



**Program and Abstracts**  
**Cooper Ornithological Society**  
74<sup>th</sup> Annual Meeting  
5-9 May, 2004  
La Crosse, Wisconsin

**Program for the 74<sup>th</sup> Annual Meeting of the  
COOPER ORNITHOLOGICAL SOCIETY**

La Crosse, Wisconsin, 5 - 9 May 2004

**Local Hosts**

U.S. Geological Survey, Upper Midwest Environmental Sciences Center  
University of Wisconsin-La Crosse

**Committee on Local Arrangements**

Eileen Kirsch, Chair	Pat Heglund
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Melinda Knutson	Kevin Kenow
Wayne Thogmartin	Dale Gentry
Randy Hines	Chris Custer
Bob Kratt	Shawn Weick

**Scientific Program Committee**

Todd Arnold, Chair

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## **General Information**

### **General Assistance**

Welcome to La Crosse, Wisconsin! Local Committee Members can be recognized by their blue name tags. General Information can be found at the registration desk and in your registration packets. There is a poster depicting a map of downtown eateries, parks, and points of interest next to the registration desk. If you have questions about the COS, board members and officers can be recognized by their yellow name tags.

### **Meeting Rooms**

All scientific sessions and socials, the business lunch, and banquet will be held in the La Crosse Center. All scientific sessions will be held in Ballroom A/B and Ballroom C in the Upper Level of South Hall. The COS board/student mixer and the poster social on Thursday will be held in the foyer and grand hallway of the Upper Level of South Hall. The business meeting and lunch on Friday will be in the Lower Level of South Hall. Just go down from the front doors and the room will be straight ahead. The banquet will be held in the Ballroom in Upper Level of South Hall, and the social before the banquet will be next to the windows overlooking the Mississippi River in the Upper Level of South Hall.

### **Breaks**

Breaks will be set up in the grand hallway just outside of the Ballroom in Upper Level South Hall.

### **Meals**

A list of restaurants is provided in your registration packet and a poster next to the registration table displays their locations. There are many choices within easy walking distance of the La Crosse Center and meeting hotels. The Welcome Reception will provide light snacks and a cash bar. The Thursday Poster Social will provide heavy hors d'oeuvres and a cash bar. Your lunch on Friday is FREE so join us for the annual general business meeting for COS members! In the morning we will provide a continental breakfast with Danish, bagels, fresh fruit, coffee, and tea

### **Phone Messages**

Phone messages will be posted on a message board by the registration desk. However, it would be more efficient for you to use your room at your hotel for messages and contacts.

### **Handicapped Access to La Crosse Center**

The front doors to the La Crosse Center are handicap accessible and there is an elevator immediately inside the front doors.

## **Presentation Preview Room**

The preview room is the small board room at the end of the grand hallway closest to the windows overlooking the Mississippi River. (It's called the Boardroom but there are three other boardrooms). We will have two computers available with CD drives.

## **Paper and Symposia Presenters**

IT IS ESSENTIAL that you turn in your Power Point presentations to the registration desk as soon as possible after arriving! Three to five papers are in each session. Each speaker is allowed 20 minutes, 17 for the presentation and three for questions. As a courtesy to other speakers and the audience, please insure that you keep to your time allotment. Session chairs will interrupt presentations that go over 20 minutes. Please let your session chair know that you are present at least 15 minutes before your session begins.

## **Poster Presentations**

Posters will be set up and on exhibit in the foyer of South Hall. Posters can be set up any time after 1700 Wednesday. Poster boards are 6 feet tall by 4 feet wide. Push pins and tacks do not work well with these boards. We recommend Velcro for laminated posters and posters on poster boards, and doubled over masking tape for paper. Please check at the registration desk if you need help setting up your poster. Please take down your posters by Saturday at 1200.

## **Vendors/Exhibitors**

Vendors and Exhibitors will be set up in the Boardrooms directly across the hall from the Ballrooms. Hours of display coincide with the scientific sessions, and will be taken down after 15:00 on Saturday.

## **Early Morning Birding**

Daily morning bird walks will meet in front of South Hall of the La Crosse Center at 0630. We will carpool or walk to local birding hotspots and have you back in time for the morning scientific session. Dress warmly, as spring in Wisconsin can be chilly!

## **T-shirts and Caps**

T-shirts and caps will be available for sale at the registration desk. T-shirts are \$7 and caps are \$11.

## **Meeting Logo**

The meeting logo was created by Eileen Kirsch and Jennifer Sauer. Jennifer's photo of the Mississippi Bluffs near Goose Island (destination for a Saturday field trip), was used as a template, and we added the silhouette of a bald eagle.

## **Field Trips**

All Sunday field trips will meet in front of the La Crosse Center at 0600. Vans will stop along the way to pick up breakfast. Box lunches are provided. As of this writing most field trips are still on. Low registration for field trips may cause their cancellation.

## Schedule of Events

### Tuesday, May 4<sup>th</sup>

18:00-22:00 Cooper Ornithological Society Board Meeting --- Iowa Room,  
2<sup>nd</sup> Floor, Radisson Hotel

### Wednesday, May 5<sup>th</sup>

08:00-17:00 Cooper Ornithological Society Board Meeting --- Iowa Room,  
2<sup>nd</sup> Floor, Radisson Hotel

18:00-21:00 Registration --- Foyer, Upper Level, South Hall

18:30-21:00 Welcome Reception and Social --- Foyer, Upper Level, South Hall

### Thursday, May 6<sup>th</sup>

06:30-08:45 Local Birding field trip ---meet in front of La Crosse Center to  
carpool

09:00-17:20 Scientific Sessions --- Ballrooms, Upper Level, South Hall

17:30-18:30 Student and COS Board Mixer --- Foyer, Upper Level, South Hall

18:30-21:00 Poster Social --- Foyer, Upper Level, South Hall

### Friday, May 7<sup>th</sup>

06:30-08:00 Local Birding field trip ---meet in front of La Crosse Center

08:30-09:20 Plenary Session: Dr. John Faaborg --- Ballroom A, Upper Level, South  
Hall

09:20-17:20 Scientific Sessions ---Ballrooms, Upper Level, South  
Hall

12:00-13:00 Business Lunch - FREE lunch - all members welcome!  
--- **Lower Level**, South Hall

## Schedule of Events, continued

### Friday, May 7<sup>th</sup>

17:30-19:00 Field Trip- Dinner Cruise on the La Crosse Queen ---Riverside Park

### Saturday, May 8<sup>th</sup>

06:30-08:00 Local Birding field trip ---meet in front of La Crosse Center

08:30-09:20 Plenary Session: Dr. William Kasarov ---Ballroom A, Upper Level  
South Hall

09:20-17:20 Scientific Sessions ---Ballrooms, Upper Level, South  
Hall

15:45-16:45 Spring Migration Scamper, 5K run/walk  
---Riverside Park

17:30-18:30 Pre-banquet social with cash bar ---Hallway, Upper Level, South Hall

18:30-21:00 Banquet and Awards ---Ballroom, Upper Level, South Hall

### Sunday, May 9<sup>th</sup>

06:00-17:00 (or 12:00) Field Trips ---meet in front of the La Crosse  
Center

**Program -- Thursday May 6, 2004 (page 1 of 6)**  
**Stars indicate a student presenter. Underlined names are presenters.**

<b>9:00</b>	Welcome Address & Announcements	
	<b>Systematics, Ecology</b> <b>Chair: Gary Voelker</b>	<b>Habitat Restoration</b> <b>Chair: Ralph Grundel</b>
	<b>Ballroom A/B</b>	<b>Ballroom C</b>
<b>9:20</b>	Systematics and biogeography of the genus <i>Turdus</i> . <u>GARY VOELKER</u> , and SIEVERT ROHWER	*Effect of restoration treatments on grassland birds in the Rainwater Basin region, Nebraska. * <u>JILL M. SPORRONG</u> , and CRAIG A. DAVIS.
<b>9:40</b>	*Genetic dynamics at varying scales: population genetic structure and parental relatedness of the Waved Albatross. <u>KATHRYN P. HUYVAERT</u> , PATRICIA G. PARKER.	Response of grassland songbirds to prairie restoration in the Loess Hills, Iowa. <u>TRACY A. WALKER</u> , and JAMES R. MILLER.
<b>10:00</b>	*Effect of imported fire ants on arthropod communities and Eastern Bluebird reproductive success in northwest Georgia. <u>AMANDA WATKINS</u> , and RENEE CARLETON.	Selection of avian conservation goals during restoration of degraded oak savannas. <u>RALPH GRUNDEL</u> and NOEL B. PAVLOVIC.
<b>10:20</b>	<b>20 Minute Coffee Break</b>	
	<b>Ecology, Behavior</b> <b>Chair: John Marzluff</b>	<b>Nesting Success</b> <b>Chair: Scott Stoleson</b>
	<b>Ballroom A/B</b>	<b>Ballroom C</b>
<b>10:40</b>	Natal dispersal in Yellow-eyed Juncos. <u>KIM SULLIVAN</u> .	*The effects of grassland patch and landscape characteristics on the nest predators of grassland bird nests. * <u>PAGE KLUG, L.L. WOLFENBARGER</u> ; J.P. MCCARTY.
<b>11:00</b>	Site fidelity and return rates of Grasshopper Sparrows in northwest Illinois. <u>DAN WENNY</u> .	*Nesting success and habitat associations of the Altamira Oriole, a species at risk, in the lower Rio Grande Valley, Texas. * <u>SCOTT M. WERNER</u> , and SALLIE J. HEJL.

**Program -- Thursday May 6, 2004 (page 2 of 6)**

**11:20**

Female Scarlet Tanagers called when their mates were temporarily removed during incubation. PAUL H. KLATT, and BRIDGET J.M. STUTCHBURY.

\*Fledging success overestimates reproductive success. MATTHEW MEDEIROS, and GUSTAV BODNER.

**11:40**

Crows, Ravens, and Culture. JOHN M. MARZLUFF, and TONY ANGELL.

Habitat correlates of nest success and cowbird parasitism in a population of southwestern willow flycatchers. SCOTT H. STOLESON, KATHY BRODHEAD, AND DEBORAH M. FINCH.

**12:00**

**90 Minute Lunch Break**

**90 Minute Lunch Break**

**Symposium: Avian Diseases**  
**Chair: Charles van Riper, III**

**Conservation Planning & Assessment**  
**Chair: Anna Pidgeon**

**Ballroom A/B**

**Ballroom C**

**13:30**

The global importance of avian botulism. TONIE E. ROCKE.

Keeping common birds common: identifying stewardship species for North American avifaunal biomes. TERRELL D. RICH.

**13:50**

Host-specificity and prevalence of blood parasites in African rainforest birds: Conservation perspectives from a molecular approach. RAVINDER SEHGAL, HUGH I. JONES, AND TOM B. SMITH.

Bird conservation planning: using regional and landscape context to inform local planning. MELINDA G. KNUTSON, WAYNE E. THOGMARTIN, TIM J. FOX, SHAWN E. WEICK, AND JOHN C. NELSON.

**14:10**

Increase in avian malaria at upper elevation in Hawaii. LEONARD FREED, REBECCA CANN, WENDY KUNTZ, AND GUSTAV BODNER.

Measuring habitat quality for birds. MATTHEW D. JOHNSON.

**14:30**

Recurring waterbird mortalities of unusual etiologies. REBECCA A. COLE, TONIE E. ROCKE, and J. CHRISTIAN FRANSON.

Design considerations for detecting treatment effects based on avian point counts. KATHRYN L. PURCELL, SYLVIA R. MORI, AND MARY K. CHASE.

**Program -- Thursday May 6, 2004 (page 3 of 6)**

**14:50**

\*Avian Pox in Galapagos Endemics. PATRICIA PARKER, TERESA THIEL, JENNIFER BOLLMER, TIM WALSH, MARY DUNCAN, ERIC MILLER, and GUSTAVO JIMENEZ.

Modeling the past and present habitat of forest warblers: using historical data to estimate species distributions in Wisconsin. ANNA PIDGEON, LISA SCHULTE, DAVID MLADENOFF.

**15:10**

**20 Minute Coffee Break**

**20 Minute Coffee Break**

**Avian Diseases**

**Chair: Charles van Riper, III**

**Habitat Relationships**

**Chair: Melinda Knutson**

**Ballroom A/B**

**Ballroom C**

**15:30**

Measuring innate humoral immunity in birds: a novel application of a classic immunological assay. KEVIN MATSON, ALEXANDER SCHEUERLEIN, ROBERT RICKLEFS, and KIRK KLASING.

\*Grazing and fire interactions and their influence on demographics of grassland birds of tallgrass prairie. \*ROY T. CHURCHWELL, CRAIG A.DAVIS, SAMUAL D. FUHLENDORF, AND DAVID M. ENGLE.

**15:50**

Immunocompetence as a life history character: a comparative study of humoral and cellular innate immunity in birds. ALEXANDER SCHEUERLEIN, KEVIN MATSON, RAYMOND PENG, KIRK KLASING.

\*Looking beyond the corridor: the use of non-breeding habitat types by Willow Flycatchers at Fish Creek, Utah. \*AMANDA V. BAKIAN and KIMBERLY A. SULLIVAN.

**16:10**

West Nile virus antibodies in central North Dakota Icterids. JENNIFER L. NEWBREY and WENDY L. REED.

\*Southwestern Willow Flycatcher potential prey base and diet in native and exotic habitats. \*SCOTT DURST, TAD THEIMER, EBEN H. PAXTON, MARLYSE C. WASKIEWICZ, and MARK K. SOGGE.

**16:30**

Modeling West Nile virus in Arizona: potential state-wide influences on birds, humans and neotropical migrant birds. CHARLES VAN RIPER III, DOUGLAS E. DOCHERTY, LAURA M. MCGRATH, KRISTINA L. ECTON, and CHRISTOPHER O'BRIEN.

Breeding bird habitat use in riparian wet meadows: does reed canary grass affect bird territory placement? EILEEN M. KIRSCH, WAYNE E. THOGMARTIN, TIM FOX, and BRIAN R. GRAY.

**Program -- Thursday May 6, 2004 (page 4 of 6)**

**16:50**

Floodplain bird communities of the Upper Mississippi River: responses to alternative future conditions. MELINDA G. KNUTSON, EILEEN E. KIRSCH, and YAO YIN.

**POSTER SESSION 18:30-21:00 South Hall, Upper Level, Foyer**

P1

Preliminary baseline data from existing databases characterizing the 10 man-made freshwater lakes in the southeastern United States with confirmed cases of avian vacuolar myelinopathy. ANDREW J. BERSCH, USGS, National Wildlife Health Center, Madison, WI, and Tonie E. Roche, USGS, National Wildlife Health Center, Madison, WI.

P2

Patch- and landscape-level effects on bird diversity in an oak savanna-bottomland hardwood forest mosaic. BRIAN JOHN BREZINSKI, Kristin DeGroot, and Evan Weiher, Dept. of Biology, Univ. of Wisconsin Eau Claire, Eau Claire, WI 54702.

