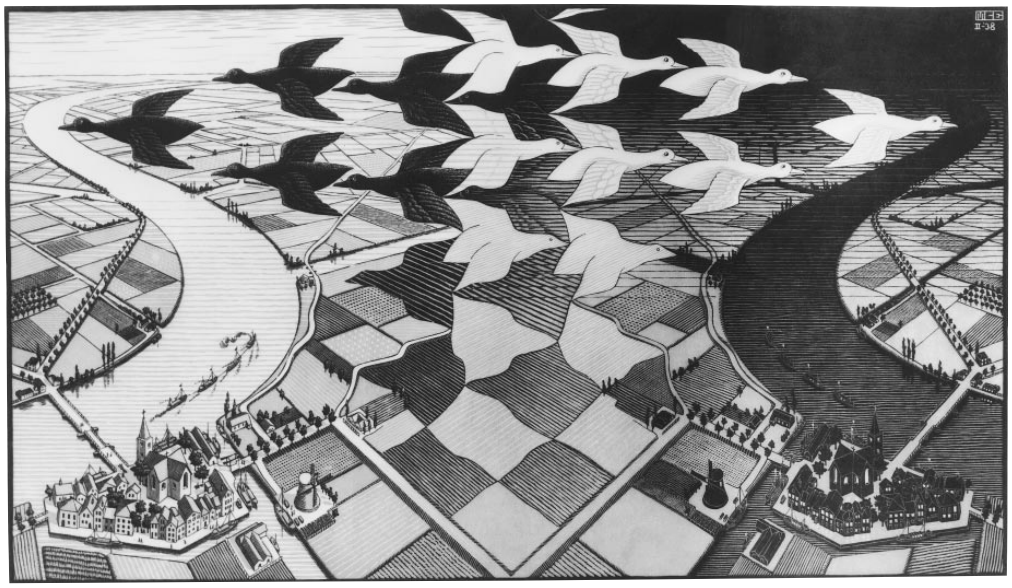
Conserving *Birds* in Human-Dominated Landscapes: Weaving a Common Future



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POSTER ABSTRACTS

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Abstracts are listed alphabetically, by first author. Names appearing in all capitals are of the presenting author attending the symposium. Contact information appears after author affiliation in the byline.
Posters on display during the symposium are organized alphabetically, by first author, beginning to the left on entering the Hall of Northwest Coast Indians.

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Teaching and Learning about Birds in Human-Dominated Environments: Linking Local City Sites with Museum Exhibits and research to Promote Advocacy and Stewardship

Response to the urgent need for quality science education and environmental stewardship must be a vital priority for educators, citizens, and Community Based Organizations (CBOs). With increasing encroachments on a variety of habitats, knowing and learning about the issues and resources needed to preserve and protect birds are the goals of the New York Habitats BIRD Curriculum Project. Education departments at the American Museum of Natural History (AMNH) and Bank Street College of Education in partnership with schools and CBOs are developing teaching and learning experiences for children and adults to foster informed and active environmental stewardship in human-dominated environments. All participants are involved in an inquiry-based process that links local knowledge with multi-site experiences in the classroom, neighborhood, and museums. This expeditionary learning approach culminates in communication through advocacy activities and sharing with the wider community through exhibit techniques adapted from the AMNH. Over the past five years, curriculum for students in kindergarten through 8th grade was developed, implemented, and evaluated with The After-school Corporation and adopted by school-day as well as after-school programs throughout New York City. Topics are selected to provide for local investigations and to link with the American Museum of Natural History's exhibits, collections, and research on birds. This presentation focuses on efforts in schools, CBOs, and graduate-level preparation of teachers for learning and teaching about birds. The BIRD Curriculum developed through AMNH partnerships will be featured along with bird studies designed by teacher candidates in the Museum Education program at Bank Street College. Illustrating and exemplifying the scope of the Bird Study, student work from Community Elementary School 42 will be displayed. Ultimately, all learners, children as well as adults can benefit from a learning process linking their local knowledge with the resources and research on birds offered by learning institutions such as the AMNH for awareness and advocacy.

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Bald Eagles in New York City: Preliminary Results of an Urban Raptor Release Project

In June 2002, the Urban Park Rangers, a division of New York City Parks and Recreation, began a five-year bald eagle (Haliaeetus leucocephalus) *release project. Goal: to determine whether or not released immature bald eagles will establish nesting areas around the Lower Hudson River where they have historically bred. 20 juvenile bald eagles will be "hack" released (four eagles each summer) on the Hudson riverfront Inwood Hill Park in Manhattan's oldest natural forest. Based on a bald eagle release project in Washington, DC, we expect one of 20 eagles (5%) will nest (at sexual maturity) in the proximate area within the next five years. For each release, the eagles are outfitted with short-distance (2-5 miles), short-lived (6-9 months) radio transmitters to allow local tracking. Starting in 2005, eagles also carry satellite transmitters that last approximately 3 to 5 years and allow long-distance global tracking. The tracking data will map the eagles' movements and flight patterns, and confirm their return to nest. Preliminary results indicate the following: (1) The "hacking" method has been successful in fledging eagles. One of the 16 released birds died during the fledging stage. Two others were confirmed dead in the wild upon retrieval of leg bands. (2) Eagles have over wintered with other wild eagles (visual observations) and there are documented current sightings of wild eagles at Inwood and adjacent park areas. (3) To date the eagles have migrated as far north as Quebec and as far south as Virginia. Beginning in the summer of 2006, we are planning to conduct a full analysis of satellite data that will be received for up to 5 five years for the 8 eagles from the 2005 and 2006 releases.*

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The Effect of Water Level on the Nesting Success of the Federally Endangered Cape Sable Seaside Sparrow *(Ammodramus Maritimus Mirabilis)*

The Cape Sable Seaside Sparrow (Ammodramus maritimus mirabilis) *is a federally endangered subspecies of Seaside Sparrow endemic to the freshwater prairies of the Everglades in South Florida. Intense agricultural and urban devel-*

opment in South Florida has led to habitat loss and an altered hydrologic regime within the Everglades ecosystem. Previous studies have shown that a change in intensity and timing of water flow through the Everglades can result in nest flooding and increased nest predation on the sparrow. Specifically, a predation pulse was shown to be associated with high water levels during the breeding season. While the correlation between increased nest predation and high water levels is clear, it is unknown how the temporal aspect of water inputs (both managed and natural) affects nesting success. To address this issue we monitored 338 nests over eight breeding seasons and recorded water levels on a daily basis. We used this data to build a stepwise logistic regression model with daily nest survival as the binomial response variable and Water Time Windows, which are averages of daily water levels over periods of time that are biologically significant to the sparrow, as our covariates. The covariate (water time window) representing the water average over the period of time nests were monitored was retained in the model as significant. This identifies point-in-time water inputs during the nesting period as the critical variable that reduces sparrow nesting success. Water management is an integral part of the Everglades restoration. The results of this study can be incorporated into water management guidelines with the goal of increasing the nesting success and population growth rate of the Seaside Sparrow.

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WHERE THE PAVEMENT MEETS THE SAND: BIRD CONSERVATION IN 21ST CENTURY NEW YORK CITY AREA

The New York City Metropolitan Area, with over 11 million people, might seem an unlikely setting for avian conservation. However, a team consisting of Federal, State, and local governments, volunteers, and private organizations is preserving and monitoring critical habitats and open spaces, undertaking on-the-ground restoration efforts, and educating the next generation to promote coastal bird conservation. A landscape approach is being undertaken across diverse habitats and locales to achieve the goals of migratory bird and endangered species conservation. The focus is on two National Park Service (NPS) areas. The first is the urban wilds of the Jamaica Bay (JABA) Unit of Gateway National Recreation Area, located within the borough of Queens, New York City. The 29-square-mile Unit is comprised of Jamaica Bay and its salt marshes; 5 upland islands; and portions of southern Brooklyn and Queens, including the Rockaway Peninsula. The second is Fire Island National Seashore (FIIS), a 26-mile-long barrier island located on the south shore of Long Island in eastern Suffolk County. The FIIS area includes ocean beaches, salt marshes, and an eight-mile stretch of federally designated wilderness. Each of these NPS areas has significant potential breeding habitat; and each averages about 4 million visitors per year. However, both also have significant anthropomorphic disturbances (pets, vehicles, kite flying, etc.), which limit breeding success. Since 1986 the NPS has been monitoring species across the landscapes at the JABA and FIIS. Years of monitoring data has suggested that each NPS area needed to implement various strategies for habitat protection. These include providing for vehicle-free beaches, pet-free areas, and other restrictions in use of habitats that have historically been used by endangered species for breeding (or, in the case of protected plant species, germination). Since implementing various protection strategies in consultation and partnership with the U.S. Fish and Wildlife Service, productivity of endangered species has been successful in both areas.

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HOW MUCH HABITAT IS ENOUGH? AREA-SENSITIVE BIRDS IN URBAN AREAS

The Canadian Wildlife Service's How Much Habitat is Enough? *initiative provides guidelines for habitat restoration and conservation in human-dominated landscapes. Restoration of wildlife habitat within Great Lakes urban centres often involves multiple stakeholders using limited resources. One key question for decision makers is the viability of restoring or maintaining area-sensitive forest bird habitat in urban or urbanizing landscapes. In assessing the viability of urban forests various factors were looked at through a literature review. These included: potential and actual area-sensitive forest bird populations, urban stressors on forest birds, and possible actions to restore urban forests. The stressors thought to have the most impact on forest bird breeding were: disruption of ecosystem processes, predation by urban-sponsored native predators, noise, and barriers to connectivity. Coupled with these stressors area-sensitive forest birds are also heavily dependent on other forest habitat metrics, in particular total forest cover and forest quality. Of over 40 potential area-sensitive forest breeding birds in Toronto only 14 still occur as breeding birds with any regularity. The inability to restore total forest cover in an urban matrix raises doubts about the ability of urban systems to support area-sensitive forest bird species. Instead, identifying and protecting existing exurban and rural forest cover well above a minimum*

30 percent threshold, before urbanization, is the most practical and appropriate means to provide habitat for area-sensitive forest birds. Traditionally restoration has been initiated to generally benefit wildlife, including forest birds. While habitat restoration will greatly benefit other critical ecological services provided by urban forests, including habitat for non-area sensitive birds, it is unlikely to benefit area-sensitive forest birds. The study shows the importance of setting clear objectives for restoration in urban areas and moving beyond traditional wildlife conservation context and considering new ecological threshold targets in fundamentally changed urban environments.

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LOGGING IMPACTS ON BIRDS IN NEW YORK: A ROLE FOR PRIVATE FOREST STEWARDSHIP IN BIRD CONSERVATION

Timber harvesting can have significant impacts on bird communities as a result of changes in habitat structure. We conducted bird and vegetation surveys in 71 northern hardwood stands in upstate New York from 1999-2001 to quantify avian responses to logging as it is conducted on private lands. In our study, we analyzed responses of three ecological habitat groups of bird species (based on previously published studies): generalists, those that prefer "early" forests with relatively few large trees, and those that prefer more "mature" forests. In addition, we analyzed the responses of individual species and all species pooled. Forest stands were grouped using cluster analysis of residual basal area and tree size into four categories resulting from their recent management: uncut or lightly thinned (category A), moderate partial harvest (category B), heavy partial harvest (category C), and clearcut (category D). Early-forest birds were more abundant in more disturbed habitats and were more habitat-specific than were mature-forest birds, which showed considerable overlap among forest categories in terms of both relative abundance and richness. For example, the abundance and richness of mature-forest birds were very similar in categories A and B and only slightly lower in C, whereas early-forest birds rapidly increased in abundance and richness across categories from A to D. Neither abundance nor richness of the generalists differed significantly among forest categories. The use of ecological habitat groups and forest condition categories simplified our findings and provided a meaningful way to describe to forestry professionals and landowners how birds responded to logging. These results provided the basis of a forestry education initiative promoting sustainable, wildlife-friendly forestry that targets private forest owners, who control nearly 85% of New York's forests. The education initiative was designed and implemented by a diverse group of stakeholders, including agency, non-profit, industry, and landowner representatives.

