shape of the left eighth primary feather. The two methods produced conflicting results for which groups show significantly different feather shapes. The perpendicular projection method depicted after-hatch-year males as different from all other groups while the bending energy alignment showed both hatch-year and after-hatch-year males as different from all females. There is some indication that the bending energy alignment increases the variance beyond what the perpendicular projection exhibits causing the results to be less accurate.

***Mouth color and tail shape as an indicator of age in American Crows.** REBECCA HEISS, Kelly Ulion, and Anne B. Clark, Biological Sciences, Binghamton University, Binghamton, NY 13902, Kevin J. McGowan, Cornell Lab of Ornithology, Ithaca, NY 14850; and Carolee Caffrey, Audubon Science, Ivyland, PA 18974.

Tail feather shape and mouth coloration are often used to determine age in birds. In American Crows (*Corvus brachyrhynchos*), the changes from a predominantly pink to a completely black mouth, and from pointed to squared-off rectrices have been used to distinguish first year from older birds. In fact, crows show a continuum of mouth color and intermediate rectrix shapes. Crows typically breed at 3+ years, often after helping at the parental nest. Thus intermediate mouth colors and tail shapes could reflect intermediate ages of life-history significance. We scored tail shape and mouth color, and evaluated whether a) 2nd or 3rd year birds could be reliably identified, or alternatively, b) sex and breeding status affected either or both. Using two populations of known-age birds assessed at banding or death, and three samples of birds captured or shot during winter, we related tail shape to mouth color and to sex, age, and breeding status where known. Tail shape discriminates first-year from older birds. Intermediate tail shapes are associated with intermediate mouth colors, suggesting real year classes. Mouths darken with age and known breeders have the darkest mouths. Variation in mouth color after 2 years is, however, great, and intermediate colors incorrectly classified some known-age birds. One 7-year old helper retained both intermediate mouth color and tail shape, perhaps reflecting its non-breeding status. Studies of behavioral and hormonal status in relation to both mouth color and tail feather shape are needed.

***Determinants of mouth color in nestling American Crows.** DOUGLAS A. ROBINSON, JR., Min Chung Chin, and Anne B. Clark, Biological Sciences, Binghamton University, Binghamton, NY 13902, Kevin J. McGowan, Cornell Lab of Ornithology, Ithaca, NY 14850.

Variation in the mouth color of nestling birds has been related to hunger state, body temperature, and immunocompetence. We examined mouth color variation with respect to body temperature, ambient temperature, and age at banding of pre-fledging nestling American Crows (*Corvus brachyrhynchos*) in 2003. Tongue and palette color were determined based on a standardized color chart, and examined in relation to cloacal temperature, and age determined by: 1. nest observations and 2. nestling morphometrics. Body temperature was significantly related to nestling age and older nestlings were generally warmer than younger ones at all ambient temperatures. Mouth color saturation was negatively related to nestling age at all ambient temperatures less than 20°C. Mouth color of crow nestlings appears to provide a signal of both body temperature and nestling age.

Comparison of digit ratio in male and female House Sparrows. Barbara M. Brown, Michael P. Lombardo, and PATRICK A. THORPE, Department of Biology, Grand Valley State University, Allendale, MI 49401.

Differences between the sexes can help reveal the effects of natural and sexual selection. Humans exhibit sexual dimorphism in digit ratio: the fourth digit is longer, on average, in males and the ratio between the lengths of the second digit and fourth digit (2D:4D) is, on average, smaller in males. This sexual dimorphism is influenced by prenatal exposure to testosterone. Thus, 2D:4D is an easily accessible indicator of prenatal exposure to testosterone and should be found in all terrestrial vertebrates due to digit formation being controlled by the same genes. We measured digit ratio in male and female House Sparrows. There was no difference between males and females in 2D:4D ratio. This suggests that the effects of prenatal exposure of testosterone on digit formation may be different in birds than in mammals.