P3

Diversity of play behaviors in birds. MILDRED FUNK, Biology Dept., Roosevelt University.

P4

Thermal regimes of Mexican Spotted Owl nest stands. JOSEPH L. GANEY, USDA Forest Service, Rocky Mountain Research Station, Flagstaff, AZ 86001.

P5

Nest site differences of primary cavity users in salvage-logged and unlogged high intensity wildfires in the Black Hills, South Dakota. DALE GENTRY, South Dakota School of Mines and Technology, Rapid City, SD, and Kerri Vierling, South Dakota School of Mines and Technology, Rapid City, SD.

P6

Migration and conservation of White Storks in Kenya. CECILIA M. GICHUKI, National Museums of Kenya Centre for Biodiversity Wetlands Programme; Anne M. Mbogo, Lake Elementaita Eco Friendly Centre Box 15157 Nakuru, Anne W. Mungari, Kipsaina Wetlands Conservation Group Private Bag Kipsaina and Moffat M. Waigwa, Lake Elementaita Eco Friendly Centre Box 15157 Nakuru.

P7

Pigment packing in body contour feathers of male Hawaii Amakihi. JENNI HIGASHIGUCHI, Dept. of Zoology, Univ. of Hawaii, Honolulu, HI, and Leonard Freed, Dept. of Zoology, Univ. of Hawaii, Honolulu, HI.

**Program -- Thursday May 6, 2004 (page 5 of 6 )**  
**POSTER SESSION 18:30-21:00 South Hall, Upper Level, Foyer**  
**(continued)**

P8

Patagial tagging of nesting Turkey Vultures. STU HOUSTON, University of Saskatchewan, Saskatoon SK S7N 0J8, and Brenton Terry, Hugh Cairns School, Saskatoon SK.

P9

Illustrating bird migration studies on the Web using Macromedia Flash. ROBERT J. KRATT and Kevin P. Kenow, USGS, Upper Midwest Environmental Sciences Center, La Crosse, WI.

P10

\*Effects of variation in egg-size and hatching date on survival in the Black-tailed Gull *Larus crassirostris*, Korea. Young-Soo Kwon, WHO-SEUNG LEE\* and Jeong-Chil Yoo. Department of Biology and The Korea Institute of ornithology, Kyung Hee University, Seoul 130-701, Korea.

P11

\*A study of relationship between clutch size and nest-site in the Great Tit (*Parus major*) on Kowhang Mount, Seoul, South Korea. WHO-SEUNG LEE\* and Jeong-Chil Yoo. Department of Biology and The Korean Institute of Ornithology, KyungHee University, Seoul 130-701, South Korea.

P12

\*Effects of egg color on Black-tailed Gulls (*Larus crassirostris*) hatching success. WHO-SEUNG LEE\*, Young-Soo Kwon and Jeong-Chil Yoo. Department of Biology and The Korean Institute of Ornithology, KyungHee University, Seoul 130-701, South Korea.

P13

The Idaho Bird Inventory and Survey (IBIS): a coordinated statewide all-bird monitoring plan. COLLEEN E. MOULTON and Rex Sallabanks, Idaho Dept. of Fish and Game, Boise, ID 8707.

P14

\*Evaluating adrenal function in eiders: focus on stress hormones. PETER. B. NILSSON\* Alaska SeaLife Center, Seward, AK and Univ. of Alaska Fairbanks, Fairbanks, AK, and Tuula. E. Hollmén, Alaska SeaLife Center, Seward, AK and Univ. of Alaska Fairbanks, Fairbanks, AK.

P15

\*First report on prey consumed at nests of White-throated Hawks (*Buteo albigula*) in Argentina. \*VALERIA OJEDA, Ana Trejo, and Marcelo Kun, Zoology Dept., Universidad Nacional del Comahue, 8400 Bariloche, Argentina.

P16

\*Distribution of riparian bird species in an urbanizing landscape. \*ONEAL, AMBER S., Department of Biology and Center for Conservation Biology, University of California, Riverside, CA 92521, Rotenberry, John T., Department of Biology and Center for Conservation Biology, University of California, Riverside, CA 92521.

**Program -- Thursday May 6, 2004 (page 6 of 6 )**  
**POSTER SESSION 18:30-21:00 South Hall, Upper Level, Foyer**  
**(continued)**

P17

\*DISTANCE analysis: a look at variation in species behavior and differences in observer ability. \*SHANE S. PATTERSON, Iowa CFWRU, NREM Dept., Iowa State University and Rolf R. Koford, USGS, Iowa CFWRU, Iowa State University.

P18

\*Winter hunting behavior of Bald Eagles using reservoirs in Kentucky. KATY PATTERSON, Eastern Kentucky University.

P19

\*Multilevel variation in the stable isotope composition of feathers: relevance to the prediction of breeding and natal origins of migrating Northern Goshawks. \*ADAM D. SMITH and Alfred M. Dufty, Jr., Department of Biology, Boise State University, Boise, ID.

P20

Low incidence of cowbird parasitism on Swainson's Thrushes in central coastal California. JENNIFER D. WHITE, Div. Biol. Sci., Univ. Missouri, Columbia, MO, and Thomas Gardali, PRBO Conservation Science, Stinson Beach, CA.

P21

Summary of Red-shouldered Hawk reproductive success along the Upper Mississippi River valley, 1983 – 1997. KELLY J. MCKAY, BioEco Research and Monitoring Center, Hampton, IL, Jon W. Stravers, Audubon Upper Mississippi River Campaign, McGregor, IA, Gary V. Swenson, Casey J. Kohrt, and Joseph S. Lundh, U.S. Army Corps of Engineers, Mississippi River Project, Rock Island District, Pleasant Valley, IA.

P22

A comparison of avifaunal monitoring using point count and random area search methods. KELLY J. MCKAY, BioEco Research and Monitoring Center, Hampton, IL, Michael S. Bornstein, and James P. Quinlivan, U.S. Fish and Wildlife Service, Mark Twain National Wildlife Refuge Complex, Port Louisa National Wildlife Refuge, Wapello, IA, and Thomas W. McClenahan, BioEco Research and Monitoring Center, Hampton, IL.

**Program -- Friday May 7, 2004 (page 1 of 3)**

**8:30**

PLENARY: Saving migrant songbirds: do we really know enough to manage? JOHN FAABORG, Dept. of Biology, Univ. of Missouri, Columbia, MO 65211.

**Ballroom A/B**

**Symposium: Migrational Stopover Ecology**  
**Chair: Pat Heglund**

**Fire Ecology**  
**Chair: Joseph Ortega**

**Ballroom A/B**

**Ballroom C**

**9:20**

Stopover biology of intercontinental landbird migrants: an eastern North American perspective. FRANK MOORE, and WYLIE BARROW

An initial report on the effects of the 2002 missionary ridge fire on breeding bird populations in southwest Colorado. JOSEPH C. ORTEGA, and CATHERINE P. ORTEGA.

**9:40**

(Moore and Barrow)

Breeding bird communities in unburned and burned jack pine - aspen forests, St. Croix State Park, MN. MATTHEW S. BERG and PAULA K. KLEINTJES.

**10:00**

Stopover ecology of migrating landbirds in riparian forests of arid southwestern North America. CHARLES VAN RIPER III, SUSAN K. SKAGEN, DAVID J. KRUEPER, and DEBORAH M. FINCH.

\*Effects of prescribed fire on avian populations in the Sierra Nevada. \*KAREN E. BAGNE, Kathryn L. Purcell, John T. Rotenberry.

**10:20**

**20 Minute Coffee Break**

**20 Minute Coffee Break**

**Migrational Stopover Ecology**  
**Chair: Pat Heglund**

**Forest Birds**  
**Chair: Steve Germaine**

**10:40**

Where would a wood warbler wrest in the west: an eclectic review. JEFF KELLY AND DICK HUTTO

\*Cavity-nesting bird use of snags in managed ponderosa pine stands. \*DAVID J. SPIERING, and RICHARD L. KNIGHT.

**11:00**

Migration stopover ecology of western avian populations: a southwestern workshop. SUSAN K. SKAGEN.

Effects of habitat edge, understory vegetation density and tree diameter on patch use by bark-foraging birds. CHRIS WHELAN, and GITOGO MAINA.

**Program -- Friday May 7, 2004 (page 2 of 3)**

**11:20**

\*Community-level patterns in phenology of fall migrants in the Yucatan Peninsula.  
\*JILL L. DEPPE.

Forest bird monitoring in northern Minnesota and Wisconsin. JIM LIND, NICK DANZ, JOANN M. HANOWSKI, GERALD J. NIEMI.

**11:40**

Migrant foraging behavior and the conservation of gulf coast stopover sites. WYLIE C. BARROW, JR., AND LORI JOHSON RANDALL.

Influence of habitat variation within a ponderosa pine forest on migrating and breeding land birds. STEVE GERMAINE, CATHERINE WIGHTMAN, and PAUL BEIER.

**12:00**

**90 Minute Lunch Break**

**90 Minute Lunch Break**

**Migrational Stopover Ecology**  
**Chair: Susan Skagen**

**Ecology**  
**Chair: Eben Paxton**

**Ballroom A/B**

**Ballroom C**

**13:30**

Riparian and upland forest stopover habitats for landbirds in urban and agricultural ecosystems. PAUL G. RODEWALD.

\*Egg morphology is an unreliable indicator of intraspecific nest parasitism in wood ducks.  
\*CHARLOTTE ROY NIELSEN, PATRICIA PARKER, and ROBERT GATES.

**13:50**

\*Stopover ecology of autumn landbird migrants in montane habitats of the west.  
\*JAY D. CARLISLE.

\*Does prey availability influence Piping Plover chick growth and survival in the Great Plains?  
\*DANIELLE LEFER, JAMES D. FRASER, and CASEY D.

**14:10**

Ecology and demography of east-west differences in molt scheduling of neotropical migrants. SIEVERT ROHWER.

\*The importance of the postfledging period to the conservation of Dickcissels. LORELLE I. BERKELEY, JOHN P. MCCARTY, and L. LAREESA WOLFENBARGER.

**14:30**

\*Plasma metabolite profiles: a physiological indicator of stopover habitat quality. \*DAVID J. CERASALE, CHRISTOPHER G. GUGLIELMO.

Response to extreme drought of a southern California riparian bird community. BARBARA KUS.

**Program -- Friday May 7, 2004 (page 3 of 3)**

**14:50**

Seasonal changes in composition of lipid stores in migratory birds: causes and consequences. SCOTT MCWILLIAMS, and BARBARA PIERCE.

Effects of the 2002 record-breaking drought on the Southwestern Willow Flycatcher. EBEN H. PAXTON, APRIL A. TUDOR, BARBARA E. KUS, MARY J. WHITFIELD, and MARK K. SOGGE.

**15:10**

**20 Minute Coffee Break**

**20 Minute Coffee Break**

**Migrational Stopover Ecology**  
Chair: Susan Skagen

**Raptors**  
Chair: Ralph J. Gutiérrez

**Ballroom A/B**

**Ballroom C**

**15:30**

Long-term monitoring of stopover habitats for landbirds and waterfowl along the Upper Mississippi River system. P.J.HEGLUND., SAUER, J., W. THOGMARTIN, K. KENOW, M. KNUTSON, E. KIRSCH, Y. YIN, L. ROBINSON, AND J. BARZEN

An experimental examination of song suppression in the California Spotted Owl following exposure to the simulated presence of a great horned owl. MICHELLE L. CROZIER, M. E. SEAMANS AND R. J. GUTIÉRREZ.

**15:50**

Lessons learned from the first decade of the Canadian migration monitoring network (CMMN). ERICA H. DUNN.

Assessment of human activity impacts on Bald Eagle reproductive success along the Upper Mississippi River. KELLY J. McKAY, JON W. STRAVERS, BEN R. CONKLIN, ULF KONIG, SHAWN HAWKS, AND THOMAS W. MCCLENAHAN.

**16:10**

The plans for a migration monitoring network in the United States. C. JOHN RALPH and MATTHEW W. JOHNSON.

Comparative reproductive ecology of the Cooper's Hawk among three North American populations. ROBERT N. ROSENFELD, JOHN BIELEFELDT, LAURA J. ROSENFELD, ANDREW C. STEWART, MELVIN P. NENNEMAN, ROBERT K. MURPHY, AND MICHAEL A. BOZEK.

**16:30**

Where are we headed? PAT HEGLUND, and SUSAN SKAGEN.

Raptor population trends as determined by forty years of Christmas Bird Count data. KELLY J. McKAY, PETER C. PETERSEN, and THOMAS W. MCCLENAHAN.

**Program -- Saturday May 8, 2004 (page 1 of 3)**

**8:30**

PLENARY LECTURE: Physiological mechanisms of resource use by birds, and their ecological consequences. WILLIAM H. KARASOV, University of Wisconsin-Madison  
Department of Wildlife Ecology

**Ballroom A/B**

**Symposium: Physiological Ecology**  
**Chairs: Carol Vleck & Blair Wolf**  
**Ballroom A/B**

**Symposium: Hierarchical Modeling**  
**Chair: William B. Kristan**

**Ballroom C**

**9:20**

17 days to adulthood: ontogeny of thermoregulation in nestling Tree Swallows. SUSAN CHAPLIN,

Symposium Introduction---Modeling species distribution: issues of accuracy and scale. J. MICHAEL SCOTT

**9:40**

Patterns and mechanisms of seasonal thermoregulation and metabolic variation in small birds. DAVID L. SWANSON,

Is it safe to assume that bird responses to habitat are hierarchically structured? WILLIAM B. KRISTAN.

**10:00**

Thermoregulation and ventilation in seasonally acclimatized House Sparrows. SHELDON J. COOPER, JEREMY R. ARENS.

A hierarchical spatial count model with application to imperiled grassland birds. WAYNE E. THOGMARTIN, JOHN R. SAUER, and MELINDA G. KNUTSON.

**10:20**

**20 Minute Coffee Break**

**20 Minute Coffee Break**

**10:40**

Aerobic enzyme activities and seasonal acclimatization in resident passerine birds. ERIC T. LIKNES, and DAVID L. SWANSON.

Fitting hierarchical models to data from the North American Breeding Bird Survey. JOHN R. SAUER and WILLIAM A. LINK.

**11:00**

Metabolic routing of dietary nutrients in migratory songbirds and its ecological significance: applications of stable isotopes. SCOTT McWILLIAMS, DAVID PODLESAK, and KENT HATCH.

A hierarchical model for analysis of the Christmas Bird Count. DANIEL K. NIVEN, WILLIAM A. LINK, and JOHN R. SAUER.

**Program -- Saturday May 8, 2004 (page 2 of 3)**

**11:20**

Water and energy balance of a desert bird community: the functional importance of columnar cacti. B.O. WOLF, and A.E. MCKECHNIE.