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GENETIC ANALYSIS OF REESTABLISHED URBAN PEREGRINE FALCONS *(FALCO PEREGRINUS)* IN THE MIDWESTERN UNITED STATES

The reintroduction and reestablishment of Peregrine Falcons (Falco peregrinus) *in the Eastern and Midwestern U.S. represents one of the most compelling examples of a native species adapting and even thriving in a highly modified, human-dominated ecosystem. Peregrine Falcons were extirpated from some regions of the United States as a result of DDT poisoning. Following the ban of DDT, efforts to reintroduce Peregrines began in 1975. Sixty-one captive Peregrine Falcons of five subspecies were bred in captivity, and their progeny released in the Midwestern United States from 1982 through 1998. Releases into cities have been more successful than those into the Peregrine's natural habitat, and currently over 150 pairs are breeding in the Midwest. We intend to establish if the reintroduction of the species resulted in reduced levels of genetic variation, as would be expected. To this purpose, we are interested in assessing population genetic structure, dispersal, and mating systems of Peregrine Falcons in urban ecosystems. Monitoring the genetic status of reintroduced Peregrines requires the use of high-resolution molecular markers such as microsatellites. Preliminary analysis of 20 representative Peregrines using seven microsatellite loci (consisting of tetra- and pentanucleotide repeats) indicated relatively high levels of allelic diversity (3-10 alleles per locus), and gene diversity ranging from 0.617 to 0.912. Thus we conclude that the bottleneck associated with the reintroduction did not result in severely reduced levels of genetic variation. Additionally, these preliminary results indicate that these markers will allow us to assess the relative contribution of the different founders (and their respective subspecies), reconstruct pedigree relationships, and compare the genetic composition of the reintroduced population to that of the extirpated native population through analysis of museum specimens.*

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Effects of Old Field Succession on a Population of Field Sparrows Breeding in Northeastern Pennsylvania, USA

Many bird species breeding in open shrub/scrub type habitat in the eastern United States are experiencing population declines partially due to the habitat loss that occurs when such areas continue their natural successional changes from once-used agricultural fields toward climax forests. Field Sparrows (Spizella pusilla) *are one such species. I have been following the mating and reproductive biology of a population of field sparrows in northeastern Pennsylvania since 1986. Over this time interval, the breeding habitat has changed from a state of relatively open fields with small, scattered woody vegetation to areas that are heavily overgrown with shrubs and trees. As this old field succession has occurred, the number of Field Sparrow breeding territories has declined steadily. However, the successional change and decline in population size are not significantly correlated with any change in individual sparrow breeding parameters, such as adult settlement dates, territory fidelity, adult survivorship, nestling growth rates, or reproductive success. Thus, as old field succession makes much of the habitat suboptimal for the sparrows, the few Field Sparrow that remain are able to find patches of suitable habitat sufficient for breeding. On those patches the smaller remaining population of sparrows is able to reproduce just as successfully as individuals that bred earlier in the successional sequence. As a result of this patchy nature of succession and of the birds' responses to it, it is likely that reduced populations of shrub/scrub breeding bird species may persist on those successional areas for much longer periods of time than would otherwise seem probable.*

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Bird Community Monitoring in a Vegetation Succession Designed as a Connection Strategy between Two Subandean Forests in the Central Andean Mountains, Colombia

Habitat forest connectivity in rural landscapes affects its structure and function. A dynamic way to enhance connectivity is through restoration strategies that can be used to implement Landscape Management Tools (LMT) in landscape elements that were previously selected by their high conservation opportunity values. LMTs are used to increase quality, quantity, and connectivity of native vegetation at landscape level. LMTs were implemented in a cattle-raising landscape at the Western slope of the Colombian Andes Central Cordillera, using native plants that favor natural succession. The first step was revegetation of previously pastured or commercial tree plantation areas and protection of riparian connective forests. The ultimate goal is to connect two fragments of ecological importance at a local level, and subsequently connect them to a protected area at a national level. Birds were used as indicators to describe the colonization process that occurs with this kind of management strategy. Point counts were used in each vegetation cover type (mature forest, secondary forest, and the revegetated area). In each spot, bird species abundance was measured, in order to determine avian colonization processes from forest to revegetated areas. Also, relative species abundances were quantified at different temporal scales. Detrended Correspondence Analysis identified the most representative species of early successional stages, species with higher disturbance tolerance and, finally, forest species in different sampled habitats. Understory insectivorous species (e.g. Henicorhina leucophrys *and* Basileuterus tristriatus*) started territory establishment in revegetated areas. Furthermore, frugivorous forest species (e.g.* Habia gutturalis*) expanded their local range from mature to secondary forests, and others (e.g.* Tangara ruficervix*) were seen foraging in revegetated areas. Monitoring of avian community in each habitat at different temporal scales will allow increasing knowledge of colonization strategies during succession process in a subandean forest.*

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Can Residential Yards Support More Birds? A Preliminary Study

As human populations grow and natural areas dwindle, the conservation importance of residential yards increases. Our goals were to assess the feasibility of (1) using existing Citizen Science tools to study and manage birds in residential yards on a continental scale and (2) identifying yard-specific habitat factors and private-landowner decisions that influence bird species richness across the urbanization gradient. We contacted bird-watchers who had contributed presence/absence checklists around their residences via an on-line project (eBird.org) and surveyed them about landowner activities surrounding their residences. From analyses of 155 yards, we found decreases in avian species richness with increasing housing density (rural-semirural-suburban-urban scale; $F_{3,154}=10.02$, $p<0.001$). Based on two-factor ANOVAs for each housing density category we found a negative effect of cats on species richness in suburban yards ($F_{1,52}=5.21$, $p=0.03$) and a negative effect of dogs on species richness in rural yards ($F_{1,46}=4.99$,

p=0.03). Presence of forest within 0.5km radius of the yard was not significantly associated with higher species richness ($F_{1,154}$=1.80, p=0.18). To detect effects of these variables with high power (>0.8), we would need data from over 7,000 yards. At least one Citizen Science program that takes place in yards, Project FeederWatch, has approximately 11,000 participants, suggesting that sample sizes are attainable. Only highly educated individuals participated in urban areas, suggesting that we need to employ community-based recruitment models to obtain balanced samples across the urbanization gradient. We emphasis that our results are preliminary because our sample sizes are small, albeit spread across the U.S. Yet, our results suggest that bird species richness in residential yards can be increased by the collective actions of landowners and that a Citizen Science approach to both understanding ecological processes and undertaking management around residences offers enormous promise for improving wildlife habitat across the urban-rural gradient.

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Nest-Site Limitation in Human-Modified Landscapes: An Experimental Study with a Neotropical Secondary Cavity Nesting Bird

Human-driven landscape modifications usually entail habitat degradation and fragmentation. My goal is to investigate the effects of changes in forest structure and the additional effects of habitat fragmentation on the secondary cavity-nesting bird Aphrastura spinicauda *(Furnariidae) in the south-temperate rainforest in Chile. Secondary cavity-nesters are non-excavators usually limited by nest-site availability and have low nest success relative to primary cavity-nesters. Three habitat treatments were replicated with two distinct 10 ha plots each: old-growth forest (OGF), selectively-logged forest (LFO) (both large enough [>400 ha] to test for habitat degradation per se), and selectively-logged forest fragments (LFR) (~12 ha to test for additional effects of fragmentation). Forest structure,* A. spinicauda *density, and Mayfield nest success were estimated during three breeding seasons (2003-2005). Density was estimated with habitat-specific detection functions using line transects. There were more potential nest-sites (i.e. large trees) in OGF than in LFO and LFR. To test for nest-site limitation, nest-boxes were added in LFO and LFR plots in 2004. In 2003, before nest-site supplementation, there was a higher density of A. spinicauda in OGF than in LFO, but density in LFR did not differ from OGF and LFO. In 2004, after nest-site supplementation, density increased significantly only in LFO, while density in OGF and LFR did not change. Therefore, after nest-site supplementation all habitats had similar densities of A. spinicauda. However, nest-box use was higher in logged-fragments (LFR) than in logged-forest (LFO). In 2005, there was an overall decrease in density. Nest success ranged from 40% to 55% and did not differ among habitats nor years. Results show that nest site availability is a limiting factor in selectively-logged forests. Further, the higher rate of nest-box use in fragments suggests that habitat fragmentation can cause an additional effect on populations by preventing birds from leaving fragments when cavities are limited.*

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Bird Conservation and Selective Logging in Western Amazonia

Logging and other human impacts now affect the majority of the world's tropical forests. Understanding how birds respond to logging is a critical part of developing forest management plans that support the long-term protection of wildlife. We examined the effects of selective logging on understory bird communities in the northern Peruvian Amazon through case studies in the Cordillera de Colán (Amazonas department) and Allpahuayo-Mishana National Reserve (Loreto department). Indigenous communities in the Cordillera de Colán harvest the timber species Cedrelinga cateniformis *for commercial sale, while local people in Allpahuayo-Mishana log the endemic tree Caraipa utilis for sale as construction material in the nearby city of Iquitos. We sampled birds using mist nets (8 x 10 m by 3 m, 36 mm mesh) at 21 lowland forest sites with different logging histories, between February and November 2005. Birds in forests logged 1, 5, and 9 years previously were compared with those in unlogged forests using a sample effort of 4439 net-hours. We made 1106 captures of 130 species belonging to 21 families. The Thamnophilidae (typical antbirds) and Trochilidae (hummingbirds) were the best-represented families, with 30 and 20 species, respectively. Rare species, which were defined as those comprising less than 2% of total captures, made up the majority (86%) of captures, and included 3 Nearctic migrant species. Preliminary data analyses suggest that the most commonly captured birds do not exhibit significant differences in abundance associated with logging history. Further tests will determine whether bird communities exhibit significant differences in species richness, similarity, and/or the presence of rare species that are associated with logging history. Results of this project include a number of new distributional records for birds and provide a valuable source of information in determining important conservation sites and existing threats to biodiversity in western Amazonia.*

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Wind Development in the Northeast United States – Using Radar Ornithology to Identify Key Migratory Patterns and Habitat Use of Birds and Bats

Wind development nationwide is an important topic for bird conservation, and one that is leading to increased potential fragmentation of habitat and increased use of migratory airspace. The potential impacts to birds and bats are largely unknown, and, more importantly, data on migratory patterns and distribution of birds and bats in most areas of the U.S. are almost entirely lacking. In order for the wind industry to better evaluate potential sites for wind turbines, and for regulatory agencies to better evaluate the potential impacts to bird populations, the U.S. Fish and Wildlife Service and USGS Patuxent Wildlife Research Center have begun landscape-scale studies using radar ornithology, GIS, and other techniques to develop bird and bat migration and distribution maps. This work will give us the necessary information that can lead to a more collaborative approach between the industry and regulators. This collaboration of federal, state, and NGO conservation groups is working in three key areas of wind development: the mid-Appalachians of West Virginia, Virginia, and Maryland, offshore areas of the North Atlantic, and Vermont and eastern New York.

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Change on the Horizon: Breeding Birds as Bioindicators of Environmental Quality in the Hudson Valley

The New York State Department of Environmental Conservation (NYSDEC) Hudson River Estuary Biodiversity Project has a need to assess wildlife populations of the Hudson Valley on a regular basis, with an emphasis on tracking the success of 5- and 15-year targets for habitat conservation. The Biodiversity Project would like to track the effects of human actions on the quality of target habitats and wildlife populations. A research project at Cornell University is creating a conceptual framework that addresses the ecological, statistical, and technical issues associated with development of a terrestrial wildlife-monitoring program. This approach is exploring use of the New York State Breeding Bird Atlas (BBA) as a baseline for identifying species that are sensitive to anthropogenic disturbance, as well as potential candidates (indicators) for long-term monitoring. Statistical models will be used to assess differences in the breeding bird community between 1985 and 2005. Explicit spatial models will then relate bird community composition to landscape cover and configuration changes occurring over the same time period. The results will capture breeding bird responses to: fragmentation, relative differences in habitat cover, minimal to heavy human land-use, and change across the Hudson Valley over time. Repeated sampling within BBA blocks, carried out by volunteers and professional ornithologists, will allow the Biodiversity Project to monitor the health and condition of the Hudson Valley landscape. Monitoring results will be used to inform decision makers and the public of breeding bird population status and trends, sound the alarm if trends are negative, identify areas of the Hudson Valley where state and local action could help to maintain existing high-quality breeding bird habitat, and effectively direct grants and other funding to achieve conservation.