***Comparison of feather and fecal material for molecular sexing of nestling House Wrens.** MORGAN HAUGEN and E. Dale Kennedy, Biology Department, Albion College, Albion MI 49224.

Theories predict that natural selection should lead to an overall 1:1 sex ratio of male to female offspring. Recent studies have demonstrated that female birds may be able to adjust sex ratios of their broods based on body condition, resource availability, breeding period, and female status. Our goal was to sex nestling House Wrens using DNA extracted from feathers and stool samples. Feathers take several days to form and DNA cannot be collected before days 9-10. Stool samples can be taken sooner than feather samples, so there is a smaller risk of bias in the sex ratio due to early death of nestlings. The null hypothesis was that the overall sex ratio would not differ significantly from 1 male: 1 female. We used QIAGEN DNeasy™ kit with DTT and QIAGEN DNA Stool™ kit for the extraction of DNA from feather and stool samples, respectively. After extraction, we amplified CHD-1 genes from the sex chromosomes by polymerase chain reaction and ran these products on agarose electrophoresis gels to determine sex. In 2003, the overall sex ratio of nestling House Wrens did not significantly differ from a 1 male: 1 female ratio for either first or second broods ($X^2 = 0.018$, $df = 1$, $P > 0.5$). Stool samples yielded insufficient DNA for sexing.

The Library of Natural Sounds (LNS) becomes a multimedia archive for the study of bird behavior. BENJAMIN M. CLOCK and Marc S. Dantzker. Cornell Lab of Ornithology, Macaulay Library, Ithaca, NY 14850.

The Macaulay Library (ML-formerly known as LNS) at the Cornell Lab of Ornithology is building a new Visual Media Library of Bird Behavior. The effort to add video to the Library's collection began in 2000 with the development of a new digital archive strategy for all media. A unique system for long term archival of video assets from virtually any type of source has been developed. A broadcast quality MPEG-2 version along with various lower-resolution and Internet streaming formats for every video asset are produced and stored on a 25 Terabyte hard-disc & server array. In addition to sounds from the ML audio collection, we are now poised to deliver a robust collection of natural history video depicting an enormous diversity of species and behaviors from all over the world to users via the Internet as part of the NSDL (National Science Digital Library). These materials currently include a wide array of sources from production quality Digibeta and HDCAM footage shot by professional videographers, MiniDV footage shot by amateur hobbyists and footage from research collections shot by biologists in the field. Here we will detail the development of this exciting new resource.

Influence of the number of repellent-treated and untreated food or water containers on intake in the European Starling, *Sturnus vulgaris*. ARLA G. HILE, USDA/APHIS/WS, National Wildlife Research Center, c/o Monell Chemical Senses Center, 3500 Market St., Philadelphia, PA 19104, and Michael G. Tordoff, Monell Chemical Senses Center, 3500 Market St., Philadelphia, PA 19104.

The availability of multiple sources of foods or drinks has a profound influence on choice behavior of rodents, so that the most abundant types of substance is chosen preferentially. However, it is not known how other taxonomic groups might respond to the same kind of variation in availability. Birds tend to be visual foragers, and are known to adjust their food selection based on relative densities of alternative foods only when the appearance of the foods differs. Here we tested European Starlings (*Sturnus vulgaris*) with various combinations of repellent-treated or unadulterated water (experiment one) or food (experiment two). In experiment one, birds consumed significantly more of the repellent-treated water (R) than plain water (W) when there were more R bottles than W bottles available, and vice-versa. Therefore in experiment one, an aversion to the repellent was reversed to an apparent preference. Similarly, birds' avoidance of repellent-treated food disappeared when bowls containing the treated vs. untreated food were relatively abundant. These results suggest that overuse of any single repellent could impact the effectiveness of the repellent. Further testing is needed to determine whether these findings will hold true under field conditions. This finding could have important implications in landscape-scale use of chemical repellents for vertebrate pest control.