Variance decomposition as a tool for uncovering cross-scale correlations in multi-scale analyses of avian habitat. JOSHUA J. LAWLER, and THOMAS C. EDWARDS, JR.

**11:40**

Proximate factors that mediate timing of reproduction in Florida Scrub-Jays. STEPHAN J. SCHOECH, and REED BOWMAN.

Addressing cross-scale correlation in the hierarchical modeling of habitat selection. JAMES BATTIN, and THOMAS D. SISK.

**12:00**

**90 Minute Lunch Break**

Hierarchical models for statewide avian distributions for the state of Georgia. JAY HOWELL, MICHAEL J. CONROY, and JAMES T. PETERSON,

**12:20**

**70 Minute Lunch Break**

**Symposium: Physiological Ecology**  
**Chairs: Blair Wolf & Carol Vleck**  
**Ballroom A/B**

**Migrational Ecology**  
**Janet Ruth**  
**Ballroom C**

**Chair:**

**13:30**

Egg neglect and embryonic development. C. R. OLSON and C. M. VLECK.

\*Evaluating migratory routes of neotropical migrants using stable isotopes. \*KRISTINA ECTON, CHARLES VAN RIPER III.

**13:50**

Preliminary analysis of yolk androgens in Ruddy duck eggs. LETITIA M. REICHART, MICHAEL S. WEBSTER, and HUBERT SCHWABL.

\*Stopover durations of fall migrating least sandpipers in the Lower Mississippi Alluvial Valley. \*SARAH E. LEHNEN, and DAVID G. KREMENTZ.

**Program -- Saturday May 8, 2004 (page 3 of 3)**

**14:10**

Does variation in corticosterone secretion track body condition or breeding stage White-throated Sparrows? BRENT HORTON and REBECCA HOLBERTON.

\*Molt strategies and age differences in migration timing among autumn landbird migrants in southwestern Idaho. \*JAY D. CARLISLE, GREGORY S. KALTENECKER, and DAVID L. SWANSON.

**14:30**

Tree swallows trade immune self-maintenance for offspring quality. DANIEL R. ARDIA.

\*Stopover habitat ecology of the Swainson's Thrush in northwestern California. \*JAMES R. TIETZ, MATHEW D. JOHNSON.

**14:50**

\*Measuring stress related to predation-induced reneating and its affect on maternal condition and productivity of Indigo Buntings. \*DANA L. MORRIS, and JOHN FAABORG.

Fall stopover duration and energetic condition of three shorebird species in the northern Prairie Pothole region. NATHAN E. THOMAS, and DAVID L. SWANSON.

## ABSTRACTS

1. Tree swallows trade immune self-maintenance for offspring quality. DANIEL R. ARDIA\*, Dept. of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY. I assessed individual variation in the tradeoff between self-maintenance and offspring quality in tree swallows, *Tachycineta bicolor*, by manipulating reproductive effort while simultaneously immunochallenging breeding females with sheep red blood cells (SRBC) and phytohaemagglutinin (PHA). The consequences of adult decisions on offspring quality were assessed through nestling immune responses to PHA, nestling growth rates and nestling body condition. Clutch initiation date, a strong measure of individual quality in tree swallows, was linked with immune responses, with early-nesting females, presumably higher quality, mounting stronger immune responses than did later-nesting birds. There was a significant interaction between individual quality and reproductive effort treatment, with lower-quality individuals showing greater depression of humoral immune response to SRBC while raising enlarged broods, suggesting individual-level variation in tradeoffs. There were limited differences among brood size treatments in offspring quality measures. Breeding females tended to raise offspring of similar quality, with only growth rate showing an effect of increasing brood size, but not nestling body condition or immunocompetence. This suggests that parents are trading immunological self-maintenance for offspring quality.
2. Effects of prescribed fire on avian populations in the Sierra Nevada. \*KAREN E. BAGNE, Univ. of California, Riverside, CA 92521; KATHRYN L. PURCELL, USFS, Pacific Southwest Research Station, Fresno, CA 93710; and JOHN T. ROTENBERRY, Univ. of California, Riverside, CA 92521. We examined changes in bird populations where prescribed fire has been applied to a fire-suppressed ponderosa pine forest in the Sierra Nevada, CA. An index of avian abundance was collected in 2001, 2002 and 2003 on nine forty-hectare sites. Three sites were fire excluded, three sites had fire applied in 2002, and three sites were 3-6 years post-burn. Fires were patchy and of generally low intensity. Changes in abundance were species-specific with a probable positive response to fire seen in American Robin, Brown Creeper, and Yellow-rumped Warbler. A negative response was indicated in Black-throated Gray Warbler and Nashville Warbler. However, fifteen other species examined showed little, if any response. Thus, within the limited scope of this study, most species did not respond strongly to prescribed fire introductions. We place what changes we observed within the greater context of annual population fluctuations and historical data collected by Joseph Grinnell prior to systematic long-term fire suppression.
3. \*Looking beyond the corridor: the use of non-breeding habitat types by Willow Flycatchers at Fish Creek, Utah. \*AMANDA V. BAKIAN and KIMBERLY A. SULLIVAN, Department of Biology, Utah State University, Logan, Utah. Willow Flycatchers are a riparian obligated nesting species but anecdotal observations suggest that these flycatchers use non-breeding habitat types during the breeding season. The degree to which these birds utilize non-riparian habitats has received little research attention but has important management and conservation implications. During the 2003 breeding season, we addressed Willow Flycatcher's use of various habitat types at Fish Creek in Manti – La Sal, National Forest using radio telemetry. Sixteen flycatchers, both male (n = 10) and female (n = 6) were captured, and radio tagged. Over a two and a half-month period, 693 radio points were collected with an average of 43 telemetry locations (4 to 86) per bird. Twenty percent of all radio-locations occurred outside of mature riparian habitats in young riparian, mountain shrub or upland forest habitats, and flycatcher's use of non-breeding habitats appears to be influenced by spatial and temporal factors such as position of the nest or inclement weather. Telemetry locations were projected on to aerial photographs of the Fish Creek drainage using Arc View, and parameters such as core area, extended home range and total use area were

quantified. Different patterns of habitat use as influenced by the breeding status and sex of the bird have emerged from our research.

4. Migrant foraging behavior and the conservation of Gulf Coastal stopover sites. WYLIE C. BARROW, JR., and LORI JOHNSON RANDALL, USGS, National Wetlands Research Center, Lafayette, LA. Because the continent-wide pattern of migration concentrates migrants in relation to ecological barriers, such as the Gulf of Mexico, coastal woodlands have been identified as being stopover sites or staging areas of special concern to migratory landbirds. Concentrations at particular places, do not mean that habitats at these locations are particularly good. It may only mean that these were the only habitats available. Suitability may be a separate issue. Wooded vegetation along the Gulf shores and up to 100 km inland is stopover habitat that migrants use in spring to replenish energy and to sequester resources for the ensuing reproductive season. In autumn, the primary need is to store energy for continued migration and molt. Thus, the ability to efficiently hunt for and find high quality food items can be critical during the migration seasons. On the gulf coast, do *en route* migrants possess similar foraging ecologies as during other times of the year? We studied migrant foraging behavior, diet, and prey availability at 3 sites along the northwest gulf coast. Migrant use of flowers and fruits was widespread across the migrant community, frequent in occurrence within species, and extensive within individuals. The location of migrant abundance within a habitat will continuously change because the food resources will vary in time and space, and the competitive environment is in constant flux. The mix of plant species at a site, coupled with the food resources they support, will influence which migrant species can successfully exploit that habitat. In more complex habitats, resource patches should be in many different locations and will accommodate a variety of species. In many cases, it may not be necessary to manage for a particular situation; managing for complexity should be enough. The loss of complexity and heterogeneity where Chinese tallow tree, an invasive exotic, predominates may be an increasingly important problem for migrants stopping-over on the gulf coast. fatty acid composition of birds suggest that the energetic cost of migration in birds can be affected by the fat composition of what a bird eats.
5. Addressing cross-scale correlation in the hierarchical modeling of habitat selection. JAMES BATTIN, Northwest Fisheries Science Center, Seattle, WA, and THOMAS D. SISK, Center for Environmental Sciences and Education, Northern Arizona University, Flagstaff, AZ. One of the most common applications of hierarchical, multi-scale modeling in ornithology is in the study of nest site selection by landbirds. Nest site selection is often investigated at multiple scales ranging from the immediate environment surrounding individual nests to landscape-level characteristics that influence the densities of nesting pairs. In typical studies of nest site selection, analyses are conducted and inferences drawn individually at each scale, with a view to assessing which factors are most important at each scale. Investigators rarely, if ever, assess the influence of cross-scale correlations on their results. Here, we use a combination of field study and simulation modeling to demonstrate how cross-scale correlations in habitat variables can lead to spurious conclusions about habitat selection at larger scales. Using the example of Plumbeous Vireos (*Vireo plumbeous*) nesting in ponderosa pine forests, we then show how a multi-scale approach can be used to tease out these correlations and assess which variables are truly driving habitat selection.
6. \*Breeding bird communities in unburned and burned jack pine - aspen forests, St. Croix State Park, MN. Matthew s. BERG and PAULA K. KLEINTJES, Biology Dept. ,Univ. of Wisconsin-Eau Claire, WI. Fire was re-introduced to St. Croix State Park, Minnesota with the management goal of maintaining and expanding current jack pine (*Pinus banksiana*) barren fragments. We examined the response of the breeding bird community to these controlled burns. We conducted breeding bird censuses and habitat assessment in four burned and four unburned, 10-ha jack pine - aspen (*Populus* spp.) plots that contained residual barren fragments. Of 45 habitat variables

measured, jack pine density and relative dominance, shrub density, percent canopy cover, trees 23-30cm dbh and dead jack pine were significantly associated ( $P < 0.050$ ) with unburned plots. Burned plots had significantly more trees 8-15cm dbh and dead aspen. Total breeding territorial males/ha were higher ( $P = 0.020$ ) in unburned plots, but evenness ( $P < 0.001$ ) and diversity ( $P = 0.019$ ) were higher in burned plots. Results of ordination analysis (NMDS) indicated strong correlation between the bird community and vegetative structure ( $r^2 = 0.957$ ) with fire being the strongest predictor of plot location. The American Redstart, Chestnut-sided Warbler, Ovenbird, Golden-winged Warbler, Nashville Warbler and Scarlet Tanager were indicator species of unburned plots. Least Flycatcher, Eastern Bluebird, House Wren, Common Yellowthroat, Eastern Towhee, Indigo Bunting, and Baltimore Oriole were indicators of burned plots. Unburned stands had significantly ( $P < 0.050$ ) more canopy and ground-nesting species, and insect gleaners while burned stands had more cavity-nesting species, insect air salliers, ground foragers and omnivore lower-canopy foragers. Our results suggested that prescribed burning primarily benefited shrubland and habitat generalist species whereas species associated with barrens were absent from the treatment area two years post burn. If management goals include using fire to restore barrens avifauna, perhaps burning larger contiguous patches would attract more species.

7. \* The importance of the postfledging period to the conservation of Dickcissels. LORELLE I. BERKELEY, Dept. of Biology, Univ. of Nebraska, Omaha, NE, JOHN P. MCCARTY, Dept. of Biology, Univ. of Nebraska, Omaha, NE, and L. LAREESA WOLFENBARGER, Dept. of Biology, Univ. of Nebraska, Omaha, NE. The postfledging period is a critical stage in the life history of birds, but until recently has received relatively little attention due to difficulty in monitoring wild birds during this period. Recent technological advances allow the application of radiotelemetry techniques to small passerines, providing the opportunity to monitor survival and movement during this previously inaccessible period. Quantitative information about this period is needed to provide information to resource managers about the habitat needs and population dynamics of species of conservation concern. This study quantifies survival, habitat use and dispersal during the postfledging period of Dickcissels, (*Spiza americana*), a species of conservation concern, to improve management strategies for this species and provide previously unknown life history and population level data. From 35 tagged fledglings, 37% suffered predation and 22% died from unknown causes. Kaplan-Meier analyses estimate a mean fledgling survival of 11.32 days  $\pm$  SE 1.78 over a 21-28 day tag-life. Mortality rates were highest within the first four postfledging days. Fledglings used a variety of habitat types including marginal areas, grasslands, wetlands and agricultural fields, and used areas adjacent to natal fields. Multivariate analyses indicate a significant interaction of Julian date and postfledging date on the distance a fledgling occurred from its nest, indicating that individuals fledging later in the season move farther from their nests at faster rates than individuals fledging earlier. The results of this project will be provided to resource managers at the national wildlife refuges where this study is done to help them manage for this species.
8. Preliminary baseline data from existing databases characterizing the 10 man-made freshwater lakes in the southeastern United States with confirmed cases of avian vacuolar myelinopathy. ANDREW J. BERSCH, USGS, National Wildlife Health Center, Madison, WI, and TONIE E. ROCKE, USGS, National Wildlife Health Center, Madison, WI. Avian vacuolar myelinopathy (AVM) is a recently discovered (1994) neurological disease affecting water birds in the southeastern United States. AVM has primarily affected American coots and bald eagles. However, AVM has also been confirmed as the cause of death in mallards, buffleheads, ring-necked ducks, Canada geese, great horned owls, and killdeer. AVM is identified by a characteristic lesion in the brain and spinal cord of affected birds. Diagnostic work at the National Wildlife Health Center has ruled out all possible causes except natural or man-made toxins.

Sentinel studies have shown that AVM is caused by an agent present at the lakes, eliminating the possibility that the disease agent was transported to the lakes by the birds. Feeding trials have provided evidence that the toxin is associated with the aquatic vegetation in these lakes and that onset of the disease is dose-dependent. We are collecting baseline data from existing databases on the 10 man-made lakes with confirmed cases of AVM and 10 paired lakes that have been surveyed for AVM yielding no confirmed cases of AVM. A comparison of these two sets of lakes may yield information about the possible source of the toxin.