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Who is Benefitting from Human Disturbance and Why? A Study from the Jamaican Dry Forest Life Zone

Jamaica's birds respond differently to habitat transformation, but no consensus exists on the causes. The present study investigated resident birds' responses by feeding guild and level of endemism to levels of habitat disturbance in the Caribbean tropical dry forest life zone using point counts (birds) and circular quadrats (vegetation). The study was conducted in southern Jamaica, which includes some of the best-preserved tropical dry forests in the Caribbean region, in natural forest and three locally abundant, woody human-disturbed habitats: grazed savanna, logged forest, and rural residential yards. The relationship between bird abundance and the combined effect of the measured

environmental variables was evaluated using Canonical Correspondence Analysis (CCA). In the direct ordination of the bird species abundance data, two axes were produced representing environmental gradients that accounted for 72.8 % of the variance explained by the analysis. The results of the CCA using these two axes therefore indicate a clear pattern of species distribution with respect to the measured environmental variables. Frugivores and understory insectivores showed a strong preference for the undisturbed forest, with some species disappearing completely from severely disturbed habitats. Most of these disturbance-sensitive birds were either species or subspecies endemic to Jamaica. In strong contrast, seed-eaters and ground-feeding predators of large arthropods were more common in disturbed than undisturbed habitats, with some species avoiding natural forest completely. None of these latter species was endemic to Jamaica at the species level, and only two were at the subspecies level. Overall, evolutionary history (degree of endemism, corresponding with adaptation to local forest environments) of these animals helps explain their response to human habitat degradation, which appears to have favored non-endemic species of once marginal open habitats, and to have depressed the forest dependent endemics.

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DISAPPEARANCE OF RAPTOR CARCASSES IN AN URBAN ENVIRONMENT

Mortality is an important aspect of population dynamics, and carcass necropsies can be an effective way of evaluating mortality factors. In human-dominated landscapes, the persistence and disposition of carcasses is likely to be different than in natural areas. As part of an investigation of raptor electrocution in Tucson, Arizona, USA, we evaluated the persistence and disposition of carcasses of birds of prey (raptors) in an urban area. We placed the carcasses of 23 raptors at the bases of the nearest "safe" utility poles to 23 Harris's Hawk nests. We revisited those carcasses daily for one week, and every other day for another week, to determine whether and how the carcasses were removed. Six to eight weeks prior to placing each carcass, we delivered letters to all properties within 300 meters of nests to inform residents that there were Harris's Hawks (Parabuteo unicinctus) *in the area, and to request that we be contacted if a dead raptor was discovered. Residents reported 22% of carcasses within 1 day, and 30% within 3.5 days. Carcasses that were not reported within 3.5 days were never reported. Another 17% of carcasses were definitely removed by humans (e.g., buried with a wooden cross over the grave), but not reported. Twenty-seven percent of carcasses disappeared, but we could not determine how that disappearance occurred, and 4% were definitely scavenged by non-humans. The remaining 26% were never removed. Participating residents often conveyed that they had encountered carcasses previously, but had not recognized their value, and had disposed of them with household garbage. We suggest that carcasses in urban environments disappear in large part via humans, and that projects investigating animal populations in human-dominated landscapes should avail themselves of the public's willingness to contribute to conservation studies.*

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NEW YORK CITY AUDUBON'S HARBOR HERON SURVEYS: A SUMMARY OF TWENTY YEARS OF NESTING IN THE NEW YORK/NEW JERSEY HARBOR

New York City is home to colonies of wading birds and seabirds, which nest on the islands of the New York/New Jersey Harbor. Species abundance and relative composition have changed over the past 20 years, with several species undergoing dramatic declines. New York City Audubon coordinated annual nesting surveys of colonial waterbirds on up to 17 islands in the Harbor for two decades (1985-2005). Since 1985, nine wading bird species have bred there: Black-crowned Night-Heron (Nycticorax nycticorax)*, Great Egret* (Ardea alba)*, Snowy Egret* (Egretta thula)*, Glossy Ibis* (Plegadis falcinellus)*, Cattle Egret* (Bubulcus ibis)*, Yellow-crowned Night-Heron* (Nyctanassa violacea)*, Little Blue Heron* (Egretta caerulea)*, Green Heron* (Butorides virescens)*, and Tricolored Heron* (Egretta tricolor)*. Total wading bird population ranged from 971 pairs on 3 islands (1985) to 2313 pairs on 9 islands (1993). Black-crowned Night-Heron was the most abundant and widespread species, occurring on eight islands (mean=981 pairs per year; SD=88.5) during the last 6 years and with a high count of 1343 nests in 1993 (60% of the population). Cattle Egret exhibited the greatest decline, numbering 266 pairs in 1985 on two islands and decreasing to fewer than 5 pairs from 2000 on. Glossy Ibis showed an overall increase from 111 pairs (1986) to 348 pairs (2005). Three islands in the Arthur Kill and Kill Van Kull supported the*

highest diversity of breeding species (8 species) but have virtually been abandoned since 2001. Double-crested Cormorants (Phalacrocorax auritus) *nested on two islands in 1987 (957 pairs), increasing and expanding their nesting to a maximum of 1806 pairs on three islands (1995). Since 2002 the average number of nesting cormorants in the harbor has been 1021 pairs, nesting on six islands. Continued monitoring is essential to track the health of the metropolitan populations, assess their significance to the larger, regional population of waterbirds, and to identify management issues for both the birds and their harbor island habitats.*

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Do Agricultural Management Practices Affect Habitat Selection in Grassland Songbirds?

Harvest of forage crops early in the breeding season has been shown to have a negative effect on reproductive success of grassland songbirds. However, if birds can alter patterns of habitat selection following nest loss due to hay harvest, the magnitude of reproductive failure might be decreased. We quantified breeding and natal dispersal patterns in Bobolinks (Dolichonyx oryzivorus) *and Savannah Sparrows* (Passerculus sandwichensis) *to assess whether choice of habitat in subsequent breeding seasons leads to increased reproductive success. We studied these species on eight fields in the Champlain Valley of New York and Vermont. The fields encompassed four management treatments with a gradient in birth rates that we used as an indicator of habitat quality. Data included dispersal within and among field sites from 2003 to 2005, and in 2005 a 1.5-kilometer search radius around each Vermont site. We collected breeding dispersal data from 250 Savannah Sparrows and 93 Bobolinks, and natal dispersal data from 28 Savannah Sparrows and 19 Bobolinks. Natal dispersal distance was greater than breeding dispersal in both species, and natal and breeding dispersal distances were greater in Bobolinks than in Savannah Sparrows. Site fidelity was high for both species, with >70% of adults and 11-60% of young birds returning to the same field. In male Bobolinks (natal) and female Savannah Sparrows (breeding and natal), > 50% of dispersal events were to fields of low habitat quality (early hay harvest or pasture). Although male Savannah Sparrows (breeding and natal), female Bobolinks (breeding and natal), and male Bobolinks (breeding) made better dispersal decisions, 33% of these birds dispersed to low quality habitats. These results suggest that strong site fidelity constrains birds' ability to select fields that would provide greater reproductive success. Management consistency across years will be critical to maintaining populations of grasslands songbirds in agricultural landscapes.*

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Grassroots All-Bird Conservation in Human-Dominated Landscapes

While integrated bird conservation can become an agency-driven exercise in top-down planning and management, effective conservation needs public buy-in and participation to produce meaningful results in human-dominated landscapes. By encouraging individuals and communities to target their conservation efforts to species of local, regional, and global conservation concern, National Audubon Society programs promote an integrated all-bird approach at a grassroots level. Our aim is to address the needs of these species across a gradient of urban, suburban, and exurban habitats through conservation actions, and to monitor the impacts of these efforts on the species of concern. We integrate these activities with site-based conservation at Important Bird Areas, and bird monitoring efforts such as Audubon's Christmas Bird Count, and cooperative programs including the Audubon/Cornell Great Backyard Bird Count and eBird. Our home- and community-based bird conservation planning, habitat management, and bird monitoring activities are creating a grassroots network of people working for birds. These "grassroots conservationists" are conserving birds in urban, suburban, exurban, and rural working lands in ways that are integrated with regional and global all-bird conservation efforts.

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Bird Species Composition in Living Fences: Evaluating the Effectiveness of Living Fences to Connect the Agricultural Landscape in Esparza, Costa Rica

The avian community was characterized in living fences of silvopastoral farms. This was done to determine the effectiveness of living fences to conserve bird diversity by providing refuge in the fragmented landscape. The fieldwork took place in the cattle-grazing districts of San Carlos and Peñas Blancas, within the province of Esparza in Costa Rica. The study examined bird species composition (forest and savanna specialist and generalist species) that use living fences as habitat to move across the fragmented landscape. The selected fences where classified into three different

treatments: living fences connected, intermediate, and distant from secondary forest patches. Distance from the fences to the forest patch was 0-125m, ±125m-250m, and ±250m-375m, respectively. The presence of birds was monitored through "Point Counts" methodology, and a total of 667 individuals of 75 species were observed. Living fence networks of five silvopastoral farms were used for the study, and four replicates were done for each fence. The study found that distance to forest patches is not as significant as crown diameter, tree diversity, and number of trees in the fence, to promote greater bird diversity in living fences. These results suggest that the structure and composition of the fence are important factors for promoting usage of living fences by bird species. In order to identify this effect, the study characterized the vegetative cover of the fences, as well as the remnant trees within the observation points. Tree diversity, crown diameter, diameter at base height (dbh), and tree and trunk heights where measured. These variables were taken into account to perform a multivariate analysis between bird species richness, live fence, and remnant tree characterization. The results propose that tree diversity and increased vegetative cover could counteract the effect of distance to the forest patch, promoting greater bird diversity in living fences.

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Bird Collisions with Glass in an Urban Environment – the Problem and Possible Solutions

After habitat loss and fragmentation, daytime collisions with glass could pose the single most important human-related threat to migratory birds. Since 1997, Project Safe Flight *(PSF) – NYC Audubon's large citizen science initiative, founded by Rebekah Creshkoff – has been monitoring bird collision locations in New York City. While collisions occur throughout the city, specific sites, known as bird-kill zones, account for a large number of collisions, sometimes totaling hundreds of dead and injured birds per year.* Morgan Processing and Distribution Center*, an unassuming building with a large façade of tinted windows on 29th St. between 9th and 10th Avenues, has been identified as Manhattan's number one bird-kill zone. In 2005 alone, PSF volunteers documented 251 bird collisions at the site. In the fall of 2005, a three-day study was conducted to determine when collisions occurred and why they were so numerous. The study, which documented 28 dead and injured birds, revealed that most collisions took place at the building's southern façade, which is opposite an urban park with large trees; collisions were also found to occur only during daytime hours. These findings suggest that the habitat reflected in the building's large windows attracts birds to fly into the solid glass barrier. There is substantial evidence to suggest that such bird-kill zones are prevalent across the country. Etching the large windows at this site with a pattern that is visible to birds represents one possible solution to this problem. In this method, the smooth reflective glass surface is "sand blasted" to create patterns that both reduce reflectivity and allow the birds to perceive the glass as a solid barrier. Other solutions that rely on new technology are being explored by NYC Audubon through the* Bird-Safe Glass Working Group *initiative.*

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The Role of Anthropogenic Fire and Livestock Grazing in Sustaining Avian Diversity in East African Savannas

As human demands on East African savannas increase, biodiversity conservation will require using human impacts to good advantage. We investigate how the practices of controlled burning and traditional livestock husbandry affect avian diversity, community composition, and abundance in the wildlife-rich but unprotected Laikipia District of central Kenya. African savanna ecosystems are sustained through fire and grazing, yet fires have largely been suppressed since European settlement. In the absence of fire, traditional livestock corrals (bomas) *serve as a major landscape modifier. We measured avian abundance and diversity, vegetation characteristics, and arthropod biomass on controlled burns of three sizes (1, 9, and 81 hectares) and on recently abandoned* bomas*. Burned plots host greater numbers of birds than controls and attract a unique assemblage of species. Bird species richness in bomas is higher than in burns of similar size, and some species prefer* bomas *over other habitats. Indeed, almost all of the species in the study areas show strong affinities for disturbed habitats (either burns or* bomas*). We investigated two mechanisms to explain these patterns: habitat structure and food abundance. Preliminary results suggest that the structure of the vegetation is more important than arthropod abundance in shaping avian communities on* bomas *and burns. Since the prevalence of undisturbed habitat may be a relatively recent phenomenon resulting from post-colonial limits on fire and grazing, the lack of birds specializing in these areas points to the key role of disturbance in maintaining avian diversity in East African savannas. Effective bird conservation in savannas will require the incorporation of both types of disturbance into management.*

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FECAL GLUCOCORTICOIDS MEASURES OF ANTHROPOGENIC IMPACTS ON THE NORTHERN SPOTTED OWL

Two of the biggest challenges facing conservation biologists and managers are determining the cause of a species decline and deciding how best to promote its recovery. Physiological techniques have enormous potential as diagnostic tools to address these challenges. Physiological measures can be linked to important fitness parameters such as survival and reproductive success. However, unlike fitness and reproductive success, changes in hormone concentrations occur rapidly, allowing them to be more closely temporally linked to disturbance variables of interest. We used non-invasive measures of fecal glucocorticoids (stress steroids) to determine the effects of roads and off-highway vehicle (OHV) exposure on the Northern Spotted Owl (NSO). Effects of roads were examined in a cross-sectional comparison involving collaborators across Washington, Oregon, and California. OHV effects were examined in a controlled experimental manipulation in Mendocino and Shasta Trinity National Forests, CA, in collaboration with government and non-profit organizations. Preliminary results from the first study showed that levels of glucocorticoids strongly correlated with proximity to roads in a dose-dependent manner. Road effects on glucocorticoids also varied with sex, breeding condition, and year. In contrast, proximity to barred owls showed no effect on NSO glucocorticoids in this study. In the OHV study, we experimentally exposed NSO to an hour-long simulated motorcycle-endurance event. Glucocorticoids were significantly elevated in treatment males compared to controls. However, no treatment effect was found on females. Combined, these two studies show that exposure to vehicle-related disturbances increase glucocorticoids in NSO, and emphasize the importance of interpreting physiology in the appropriate context of sex, season, and year. We hope these and similar physiologic approaches will be useful in designing mitigation and applying adaptive management in this and other species of concern.