Effect of cowbird removal on Black-capped Vireo nest success and population growth at Fort Hood, Texas. Richard Kostecke, Scott Summers, and David Cimprich, The Nature Conservancy of Texas, Fort Hood, TX 76544, and Gilbert Eckrich and JOHN CORNELIUS, Directorate of Public Works, Environmental Division, 4612 Engineer Drive, Room 76, Fort Hood Texas 76544.

High parasitism of Black-capped Vireo (*Vireo atricapilla*) nests (up to 91%) by Brown-headed Cowbirds (*Molothrus ater*) and associated low nest success (< 5%) at Fort Hood, Texas, warranted cowbird removal. Beginning in 1988, cowbirds were removed from vireo nesting habitat with little effect on parasitism rate and nest success. However, parasitism rate decreased (< 20%) and nest success increased (> 20%) with the onset of more intensive removal efforts in 1991. Number of territorial male vireos at Fort Hood has also increased over time from 9.00 (95% CI = 6.01–11.99) in 1987 to 38.33 (95% CI = 18.46–58.20) in 2003. Nest success and parasitism rate varied by management regime (i.e., different combinations of trapping, shooting, and cattle grazing) within particular regions of Fort Hood, but generally increased and decreased, respectively, over time. Because removal techniques were applied simultaneously and without controls, it is difficult to determine the exact effect that these techniques had on vireos. However, a reduction in parasitism rate on the East Range of Fort Hood can be attributed to a reduction in cattle stocking rate. On West Fort Hood, trapping efforts were absent or minimal; thus, a reduction in parasitism rate and an increase in nest success can be attributed primarily to shooting. The effectiveness of shooting on West Fort Hood suggests the possibility of reducing or eliminating trapping when it is cost and time efficient to do so. Overall, we attribute success in meeting local and regional management goals for the vireo to cowbird removal.

A comparison of the three-minute point count and the five-minute point count. DARRYL SPEICHER and JACKIE SPEICHER, Pocono Avian Research Center, P.O. Box 4, Cresco, PA, 18326.

Many researchers utilizing point counts to conduct breeding bird surveys use three minutes of monitoring at each point before moving on to the next. Others argue that three minutes is not enough time to allow more secretive species of birds or timid individuals to vocalize and suggest that five minutes at each point is required. The Pocono Avian Research Center, Inc. (PARC) was contracted by the Nature Conservancy to do point counts during the 2003 breeding season. Point counts were conducted in the Cherry Creek watershed, located in southern Monroe County, PA. The protocols assigned by PARC called for five minutes of observation at each point. Each five minute observation period was divided into three-minute and two-minute segments. The findings of this study indicate that there is a portion of the breeding bird population being underdocumented when adhering to a strict three-minute point count protocol.

Integrating GPS, GIS, and avian call-response surveys using pocket PCs: an example using Cerulean Warblers. Scott H. Stoleson and Kari Kirschbaum, U.S.D.A. Forest Service, Northeastern Research Station, Irvine, PA 16329, Jack Frank, U.S.D.A. Forest Service, Allegheny National Forest, Warren, PA 16365, and Chad Atwood, School of Forest Resources, Pennsylvania State University, University Park, PA 16802.

Avian surveys employing a call-response (tape playback) methodology are especially useful for detecting cryptic or elusive species (e.g., owls, marsh birds) that are poorly sampled by passive methods. Increasingly, researchers have used GPS and GIS to incorporate the spatial arrangement of birds across landscapes, linking field locations with existing GIS layers of vegetation cover, hydrology, or elevation. Typically, to simultaneously broadcast vocalizations for surveys, record GPS locations, and collect additional field data would require separate equipment for each task: a CD or tape player, a handheld GPS unit, and a clipboard with data sheets. We developed an efficient technique to accomplish all three tasks using new technology in the form of a handheld Pocket PC computer (Dell Axim X5), with added GPS antenna and receiver and external, self-amplified speakers. We used this setup to survey for Cerulean Warblers (*Dendroica cerulea*) in northwestern Pennsylvania. Cerulean songs in mp3 format were broadcast at survey points. We simultaneously collected spatial data using ESRI's ArcPad™, a mobile mapping and GIS program designed for the Pocket PC platform. Additional site information was recorded in a spreadsheet. All data were automatically uploaded to a desktop computer through process of synchronization. This compact and relatively inexpensive technology has great potential for avian research.