9. Patch- and landscape-level effects on bird diversity in an oak savanna-bottomland hardwood forest mosaic. BRIAN JOHN BREZINSKI, KRISTIN DEGROOT, and EVAN WEIHER, Dept. of Biology, Univ. of Wisconsin Eau Claire, Eau Claire, WI 54702. We know that bird diversity can be affected by local vegetation structure, habitat geometry, and the quality of the surrounding landscape. Rarely have all of these factors been simultaneously addressed, and furthermore, we know of no cases where structural equation modeling has been used to assess the independent effects of these factors. Trimble GPS units were used to map the main vegetation units (habitat patches) in a 750 ha mosaic of bottomland hardwood forest, oak forest, oak savanna, prairie, and shrub thicket in the Tiffany Wildlife Area of western Wisconsin. Four replicate point count surveys were conducted at 90 sampling points from late May to early July. Vegetation data included measurements of cover, structural complexity, composition, and diversity. ArcView 3.2 and ArcInfo 8.2 were used to determine patch geometry (area, area-perimeter ratio, distance to edge), and surrounding landscape context (surrounding habitat diversity at five scales). In general, standardized richness (species richness divided by the log of the number of detections) increased with vegetation cover and evenness, with bird abundance, and with landscape diversity. We used structural equation modeling to determine the independent effects of four latent variables on standardized richness: landscape diversity, patch geometry, local vegetation, and bird abundance. The final structural equation model explained 33% of the variation in standardized richness. Independently, vegetation and bird abundance had twice the effect of landscape factors, while habitat geometry was not significant. Landscape diversity and evenness within a 200 m radius (about 12.6 ha) had the strongest effects on bird richness, and this suggests a possible critical scale for birds in this system.
10. Molt strategies and age differences in migration timing among autumn landbird migrants in southwestern Idaho. \*JAY D. CARLISLE, Dept of Biology, Univ. of South Dakota, Vermillion, SD 57069, GREGORY S. KALTENECKER, Idaho Bird Observatory, Boise State Univ., Boise, ID 83725, and DAVID L. SWANSON, Dept of Biology, Univ. of South Dakota, Vermillion, SD 57069. Intraspecific patterns of autumn migration timing are not well known, particularly in the western United States. Here, we (1) describe autumn migration timing of landbird migrants in southwestern Idaho, (2) examine differences in timing among age and sex classes, and (3) demonstrate how prebasic molt strategies affect among-age migration timing differences. As a group, Neotropical migrants were most common from late July through early September whereas Temperate migrants were most common from mid-September into early October. Overall species richness was greatest at the end of August and early September. Timing differences among sex classes were detected in few species and no general patterns emerged. In 22 of 31 Neotropical and Temperate migrants examined, there were significant differences in timing between adults and hatch-year birds. In species in which adults begin fall migration before replacing flight feathers, adults migrated earlier than hatch-year birds. Conversely, in species in which adults molt flight feathers on or near the breeding grounds before departing on fall migration, hatch-year birds migrated earlier than adults in all but one case. Therefore, it appears that molt strategy is a powerful determinant of intraspecific migration timing differences and, to our knowledge, this is the first study to document this pattern among migrant passerines of North America.

11. \*Stopover ecology of autumn landbird migrants in montane habitats of the west. \*JAY D. CARLISLE, Dept of Biology, Univ. of South Dakota, Vermillion, SD 57069 and Idaho Bird Observatory, Boise State Univ., Boise, ID 83725. The topographic and climatic gradients of western ecosystems make for a fascinating setting in which to investigate stopover ecology. In particular, the late summer heat and aridity across much of the Intermountain West and Great Basin may have important ramifications shaping life history strategies of western migrants. To date, most investigations of landbird migration in the west have focused on riparian systems, which are clearly critical to migrants and deserving of conservation measures. However, the extent to which autumn migrants utilize non-riparian habitats has received relatively little attention. Data from several western states suggest that montane habitats might serve an important role for many landbird migrants during the late summer molt period and autumn migration, a time period when many lowland areas of the west (including some riparian systems) are extremely arid. Here, I examine seven years of stopover ecology data from a montane area in southwestern Idaho where fruits and arthropods are available throughout the fall. I compare recapture rates, stopover length, and changes in energetic condition within and among species and between two netting sites situated in different habitats. Stopover strategies varied within and among species but many species exhibited an ability to gain mass. These results suggest that including non-riparian and montane habitats in future stopover ecology studies will allow for a more complete understanding of migrant habitat needs in the west.
12. \*Plasma metabolite profiles; a physiological indicator of stopover habitat quality; \*DAVID J. CERASALE., Wildlife Biology Program, Univ. of Montana, Missoula, MT, 59812, and CHRISTOPHER G. GUGLIELMO, Div. of Biological Sciences, Univ. of Montana, Missoula, MT, 59812. Avian refueling performance during stopover is a major determinant of overall migratory success and is a valuable indicator of stopover habitat quality. Reliable methods for measuring refueling rates can elucidate factors influencing stopover ecology and improve habitat conservation efforts. Traditional measures of refueling rate (i.e., recapture analysis, mass vs. time of day regression) require large sample sizes, and have associated capture biases. Plasma metabolites provide an instantaneous measure of refueling performance from small numbers of single captures. Captive studies demonstrate that plasma concentrations of selected metabolites (triglyceride, glycerol, and B-OH butyrate) are predictive of mass changes and respond quickly (within 30 minutes) to alterations in feeding rate. Recently, we validated the use of plasma metabolite profiles under field conditions at sites of known high and low quality. Here, we further illustrate the value of this technique with a case study. Riparian habitats are used extensively by vernal migrants in the arid Southwest United States. Human impacts have severely degraded these habitats and facilitated the invasion of saltcedar (*Tamarix ramosissima*), an exotic tree thought to be of little value to migrating birds. We compared refueling performance of Wilson's warblers between native cottonwood-willow and saltcedar dominated riparian habitats along the San Pedro River, Arizona. Elevated plasma triglycerides indicated that refueling rates were higher in the saltcedar habitat, whereas glycerol and B-OH butyrate concentrations did not differ between habitats. Thus, saltcedar habitats, often assumed to be inhospitable to most migrants, may be tolerable or even beneficial to some species. Our data also suggest that release from intraguild competition may be a mechanism contributing to better refueling performance by Wilson's warblers in saltcedar. However, additional experiments are needed to explore how this and other factors, such as predation risk, may influence stopover habitat quality.
13. 17 days to adulthood: ontogeny of thermoregulation in nestling Tree Swallows. SUSAN CHAPLIN, University of St. Thomas, St. Paul, MN. Altricial avian nestlings typically depend on their parents and their nest mates for maintenance of body temperature during their rapid growth phase in the first week after hatching. Unlike other species whose transition to endothermy is

marked by a sudden shift in muscle enzyme activity, shivering, or metabolic rate, the transition to endothermic control of body temperature in Tree Swallow nestlings is gradual throughout the latter half of Tree Swallow nestling development, and only attains adult capacity just prior to fledging at 17-18 days. Mean body temperatures of nestlings, their response to cooling for 15 min at 5 C, total pectoral muscle mass and amount of muscle soluble protein, and activity of citrate synthase, an aerobic activity indicator, all increased or improved gradually with nestling age from 8 to 16 days. Since nestling nutrition can be interrupted during periods of inclement weather common during the Tree Swallow breeding season in Minnesota, maturation of nestling physiology is a compromise between the increased metabolic expense of maintaining a warm body and energy that must be allocated to developing organs.

14. Grazing and fire interactions and their influence on demographics of grassland birds of tallgrass prairie. \*ROY T. CHURCHWELL, CRAIG A. DAVIS Dept. of Zoology, Oklahoma State University, Stillwater, OK, SAMUAL D. FUHLENDORF, and DAVID M. ENGLE, Oklahoma State University, Dept. of Plant and Soil Science, Stillwater, OK. The Tallgrass Prairie Preserve in Osage County, Oklahoma is currently managed under two cattle grazing regimes. Traditional grazing management for the Osage region uses annual spring burning of entire pastures combined with a moderate stocking rate. The experimental grazing regime, patch-burn grazing, uses partial burning of pastures to create several small homogenous patches within a pasture, which in turn creates a heterogeneous landscape. Floristic and structural diversity are higher on the patch-burn pastures than on the traditional management pastures. Our project investigated the response of grassland bird productivity and territory configuration to these changes in the plant community. We collected data using nest searching and spot mapping techniques. Our efforts focused on the three most common grassland nesting species: grasshopper sparrow (*Ammodramus savannarum*), dickcissel (*Spiza americana*), and eastern meadowlark (*Sturnella magna*). Preliminary data analysis indicates a significant response of nest survival and territory size. In general, nests had higher survival in plots that had not burned during the current year, with the highest survival on plots that were 1-year post burn. Territory size was larger on plots that burned during the current year, while the smallest territories were found on plots that were 1-year post burn. Research such as this provides insights that allow managers to provide grazing areas for local ranchers while creating a diversity of habitats for grassland birds.
15. Recurring Waterbird Mortalities of Unusual Etiologies. REBECCA A. COLE, TONIE E. ROCKE and J. CHRISTIAN FRANSON USGS, National Wildlife Health Center, Madison. Over the last decade NWHC has documented various large-scale mortalities of birds caused by infectious and non-infectious disease agents. Some of these mortality events have been recurring with unusual or unidentified etiologies. While some of the causes of mortalities have been elucidated, others remain in various stages of investigation and identification. Three examples will be discussed. 1). *Leyogonimus polyoon* (Class: Trematoda), not found in the New World until 1999, causes severe enteritis and has killed over 15,000 American coots (*Fulica americana*) in the upper mid western United States. The geographic range of this parasite within North America is predicted to be limited to the Great Lakes Basin. 2). Avian vacuolar myelinopathy (AVM) causes severe neurologic dysfunction and debilitation. The disease was first seen in 1994 in the southeastern United States in bald eagles (*Haliaeetus leucocephalus*) but was later determined to occur primarily in coots and other waterbirds and only secondarily in eagles. Experimental work suggests that one or more toxic algae that live on an invasive, exotic weed hydrilla (*Hydrilla verticillata*) may be the etiologic agent, but its identification has been difficult. 3). In the early 1990's estimates of up to 6% of the North American population of eared grebes (*Podiceps nigricollis*) died at Salton Sea, California, with smaller mortalities occurring throughout the 1990's. Birds were observed to have unusual preening behavior, and to congregate at fresh water drains and move onto land. Suggested etiologies included interactions

of contaminants, immunosuppression, an unusual form of a bacterial disease, and an unknown biotoxin. During studies carried out from 2000 to 2003, eared grebe mortality did not approach the level seen in the early 1990s and, although bacteria were identified as minor factors, the principal cause of mortality remains undetermined. The potential population impact of these emerging and novel disease agents is currently unknown.

16. Thermoregulation and ventilation in seasonally acclimatized House Sparrows. SHELDON J. COOPER, Dept. of Biology & Microbiology, Univ. of Wisconsin Oshkosh, Oshkosh, WI 54901, and JEREMY R. ARENS, Dept. of Biology & Microbiology, Univ. of Wisconsin Oshkosh, Oshkosh, WI 54901. Passerines that are year-round residents in temperate climates undergo seasonal acclimatization which facilitates maintenance of thermoregulatory homeostasis. These changes in thermoregulatory metabolism must be supported by equivalent changes in O<sub>2</sub> transport. We measured the effects of ambient temperature and time of day on metabolism and ventilation in House Sparrows (*Passer domesticus*) in summer and winter. House Sparrows were exposed to ambient temperatures (T<sub>a</sub>) ranging from -15o to 15oC. Open-circuit respirometry was used to measure oxygen consumption (VO<sub>2</sub>) and ventilation was recorded using whole-body plethysmography. In both summer and winter, VO<sub>2</sub> increased with decreasing T<sub>a</sub>. VO<sub>2</sub> was significantly higher during the active phase compared to the resting phase of the daily cycle in both summer and winter. With increased oxygen demands, minute volume (VI) increased in both summer and winter. In summer, ventilation was not significantly affected by time of day. In winter, active phase birds had significantly higher respiratory frequency (f) and minute volume (VI) than rest phase birds. However, winter birds in their rest phase had significantly higher oxygen extraction efficiency (EO<sub>2</sub>%) than active phase birds. Winter birds had significantly higher EO<sub>2</sub>% vs. summer birds.
17. An experimental examination of song suppression in the California Spotted Owl following exposure to the simulated presence of a Great Horned Owl. MICHELLE L. CROZIER, M. E. SEAMANS and R. J. GUTIÉRREZ. University of Minnesota, Department of Fisheries, Wildlife, and Conservation Biology, St. Paul, MN. California Spotted Owls (*Strix occidentalis occidentalis*) may use mature forest to avoid potential competitors and predators such as Great Horned Owls (*Bubo virginianus*). If Spotted Owls avoid Great Horned Owls, we hypothesized that Great Horned Owl vocalizations would affect Spotted Owl calling behavior. Therefore, we designed a crossover experiment which examined vocal responsiveness of male California Spotted Owls to conspecific calls following broadcast of a recorded Great Horned Owl calling bout in their territories to a control consisting of a Spotted Owl call only. We found little evidence that broadcasting Great Horned Owl vocalizations in Spotted Owl territories affected short-term responsiveness of male Spotted Owls. Heterospecific response rates were also low for both species. Our prediction that the presence of Great Horned Owls (i.e., simulated calling by Great Horned Owls) would suppress Spotted Owl responsiveness was not supported. Although interspecific competition has been extensively observed in other raptor species, we found no evidence that Spotted Owls and Great Horned Owls have a strong vocal response to one another. Other mechanisms, such as physical interactions or different foraging strategies, may play a role in division of resources between the two species, and may explain differences in observed habitat use patterns.
18. \*Community-level patterns in phenology of fall migrants in the Yucatan Peninsula. JILL L. DEPPE, Department of Biology, University of California Riverside. I investigated temporal patterns in composition of fall migrant communities along the northern coast of the Yucatan Peninsula. I used mist nets to census migrants in coastal vegetation on 3-5 days each week during fall 2001-2003. Eighteen species were common at the site and were included in analyses. I standardized the weekly abundance of each species and used Detrended Correspondence Analysis

(DCA) to evaluate community dynamics. Fourteen of the eighteen common species have wintering populations in the study site, therefore, I analyzed communities with and without winter residents. DCA axis I had eigenvalues of 0.59 and 0.72 (1.0 maximum possible) in communities analyzed with and without residents, respectively. In both analyses first axis scores were significantly correlated with date and represented within-year variation in bird composition and abundance. When winter residents were excluded the length of axis I was 4.99, indicating complete turnover in migrant community composition from the start to the end of the migratory season. When I included residents the length of axis I was reduced to 3.37, and turnover was incomplete. DCA II for communities with residents showed a quadratic relationship with date, suggesting that communities and censuses at the end of the season were more similar to those earlier on, due to the presence of wintering populations of early-season migrants in the study area. The position of species along axis I was similar for communities with and without residents. Turnover was continuous throughout the season, and species did not arrive in waves as observed at other fall stopover sites. Migrant communities including winter residents also showed between-year differences in DCA scores (ANCOVA,  $p < 0.01$ ). Within-year variation in species composition and abundance may be related to the geographic location of species' breeding and/or wintering grounds, whereas between-year variation may be caused by en-route weather conditions or factors affecting reproductive success, and consequently, population size of species on their breeding grounds.