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AMERICAN CROW NESTLING GROWTH AND NUTRITIONAL STATE VARY WITH TERRITORY LOCATION

Urbanization eliminates habitats for many organisms. For those organisms apparently adapting well to urbanization, closer studies may elucidate more subtle, but important reductions in fitness. American crows (Corvus brachyrhychos) *are common, apparently successful urban residents. This study of crow nestlings in and near Ithaca (Tompkins Co.), NY, investigated differences in growth, corticosterone, serum calcium, and total serum protein across a rural-managed-suburban continuum of habitat. "Managed" areas included golf courses and other areas with large expanses of mowed grass. The land use of each crow family territory was quantified for classification. Neither baseline corticosterone nor the scope of corticosterone response differed in nestlings across habitats, but serum protein and all body-growth measures were higher for birds in rural than in suburban habitats. Nestlings in managed areas were, for most measures, statistically similar to rural birds, except in their blood calcium levels, which were significantly lower than birds from either rural or suburban habitats. A food supplementation study was conducted in which birds from both suburban and rural habitats were provided with a nutrient-rich supplement. Supplemented suburban nestlings had significantly larger bills and tarsi than unsupplemented suburban nestlings. Surprisingly, supplemented rural nestlings had significantly lower weights, and smaller bills and heads, than unsupplemented rural nestlings. This study confirms and extends previously reported growth differences between suburban and rural crows. It further suggests that managed areas may have their own set of negative impacts for nestlings, potentially including turf treatment practices that affect the quality and quantity of food available to crows.*

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THE SHOREBIRD PROJECT INTERNSHIP: A CASE STUDY ON THE ECONOMICS OF CONSERVATION

Horseshoe Crab (Limulus polyphemus) *eggs are a critical resource for Red Knots* (Calidris canutus rufa) *during their spring stopover on Delaware Bay, and adequately monitoring that resource has represented a significant expense to the New Jersey Endangered and Nongame Species Program (ENSP). In*

an effort to ameliorate the monitoring effort, the Delaware Bay Shorebird Project Internship was begun in spring of 2005. The Internship is a joint venture between the Richard Stockton College of New Jersey (RSC), The Wetlands Institute (WI), and ENSP. The Internship took over responsibility for the New Jersey Horseshoe Crab Egg Survey from ENSP in its first year. Using cost-benefit analyses of each organization's available resources, I was able to identify and combine resources more efficiently in conducting the survey. By combining the strategic locations of WI and RSC (near Delaware Bay) with the logistical support of ENSP and the academic resources of RSC, I was able to conduct the survey for significantly less money than was previously spent. In addition to the economic benefits mentioned, the Internship has had the added benefit of providing a venue for practical education of undergraduates. The internship is being expanded in 2006 to include other projects on resighting of marked knots, stewardship of closed beaches, and support of banding activities, all while further reducing costs. I submit the Shorebird Project Internship as a cooperative model for state agencies, NGOs, and higher education to increase the efficiency and cost-effectiveness of conducting research.

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A Quantitative Methodology for Determination of Bird Strike Mortality Risk from Manmade Structures

Quantitative methodologies for determination of bird strike mortality risk presented by tall manmade structures have to date not been available. Recent advancements in avian radar survey systems and technologies developed for the wind energy development sector have resulted in a highly quantitative methodology that provides for accurate measurement of bird activity at proposed wind turbine sites and permits quantitative calculation of mortality risk. The methodology combines precise radar bird target enumeration and measurement of movements across proposed turbine sites with concurrent monitoring of weather data to provide an extended dataset of detailed, altitude-specific data for statistical determination of mortality risk with a high degree of accuracy. The methodology and technology is directly applicable to other manmade structures including tall buildings, communication towers, and suspension bridges. This poster presentation details the data collection methodology using an advanced avian radar system that includes weather and other sensors and the corresponding data processing and analysis procedures for determination of risk. Data examples from wind turbine application and modifications required for other types of structures are also presented and discussed.

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Long-Term Extinction Patterns in the Avifauna of an Isolated Tropical Woodlot in a Human-Dominated Landscape

Much of the world's tropical forests are rapidly being converted to human-dominated landscapes where only isolated forest patches remain. The long-term extinction patterns and processes in such forest patches, as well as their conservation value, are poorly studied. Here, we report on the avifaunal turnover in an isolated 85 ha tropical woodlot – the Bogor Botanical Gardens (BBG), located within a human-dominated landscape in Indonesia. The BBG has been surveyed several times before and after its isolation in 1936. By 2004 the original avifaunal richness of this woodlot declined by 59% (97 to 40 species) and its forest-dependent avifauna declined by 60% (30 to 12 species). Large-bodied birds were particularly prone to extinction prior to 1987, but following this time none of the species traits we studied were predictive of extinction proneness. All seven forest-dependent bird species that attempted to colonize this woodlot by 1987 perished thereafter. Our results suggest that area reduction, isolation, intense human use, and inappropriate management (e.g., understory removal) of this forest patch have negatively impacted the long-term sustainability of its forest avifauna.

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Changing Attitudes toward a Charismatic Raptor in Western Montana: Is Opposition to Predator Control Too Much of a Good Thing?

Grassland birds represent some of the most imperiled animal communities on earth. Because of this, conserving grassland biodiversity may be less a function of preserving historic conditions than one of accommodating variations in avian diversity across

human-dominated landscapes that have replaced them. As undergraduate university students in the Wilderness and Civilization Program at the University of Montana, we have had the unique opportunity to explore contemporary human attitudes to biodiversity in grassland systems, and to study trends in historic attitudes in these heavily impacted landscapes. Notably, northwestern Montana provides key habitat for waterfowl and contains a network of wildlife preserves reflecting the high value placed on maintaining avian game species within threatened prairie and grassland pothole pond landscapes. Cyclic irruptions in migration of large numbers of snowy owls were historically met with opposition by the public; as recently as 1966, more than fifty individuals were shot by hunters. During the latest immigration of large numbers of owls into the Mission Valley (during the winter of 2005-2006), the public showed a general acceptance of the raptors in significant contrast to previous interactions with the snowy owls. Waterfowl populations currently in decline could be further impacted by the influx of the raptors, demonstrating a shift in public concern to focus on species other than waterfowl, and generating the need for clear objectives regarding biodiversity conservation on a landscape scale. We present data on: 1) the nature of snowy owl 'irruptions' in western Montana: 2) tracking recent trends in human attitudes toward these events; and 3) highlighting the importance of understanding human responses to cyclic range shifts in predatory species as harbingers of the complexity of managing human attitudes toward range shifts of predatory species precipitated by climate change.

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HABITAT ENHANCEMENT TO IMPROVE WATERBIRD PRODUCTIVITY AT BREEZY POINT, NEW YORK: WHAT IS THE BEST METHOD?

Different methods are evaluated to enhance habitat to improve waterbird productivity at Breezy Point, Gateway National Recreation Area, New York City, New York. In the absence of a major storm to open habitat in the past ten years, American Beachgrass (Ammophila breviligulata)*, through the process of succession, has become dense and is encroaching upon the oceanfront. This appears to be discouraging waterbird breeding, including federally threatened Piping Plovers* (Charadrius melodus)*, since available nesting habitat has become limited. Moreover, waterbird species, including Piping Plovers and Common Terns* (Sterna hirundo)*, are shifting nesting closer to the high-tide line creating a conflict with beach bathers. Thus, to improve nesting and to ease interaction between birds and people, a project has been proposed to enhance habitat by removing vegetation. Different methods are considered including: large mammal grazing, burning, hand removal, mowing, the use of landscape fabric, disking, herbicide application, bulldozing, raking, and burying vegetation with sand. These methods used either singly or in combination have advantages and disadvantages depending upon the site, as well as equipment, staff, and available funding. Based upon a review of the literature and discussions with wildlife professionals, the preferred method for Breezy Point is bulldozing to remove vegetation above and below ground followed by beach raking. Reasons for this are discussed. After an initial experimental removal results will be evaluated and incorporated into a long-term habitat management plan.*

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CONSERVING AVIFAUNAL DIVERSITY IN HUMAN-DOMINATED LANDSCAPES: LESSONS FROM THE PROTECTED AREAS IN SULAWESI (INDONESIA)

Protected areas are crucial for the conservation of tropical avifaunal diversity. However, such natural areas are increasingly encroached by human activities, including settlements and agricultural areas. Therefore, it is critical to assess the effects of human disturbances in conserving avian diversity, especially in Southeast Asia. We evaluated the importance of natural spaces (i.e., protected areas) in preserving the avifaunal diversity, particularly the endemic and forest species, on the island of Sulawesi. Rarefaction analyses and species estimators showed that human-dominated areas consistently recorded lower numbers of forest and endemic bird species, in addition to smaller population densities, than in the reserves across eight protected areas. This trend implies that large natural spaces are crucial to birds of high conservation concern, and must remain as one of the fundamental conservation strategies. Two small reserves, however, had high numbers of forest and endemic bird species both within and outside their boundaries. This suggests the importance of allocating buffer areas of natural habitats to augment small reserves so as to reduce the negative effects of human activities on bird diversity. Ordination analyses revealed the differential response of bird species to different environmental factors (e.g., native tree cover), highlighting the significance of retaining forested habitats with dense native vege-

tation cover in modified landscapes for effective conservation of forest-dependent and endemic avifauna. In addition, due to the distinctiveness in bird species composition among the regional protected area network, it is important to designate more natural spaces across major altitudinal zones (i.e., lowland and montane) so as to achieve maximum complementarity for the conservation of Sulawesi's unique birds. We conclude that more natural habitats should be distributed across human-dominated landscapes and these areas should be included as part of the regional land-use plan to complement the existing protected area network for the conservation of avian diversity.

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Avian Conservation from an Entomological Perspective: Interdependence and Benefits of Integration

The conservation of major taxonomic groups are often supported and implemented by different organizations. In this study we investigate the ecological connections between two such groups, birds and insects, and attempt to determine if conservation of both groups would be facilitated by increased cooperation and integration. It is generally accepted that many bird species consume insects but there was no viable estimate of the extent to which birds depend on insects as a food source. Our first step was to estimate what proportion of bird species that are dependent on insects for nutrition. Based on data from The Birder's Handbook (Erhlich et al. 1988) we published an estimate that 61% of the bird species known to breed in the U.S. are primarily insectivorous and another 25% are at least partially insectivorous (Losey and Vaughn 2006). These results are based on the average proportion of insectivorous species across twenty bird families. In this study we extend these results by factoring in the density of individual species. The passerines, for example, are primarily insectivorous and extremely numerous. We further extend these results by specifically examining the role of insectivory in bird species that are rare, threatened or endangered. Finally, we consider the implications of these ecological connections for the two primary conservation activities acquisition of reserve areas and habitat management. We conclude that acquisition of land to protect bird species is of great benefit to rare insects as birds can serve as both flagship and umbrella species. Furthermore, we conclude that habitat management practices that directly benefit insect species including enhancing plant diversity and minimizing the use of pesticides can provide indirect but important benefits for bird species.