Detecting warning signs of trouble within population fluctuations: using capture-recapture modeling to uncover changes in population dynamics leading to declines. JEFFREY A. SPENDELOW, Jim D. Nichols, William L. Kendall, James E. Hines, and Jeff S. Hatfield, USGS Patuxent Wildlife Research Center, Laurel, MD, 20708, and Ian C.T. Nisbet, I.C.T. Nisbet & Co., North Falmouth, MA, 02556.

An intensive mark-recapture/resighting program has been carried out on the Roseate Terns nesting at Falkner Island, Connecticut, since the late 1980s as part of a regional study of the metapopulation dynamics and ecology of the endangered Northwest Atlantic breeding population of this species. Substantial losses of tern eggs and chicks to predation at this colony site began in 1996 when at least five Black-crowned Night-Herons started nocturnal raids. This depredation has been a major factor in the reduction of productivity from an average of about 1.0 chicks/pair for the 10 years before night-heron predation began to as low as about 0.2 chicks/pair in 2002. Recent capture-recapture modelling analyses have detected other important impacts on the population dynamics of the Roseate Terns at this site including a reduction by about half in the "development-of-residency" rates of first-time breeders, and a substantial decline in the local "survival-and-fidelity" rates of experienced breeders believed due mostly to increased immigration rates to other colony sites.

***The prevalence of flight calls in wood-warblers during non-migratory periods.** ANDREW FARNSWORTH, Cornell University, Department of Ecology and Evolutionary Biology, Corson Hall, Ithaca, New York 14850.

Flight calls of migrating birds apparently serve to maintain flocks and to communicate information, and these vocalizations occur frequently at night and occasionally during the day. Although daily pattern information is available, little is known about seasonal patterns. I studied flight calling behavior of 16 species of wintering warblers in southern Mexico and eastern Cuba during January and February 2004 and 14 species of breeding warblers in the Adirondack State Park in New York during June 2003. I observed individual birds for 10 minute periods, noting prevalence of flight calls, age and sex of birds, any behavior associated with these calls, and conditions (e.g., time of day, weather) associated with these calls. I made observations on 28 days in 169 observation periods during winter 2004, and I made observations on 21 days in 123 observation periods during summer 2003. I recorded no flight calling activity for 11 species during winter observations; for 5 species, I recorded flight calls, although in only one species – Cape May Warbler – were flight calls given with any regularity. I recorded no flight calling activity during summer observations with the exception of one species – Nashville Warbler. Flight calling appears to be restricted to migratory periods; however further summer studies of warblers in the post-fledging and pre-migratory stages and winter studies in recent post-migratory and pre-migratory stages are critical for clarifying this conclusion. Once complete seasonal information is available, a clearer understanding of the function of flight calls will be possible.

***Do male House Wrens sing the same songs year to year?** SHARI GROSS and E. Dale Kennedy, Biology Department, Albion College, Albion MI 49224.

Male House Wrens (*Troglodytes aedon*) use songs to attract mates and establish and maintain territories. Each song consists of two parts, an introduction and a terminal section, and songs vary depending on the number and combination of different notes. Some bird species have been found to sing only songs that they learned while young but others are able to pick up new notes and songs as adults. It is not known whether House Wrens can add new notes as adults or how many different songs each wren is capable of singing. We used Avisoft SASLab Pro to analyze recordings made during early morning bouts of unmated male House Wrens that sang in Whitehouse Nature Center, Albion College, for two or three consecutive years. We analyzed 6,650 songs of 11 individual males to determine whether they sang the same songs year after year. Each male sang a variety of song types (range 10-74 types) but showed little or no overlap in song types (0-6) between years. Most males increased the number of song types as a function of number of songs. One male recorded at multiple times during the same day sang different song types at different times of day. These results suggest that House Wrens create large song repertoires by combining different notes

***Spectral and temporal variation in song in an eastern population of the Grasshopper Sparrow (*Ammodramus savannarum*).** Sarah Wakamiya, Sarah Bruno, Bernard Lohr, and Douglas E. Gill, Department of Biology, University of Maryland, College Park, MD 20742.