19. Lessons learned from the first decade of the Canadian Migration Monitoring Network (CMMN). ERICA H. DUNN, Canadian Wildlife Service, Ottawa, ON Canada K1A 0H3. CMMN is a loose association of 21 independently-operated migration monitoring stations, spread fairly evenly across the entire southern portion of Canada. Full member stations agree to develop and adhere to a station-specific, standardized protocol, and to annually submit daily count data to Bird Studies Canada (BSC) for trend analysis. BSC posts trend results on its website, helps with fund-raising, and helps organize regular meetings of station personnel. After a decade of operation, the benefits of the network are very clear, and lessons have been learned that were not anticipated at the outset. The most important benefit has been an expansion of mind-set from the purely local to the scale of national "big picture." The network has encouraged cooperative projects, both through collection of new data and analyses of past data (such as a cross-country comparison of mass gain by migrants). Such projects have highlighted limitations of the data sets, which in turn has led to greater standardization of methods among stations. Comparison of trend results has demonstrated the importance of controlling local habitat change, the need for better understanding of breeding origin of populations being sampled at each location, and the desirability of having multiple stations to sample each monitored population.
20. Southwestern Willow Flycatcher potential prey base and diet in native and exotic habitats. \*SCOTT DURST, USGS, Colorado Plateau Research Station, Northern Arizona Univ., Flagstaff, AZ, TAD THEIMER, Northern Arizona Univ., Flagstaff, AZ, EBEN H. PAXTON, USGS, Colorado Plateau Research Station, Northern Arizona Univ., Flagstaff, AZ, MARLYSE C. WASKIEWICZ, USGS, Colorado Plateau Research Station, Flagstaff, AZ, and MARK K. SOGGE, USGS, Colorado Plateau Research Station, Flagstaff, AZ. We studied the potential arthropod prey base and diet of endangered Southwestern Willow Flycatchers (*Empidonax traillii extimus*) breeding at Roosevelt Lake, Arizona, in 2002 and 2003. We used Malaise traps to quantify the arthropod community composition in three habitats utilized by breeding willow flycatchers: (1) native Gooddings willow (*Salix gooddingii*), (2) exotic saltcedar (*Tamarix* spp.), and (3) a mixture of these two locally dominant riparian tree species. In addition to sampling the potential prey base of the flycatchers, we collected willow flycatcher fecal samples during routine banding activities and identified arthropod fragments in 174 fecal samples to estimate the dietary composition of adults and nestlings. We will explore the relationship between the observed

willow flycatcher diet and the potential arthropod prey base, as well as examine variation in diet according to: sex, age, year, time in the breeding season, and habitat type. The ultimate goal of this study is to examine the dietary ecology of the Southwestern Willow Flycatcher as an important factor in the conservation of this endangered species.

21. Increase in avian malaria at upper elevation in Hawaii. LEONARD FREED, Dept. Zoology, Univ. of Hawaii, Honolulu, HI, and REBECCA CANN, Dept Cell and Molecular Biology, Univ. of Hawaii, Honolulu, HI, and WENDY KUNTZ, Dept. Zoology, Univ. of Hawaii, Honolulu, HI, and GUSTAV BODNER, Dept. Zoology, Univ. of Hawaii, Honolulu, HI. Mosquito-borne avian malaria (*Plasmodium relictum*) and poxvirus (*Poxvirus avium*) have contributed to extinction and endangerment of Hawaiian birds. Forests above 1500 m elevation are the only habitats in which endangered species persist, having formerly occurred at lower elevations. An elevational gradient in these diseases exists: the vector (*Culex quinquefasciatus*) becomes rarer above 1500 m elevation and development of sporozoites in Plasmodium is slower at cooler temperatures, with threshold of 13 degrees C. Work from 1988-early 1992, using a PCR diagnostic, showed low prevalence of malaria (2.1%, n =532) at the highest elevation where endangered birds of (*Metrosideros polymorpha*)/(*Acacia koa*) forest occur. It was found in only 3 species: Hawaii Amakihi, Apapane, and Omao. Recent work at the same site, using 120 samples collected in 2001, revealed significant increase in malaria (15.8%), including Iiwi, Hawaii Elepaio, and the endangered Hawaii Akepa, as well as higher prevalence in Hawaii Amakihi and Apapane. The Elepaio, Akepa, and Amakihi are permanently resident with very limited dispersal, indicating that transmission likely occurred at upper elevation. Second instar mosquito larvae were detected on December 1, 2001, in one of 12 mosquito oviposition buckets, shortly after a major epizootic extending from August-October 2001. Comparison of July-August air temperatures of the two time periods indicated increased prevalence of malaria with warmer temperatures. Temperatures on days above mean of 13 degrees C were significantly higher in 2001 than in 1989-1991. First indications of tolerance to malaria were documented in Iiwi and Hawaii Akepa through survival and nesting success. A cost of tolerance to malaria was also documented through broken head feathers and shivering. The reservoir of malaria in tolerant individuals at upper elevations will accelerate conditions for mosquito-borne disease to become endemic at these elevations with warmer temperatures, with extinction of endangered species as a likely consequence.
22. Diversity of play behaviors in birds. MILDRED FUNK, Biology Dept., Roosevelt University. Though play has been described in at least half the 28 orders of birds, avian play is still rarely reported (Gamble & Cristol, 2002). Most avian play involves objects, but exercise play and social play between individuals have also been noted. In this poster, I give examples of these three types of play in young Yellow-crowned parakeets I observed (Funk, 2002). For instance, the birds spontaneously played with novel objects (spinning tops, repetitively dropping objects and monitoring their fall) they played tug-of-war with each other and they exercised (swung on swings and did somersaults). Sub-song, a rambling practice of the species song, has also been suggested as vocal play. The parakeets practiced their species song for weeks before they began to sound like their parents. In other species, "games" (either games an individual plays alone or games between individuals) and "pretence" have been described as play. I offer examples of avian games and pretence that have been in the recent literature.
23. Thermal regimes of Mexican Spotted Owl nest stands. JOSEPH L. GANEY, USDA Forest Service, Rocky Mountain Research Station, Flagstaff, AZ 86001. To evaluate the hypothesis that Spotted Owls (*Strix occidentalis*) select habitats featuring cool microclimates to avoid high daytime temperatures, I sampled thermal regimes in nest areas used by Mexican Spotted Owls (*S. o. lucida*) in northern Arizona. I sampled air temperature at 30-min intervals in 30 pairs of nest and random sites from May - August and used the resulting thermal profiles to estimate a suite of

diurnal temperature parameters. I also estimated diurnal energy use and evaporative water loss, and compared these estimates and temperature parameters between nest and random areas. Owl nest areas were significantly cooler than random areas, and estimated evaporative water loss was significantly lower in nest than in random areas. In contrast, there was little difference in estimated diurnal energy use between nest and random areas. These results support the hypothesis that Mexican Spotted Owls select cool habitats. Use of these cooler habitats appears to reduce diurnal evaporative water loss relative to random areas, suggesting that water balance may be more important in habitat selection by Spotted Owls than previously realized. Selection of cool nest areas does not appear to result in large energy savings, however, at least in this high-elevation study area (mean elevation at nest areas in this study was 2,230 m).

24. Nest site differences of primary cavity users in salvage-logged and unlogged high intensity wildfires in the Black Hills, South Dakota. DALE GENTRY, South Dakota School of Mines and Technology, Rapid City, SD, and KERRI VIERLING, South Dakota School of Mines and Technology, Rapid City, SD. Woodpeckers excavate cavities in snags for nesting and roosting, and post-fire habitats are important source of snags for many cavity-nesting communities. Post-fire salvage logging immediately influences snag availability, but its later influence on other important factors such as spatial distribution, height, and diameter at breast height (dbh) of available snags is unknown. The objective of this study was to determine how salvage logging practices affected cavity user communities in the Black Hills, South Dakota 12-15 years after the fire/salvage logging occurred. We examined cavity-nesting communities in similar aged burns that differed in post-fire salvage logging activities located within Wind Cave National Park, the Black Hills National Forest, and Custer State Park. During 2002-2003, we surveyed four 250-400ha sites; two of these sites were burns with no salvage logging after the fire and two sites had salvage logging occur after the burn. We found 79 nests in 70 different snags; 42 nests were in logged units and 28 were in unlogged units; overall, nest density was higher in unlogged units. Diversity of the cavity user community did not differ between logged and unlogged sites but the relative abundance of some species did. We completed vegetative surveys around each nest snag and found that nest sites in the unlogged units were surrounded by more large (>23 cm dbh) and small (<23 cm dbh) snags than nests in logged sites. However, the mean snag height and diameter at breast height (dbh) was higher around nests in logged landscapes. The higher nest density in unlogged units and the general tendency of woodpeckers to select nest sites in clusters of snags suggests that the lower snag densities in salvaged forests is negatively influencing cavity-nester communities 15 years post fire.
25. Influence of habitat variation within a ponderosa pine forest on migrating and breeding land birds. STEVE GERMAINE, Washington Dept. of Fish and Wildlife, Olympia, WA, CATHERINE WIGHTMAN, Arizona Game and Fish Dept., Phoenix, AZ, and PAUL BEIER, Northern Arizona University, Flagstaff, Arizona. We surveyed birds during spring and fall migration and breeding season in a northern Arizona ponderosa pine forest, and identified seasonal habitat relationships. We measured stand-level variables describing density/ha for 3 size classes of each tree species, and canopy closure. We submitted habitat and seasonal bird species abundance data to canonical correspondence analysis (cca) to identify gradients of habitat variation and ordinate abundance optima of birds in each season. We estimated bird species richness and diversity and correlated these with habitat gradients. The cca generated two axes. Axis 1 described a gradient of forest dominated by pinyon pine and juniper to forest dominated by ponderosa pine and containing trees >38 cm diameter at breast height. Axis 2 described a gradient of high-density small and medium diameter ponderosa-dominated stands at one end and open canopied, heterogeneous forest with a marked deciduous component at the other. Both axes contained bird species that oriented farther from ponderosa-dominated stands in spring than in either other season. In addition, while some birds reached optima in similar habitat in multiple

seasons, others demonstrated marked inter-seasonal differences in habitat use. Most frequently, habitat use differed in spring with breeding and fall habitat use similar. Indices of diversity for most guilds were slightly higher during breeding season than fall, and 2-3 times higher during these seasons than spring. Species richness during fall migration and breeding season was weakly positively associated with open-canopied, heterogeneous forest containing a deciduous component. Ponderosa pine forests may be used less by migrating land birds during spring than in either other season. Furthermore, variation in seasonal habitat relationships demonstrated by several bird species indicates a range of habitat conditions must be provided within ponderosa pine forests if managing for land birds outside the breeding season is a concern.

26. Migration and conservation of White Storks in Kenya. CECILIA M. GICHUKI, National Museums of Kenya Centre for Biodiversity Wetlands Programme; ANNE M. MBOGO, Lake Elementaita Eco Friendly Centre Box 15157 Nakuru; ANNE W. MUNGARI, Kipsaina Wetlands Conservation Group, Private Bag, Kipsaina; and MOFFAT M. WAIGWA, Lake Elementaita Eco Friendly Centre, Box 15157, Nakuru. White Storks migrate to Africa from Europe and East Asia. In Africa White Storks follow the Great Rift Valley and River Nile on their southern migration. The birds arrive in Kenya during the period between 15th October and 31st December of each year and leave Kenya from the beginning of February to end of March. In their wintering areas the birds share foraging sites with other water birds and feed in groups of 200-1000 birds in open habitats. White Storks in Kenya face a wide range of threats, the most serious being degradation of foraging habitats and climatic changes. Most of the Storks are estimated at 100,000 birds. Past records have indicated that Kenya hosts between 50,000-80,000 birds per year but majority of these birds stop over for a period of less than two weeks. Records available indicate that between 1983-1998, an average of 39,876 birds wintered in Kenya feeding and moving about in the country. These birds inhabit about 45% of Kenya's total land area of some 568,000 km<sup>2</sup>. Countrywide surveys done in 1983 showed that 53,000 birds wintered in Kenya. Another survey in 1989 revealed that 47,800 birds had wintered in the country. Generally, the numbers have been decreasing over time. Between 1989 and 2001, the number of storks has fallen from an estimated 50,000 to 35,000 birds. A total of about 41,000 birds wintered in Kenya in 2002, with the highest number being recorded in the western region
27. Selection of avian conservation goals during restoration of degraded oak savannas. RALPH GRUNDEL and NOEL B. PAVLOVIC, USGS, Great Lakes Science Center, Porter, IN. Oak savanna was a common Midwest ecosystem at the time of European settlement but is rare today. Avian populations were surveyed, across seasons, in a series of twenty-five historic savanna sites. These sites have been managed in a variety of ways over the past century and today represent a spectrum of habitat types, from grasslands to savannas to forests, along a gradient of woody vegetation. The conservation value of each of these sites was evaluated by four methods. These methods estimated how valuable for conservation of birds different combinations of the current habitat types would be. Preferred habitat combinations represented a tradeoff between managing for species diversity and managing for more threatened species.
28. Long-term monitoring of stopover habitats for landbirds and waterfowl along the Upper Mississippi River system. HEGLUND, P.J., SAUER, J., THOGMARTIN, W., KENOW, K., KNUTSON, M., KIRSCH, E., YIN, Y., ROBINSON, L. USGS-UMESC, 2630 Fanta Reed Road, La Crosse, WI and BARZEN, J. International Crane Foundation, Baraboo, WI. The Upper Mississippi River (UMR) is one of this Nation's unique natural resources. The ecosystem provides habitat to a wide array of fish and wildlife species distributed among a complex assortment of flowing channels, floodplain lakes, backwaters, wetlands, and floodplain forests. It acts as a major migration corridor for millions of birds representing almost 300 species. The river's north-south orientation and nearly contiguous habitat makes it an important flight path for

many species birds. With an ecosystem as diverse and complex as the UMRS, many of its processes and their interrelationships are not well known. One way to help understand this multifaceted system is through a combination of environmental monitoring and focused studies. We present results of exploratory analyses on data collected by staff from the USGS – Upper Midwest Environmental Sciences Center and the USFWS Upper Mississippi River Wildlife and Fish Refuge on waterfowl use and landbird migration. These data when combined with habitat, vegetation and food resource data collected by the USGS's Long Term Resource Monitoring Program can be used to explore associations between bird abundance and important bird habitats and understand the effects of river management on the resources used by birds in the UMR. We present 3 case studies of waterfowl use, landbird use, and bird response to management obtained from monitoring activities taking place on the UMR over the past 10 years.