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Louisiana Waterthrush Ecology and Riparian Conservation in the Georgia Piedmont

Louisiana Waterthrushes (Seiurus motacilla) *are infrequently studied riparian obligates in the southeastern U.S., and riparian habitats are threatened ecosystems in the fast developing Southern Piedmont. We studied breeding waterthrushes in 13 headwater drainages of the Georgia Piedmont from 2002-2005. During site selection, we surveyed over 60 streams and found that waterthrushes were absent from streams with forest canopies narrower than 20 m on each side in residential areas. Waterthrushes, however, bred along streams in landscapes dominated by silviculture, pastures, or residential developments, provided that there were long (>500m) sections of wide (>20 m) riparian buffers. Along these streams, we monitored 175 active waterthrush nests, of which 111 fledged between 1 and 5 young. During a drought in 2002, steep drainages with gravel dominated riffles had higher juvenile waterthrush densities than drainages with sand dominated riffles. In 2003, rainfall was at all time record highs, and rainfall was moderate in 2004 and 2005. During these wetter years, some pairs raised two broods successfully within both forested and urbanized drainages. Using an individual-based model to simulate seasonal reproduction, we discovered that reproduction is most sensitive to variation in survival of nests and apparent survival of fledged young. Multiple regression models including land use, habitat, and climatic variables, however, failed to predict consistently the variation in survival of nests and apparent survival of fledglings. Nest survival tended to decrease for nests that experienced higher amounts of rainfall, but this effect remains uncertain. While it is clear that waterthrushes require buffered streams for nesting, a better understanding of the factors driving survival of both juvenile and adult waterthrushes is needed before specific management actions can be implemented to ensure their persistence in human-dominated landscapes of the Piedmont.*

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Socioeconomic Indicators of Urban Bird Diversity, Vancouver, British Columbia

As human population density increases in urban areas, vegetation is invariably altered – the total amount of vegetation

is reduced and replaced by impervious surface, remaining native plants are removed and replaced by non-native species, and vertical plant strata are often simplified. These complex changes can be summarized into a gradient of urbanization; with increasing urbanization, bird species diversity declines and the abundance of non-native bird species increases. But, urban bird communities can exhibit substantial spatial variation; and spatial variation in bird communities may also reflect socioeconomic inequalities and cultural differences among the human population. Humans are profound and industrious agents of landscape change, often mobilized by economic and cultural autonomy. This research examines whether socioeconomic and cultural factors such as: mean family income, education, ethnicity, and human population density (1996 Statistics Canada census) are related to the diversity and abundance of birds in Vancouver, B.C. The bird community was sampled in 44 census neighborhoods (1997 and 1998) and gradient analysis (Redundancy analysis) was used to determine if these variables could explain the spatial variation in the bird community. Results show that as the human population in a census neighborhood increased, socioeconomic status declined; and, wealthier neighborhoods had both higher abundances and more species of native birds. These results could have implications for social justice, as continued 'biological poverty' could adversely affect the way people perceive, appreciate, and understand nature.

MORGAN, MICHAEL and Michael Burger

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PARTNERING WITH AGRICULTURE TO CONSERVE GRASSLAND BIRDS IN NEW YORK

Historically high populations of grassland birds in the Northeast were the result of widespread clearing of land for agricultural purposes by European colonists. However, as approximately 50% of agricultural land in the Northeast has been lost to development or reverted back to forest or other later successional stages, grassland bird populations have declined by 90% or more for many species. In addition, modern agricultural practices are often unsuitable for providing habitat on the remaining land, particularly hayfields and pastures that hold potential for sustaining significant portions of the remaining populations of grassland birds. Audubon New York is partnering with New York's conservation community to coordinate efforts to conserve these remaining populations. Initial efforts are being focused in eight regions of the state identified by Audubon New York as containing core populations of the remaining grassland birds, and Audubon New York is developing habitat management recommendations specific to the unique assemblage of grassland birds found in each region. These recommendations include minimum size requirements, vegetation and litter preferences, and fledging dates for each grassland bird species. The primary strategy for this conservation effort is landowner incentive programs, which partially reimburse private landowners within the focus areas to defray potential losses that they may sustain by modifying their agricultural practices to provide habitat for grassland birds. While grassland conservation is being practiced to varying extents on public land throughout the Northeast, the preponderance of potential grassland habitat that is suitable for sustaining populations of breeding birds is privately owned, and conservation efforts may not succeed without this critical partnership.

NAGY, CHRISTOPHER and Willam Giuliano

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THE CENTRAL PARK EASTERN SCREECH OWL REINTRODUCTION: STATUS AFTER FOUR YEARS

Between September 2001 to August 2002, 32 rehabilitated juvenile Eastern Screech Owls (Megascops asio) *were released into New York City's Central Park. These owls were monitored via radio telemetry and call-surveys until November 2003 to estimate survival, reproduction, home range size, and habitat selection. First-year survival rates for each yearly cohort were estimated at 33.3% for the 2001 cohort and 23.1% for the 2002 cohort. Second-year survival of the 2001 cohort was 66.6%. Survival of the 2001 group is comparable to other studies, while the 2002 group had lower survival. Mean home range size (95% minimum convex polygon) was 33.08 + 7.46 ha, with males having larger home ranges than females. Owls were found more often than expected by chance near paths, buildings, and shoreline, while avoiding urban habitat. Depending on the configuration of available habitat, forest was either selected or used no differently than expected by chance. These results suggest that owls select edge habitats, possibly due to higher prey availability in these areas. Since 2002, there have been 3 successful nests found in the park, producing a total of six fledglings and, as of December 2005, there are seven owls that can be found in the Park via call surveys. The installation of additional nest boxes across the park would provide more nest sites and increase productivity. Due to the differences in survival rates between cohorts, we suggest that wildlife rehabilitators hold young owls until they have completed their juvenile molt (usually sometime in September for April/May hatched birds) and provide as much live prey as possible, preferably exclusively, once the owls can handle it.*

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HEALTH ASSESSMENT OF BLACK-CROWNED NIGHT HERONS IN NEW YORK HARBOR ESTUARY

The health of New York Harbor is in a constant state of flux due to declines in certain contaminants (PCB's, certain pesticides), increases in other contaminants (heavy metals, other pesticides), dredging practices, and changes in local and regional water quality. Black-crowned Night Herons (Nycticorax nycticorax)*, a species nesting on multiple islands in New York Harbor, serve as excellent indicators as they can accumulate toxins. Because the herons are top predators and generalized feeders, and because adults forage in different places in New York Harbor, depending on which colony they are nesting at, they serve as environmental sentinels, or health proxies, for specific regions of the New York Harbor Estuary ecosystem. In an effort to assess the health of the New York Harbor ecosystem, we collected blood, feather, and regurgitant samples from heron chicks on North Brother, Goose, Hoffman, and Canarsie Pol Islands in 2004 and 2005. Blood samples were analyzed for hematologic health parameters: packed-cell volume (PCV), total plasma solids (TS), white blood cell count (WBC), and differential white blood cell counts. WBC was significantly different between North Brother (24,131 cells/?l ± 2,520) and Hoffman (15,487 cells/?l ± 1,466) in 2004. WBC on North Brother was higher than on Hoffman. Biochemical blood analyses, feather metal concentrations, and contaminant concentrations in prey items are currently underway and will complete the assessment of the effects of contaminants on the health of herons in New York Harbor.*

OLSON, LEIF[1] and Kathryn Lindsay[1,2]

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SETTING SIGHT ON THE FUTURE WHILE ACTING TODAY: THE EFFECTIVENESS OF PRESENT-DAY CONSERVATION EFFORT IN THE FACE OF CLIMATE CHANGE

Recent research into climate-driven species distributions predicts extensive changes in species richness, abundance, ranges, and thus regional extirpations and extinctions. However, these broad, course-scale analyses rarely assess direct climatic effects on specific conservation efforts, and can critically underestimate the impacts of climate change on endemic species in habitat-restricted regions. This poster evaluates the potential impact of climate-driven shifts in species distributions on the future success of a present-day theoretical conservation reserve design. Using present-day Breeding Bird Survey (BBS) data for 150 species in the eastern United States, we select complementary sets of reserve sites to meet a range of conservation targets: from 10 occurrences of each species in the reserve network (low levels of conservation effort), up to 100 (higher levels of effort). Two global circulation climate models predicting increased precipitation (Hadley) and temperature (CCC) have been used to produce potential future species distributions. Using these future distributions, sites selected to conserve present-day distributions of species continue to meet conservation targets for 68–79% of bird species in the two predicted future species distributions. Underrepresented species fall into two principle groups, those strongly associated with Balsam Fir or Paper Birch distributions, and those associated with temperature variables. Northern range shifts produce regional extirpations and demand cross-border bilateral conservation efforts. Regional trends in conservation priority are highlighted by an interpolated 'conservation priority surface.' These surfaces can be used to identify changing areas of biodiversity and guide adaptive management strategies.

OPOTOW, SUSAN

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PROTECTING BIRDS AND THEIR HABITATS: THE PSYCHOLOGY OF CONSERVATION AND INCLUSION

Conserving avian diversity in human-dominated landscape poses biological, ecological, economic, and legal challenges. It also poses psychological challenges. This poster presents experimental research on social psychological factors that lead people to include a species within the scope of justice *and therefore of moral concern. The research examines the influence of inclusion in the scope of justice on support for conservation initiatives. Based in research on the extension of justice beyond humankind, the poster presents results from a study that examined the prediction that three factors influence support for environmental protection: 1) perceiving an animal similar to (vs. different than) people, 2) as useful for humankind, and 3) as needing habitat because of endangerment (high or low need). It examined the effect of inclusion in the scope of justice (high vs. low moral concern) on support for conservation. The study used a beetle species as an analog to understand what leads people to support conservation of animals that are neither cute nor charismatic. 432 par-*

ticipants read experimental manipulations, allocated a resource to assess distributive justice beliefs, and completed a scope of justice and conservation scale. Multiple regression mediation analysis indicated that scope of justice mediated the effect of usefulness, similarity to people, and urgency of its need for habitat on support for environmental protection. As the poster will explain, when people see wild birds as outside their scope of justice they view the economic utilization of critical avian habitat as acceptable. They discount scientific findings about long-term negative environmental effects of economic utilization of terrestrial and aquatic resources that run counter to avian conservation. These findings contribute insight into the psychology of species and habitat conservation. They suggest ways that biologists, urban planners, practitioners, and behavioral scientists can work together to improve avian conservation in an increasingly developed and industrialized world.

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Human Impacts on Bird Diversity across the Energy Gradient of North America

An interesting area of research has shown that energy availability has an important influence on species diversity at broad spatial scales. Additionally, human activities are sufficiently widespread to modify biodiversity by altering and reducing habitat at these broad scales. The interaction between these two controls provides a challenge for realizing the best conservation strategies for management of biodiversity. This research investigates the nature of the relationship between available energy, bird diversity and human activities across the biophysical gradient of North America. Using state-of-the-art measures of available energy collected by the Moderate Resolution Imaging Spectroradiometer (MODIS); human population density and human land use from census and satellite data; and bird diversity from USGS Breeding bird survey; we found that in North America, various measures of energy availability are strongly correlated with both bird diversity and human activities. Furthermore, the strength of the relationship is not constant, but rather varies across an energy gradient. We found that human activities and diversity are more strongly correlated in harsher regions than more mesic regions, suggesting that harsh regions have the most pronounced human/diversity conflict. This likely results from humans and birds both selecting the most suitable habitats that are least frequent on the landscape. We demonstrate the implications of this spatial variation in bird richness/human conflict for selected ecoregions in North America.

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Minimizing Risk of Bird Collision at the Freedom Tower at Ground Zero in Lower Manhattan

Skyscrapers, tall communication towers, lighthouses, offshore oil rigs and other similar tall structures in the built environment are well documented to be significant sources of avian mortality. Indeed, birds lost to collisions with buildings is thought to be the number one human-induced cause of premature death among birds and estimated to be between 98 and 980 million annually in the USA alone. However, mortality from collision with tall structures such as skyscrapers is temporally discrete occurring primarily at night during Spring and Fall migration and especially on nights when low cloud ceiling dominates the weather. Two other factors that have been shown to increase the risk of bird collisions with tall structures are the amount of artificial lighting and the extent to which building façades reflect sky, clouds, and surrounding vegetation. In an ongoing consultation with the architects and developers of the Freedom Tower, the nearly 2,000 foot tall building that is to replace the "Twin Towers" of the World Trade Center at Ground Zero in Lower Manhattan, efforts are underway to both design and manage the Freedom Tower such that bird collisions are minimized. The design elements to be discussed include: minimizing and managing artificial lighting and reducing the amount of highly reflective façades. Regarding management of the buildings, systems are being considered that will automatically implement collision-reduction features during those nights with highest migration passage rates and nights with weather conditions most associated with high risk of collisions.