We examined microgeographic variation in the spectral and temporal characteristics of song in an eastern population of the grasshopper sparrow (*Ammodramus savannarum*). We recorded songs on a 230-acre experimental grassland at the Chester River Field Research Center near Chestertown, MD, during the summer of 2001. Grasshopper sparrows produce two distinct classes of song. We measured both individual and population variation in measurable features of the Type I ("buzz") song of these birds. Variation in song characteristics was significantly greater across individuals than within individuals, and neighboring birds exhibited relatively distinct total power spectra when compared with the population as a whole. Our results support the suggestion that song features could be used for individual recognition of territorial neighbors in this species.

***Are the effects of the eastern House Finch bottleneck evident today? An investigation through the use of allelic and haplotypic diversity.** DANIEL HANLEY, Dana Hawley, and André Dhondt Cornell University, Ithaca, NY.

House finches (*Carpodacus mexicanus*), although now common across all of North America, are relatively new arrivals to the East Coast. House finches were introduced in Long Island in 1941, after being released by a pet store owner that realized they were a protected species. It may have been thought that this west coast species would not survive the harsh winters of the northeast. However, house finches have proven to be extremely resilient, and are now one of the most common winter birds in many parts of the east. Since the founding population of eastern house finches was small, it is likely that there was a significant population bottleneck, which may have reduced levels of genetic variation. However, no one has provided genetic evidence of a significant bottleneck in this species. We test for genetic fingerprints of a bottleneck by comparing eastern house finches to their native western counterparts. We analyzed six populations (three eastern and three western) and compared allelic and haplotypic diversity. We discuss the results of this analysis, along with the implications of house finch genetic diversity for resistance to a novel epidemic pathogen, *Mycoplasma gallisepticum*, which is prevalent in this species across United States.

***Geographic variability in mitochondrial introgression among hybridizing populations of Golden-winged and Blue-winged warblers.** AMY DABROWSKI, Cornell Laboratory of Ornithology, Ithaca, NY 14850, Rachel Fraser, Department of Biology, Queen's University, Kingston, ON, Canada K7L 3N6, John Confer, Biology Department, Ithaca College, Ithaca, NY 14850, and Irby Lovette, Cornell Laboratory of Ornithology, Ithaca, NY 14850.

The Golden-winged Warbler (*Vermivora chrysoptera*) is of conservation concern because of its current rapid population decline throughout the northeastern U.S. The advancement of Blue-winged Warblers (*V. pinus*) into historically Golden-winged habitats and the hybridization of the two species in areas of sympatry may play a role in the decline of Golden-winged populations. In this study, we obtained mtDNA sequences from 104 individuals of known phenotype from two study sites that have different histories of contact. The Sterling Forest site in southern New York has been populated by phenotypically pure Golden-wings and Blue-wings and their hybrid phenotypes for over a century. The Queen's University site in southeastern Ontario has been populated by only Golden-winged phenotypes since the mid 1900's, followed by the recent invasion of Blue-winged and hybrid phenotypes within the past 5 years. We surveyed the relationships between phenotype and mtDNA haplotype in individuals of each population and found that while the results from both sites indicate that introgression occurs bi-directionally between the species at each site, there is variation between sites in terms of the rate and extent of introgression. In southern New York, phenotypically pure Golden-wings possess either Golden-winged or Blue-winged type mtDNA at approximately equal frequencies. At Queen's, most samples of phenotypically pure Golden-wings have Golden-winged type mtDNA, while only a few possess Blue-winged type mtDNA. This comparison suggests that sites with different histories of contact may experience differing levels and patterns of hybridization and subsequent introgression.