29. Pigment packing in body contour feathers of male Hawaii Amakihi. JENNI HIGASHIGUCHI, Dept. of Zoology, Univ. of Hawaii, Honolulu, HI, and LEONARD FREED, Dept. of Zoology, Univ. of Hawaii, Honolulu, HI. Plumage coloration in sexually dichromatic birds can signal age or condition for both male rivalry and female choice. The packing of pigment in the barbs of the pennaceous portion of contour feathers influences color. Birds typically do not pack pigment in all barbs, and not all barbs with pigment are fully packed. Greater packing within barbs, and greater numbers of barbs packed will increase the saturation and brightness of color. We explored the packing of pigment in body contour feathers of the Hawaii Amakihi (*Hemignathus virens virens*), a Hawaiian Honeycreeper on the windward slope of Mauna Kea, Island of Hawaii. This subspecies is sexually dichromatic, with males bright yellow and females duller yellow-green. However, extensive variation in plumage occurs among both males and females. With birds in hand, the pigment is concentrated at the distal portion of the feather, with full packing transitioning into partial packing toward the proximal end before the plumulaceous portion of the feather. Our initial approach was to compare pigment packing in breast feathers removed from birds. Two feathers were removed from each of 15 males and examined under a stereo microscope. The mean number of fully packed barbs was 22.4, with a range of 13 to 29. The difference in number of fully packed barbs between the two feathers for each male averaged 2.2 barbs. Differences between males, calculated by mean pairwise differences among males, averaged 7.5, significantly larger than differences within males ( $p < .01$ ). Thus the number of barbs packed with pigment may be the basis for variation in brightness and saturation of color among males. The packing may be a direct indication of the amount of carotenoid pigment a male is able to sequester during molt, or chooses to sequester, with consequences for mate choice and status signaling.
30. Does variation in corticosterone secretion track body condition or breeding stage White-throated Sparrows? BRENT HORTON and REBECCA HOLBERTON, Department of Biological Sciences, University of Maine, Orono, ME. Many studies have investigated corticosterone secretion and changes in body mass in a wide variety of species. The interpretations of their observations have been as diverse as the hormone patterns, perhaps due to corticosterone's multiple roles in regulating behavioral as well as physiological activities. Changes in baseline corticosterone often mirror changes in energy reserves, a pattern exhibited by both sexes in all seasons. A pattern observed in some breeding birds is a reduction in the acute secretion of corticosterone in response to environmental perturbation (the stress response). As breeding progresses, both sexes may face different time and energy constraints due to changes in parental responsibilities, and variation in corticosterone secretion and body mass may reflect these differences. To better understand sex-dependent differences in corticosterone secretion, we measured body condition (mass corrected for body size) and plasma corticosterone in White-throated Sparrows (*Zonotrichia albicollis*) across three stages of reproduction: pre-incubation (pair formation, nest building, egg laying), incubation, and nestling provisioning. Female body

condition declined as breeding stage progressed while male condition did not change. The decline in female body condition may reflect the cumulative effects of an energetic investment in egg production and incubation not shared by males or unequal provisioning efforts. However, baseline corticosterone levels increased in both sexes when provisioning young, and were negatively correlated with body condition in females and independent of body condition in males. These results suggest that increased baseline corticosterone need not always be in response to, or necessary for, a decline in energy stores. Rather, this increase in corticosterone may promote behavioral changes to meet the increased foraging activity necessary for provisioning young. Both sexes reduced the intensity of the stress response when provisioning young, which could further support parental responsibilities by deterring the abandonment of provisioning behavior in the face of environmental perturbation. It is currently unknown if these elevated baseline corticosterone levels or reductions in the stress response pose a risk to either sex.

31. Patagial tagging of nesting Turkey Vultures. STU HOUSTON, University of Saskatchewan, Saskatoon SK S7N 0J8, and BRENTON TERRY, Hugh Cairns School, Saskatoon SK. In the past 20 years, many Turkey Vulture pairs in Saskatchewan have adapted to nesting in dark corners of attics of deserted farm homes, and have increased in numbers and in range. Through province-wide publicity, 20 such nesting pairs were reported to us in 2003, some too late to visit. Following Brent's hands-on instruction from Peter Bloom in California, we tagged 14 Turkey Vultures at 9 nests in 2003. Letter-number combinations on wing tags were visible at 8 nests for up to 5 weeks after the young learned to fly; no adverse effects from the tags were evident. This begins the first major tagging project of nestling Turkey Vultures.
32. Hierarchical models for statewide avian distributions for the state of Georgia. JAY HOWELL, Warnell School of Forest Resources, The University of Georgia, Athens, GA, MICHAEL J. CONROY, U.S.G.S. Cooperative Fish and Wildlife Research Unit, Warnell School of Forest Resources, University of Georgia, Athens, GA, and JAMES T. PETERSON, U.S.G.S. Cooperative Fish and Wildlife Research Unit, Warnell School of Forest Resources, University of Georgia, Athens, GA. To predict the distributions of nine breeding birds in the state of Georgia, we built models consisting of four hierarchical levels built on nested mapping units of decreasing area: 90,000 hectares (level 4), 3600 hectares (level 3), 144 hectares (level 2), and 5.76 hectares (level 1). We used the Partners in Flight (PIF) database of point counts to generate presence vs. absence at locations across the state of Georgia for nine avian species: Acadian Flycatcher, Brown-Headed Nuthatch, Carolina Wren, Indigo Bunting, Northern Cardinal, Prairie Warbler, Yellow-Billed Cuckoo, White-eyed Vireo, and Wood Thrush. At each location, vectors of habitat measurements were taken from the Georgia GAP landcover and other GIS sources for each of the hierarchical levels. We selected variables for each species based on a literature for each species. The models were then fit to a hierarchical logistic regression model using MCMC and Gibbs sampling through the program WinBugs. Model selection was performed using AIC and DIC. We tested out of sample prediction using three fold cross validation. Results showed an average overall correct classification rate of 72% for the top three models for each species. For all species, models from the final top three set utilized variables from multiple hierarchical levels. The second hierarchical level tended to account for the most variation between points. In many cases, a habitat measure was found to be important at multiple levels. Finally, we found that many variable relationships at coarse spatial scales deviated from what we expected, based on local habitat preferences from our literature review.
33. Genetic dynamics at varying scales: population genetic structure and parental relatedness of the waved albatross KATHRYN P. HUYVAERT, Dept. of Biology, Univ. of Missouri- St. Louis, St. Louis, MO 63121, and PATRICIA G. PARKER, Dept. of Biology, Univ. of Missouri- St. Louis, St. Louis, MO 63121. We used data from two hypervariable molecular markers to

examine the distribution of genetic variation among subpopulations and among individuals within a subcolony of the waved albatross (*Phoebastria irrorata*). The breeding population of this species is almost entirely limited to the island of Española in the Galápagos Archipelago. Such strong philopatry could lead to population genetic structure among subcolonies on the island. Nevertheless, pairwise  $F_{st}$  values calculated from microsatellite data for individuals from three subpopulations were all less than 0.02 ( $p > 0.02$  after Bonferroni correction) suggesting little genetic differentiation and the presence of gene flow throughout the population. The waved albatross mating system is characterized by high year-to-year mate and site fidelity as well as an unexpectedly high rate of extra-pair fertilization (EPF) as a result of frequent extra-pair copulations (EPCs). We tested predictions of two hypotheses bearing on the genetic similarity among social and genetic mates. One is that females may pursue EPCs when her mate is a close relative. However, we found no difference between minisatellite band-sharing values of females with their social mates compared to those with the genetic fathers of their extra-pair offspring (paired- $t = 1.70$ ,  $p > 0.05$ ). We also demonstrate no support for a kin-based EPF tolerance hypothesis: cuckolded males are not more closely related to the genetic sires of their extra-pair offspring than they are to randomly drawn breeding males (Wilcoxon matched pairs,  $z = 1.94$ ,  $p > 0.05$ ).

34. Measuring habitat quality for birds. MATTHEW D. JOHNSON, Dept. Wildlife, Humboldt State Univ., Arcata, CA 95521. Understanding the quality of habitat is fundamental to avian ecology and conservation. Previous work has revealed nuances of density, carrying capacity and site occupancy with respect to habitat quality, but few have synthesized concepts with approaches for measuring habitat quality in the field. Here, I outline conceptual aspects of habitat quality and briefly review common techniques for measuring it with wild birds, including both traditional measures (e.g., density) and newly emerging methods (e.g., fluctuating asymmetry). I emphasize the importance of defining habitat and distinguishing habitat quality from animals' vs. conservationists' perspectives. The diversity of techniques ornithologists use to measure habitat quality can be clarified with 4 categories emphasizing (1) direct measures of resources & the ecological processes that constrain their use (e.g., food availability and/or predation risk); (2) demographic indicators (e.g., density and/or reproduction); (3) distributional indicators (e.g., sequence of habitat occupancy); or (4) individual measures (e.g., fat scores). Each approach carries partially unique assumptions and constraints. By articulating the objectives for measuring habitat quality and recognizing the parameters of a variety of techniques to measure it, ornithologists can better choose appropriate methods.
35. Physiological mechanisms of resource use by birds, and their ecological consequences. WILLIAM H. KARASOV, University of Wisconsin-Madison Department of Wildlife Ecology, Ecological science, in its many guises relies on molecular biology, chemistry, and physiology to understand ecological systems and to attempt to solve environmental problems. Using examples from our own work and that of others, I will illustrate how physiological mechanisms of resource use potentially have great ecological penetrance, meaning that the physiological details of these processes are likely to create pattern at the behavioral, population, community, or ecosystem level. The examples cluster around (1) digestive and post-absorptive processing that constrain the nutritional ecology of birds during migration, and (2) features of avian nutritional ecology that determine avian responses to environmental contamination.
36. Breeding bird habitat use in riparian wet meadows: does reed canary grass affect bird territory placement? EILEEN M. KIRSCH, WAYNE E. THOGMARTIN, TIM FOX, AND BRIAN R. GRAY, USGS, Upper Midwest Environmental Sciences Center, La Crosse, WI, 54603. Riparian wet meadows are endangered habitats in the upper Midwest due to river development, conversion of floodplains to agriculture, and urbanization. Most remaining wet meadows are dominated by

invasive reed canary grass, and wet meadows dominated by native vegetation communities are very rare. The prevailing notion among resource managers is that reed canary grass is of little value to birds and other wildlife. In 2001 and 2002, we studied breeding bird habitat use and estimated an index of productivity in riparian wet meadows across a range of reed canary grass dominance. We selected 12 wet meadows for study in 2001 and added another in 2002. We used spot mapping to estimate locations and sizes of bird territories, and indexed productivity from observed behavior. Vegetation features were estimated every 50 meters in a grid pattern at each study plot in late July. We developed an extension in ArcView 3.2 to select sample areas outside of territories on study plots (i.e., non-territories), because the sampling units were territories. In ArcMap 8.1, surfaces for vegetation variables were created using inverse distance-weighting, and territories and non-territories were joined with these surfaces. We compared means of each variable between territories and non-territories. We found that territories of Common Yellowthroats and Swamp Sparrows occurred without regard to reed canary grass dominance. Sedge Wrens territories showed a slight tendency to occur in areas with greater reed canary grass cover. The common bird species typically found in Midwestern wet meadows, are present in areas dominated by reed canary grass.

37. Female Scarlet Tanagers called when their mates were temporarily removed during incubation. PAUL H. KLATT, Dept. of Biology, Univ. of North Dakota, Grand Forks, ND, 58202 and BRIDGET J.M. STUTCHBURY, Dept. of Biology, York Univ., Toronto, ON, M3J 1P3. We observed pairs of Scarlet Tanagers to assess the importance of mate guarding and incubation in the mating system. Males stayed fairly close to their mates during the fertile period and often followed them to and from the nest area during nest building. Almost all males (12 of 13) were observed feeding their mates during the incubation period. Females seldom gave “chick-burr” calls during regular incubation observations, and often actively begged from the male. We temporarily removed males (N = 7), for 2 hours, to determine the female’s response to her mate’s absence during incubation. All 7 females gave long bouts of “chick-burr” calls the first time they came off the nest while their mate was absent. One female even permanently abandoned her eggs and the territory during the removal. This suggests that males who do not attend their mate closely during incubation risk being deserted. We expect to find few extra-pair fertilizations due to the close association of the pair and high incubation feeding by the male.
38. The effects of grassland patch and landscape characteristics on the nest predators of grassland bird nests. \*PAGE KLUG, Dept. of Biology, University of Nebraska, Omaha, NE 68182; L.L. WOLFENBARGER, Dept. of Biology, University of Nebraska, Omaha, NE 68182; J.P. MCCARTY, Dept. of Biology, University of Nebraska, Omaha, NE 68182. The prairies of North America and the birds associated with them are of conservation concern. Agriculture has replaced prairies and fragmented habitat. The effects of today’s land-use on avian communities are largely unknown. Predation is of special concern in agricultural habitats where nest predators have responded positively to fragmentation. Our focus is on nest predation in Dickcissels (*Spiza americana*). The purpose of our work is to understand the influence of habitat fragmentation on predator communities and the relation to nest predation rates. At 23 sites, we monitored nests (n=225) to calculate patch level predation rates. We survey small mammals, mid-sized mammals, reptiles, and avian predators to monitor possible predators. We use video-systems to identify species responsible for predation. Predator specific analyses are done at three spatial scales: nest site, patch, and landscape. In our first field season we recorded 14 predation events. I documented seven small mammals, four snakes, two mid-sized mammals, and one Brown-headed Cowbird. In analyzing the predator community, mid-sized mammals tended to be more prevalent within 50 meters of the edge when compared to interior. Snakes and small mammals did not differ in presence between edge and interior habitats. The presence of mid-sized mammals was negatively correlated to the daily survival rate (DSR). The presence of snakes was

positively correlated to DSR. The variation in litter depth of a grassland patch tended to be positively correlated to small mammal presence; litter depth was negatively correlated to reptile presence. These results indicate that patch level vegetative structure as well as predator interactions may be shaping the predator community and affecting predation rates. By studying the predators at multiple scales we will better understand the effects of fragmentation on predation risk. With this knowledge managers will be able to more effectively manage habitat for declining grassland birds.