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Predicting Patterns of Avian Community Composition in the Tropical Countryside with Remote Sensing

The future of biodiversity in the tropics increasingly rests in the unprotected agricultural countryside. However, the characteristics of the countryside that promote biodiversity preservation remain largely unknown, particularly at the local scale. A particular problem, which we address here, is the lack of effective and rapid techniques for assessing animal community composition in

regions of high land-cover heterogeneity. Over seven years, we monitored birds within the countryside of Costa Rica, across a wide gradient of climate and land cover. We also measured landscape composition of these same regions, by using the three metrics that result from a tasseled-cap transformation of Landsat ETM+ data (a standard remote-sensing technique). For all study regions, we found that these metrics significantly correlated with overall species richness, as well as with richness within several families. Intriguingly, across study regions, there were large variations in the specific metric that significantly correlated with a given component of community composition. These satellite-derived metrics of landscape, which are easily and quickly generated and have been little used in the conservation community, have great potential for addressing questions regarding avian community response within the countryside.

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The Influence of Atmospheric Pollution on Mountain Songbirds

Bicknell's Thrush (Catharus bicknelli) *is a rare, range-restricted habitat specialist that breeds in montane spruce-fir forests of the northeastern United States and adjacent Canada. Among multiple anthropogenic stressors that potentially threaten this species are effects of atmospheric pollution. Impacts may be direct and short-term, reducing individual fitness, or indirect and longer-term, altering habitat suitability. We present data indicating that bioaccumulation of atmospherically-deposited mercury and potential loss of montane conifer forests due to climatic warming may jeopardize Bicknell's Thrush and other high-elevation birds. Mean thrush blood-mercury concentrations from 22 distinct mountaintop breeding sites in the Northeast revealed that southern parts of the breeding range tend to be at greater risk than northern parts, and that modeled mercury deposition is closely correlated to avian bioaccumulation. Adult thrushes had significantly higher concentrations of feather mercury than did young-of-the-year, suggesting chronic lifetime buildup. To assess potential effects of elevated temperatures on Bicknell's Thrush habitat in the U.S., we used GIS modeling approaches to predict the consequences of 1° C to 8° C temperature increases on habitat area, number of habitat patches, and mean patch size. Results indicated that a 3° C increase in mean July temperature could cause an 88% to 98% loss of potential U.S. habitat and extirpations of Bicknell's Thrush from the Catskill Mountains, the southern Adirondacks, the Green Mountains, and the mountains of western Maine. The same increase could eliminate breeding habitat from up to 144 mountains in New Hampshire. The recent 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. Cumulatively, these data suggest that short- and long-term impacts of atmospheric pollution may combine to negatively impact the future viability of this rare and vulnerable songbird.*

ROMAN, KATRINA and William David Webster

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Birds vs. Beach Front Property: Wrestling against All Odds to Conserve the Featherweight Class

The completion of the Mason Inlet relocation project in the spring of 2002 added over thirty-five hectares of beach habitat on the northern end of Wrightsville Beach, a barrier island located off the southeastern coast of North Carolina. This project ushered in two evident opportunities, new beach habitat for nesting birds and a new recreational area for the public. Based on the use of similar dredge spoil in the region, this area could have accommodated several hundred nests of at least five different species of colonial waterbirds and shorebirds. However, by the end of the nesting season of 2002, less than a dozen nests were laid and only two of those nests produced chicks. Suspecting that human disturbance might have been responsible, the Audubon Society constructed a post and rope fence encompassing a large portion of the beach habitat. They also placed educational signage for public viewing and used volunteers to patrol this newly designated bird sanctuary. We have monitored nests in this area from April through August, 2002-2005, and noted a significant increase in number of species, nests, eggs, and chicks since the inception of the sanctuary. Of particular interest are the Least Terns (Sterna antillarum)*, whose nests have increased every year from 0 in 2002 to over 600 in 2005, and Wilson's Plovers* (Charadrius wilsonia)*, whose nests have increased from 4 in 2002 to 35 in 2005. Other colonial waterbirds nesting in the sanctuary include the Black Skimmer* (Rynchops niger) *and Common Tern* (Sterna hirundo)*. Other solitary shorebirds nesting in this area include the American Oystercatcher* (Haematopus palliates) *and Willet* (Catoptrophorus semipalmatus)*. We offer our results as critical baseline data for colonial waterbird and shorebird management. The Mason Inlet Bird Sanctuary is an example of successful coexistence between birds and humans in a coastal community.*

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THE EFFECTS OF HIKING TRAILS AND FOREST ROADS ON AVIAN DIVERSTIY AND ABUNDANCE

The objective of this study was to assess the impacts of forest roads and trails on birds breeding in a multi-use forest preserve. Black Rock Forest, located in Cornwall, New York, is a 1,530 hectare forest preserve to which access is limited mostly to researchers, hikers, and school groups. Eighteen field sites (6 trailside, 6 roadside, and 6 forest interior) were set up at which both bird diversity and abundance were recorded. During early morning point-count surveys completed from May to July of 2003 and 2004, 999 and 1186 bird observations were recorded, respectively. Human trail-use data was collected using six sign-in boxes and two motion-sensor camera traps during the 2004 field season. Avian diversity was not statistically different among road, trail, and forest interior sites, with averages of 19, 18, and 17 bird species recorded at those sites, respectively. Likewise, abundance values were not statistically different among the three site categories. In both years, Ovenbirds (Seiurus aurocapilla) *and Red-eyed Vireos* (Vireo olivaceus) *constituted the largest proportion of recorded birds. During 2004, there was an absence of four wood warbler species, a decrease in Mourning Doves* (Zenaida macroura)*, and an increase in ovenbirds at survey sites when compared to the 2003 field season. This study concluded that the overall diversity and abundance of birds breeding in Black Rock Forest are not affected by the trails and roads within the forest, a finding likely attributed to the consistent canopy cover over these sites. Moreover, the number of hikers at each trail site did not appear to have an impact on avian diversity or abundance. However, the change in abundance and loss of specific species at these sites suggest more subtle impacts that should be clarified by species-specific studies, including nesting success and site preference along forest roads and trails.*

ROWDEN, JOHN and Andrew Nelson

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CONSERVING THREATENED NATIVE BIRDS IN NEW ZEALAND: USING EX-SITU TECHNIQUES TO MAXIMIZE IN-SITU BENEFITS

New Zealand's native avifauna has been severely impacted by human disturbance and introduced species. The Auckland Zoo has forged strong links with New Zealand's Department of Conservation (DOC) to maximize the impact that ex-situ conservation programs can have on in-situ conservation. We participate in the recovery program for North Island Brown Kiwi (Apteryx australis mantelli), which is threatened by predation from introduced predators and pet dogs. We collect eggs from nests north of Auckland and incubate them at the zoo. Approximately three weeks after hatching we translocate the birds to a pest-free offshore island where they spend another ten months. By then they weigh around one kilogram, are able to defend themselves against introduced species such as stoats, and are translocated again back to the mainland. To date, 135 birds have been reared through this program and we are reintroducing birds to areas from which they have been extirpated. We also partner with DOC to breed threatened species for release, including North Island Kokako (Callaeas cinerea)*, North Island Kaka* (Nestor meridionalis septentrionalis)*, Pateke* (Anas aucklandica)*, and Whio* (Hymenolaimus malacorhynchos)*. Each species presents unique challenges and the specific breed-and-release programs are tailored to reflect that, including monitoring after release to gauge survivorship. The Fairy Tern (Sterna nereis) is New Zealand's rarest bird, with a population of around 40 individuals, and is threatened by introduced pests, pets, and human recreational activities. When nests are threatened, eggs are brought to the zoo for incubation until a suitable foster nest is found. Because parental care is crucial for the behavioral development of the chicks, we cannot hand-rear individuals and must rely on fostering to improve productivity. We developed these programs in response to heavy human impacts here and believe they may be useful as models for the recovery of other bird populations.*

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IS SURVIVAL DEPENDENT ON PATCH SIZE? SURVIVAL OF FOREST BIRDS IN SOUTHWESTERN COSTA RICA

Anthropogenic conversions of forest, grassland, and wetland ecosystems have altered around 30% of total global land area, creating roughly 4 billion ha of non-optimal habitat worldwide. This alteration of ecosystems, projected to cover about a third of global land area by 2100, is signaled as the main cause for worldwide population declines and extinctions. Therefore, we face an urgent need to determine how human disturbances are directly influencing populations in disturbed landscapes. Current research on the effects of habitat fragmentation on populations has mainly focused on quantifying differential reproductive success

between fragmented and continuous habitat. Not until recently has research begun to focus on the effects of habitat fragmentation on survival. We analyzed the effects of patch size on survival for five forest birds in the region of Coto Brus, Costa Rica. All individuals were marked and recaptured in six forest fragments ranging in size from 0.09 – 30.0 ha, from 1994 until 2005. The effects of patch size on survival varied between species, with Platyrinchus mystaceus *and* Atlapetles brureinnucha *showing the strongest effect ($R^2 = 0.95$ and $R^2 = 0.43$, respectively). We then grouped all species by degree of forest dependency. As expected, the effect of patch size was strongest for the group with a high degree of forest dependency ($R^2 = 0.47$) compared to the group with a medium degree ($R^2 = 0.13$). These findings suggest that highly forest-dependent species might have an estimable threshold patch size at which the probability of survival will be too low to sustain the population.*

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Molecular Tools for Elucidating the Mechanisms of Monk Parakeet *(Myiopsitta monachus)* Invasion Success

The severe ecological and economic impacts caused by some invasive species make it imperative to understand the attributes that permit them to expand their ranges. Native to South America, the Monk Parakeet (Myiopsitta monachus) *is the most widely successful parrot invader, establishing self-sustaining breeding populations in such disparate regions as Puerto Rico, Kenya, Japan, Western Europe and throughout USA. A notorious crop pest across its native range,* M. monachus *has not had a quantifiable impact on USA agriculture, but does cause significant financial losses through the utilization of artificial nesting substrates, including electrical poles and power substations. Despite their successful colonization, very little is known about the history of their invasion(s) as well as the characteristics that allow them to be a successful invader. In order to study a range of mechanisms underlying* M. monachus *invasion success, mitochondrial DNA markers were developed to permit historical DNA sampling of museum specimens and Myiopsitta-specific microsatellites were characterized. A set of mtDNA control region primers was designed to amplify a 558-basepair region in four overlapping fragments. Application of this primer set to DNA extracts from 77 museum specimens sampled from across the native range of* Myiopsitta *revealed 13 haplotypes, one of which, sampled from Argentina, was identical to the common haplotype found in over 90% of individuals recovered in the Connecticut, New Jersey, and Florida populations. In order to more accurately assign invasive individuals to their native population of origin, 19 polymorphic microsatellite loci were characterized, exhibiting two to ten alleles per locus and high levels of heterozygosity (0.47-0.74). Knowledge of the native source(s) of the Monk Parakeet invasion of North America will permit comparative analyses of relative behavioral, cultural, and genetic variation in the native versus the naturalized populations in order to fully elucidate the mechanisms of* M. monachus *invasion success.*

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Landbird Community and Population Responses to Development and Human Disturbance in the Urbanizing Lake Tahoe Basin

Avian communities and populations often undergo distinct changes with urbanization, such as lower diversity, altered species abundances, and reduced reproductive success. Habitat alteration, increased predation rates, changes in resource availability, absence of important habitat features, and human disturbance are commonly observed in association with human development; however, few studies have examined multiple interacting factors and their effects on birds at both community and population levels. From 2003 to 2005 we studied landbirds along an urban–forest gradient at 97 sample units in the Lake Tahoe basin, California/Nevada. We investigated landbird species composition, nest success, and nest-site selection using point counts, nest monitoring, and habitat measurements. We found strong and diverse responses to urbanization. Species richness declined with development, whereas total abundance increased. Responses varied among species, with 33% of species decreasing and 21% increasing in abundance. Responses varied by nesting, foraging, and dietary guild (e.g., abundance of ground nesters decreased with development, whereas that of ground foragers increased). Rates of nest failure matched abundance patterns for most species, suggesting that the basin's urban forests are not acting as ecological traps for the species in our study. Species such as Steller's Jays (Cyanocitta stelleri) *showed higher nest success and abundance in urban areas, whereas more urbanization-sensitive species such as Dusky Flycatchers* (Empidonax oberholseri) *did not even*

occur in urban areas. In some cases, abundance of species or guilds, nest success, and nest-site characteristics were closely related to abundance of habitat features or human presence; for example, heights of American Robin (Turdus migratorius) *nests increased with increasing human presence but were unrelated to level of development. Managers can use results from this study to evaluate the value of urban forest remnants, ensure important habitat features are retained, and ensure that human presence does not negatively affect landbirds, thus promoting coexistence of humans and avian biodiversity in urbanizing areas.*

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The Energetics and Stopover Ecology of Neotropical Migrant Passerines in an Urban Park

Due to the overlap of the Atlantic Flyway with one of the most urbanized regions of North America, the habitats remaining within cities may play an important role in bird migration. Yet, the use of urban parks by migrating birds is currently poorly understood. To determine if an urban habitat is serving as a suitable stopover site, I investigated the energetics of 8 species of migratory songbirds in Bronx Park (Bronx, NY) during two consecutive spring and fall migrations. Fat score, size-corrected body mass, and rate of mass gain of birds of different ages and sexes were compared within and between migration seasons. For comparison to other studies, I calculated possible flight ranges. Fat score and body mass were significantly higher in spring than fall for most species. There were few significant sexual differences in fat score or body mass in spring and few significant age-related differences in fall. Rate of mass change was positive in 12 of 17 possible combinations of species and season. Rates of mass gain were greater in spring than fall for most species. Flight ranges were comparable to those calculated in studies in rural areas and suggest most migrants in Bronx Park store enough energy to fly longer distances than are possible in the course of one night. High fat scores, body masses and flight ranges, and positive rates of mass gain demonstrate that the study site is a place where migrants can sufficiently restore depleted energy reserves. These findings highlight the importance of conserving and properly managing the green spaces remaining in urban areas situated along migratory bird flyways.

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Tropical Forest Birds in Agricultural Countryside: Residents or Commuters?

Understanding the persistence mechanisms of tropical forest species in human-dominated landscapes is a fundamental question in tropical ecology and conservation. Many species, including more than half of Costa Rica's native land birds, utilize mostly deforested agricultural countryside, but how they do so is poorly known. Do they commute regularly to forest or can some species survive in this human-dominated landscape year round? Using radio telemetry, we detailed the habitat use and movements of three bird species, Catharus aurantiirostris*,* Tangara icterocephala*, and* Turdus assimilis*, by obtaining 8101 locations from 156 individuals. We chose forest birds that varied in their vulnerability to deforestation and were representative of the species found both in forest and human-dominated landscapes, about half of the local avifauna. Here we show that our study species do not commute to extensive forest, but feed and breed in agricultural countryside. Nevertheless, more habitat sensitive* Tangara icterocephala *and* Turdus assimilis *were highly dependent on the remaining trees. Although trees constituted only 11% of land cover, these birds spent 69%-85% of their time in them. Tropical countryside has high potential conservation value, which can be enhanced with even modest increases in tree cover. Our findings have applicability to many human-dominated tropical areas that have the potential to conserve substantial biodiversity if appropriate restoration measures are taken.*

SNOW, KELLY

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Expanding the Parameters of City Building – Incorporating the Needs of Migratory Birds

Each year, millions of migratory birds pass through the Greater Toronto Area en route to their summer breeding grounds in the spring and winter residences in the fall. Many of these birds die from colliding with buildings and glass. The Fatal Light Awareness Program (FLAP) began working to rescue and

rehabilitate injured migratory birds in 1993 and since that time have found tens of thousands of dead migratory birds. In April 2005, FLAP brought this issue to the attention of Toronto City Council who directed City Planning staff to work with the community in developing recommendations for preventing the needless deaths of migratory birds. As a result, a pilot project to raise awareness of this issue will be launched in April 2006. "Lights Out Toronto" will run for the spring and fall migratory seasons, arbitrarily defined as April/May and September/October. The goal of the project is to inform the public of the dangers that unnecessary lighting poses to migratory birds as they pass through the Toronto area. Anecdotal evidence suggests that there is a general lack of public awareness of this issue. Also anecdotally, there is a high degree of public support for the City becoming involved in reducing the needless deaths of migratory birds. The message will be disseminated through a variety of means, including advertisements on subway, streetcar, and other public-transit vehicles; brochures; advertisements on elevator television screens; and opportunities such as Earth Day and Migratory Bird Day, during which volunteers can distribute materials and engage the public one on one. The pilot project will also see the City of Toronto become involved in the efforts to rescue, rehabilitate, and release injured migratory birds.

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Laser Remote Sensing of Canopy Habitat Heterogeneity as a Predictor of Bird Diversity in a Suburban Landscape

Habitat heterogeneity has long been recognized as a fundamental variable indicative of species diversity, in terms of both richness and abundance. Satellite remote-sensing data sets can be useful for quantifying habitat heterogeneity across a range of spatial scales. Past remote-sensing analyses of species diversity have been largely limited to correlative studies based on the use of vegetation indices or derived land-cover maps. A relatively new form of laser remote sensing (Lidar) provides another means to acquire information on habitat heterogeneity. Here we examine the efficacy of Lidar metrics of canopy structural diversity as predictors of bird species richness and abundance in suburban forests of Maryland. Canopy height, topography, and the vertical distribution of biomass were derived from Lidar imagery and compared to bird survey data collected at referenced grid locations. The vertical distribution of biomass was found to be the strongest predictor of both total richness and abundance. Species richness was predicted best when stratified by guilds dominated by forest, grassland, scrub, suburban, and wetland species, with different variables selected as primary predictors across guilds. Generalized linear and additive models, as well as binary hierarchical regression trees produced essentially similar results. The Lidar metrics were consistently better predictors than traditional remotely sensed variables such as canopy cover, indicating that Lidar provides a valuable resource for biodiversity research applications – particularly in complex and highly modified environments.

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Do Urban Areas Act as a Refuge from Nest Predation for an Urban "Winner," the Northern Mockingbird *(Mimus Polyglottos)*?

Urban environments are characterized by reduced avian species richness and evenness. Most urban studies focus on species that disappear or decline. Yet community-wide abundance and biomass is often greater in urban environments because a few, usually large species tend to become dominant. I investigated one possible mechanism underlying the increase in abundance of one of the urban "winners," the Northern Mockingbird (Mimus polyglottos) *in Gainesville, FL, where census data show that mockingbirds are twice as abundant as they are in nearby non-urban habitats (natural areas and pastures). I collected data on nest predation rates to assess the hypothesis that a decrease in nest predation in urban areas leads to an increase in the abundance of mockingbirds. In Gainesville, urban areas have enhanced populations of avian predators, but data on abundance of some major nest predators (e.g. snakes) remain difficult to obtain and cannot be assessed using artificial nests. Therefore, to assess nest predation rates, I located and monitored nests of mockingbirds in three types of habitat: parking lots, residential areas, and natural areas. Nest predation rates were significantly higher in natural areas than in either parking lots or residential areas: 54%-57% of nests in parking lots and residential areas were depredated, compared with 86% of nests in natural areas. I also monitored nests of Northern Cardinals* (Cardinalis cardinalis) *and Brown Thrashers* (Toxostoma rufum) *to determine if there were consistent patterns in nest predation rates for different species. Predation rates for both of these species followed the same pattern as nest predation rates of Northern Mockingbirds. These results are consistent with the hypothesis that nest predation rates in urban areas are lower than in non-urban areas, providing, at least for some species, a refuge from predation. The species that are able*

to exploit this refuge may be species that can aggressively defend their nests from abundant avian predators.

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Influence of Landscape- and Patch-Level Factors on Bird Communities in an Urbanized Tropical Island Landscape

An accelerating pattern of urban development is one important factor affecting bird populations. In Puerto Rico, only 1.2 % of the lowland moist seasonal evergreen forests on the island are protected. Generally, these forests occur at the lowest elevations where rates of land-cover conversion to urban and developed areas are highest. Puerto Rico provides a unique opportunity to assess how the spatial arrangement of urban forest patches and the interior patch structure influence the bird communities within a range of urbanization intensity. Landscape as well as the interior patch structure is influencing the bird communities. Bird assemblages differed along the urban-suburban gradient in Puerto Rico: some species were relatively unaffected by urbanization, while several increased in abundance with increased urbanization and some were sensitive to even minor disturbances by urban development. It is important to understand the sensitivity of particular bird species to habitat degradation in the urban-rural interface, areas that in Puerto Rico are used by both endemic and Neotropical migrant species. Identifying the importance of forest patches for these groups of birds will greatly aid in their conservation. In addition, we are identifying those species that are particularly sensitive to fragmentation, so that these can be used as bio-indicators of environmental health.

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Local and Landscape-Level Effects on Marsh Bird Distribution in a Developing Landscape

Wetlands are biologically diverse habitats that are under immediate threat; in some states of the U.S., >80% of historic wetlands have vanished. This extensive habitat loss has placed many marsh-dependent birds at risk, including several species of rails that are of conservation concern at state and federal levels. Unfortunately, marsh birds are poorly censused by common survey methods (such as the Breeding Bird Survey), and rails in particular are behaviorally cryptic. During 2005, we used visual surveys and call playback to do repeated surveys for marsh birds in 34 wetlands in eastern Massachusetts. Wetlands were in habitat matrices ranging from urban to rural settings, and were selected to duplicate sites surveyed in the early 1990s. Local habitat variables measured included wetland area, amount of open water, and coverages of different types of emergent vegetation. At the landscape level we quantified land use at 5 spatial scales (100 m through 4 km), and focused on land use thought to affect wetland occupancy by these species. The largest spatial scale was selected because of reported influences of wetland chemistry at this spatial scale. We analyzed species richness, and modeled occupancy for the most common rail species, the Virginia Rail (Rallus limicola). *We found both local and landscape variables to be important in predicting species richness ($r^2 = 0.61$) and occupancy by Virginia Rails ($r^2 = 0.74$). Important variables determining species richness included: area of cattail* (Typha sp.) *within 100 m of survey points, area of wetland within 100 m of surveyed wetlands, and area of agricultural land within 50 m of surveyed sites. Factors important in predicting Virginia Rail occupancy included: area of wetland within 50 m of the surveyed wetlands, area of dense residential land within 1 km of surveyed sites, and area of cattail within 100 m of survey points. Future analyses will include comparison of our results to those obtained using the data collected during the 1991-1993 surveys.*

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Songbird Trends in Relation to Human-Induced Landscape Changes in Exurban Southeastern Michigan

The fundamental goal of our research is to investigate the ecological effects of human-induced landscape alterations at the urban-rural interface. Our first research objective seeks to answer the question "how have historical landscape changes affected avian populations at the urban-rural interface in Southeastern Michigan?" Answering this question is relevant for two reasons. First, it has been shown that geographic locale, and its location relative to the range of any focal species, is partially responsible for species dynamics and community structure, such

that bird-habitat relationships demonstrated in one region are likely to hold true for only that region. Second, in an effort to support more ecologically sensitive land-use policies, it is necessary to characterize the local effects of local landscape change. To answer our question we used land-cover interpretations completed during Project SLUCE (Spatial Land Use Change and Ecological Effects) at the University of Michigan and avian data from the North American Breeding Bird Survey (BBS) from 1970-2000. Utilizing both the landscape and BBS data, we analyzed guild-level responses of breeding birds to land-cover changes within the region. The spatial and temporal configurations of the survey sites allowed for an analysis over many time steps while holding the site constant, as well as across many survey sites while holding time constant. The most notable of our results indicate that between 1970 and 2000 agricultural lands have decreased by an average of 52% while the average amount of tree cover and the number of human settlements increased by 87% and 99%, respectively. Concurrently, the average number of grassland species counted per survey declined in each decade while woodland species remained relatively constant. These results suggest that agricultural row crops may serve as a surrogate habitat for grassland species, and that factors other than the area of tree cover influence the number of woodland species present at our sample sites.

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Scale of Movement Reveals How Neotropical Birds Use a Fragmented Landscape

Recent research indicates that declines in farmland birds in temperate regions may be caused by an incompatibility between the scale of agricultural landscape structure and the scale of landscape use by birds. Assessments of the impacts of habitat fragmentation on bird diversity in the tropics give conflicting results that may reflect inconsistencies between scale of measurement and the distances over which birds use the landscape. Here, we address this problem for Neotropical birds in a pastoral landscape derived from forest in Rio Frio, Costa Rica. We measured the scale of landscape use for birds using relocation of colour ringed individuals in 2003-2004. Over 700 encounters with 100 individuals of 25 species were mapped over 562 days of observation, and inter-location distances calculated for individuals and species. We subsequently grouped species to give three significantly different spatial scales of landscape use (7 m, 50 m and 150 m) and investigated their implications for use of the fragmented vegetation cover. The 7 species in the group with the smallest scale were all forest-dependent species. Of five woodcreeper species, classed as forest dependent, four used the landscape at larger scales than all other forest dependent species (2 at 50 m and 2 at 150 m). Birds that have increased in abundance following deforestation and conversion to agriculture in Rio Frio, use the landscape at spatial scales larger than typical vegetation patch sizes, allowing them access to resources in several vegetation types. In contrast, most forest-dependent species operate at such small scales that they may be restricted to continuous vegetation corridors. Agricultural intensification leads to larger and more uniform farmed vegetation patches and fewer structural features such as live fences and riparian strips. Action to maintain and develop structural complexity and connectivity in farmed landscapes is vital for forest birds to persist.