39. Bird conservation planning: using regional and landscape context to inform local planning. MELINDA G. KNUTSON, WAYNE E. THOGMARTIN, TIM J. FOX, SHAWN E. WEICK, and JOHN C. NELSON, USGS, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603. Land management agencies and nonprofit organizations involved in bird conservation would like to identify habitats where high-priority bird species are likely to occur and to determine whether current management actions will sustain priority bird populations. Effective bird conservation and efficient prioritization of management activities both require that land managers place their management unit in the context of the larger landscape or region. We focus on Necedah and Sherburne National Wildlife Refuges in Bird Conservation Region 23, the Prairie-Hardwood Transition Zone, to demonstrate how refuge managers can use the GIS tools and statistical models we developed to inform the management process. We identified the avian species expected to occur on each refuge, the importance of the refuge to particular bird/habitat suites, and the potential contribution of the refuge to regional avian conservation objectives. We used our statistical models of avian abundance to evaluate local management unit contributions to the conservation of avian species of concern and to inform the process of stepping through population objectives between continental, regional, and local scales.
40. Floodplain bird communities of the Upper Mississippi River: responses to alternative future conditions. Melinda G. KNUTSON, EILEEN E. KIRSCH, YAO YIN, USGS, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603. Large rivers of the Upper Midwest are managed to meet multiple societal goals, including navigation, recreation, and sustaining wildlife habitat. Most large rivers are regulated by locks, dams or levees. These structural changes allow manipulation of water flows for human objectives, but hydrologic changes also have short and long-term effects on the plant communities of large river floodplains. This, in turn, affects the bird communities that depend on them. We have studied floodplain birds of the Upper Mississippi River for over a decade, collecting data on the composition of the bird communities, nesting success, and food availability. We will present an overview of the bird communities of the Upper Mississippi River and discuss how predicted habitat changes, driven by hydrologic factors and sedimentation, may influence them. For example, large areas of the floodplain currently occupied by forests may succeed to grasslands or willow thickets because they are too wet to support future tree regeneration. Floodplain forests currently support high densities of forest-nesting bird species, many of management concern. Floodplain wet meadows support a different suite of species and many areas are dominated by invasive *Phalaris arundinacea* (reed canary grass). Therefore, large river floodplains like the Upper Mississippi River may experience major changes in both habitats and the associated bird communities over the coming decades. We will present recommendations for research, monitoring, and management that will enhance habitat quality for high priority species and support bird diversity into the future.
41. Illustrating bird migration studies on the Web using Macromedia Flash. ROBERT J. KRATT AND KEVIN P. KENOW, USGS, Upper Midwest Environmental Sciences Center, La Crosse, WI. The USGS Upper Midwest Environmental Sciences Center has collaborated on efforts to radiomark and track migratory movements of common loons (*Gavia immer*) in the northcentral and northeastern United States. Animated graphics of these loon migration studies have been

developed using Macromedia Flash, and the presentation is served on our Center website ([http://www.umesc.usgs.gov/terrestrial/migratory\\_birds/loons/migrations.html](http://www.umesc.usgs.gov/terrestrial/migratory_birds/loons/migrations.html)). The site features loon migration paths, current locations of loons, and the science behind the project. This provides a means to share loon movement data with project cooperators and the general public in a timely manner. Installed on 98% of all web browsers, Flash is a cross-platform tool that enables developers to create immersive, high-quality animations and seamless transitions between sections of content. As a streaming vector-based technology, Flash animations are efficient and lightweight, allowing developers to achieve rich graphical presentations with manageable file sizes.

42. Is it safe to assume that bird responses to habitat are hierarchically structured? WILLIAM B. KRISTAN, Department of Biological Sciences, California State University, San Marcos, CA 92096 A central lesson of landscape ecology is that environmental variation is hierarchically structured. Factors that vary over long time periods and large areas constrain variables that vary over finer scales of space and time. Such hierarchies are easy to demonstrate, and are ubiquitous. The effects of this hierarchy of environmental variation on bird populations will be expressed through its effects on demography and habitat choice. Consequently, a hierarchy of habitats can also be interpreted as a hierarchy of statistical information about avian demography and habitat associations. Habitat can influence reproduction and survival differently at different levels in the hierarchy; for example, different stand types may have different predator communities and impart different levels of predation risk, but predation within a stand may be only weakly dependent on their nest-site choices; thus, stand-level variation would carry more information about demography than would variation among nest sites within a stand. Additionally, birds may respond behaviorally to scale-dependent cues in their environment. In the previous example, stand-level variation may be the most informative, but constraints on searching behavior may prevent them from using this information effectively. Though there are strong logical and empirical reasons for expecting to find hierarchical structure in bird habitats, the combination of demographic and behavioral effects make simple predictions about the effects of hierarchical structure in bird habitats difficult.
43. Response to extreme drought of a southern California riparian bird community. BARBARA KUS, USGS, Western Ecological Research Center, San Diego, CA. An important aspect of avian conservation is monitoring trends in population size and productivity of species of concern. This information is used to guide management by determining whether a particular observation is exceptional relative to the natural variability in these parameters. However, knowledge of the range of natural variability is often incomplete, especially with regard to extreme events in climatically variable regions. I report on the effect of drought on riparian birds at two MAPS stations at MCB Camp Pendleton in southern California during 2002, the driest year recorded since record-keeping began in 1860. Species richness at both stations was comparable to that in previous years; however, species composition changed in a manner suggesting movement into the riparian habitat from adjacent uplands. Of the species making up >5% of all birds caught at the De Luz station, adult Song Sparrow and Common Yellowthroat numbers remained constant, but numbers of Pacific-slope Flycatcher, California Towhees, House Wren, Bushtits, and Wrentit increased, with the latter species increasing three-fold to replace Song Sparrow and Common Yellowthroat as the most abundant bird at this station. Changes at the Santa Margarita station, a more mesic site, were less dramatic, but Song Sparrow numbers declined while abundance of Bushtit, House Finch, and Pacific-slope Flycatcher increased. Only 7/39 species at De Luz produced young in 2002, and hatching-year birds accounted for just 2% of all birds caught, an order of magnitude lower than the average of 22% in 1995-2001. More species fledged young at the Santa Margarita station (16/38), but the proportion of young among all captures (11%) was the lowest documented and well below the average of 40% recorded in 1998-2001. Continued

monitoring at these sites will provide valuable data on the recovery of populations to extreme events.

44. Effects of variation in egg-size and hatching date on survival in the Black-tailed Gull *Larus crassirostris*, Korea. YOUNG-SOO KWON, WHO-SEUNG LEE\* and JEOUNG-CHIL YOO. Department of Biology and The Korea Institute of ornithology, Kyung Hee University, Seoul 130-701, Korea. Egg-size variation within and between the clutches may vary considerably in birds. Several studies were shown a positive relationship between offspring survival and egg-size. To analyze the variation in egg size of Black-tailed Gulls and its relationship to nestling growth during rearing periods, we examined whether a positive relationship between offspring survival and egg size in 2002 and 2003, Korea. In addition, we investigate the influence of laying date on egg-size and chick survival rate. Fresh egg-weight and its pipped egg in a clutches were decreased as the season progress. Therefore, It was shown that there was negative relationship fresh egg weight and hatchling mass with laying date. Fresh egg weight (g) was positive correlated with chick mass both at hatching and at 15 days old in 2002 and 2003. In particularly, a significant relationship in egg weight and survival to day 15 was found in both 2002 and 2003. In addition, nestling survival decreased as the breeding season progresses. Nestling from larger eggs and from nests that hatched early in the breeding season were more likely to survive than those from smaller or earlier hatching eggs. In other words, the survival probability of offspring often changes throughout the breeding season. In conclusion, offspring from larger eggs and from nests that hatched early in the breeding season were more likely to survive than those from smaller or later hatching eggs.
45. Variance decomposition as a tool for uncovering cross-scale correlations in multi-scale analyses of avian habitat. JOSHUA J. LAWLER, Dept. of Zoology, Oregon State University, Corvallis, OR, and THOMAS C. EDWARDS, JR., USGS Biological Resource Division, Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan, UT. The theory that birds select habitat hierarchically is based on the premise that birds respond to environmental patterns at multiple spatial scales. Although many studies have investigated avian habitat associations at a range of spatial scales, few have addressed the potential effects of cross-scale correlations on the interpretation of the statistical models used in the analyses. When cross-scale correlations in such studies are strong, conclusions drawn about the relative strength of habitat associations at different spatial scales may be misleading. Here we adapt and demonstrate an analytical technique based on variance decomposition for quantifying the influence of cross-scale correlations on multi-scale habitat associations. We used the technique to quantify the variation in nest-site locations of Red-naped Sapsuckers (*Sphyrapicus nuchalis*) and Northern Flickers (*Colaptes auratus*) associated with habitat descriptors at three spatial scales. We demonstrate how the method can be used to identify components of variation that are associated only with factors at a single spatial scale as well as shared components of variation that represented cross-scale correlations. Despite the fact that no explanatory variables in our models were highly correlated ( $r < 0.60$ ), we found that shared components of variation reflecting cross-scale correlations accounted for roughly half of the deviance explained by the models. These results emphasize the importance of both conducting habitat analyses at multiple spatial scales and of quantifying the effects of cross-scale correlations in such analyses. Given the limits of conventional analytical techniques, we recommend alternative methods, such as variance decomposition, for analyzing habitat associations at multiple spatial scales.
46. A study of relationship between clutch size and nest-site in the Great Tit (*Parus major*) on Kowhang Mount, Seoul, South Korea. WHO-SEUNG LEE\* and JEONG-CHIL YOO. Department of Biology and The Korean Institute of Ornithology, KyungHee University, Seoul 130-701, South Korea. In 2000, we examined relations between breeding biology and nest-size

(volume, cm<sup>3</sup>) of Great tits (*Parus major*) on Kowhang mount. In Kowhang mount, we have been studying breeding biology of Great tits for ten years. Mean clutch size was 8.64±2.42, laying date was 14.09±5.61, and mean nest-size was 207.59±77.93 (cm<sup>3</sup>). Clutch size increased gradually from small (100-200cm<sup>3</sup>) to large (above 300cm<sup>3</sup>) nest (rs=0.178 p<0.05). In addition, laying date showed a similar increase ( $\chi^2=8.95$  p<0.05). Therefore, we suggested that 1) Great tits selected strategy that female costs of nest-building and laying eggs were less than benefits of minimum conserving energy(heating) and 2) nest-size may provide the sitting female of Great tits with information on the ‘completeness’ of the clutch, a certain clutch size being accepted as ‘complete’ in a certain nest-size.

47. Effects of egg color on Black-tailed Gulls (*Larus crassirostris*) hatching success. WHO-SEUNG LEE\*, YOUNG-SOO KWON and JEONG-CHIL YOO. Department of Biology and The Korean Institute of Ornithology, KyungHee University, Seoul 130-701, South Korea. In 2003, we investigated the value of eggshell coloration against avian predators in the Black-tailed Gull (*Larus crassirostris*). We collected a value of egg color in 93 nests. A sample of eggs was photographed directly above nests with a digital camera, and we analyzed a difference in color (two systems: RGB and Gray scale) between eggshell and nest-ground using graphic software. The difference in color between eggshell and nest-ground had a significantly negative relationship to hatching success (RGB: r=-0.593 p<0.001; Gray: r=-0.548 p<0.001). As differences between eggshell and nest-background decrease, eggs were less conspicuous. Therefore, we suggested that eggs with less difference between the eggshell and nest-background color were camouflaged in the nests, and were a high hatching success.
48. Does prey availability influence piping plover chick growth and survival in the Great Plains? LEFER, DANIELLE, Virginia Tech, Dept. of Fisheries and Wildlife, Blacksburg, VA, JAMES D. FRASER, Virginia Tech, Dept. of Fisheries and Wildlife, Blacksburg, VA, and CASEY D. KRUSE, U.S. Army Corps of Engineers, POB 710, Yankton, SD. Piping plover recovery in the Great Plains requires increasing productivity and available high quality habitat. We compared indices of foraging site quality and chick success among three sites on the Missouri River and one site in the alkali wetlands. We compared piping plover (*Charadrius melodus*) chick growth rates, invertebrate abundance and biomass at the four sites from 2001-2003. Chick growth rates downstream of a warm-water release dam were higher than at the other sites (ANOVA, F=3.2, P=0.03, DF=3). Invertebrate numbers were lower downstream of the cold-water release dam than at the two other river sites (Kruskal-Wallis,  $\chi^2=33.6$ , P<0.01, DF=3). Invertebrate biomass was higher at the Alkali wetlands and downstream of the warm water release dam than on the reservoir or downstream of the cold-water release dam (Kruskal-Wallis,  $\chi^2=30.8$ , P<0.01, DF=3). Chicks with greater mass at day 4-5 (Logistic regression,  $\chi^2=12.5$ , P<0.01, DF=1) and day 8-9 ( $\chi^2=4.4$ , P=0.04, DF=1) were more likely to survive to fledging. Results are consistent with the hypothesis that invertebrate numbers downriver from cold-water release dams are inferior to conditions in other habitats in the region. These differences in prey availability are reflected in chick growth rates. These results indicate the need to consider river management options on river reaches with lower foraging site quality and lower chick growth rates.
49. Stopover durations of fall migrating least sandpipers in the Lower Mississippi Alluvial Valley. \*SARAH E. LEHNEN, Arkansas Cooperate Fish and Wildlife Research Unit, University of Arkansas - Fayetteville, Fayetteville, AR and DAVID G. KREMENTZ, USGS, Arkansas Cooperate Fish and Wildlife Research Unit, University of Arkansas - Fayetteville, Fayetteville, AR. Estimates of stopover duration, the average amount of time that a migrating bird remains at a stopover site, have traditionally been underestimated using mark-resight data. Estimates of stopover duration using this method have not included time at site before capture and frequently have not included estimates of time at site after the last resighting. Therefore, we used Pradel's

recruitment models to estimate time at site before capture and apparent survival models to estimate time at site after capture to estimate the stopover duration. We individually color-marked and resighted 293 least sandpipers (*Calidris minutilla*) at 3 sites in the Lower Mississippi Alluvial Valley (LMAV) during Fall 2002. The best models for time at site before and after capture were selected using QAIC<sub>c</sub> ranking in program MARK. Using program SODA, these models were then used to generate estimates of stopover duration at each site. The stopover duration for least sandpipers was 8.5 days (95% CI = 5.0-12.8) at Bald Knob National Wildlife Refuge, Arkansas, 12.8 days (95% CI = 10.0-15.9) at Yazoo National Wildlife Refuge, Mississippi, and 21.0 days (95% CI = 16.0-27.9) at Morgan Brake National Wildlife Refuge, Mississippi, during Fall 2002. Our estimates are considerably longer than those calculated using traditional methods of stopover duration estimation. Two of these 3 estimates of stopover duration also are longer than has been assumed for shorebirds in the LMAV, which suggests that more shorebird habitat may be needed during fall migration than has been estimated.

50. Aerobic enzyme activities and seasonal acclimatization in resident passerine birds. ERIC T. LIKNES, Department of Biology, Northern State University, Aberdeen, SD 57401 and DAVID L. SWANSON, Department of Biology, University of South Dakota, Vermillion, SD 57069. Improved winter cold-tolerance is widespread among small birds from temperate climates and is usually associated with improved shivering endurance and elevated peak metabolic rate ( $M_{sum}$ ), although precise mechanisms of acclimatization are incompletely understood. Elevated  $M_{sum}$  and improved cold-tolerance may be associated with greater metabolic intensity of thermogenic tissues, due to mass-specific increases in oxidative enzyme capacity, or to increases in the masses of metabolically active tissues. To examine mechanisms underlying winter increases in  $M_{sum}$ , we captured wild, free-living individuals of three resident passerine species, White-breasted Nuthatch (*Sitta carolinensis*), Black-capped Chickadee (*Poecile atricapillus*), and House Sparrow (*Passer domesticus*). Each of these three species shows large seasonal variation in  $M_{sum}$ , in excess of 35%. We investigated seasonal changes in the pectoralis and supracoracoideus muscles of mass-specific and total activities of key enzymes in catabolic pathways; Phosphofructokinase (PFK), Citrate synthase (CS), and b-hydroxyacyl Co-A Dehydrogenase (HOAD). Preliminary analyses of these data suggest that neither total nor mass-specific activities of PFK, CS, and HOAD varied seasonally in any species. If correct, this suggests that the modulation of cellular aerobic capacity is not an important mechanism of seasonal acclimatization. Such a result is generally consistent with other studies of seasonal acclimatization in small birds.
51. Forest bird monitoring in northern Minnesota and Wisconsin. JIM LIND, Natural Resources Research Institute, Duluth, MN, 55811, NICK DANZ, Natural Resources Research Institute, Duluth, MN, 55811, JOANN M. HANOWSKI, Natural Resources Research Institute, Duluth, MN, 55811, and GERALD J. NIEMI, Natural Resources Research Institute, Duluth, MN, 55811. The national forests of the western Great Lakes support some of the most diverse breeding bird communities in North America, and are thought to be important sources for regional forest bird populations. The Natural Resources Research Institute initiated a breeding bird monitoring program in the early 1990's in an effort to document population trends in forest bird species in the region and examine bird/habitat relationships. Population trends from 1991 to 2003 will be presented for the 1,400+ off-road, habitat-specific survey points throughout the Superior, Chippewa, and Chequamegon National Forests, and state-owned lands in east-central Minnesota. More species had declining trends than increasing trends, especially among ground-nesting species. Among the species tested, the percentage of increasing species in each study area ranged from 13 to 29% and the percentage of decreasing species ranged from 25 to 35%. Life-history traits and cover-type affinities of increasing and decreasing species will be discussed, as well as potential causes of population trends.