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Temperate Agroecosystems and Agricultural Intensification: Global Trends and Patterns and Their Implications for Avian Conservation and Management

Temperate agroecosystems have undergone large changes in land-use and management practices, particularly since the mid 20th century. These changes are primarily related to the intensification in row-crop agriculture and livestock husbandry and have had significant negative impacts upon avian populations at local, regional, and continental scales. European agroecosystems had a centuries-long, if not millennial, history of extensive use and low input management, where as the temperate grassland systems of North America, South America, and southern Africa underwent large-scale conversion to agricultural production starting in the mid 19th century. Following World War II, global agriculture became regionally specialized and increasingly intensified, utilizing large amounts of agrochemicals, more and larger farm machinery, irrigation, and new cultivar strains. Concurrently, livestock husbandry became more intensified, dependent upon higher stocking rates and feed supplementation. Through intensification, temperate agroecosystems have become increasingly homogenized due to reduction in cultivar varieties, larger fields, and less fallow, forage crops, and pastures. Moreover, the quality of those agroe-

cosystems as wildlife habitat has been reduced by the indirect effects of pesticides. Although the process of rapid agricultural intensification has occurred on different time scales for different regions, beginning in Europe and the prairie region of North America during the 1950s, the Veldt of South Africa in the 1980s, and the Pampas of Argentina in the 1990s, there are commonalities shared among regions illustrated by the effects intensification has upon diversity and populations of birds in these systems. Based on these commonalities we illustrate the importance of both spatial and temporal heterogeneity in agricultural landscapes and within farm-management activities as key factors in determining avian populations and diversity. Furthermore, we highlight how the similar patterns and processes exhibited among regions aid in the development and application of management strategies to mitigate the negative impacts of intensive agricultural management.

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Grassland Birds Nesting on Historic Airfield at Floyd Bennett Field, Gateway National Recreation Area

Floyd Bennett Field opened in 1931 as New York City's first municipal airport. It was decommissioned in the 1950's and transferred to the National Park Service (NPS) in 1972. In addition to its historic significance, the airfield was identified as providing critical grassland habitat for such avian species as American Kestrel (Falco sparverius)*, Horned Larks* (Eremophila alpestris)*, Eastern Meadowlark* (Sturnella magna)*, and Grasshopper* (Ammodramus savannarum) *and Savannah Sparrows* (Passerculus sandwichensis)*. However, without the mowing regime to maintain aircraft visibility standards, the 129.6 acres were quickly succeeding into shrubland. In 1985 the NPS and NYC Audubon agreed to manage the 129.6 acres (the largest contiguous block of grasslands within New York City limits) as maritime grassland. Management strategies have included scheduled mowing, prescribed burns, debris removal, and woodchip deposition. Management by fire is considered the best practice for grassland management. In the three years following the 1993 prescribed burn, both numbers and diversity of grassland dependant birds significantly increased. However, conducting prescribed burns within the boundaries of New York City is difficult and has not been attempted since. Species data trends (conducted by weekly point counts) suggest that, at the start of the project, species diversity was at a peak, though no savannah sparrows were noted. Over the course of the project, species have all but disappeared with the exception of the savannah sparrow. Meadowlarks last nested in 1988, Horned Larks and kestrels in 1992, and Grasshopper Sparrows in 1995. In contrast, from 1998 to 2002 savannah sparrow territories numbered 30 or more. In 2003 there were 19 nests and, in 2004, 22 nests. Many factors have contributed to these nesting declines at Floyd Bennett Field: the variations in habitat-management regimes; the anthropomorphic effects of light pollution, various forms of human recreation, and vehicular traffic; and the general rarity and steady decline of grassland species. Currently, the park is reevaluating management objectives and strategies with the ultimate goal of developing a management plan with specific success criteria and monitoring protocols, in order to evaluate a broader array of species trends, habitat values, and activities likely to cause resource impacts.*

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Avian Abundance and Distribution in the New Jersey Meadowlands District

The Meadowlands and its expansive wetlands have long been recognized as a critical resource for birds. Given its location amidst a highly urbanized landscape, its importance as an oasis for wildlife cannot be overlooked. The New Jersey Meadowlands Commission contracted New Jersey Audubon Society to conduct two full years of avian surveys in the District. The goal of the project is to collect baseline data about species present, and their abundance and distribution in different sites and habitats. Following standard point count methodology protocols, a total of 118 points at 28 sites were surveyed from the end of August 2004 through August 2005. Marsh bird callback surveys were conducted at 69 of these points. Data were analyzed to produce summary information on the occurrence, relative abundance and relative species diversity of species across all survey locations. A total of 80261 individual birds of 181 species were observed in the Meadowlands District during the first year of the study. Of these, 1191 were individuals of 29 state endangered, threatened or species of concern. The most commonly seen endangered species was the Northern Harrier (Circus cyaneus)*. Red-winged Blackbird* (Agelaius phoeniceus)*, Song Sparrow* (Melospiza melodia)*, and European Starling* (Sturnus vulgaris) *were the most common and most abundant passerine species. Herring* (Larus argentatus)*, Ring-billed* (L. delawarensis)*, and Great Black-backed Gull* (L. marinus) *were the most common colo-*

nial water birds and Mallards (Anas platyrhynchos) *and Canada Geese* (Branta canadensis) *were the most common waterfowl. The most common raptor seen was the Red-tailed Hawk* (Buteo jamaicensis). *Semipalmated Sandpiper* (Calidris pusilla) *and Ruddy Duck* (Oxyura jamaicensis) *were the birds seen in highest numbers. Common Moorhen* (Gallinula chloropus) *was the most common bird encountered during secretive marsh bird playback surveys. Clapper* (Rallus longirostris) *and Virginia Rail* (Rallus limicola), *and Least Bittern* (Ixobrychus exilis) *also responded to species-specific calls during playbacks. These data will allow NJMC to evaluate avian responses to habitat modifications, predict changes in the bird community resulting from habitat alteration, and develop effective management strategies for avian species.*

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FALCONS IN HUMAN-DOMINATED LANDSCAPES

The once-endangered Peregrine Falcon (Falco peregrinus anatum) *is recovering from the population-decimating effects of DDT contamination. Throughout its range, territories are being re-occupied. Most endangered species suffer from habitat loss. Peregrines are able to re-occupy most of their range because they are avian and bat predators, which capture their prey in the air. As a result, some alteration of the ground in their territories (due to forestry, agriculture, human development, etc.) does not destroy their habitat. Even urbanization has advantages because high-rise buildings and bridges function as equals to wilderness cliff sites and can be used for nesting by Peregrines. Because of this factor, in California, not only has the Peregrine population increased but it has also increased in areas where Peregrines did not exist prior to buildings and bridges being constructed. In California, a census is being accomplished in the spring of 2006. No statewide approach has been attempted since the early 1990s. It is estimated at this time that 10 to 20% of the Peregrine population now resides on buildings, bridges, and other human-constructed "habitat." The densest pairs in the state live in the Long Beach/Los Angeles Harbor area. There are many urban pairs along Wilshire Boulevard in Los Angeles. San Diego and the San Francisco Bay area also home for many territories. How the territories in human-dominated habitat have become so suitable for Peregrine falcon occupation will be discussed. Information on the population status and what portion of the population now breeds in human-dominated habitat, based on our census results, will be clarified.*

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WHO FEEDS THE BIRDS? A COMPARISON BETWEEN PHOENIX, ARIZONA AND SOUTHEASTERN MICHIGAN

Research on human-environment interactions often focuses on negative human activities, such as habitat destruction. But humans also engage in activities that either create new environments or subsidize existing ones. For instance, many environmental organizations encourage people to manage their property in ways that are beneficial to wildlife, plants, and the larger ecosystem. People participate in these activities with explicit intention to 'benefit the environment.' Examples include: gardening to attract birds and butterflies, building bird or bat houses, installing ponds or bird baths, and perhaps most commonly, hanging bird feeders. How often and in what ways do humans elect to participate in activities intended to benefit birds? What are the impacts on the actual bird communities? In parallel studies in Phoenix, Arizona and Southeastern Michigan, we surveyed human bird feeding behavior using mail surveys. We found both striking similarities and differences between the two regions. In both studies, a large proportion of respondents fed birds: 66% in southeastern Michigan (635 of 968) and 47% in Phoenix, Arizona. The predominant food types were: commercial seed mixtures, specialized seed (sunflower, thistle), or nectar. In Michigan, 80% of respondents engaged in at least one of three activities that influence birds compared to 65% of respondents in Phoenix. In addition, only 22% of those who fed birds in Phoenix engaged in activities that support a diversity of birds, e.g. feeding more than one type of food, or planting plants to attract birds. Feeding certain kinds of food – notably sugar water, which attracts nectivores – was strongly correlated with income level in Phoenix. Thus, while many people engage in food subsidies for birds, many fewer people are providing food that supports a diversity of species.

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Species-Specific Probabilities of Dispersal and Movement Patterns through an Urban Landscape during the Post-Fledging Period

Habitat loss and fragmentation as a result of urbanization are altering the population dynamics and community composition of forest songbirds in the Puget Sound Region and leading to the extirpation of species in some areas (Donnelly and Marzluff 2004). For forest bird populations to remain connected after their habitat becomes isolated into separate patches, they must be able to successfully move between forest remnants. The process of dispersal is essential for maintaining metapopulations (Levins 1970), source/sink dynamics (Pulliam 1988), and gene flow. The primary objective of our research is to understand the process of bird dispersal in a heterogeneous urban landscape characterized by a pattern of fragmented forest patches. As a part of this research, we are investigating the patterns of post-fledging movements of juvenile birds of 6 target species at 20 study sites across the urban gradient of the Seattle metropolitan area using radio telemetry. We will present preliminary results testing hypotheses regarding (1) the costs and benefits of natal dispersal versus philopatry, (2) differences in dispersal probabilities and movement patterns between species, and (3) differences in the characteristics of landscapes used during the post-fledging period between species. We radio-tagged 130 recently fledged birds (age 1-~20 days after fledging) and followed their movements daily for 3-9 weeks, until death or transmitter battery expiration. The overall mortality rate was 20%, with the majority of mortalities occurring in one species (American Robin, Turdus migratorius*, 48% mortality rate). Our ultimate goal is to use this understanding of bird dispersal to help guide future land-use policies and land-cover patterns in this region so that future developments have the least negative impact on this important process.*

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Can Atlas Data be Used to Monitor Avian Population Change?

Ecological processes, such as extinction and invasion, are often the culmination of years and decades of population change. Consequently, long-term population monitoring represents an essential component of conserving birds in human-dominated landscapes. Agencies involved in monitoring often collect distributional data, however, little is known about whether these data accurately reflect changes in abundance. New York is the first state to have completed two statewide Breeding Bird Atlases. Our objective was to determine if distributional changes are correlated with changes in relative abundance using two independent data sets: the Breeding Bird Atlas (BBA) and the Breeding Birds Survey (BBS). The BBA is a comprehensive, state-wide survey documenting the distribution of breeding birds in New York. The 1980 BBA was conducted between 1980-1985 and the 2000 BBA was conducted between 2000-2005. Over the same time period, the BBS has collected bird abundance data on 198 roadside routes randomly distributed throughout the state. For 110 species, we found that there is a positive interspecific relationship between statewide abundance and distribution in the two independent sampling periods of 1980-1985 ($R^2 = 0.59$, $p < 0.001$) and 2000-2005 ($R^2 = 0.50$, $p < 0.001$). Of these 110 species, 52.7% demonstrated a decline and 33.6% demonstrated an increase in both distribution and abundance. For those species demonstrating significant changes in abundance ($n = 68$), we found that distributional changes were highly correlated, in both direction and magnitude, with changes in state-wide abundance ($R^2 = 0.84$, $p < 0.001$). These findings suggest that changes in Atlas data accurately reflect changes in relative abundance, and that distributional surveys offer a powerful tool for measuring avian population change.