52. Crows, Ravens, and Culture. JOHN M. MARZLUFF, U. WASHINGTON, Seattle, WA, and TONY ANGELL, Seattle, WA. What do Van Gogh, Shakespeare, Noah, the Norse God Odin, the Hopi People, The Atlantic Spice Company, Mark Twain, and the rock band The Counting Crows have in common? They have all drawn inspiration from crows and ravens. In fact members of the genus *Corvus* have profoundly affected our culture since people evolved. We explore these affects and show that this influence is not unidirectional: people also profoundly influence crow culture, ecology, and evolution. We describe the relationship between *Corvus* and people using a new concept, cultural coevolution. Cultural traits that stimulate each others' cultural evolution are said to be culturally co-evolved. Take the interaction between early fishers and ravens for example. Fishers that dried salmon on racks certainly lost part of their catch to clever ravens. In response they posted children and eventually scarecrows to reduce losses. Ravens figured strongly in these people's culture as the creator and chief trickster, possibly in part because of the challenges in keeping this intelligent competitor from their food. The behavior of scavenging from people and circumventing their scare tactics was likely learned through individual trial and error and social transmission. Social learning in ravens is especially likely as young follow their parents to novel foods. Thus the culture of northwest native fishers and ravens has coevolved. Cultural coevolution is most likely to occur between people and animals we regularly interact with that are long-lived, intelligent, and social. It may occur for utilitarian reasons, but this is not common in our interactions with crows. We identify six major pulses to the coevolution between *Corvus* and people: hunting and gathering, expansion of agriculture, war and aggression, urbanization and recreation, hunting for recreation, and bird feeding. In North America, and perhaps worldwide, our culture currently is stimulated by crows more profoundly than by ravens.
53. Measuring innate humoral immunity in birds: a novel application of a classic immunological assay. KEVIN MATSON, UM-St Louis, Department of Biology, St Louis, MO 63121, ALEXANDER SCHEUERLEIN, UM-St Louis, Department of Biology, St Louis, MO 63121, ROBERT RICKLEFS, UM-St Louis, Department of Biology, St Louis, MO 63121, KIRK KLASING, UC-Davis, Department of Animal Science, Davis, CA 95616. Assessment of immune function in free-living birds is emerging as an important tool in evolutionary and ecological research. The direct, genotype-dependent expression of natural antibody (NAb) genes makes the assessment of this facet of innate immunity particularly appealing for addressing questions of avian life history diversification. The hemolysis-hemagglutination (HL-HA) assay requires ~100 microL of blood collected at a single time-point and represents a highly repeatable method for quantifying innate humoral immunity via NAb-mediated complement activation (i.e. lysis) and exogenous red blood cell agglutination. To validate comparisons among avian species, the effects of complement deactivation, age, and lipopolysaccharide (LPS)-induced sickness response were examined. Complement deactivation by heating reduces lysis; lysis and agglutination both increase with age in growing chickens; and LPS vaccination does not influence these variables. In a comparison of 11 diverse species, lysis and agglutination titers vary significantly among species. Following validation, the HL-HA assay was used to quantify innate humoral immunity in 23 species of parrots in 9 genera. Parrots have relatively low lysis and high agglutination titers, both of which vary significantly among species. A multivariate analysis shows high agglutination is associated with large body mass and long incubation period, while high lysis is associated with large body mass only. Thus, as one aspect of self-maintenance investment, quantification of NAb agglutination titers may contribute to our understanding of the forces that shape avian life histories.
54. Assessment of human activity impacts on Bald Eagle reproductive success along the Upper Mississippi River. KELLY J. MCKAY, BioEco Research and Monitoring Center, Hampton, IL, JON W. STRAVERS, Audubon Upper Mississippi River Campaign, McGregor, IA, BEN R. CONKLIN, Ulf Konig, and SHAWN HAWKS, Midwest Raptor Research Fund, McGregor, IA,

and THOMAS W. MCCLENAHAN, BioEco Research and Monitoring Center, Hampton, IL. We assessed the effects of human activities on Bald Eagle (*Haliaeetus leucocephalus*) reproductive success within Pools 9-11 of the Upper Mississippi River National Wildlife and Fish Refuge. Human Activity Units (HAU) occurring within 1 mile of monitored nests were recorded, along with any observed eagle reactions. Bald Eagle productivity was compared between low and high traffic sites. In 1994, five low traffic nests averaged 2.16 HAU per hour and produced 10 fledglings (2.0 per nest). By comparison, five high traffic nests averaged 7.68 HAU per hour and fledged only 5 birds (1.0 per nest). In 1995, six low traffic nests averaged 1.50 HAU per hour and produced only 6 fledglings (1.0 per nest). But high traffic nests averaged 3.88 HAU per hour and produced 11 fledglings (1.8 per nest). The contradictory results between the two years may have been due to the much stronger dichotomy which distinguished high from low traffic sites in 1994, as compared to 1995. Essentially, all nest sites were relatively low traffic in 1995. Additionally, different pairs of eagles seemed to exhibit extremely different levels of tolerance to human activity, which may have substantially influenced the reproductive success among individual pairs. Based on these results, we believe that higher rates of Human activity do indeed negatively impact Bald Eagle reproductive success within the Upper Mississippi River Region.

55. A comparison of avifaunal monitoring using point count and random area search methods. KELLY J. MCKAY, BioEco Research and Monitoring Center, Hampton, IL, MICHAEL S. BORNSTEIN, and JAMES P. QUINLIVAN, U.S. Fish and Wildlife Service, Mark Twain National Wildlife Refuge Complex, Port Louisa National Wildlife Refuge, Wapello, IA, and THOMAS W. MCCLENAHAN, BioEco Research and Monitoring Center, Hampton, IL. During 1994 we monitored avian diversity at two Mississippi River floodplain bottomland sites (Big Timber and Keithsburg), comparing two avifaunal survey methods – point counts and random area search. Both sites were surveyed twice during each sampling period (3 spring migration, 2 breeding season, and 3 fall migration). One survey used a 10-minute point count method at 10 permanently marked points. The second survey utilized a 4-hour random area search technique. The total amount of search effort was 100 minutes for the point counts and 380 minutes for the area search. In order to compare the methods, we needed comparable amounts of search effort. We therefore decided to compare the data between the 100 minutes of point counts and the first 100 minutes of area search. Our analysis incorporated 16 sets of data (8 Big Timber and 8 Keithsburg). Overall, the avian diversity at Keithsburg was slightly higher than at Big Timber. Likewise, the diversities encountered on point counts, the comparable 100-minute area searches, as well as the full 380-minute area searches were all higher at Keithsburg. The 380-minute area search survey always resulted in the highest avian diversity. However, data from the point count and 100-minute area search comparison resulted in a greater diversity on 15 of the 16 point count surveys. Point counts appear to be the preferred method for sampling avifaunal diversity, since they produce similar results per search effort to random area search techniques. Additionally, point counts are repeatable and provide a basis for examining the influence of habitat on avian diversity over time.
56. Raptor population trends as determined by forty years of Christmas Bird Count data. KELLY J. MCKAY, BioEco Research and Monitoring Center, Hampton, IL, PETER C. PETERSEN, Quad City Audubon Society, Bettendorf, IA, and THOMAS W. MCCLENAHAN, BioEco Research and Monitoring Center, Hampton, IL. The BioEco Research and Monitoring Center, along with the Quad City Audubon Society, has conducted and compiled five Christmas Bird Counts (CBC) since the mid 1950's. Each of these counts is centered on or near the Mississippi River in eastcentral Iowa and northwest Illinois. These counts have accumulated 40 years of data regarding avian populations wintering in the Midwest. Long-term information concerning regional raptor populations is minimal. Therefore we decided to use this CBC data set to examine the observed changes in raptor populations since the mid 1950's. During our analysis,

we added the total number of individuals for each species from all five CBCs each year. Furthermore, we combined the data into five-year increments. Six species have been characterized by populations which were stable until the latter 1970's or early 1980's, after which they have steadily increased. These species include the Sharp-shinned Hawk, Cooper's Hawk, Red-tailed Hawk, American Kestrel, Bald Eagle, and Barred Owl. The population trend of the Eastern Screech-Owl was similar, except they have been increasing since the early 1970's. The Red-shouldered Hawk, Long-eared Owl, and Short-eared Owl are characterized by populations that have severely declined and never recovered. Populations of the Northern Harrier and Rough-legged Hawk have fluctuated since the mid 1950's, while the Great Horned Owl has steadily increased. Although our project included data from a relatively small geographic area, we believe the long-term data generated by the CBC Program can be used to monitor regional raptor population trends over time and across North America.

57. Summary of Red-shouldered Hawk reproductive success along the Upper Mississippi River valley, 1983 – 1997. KELLY J. MCKAY, BioEco Research and Monitoring Center, Hampton, IL, JON W. STRAVERS, Audubon Upper Mississippi River Campaign, McGregor, IA, GARY V. SWENSON, CASEY J. KOHRT, and JOSEPH S. LUNDH, U.S. Army Corps of Engineers, Mississippi River Project, Rock Island District, Pleasant Valley, IA. Red-shouldered Hawks (*Buteo lineatus*) are listed as state endangered in Illinois and Iowa, threatened in Wisconsin, and a species of special concern in Minnesota. When this project began in 1983, little information was available regarding the overall number and density of active Red-shouldered Hawk (RSH) nesting territories along the Upper Mississippi River Valley. In fact, we knew of only 5 documented active territories along the Mississippi River from Wabasha, Minnesota to Burlington, Iowa. Between 1983 and 1997, we identified and confirmed RSH presence or nesting activity at 37 sites along this approximately 400-mile stretch of river. During these 15 years, we were able to document the results from 80 separate nesting attempts. Of these, 54 (67.5%) were successful. A total of 117 fledglings have been produced from these sites (2.17 per successful nest and 1.46 per nesting attempt). Over the years, we have observed a substantial variation in RSH reproductive success, ranging from a low of 38% in 1993 to a high of 88% in 1984. Low rates of reproductive success appear to be directly linked to either persistent adverse weather conditions, or extended periods of high water. Additionally, RSH seem to be negatively impacted by human activity and extensive alteration of mature floodplain forest habitat. During this project, we also documented the fact that RSH demonstrate a high degree of territory reoccupation. Our results indicate that indeed the overall number of RSH nesting along the Upper Mississippi River is relatively low, and their reproductive success is quite variable.
58. Metabolic routing of dietary nutrients in migratory songbirds and its ecological significance: applications of stable isotopes. SCOTT McWILLIAMS, University of Rhode Island, Kingston, RI; and DAVID PODLESAK, University of Rhode Island, Kingston, RI; Kent Hatch, Brigham Young University, Provo, UT. Stable isotopes can be used to quantify the magnitude of metabolic routing of dietary nutrients in wild birds, although few such studies have been conducted and most of the inherent assumptions have not been tested. Some recent studies of captive warblers demonstrated that metabolic routing of dietary nutrients with unique  $\delta^{13}\text{C}$  signatures was affected by the carbohydrate and lipid composition of diet. For example, dietary protein was primarily routed to proteinaceous tissue for birds fed high-protein diets, whereas birds fed low-protein diets routed carbon from primarily nonprotein dietary sources to proteinaceous tissue. Other recent work with songbirds has quantified the turnover rates of different tissues in birds. Turnover rate for a given tissue is more rapid in smaller birds, and within a given bird, carbon in some "tissues" (e.g., breath and blood plasma) is replaced much faster than carbon in other tissues (e.g., blood hematocrit). We provide some examples of captive and field studies that have used stable isotopes of carbon in breath, blood, feces and feathers,

along with measurements of turnover times of these tissues, to identify intraindividual changes in diet and the timescale of diet changes in songbirds during migration.

59. Seasonal changes in composition of lipid stores in migratory birds: causes and consequences. SCOTT MCWILLIAMS, University of Rhode Island, Kingston, RI; and BARBARA PIERCE, University of Rhode Island, Kingston, RI. Fatty acid composition of body fat in migratory birds changes seasonally and diet switching may be responsible for the observed seasonal patterns. Alternatively, migratory birds may selectively metabolize and store certain fatty acids during migration in lieu of changing their diet. We review recent studies of fatty acid nutrition in migratory birds that show (1) birds prefer diets with mostly long-chain unsaturated fatty acids, and (2) diet composition has a stronger effect than selective metabolism in determining fatty acid composition of body fat. The implication is that birds during migration can directly affect the composition of their fat reserves by selective feeding. Given that birds can alter the composition of their fat, we tested the hypothesis that fatty acid composition of fat stores affects exercise performance of migratory birds. We tested this hypothesis by measuring metabolic rate at rest and during intense exercise in two groups of red-eyed vireos, a long-distance migratory passerine, that were fed either a diet with more unsaturated fats (82%U) or a diet that had relatively less unsaturated fats (58%U). Resting metabolic rate of vireos fed either diet was similar; however, peak metabolic rate of vireos fed the 58%U diet was significantly higher than that of vireos fed the 82%U diet. Such whole-animal energetic effects of fatty acid composition of birds suggest that the energetic cost of migration in birds can be affected by the fat composition of what a bird eats.
60. Fledging success overestimates reproductive success. \*MATTHEW MEDEIROS, Dept. Zoology, Univ. of Hawaii, Honolulu, HI, and LEONARD FREED, Dept Zoology, Univ. of Hawaii, Honolulu, HI, and GUSTAV BODNER, Dept Zoology, Univ. of Hawaii, Honolulu, HI. Reproductive success in birds is usually documented by observing that at least one nestling has successfully left the nest as a fledgling. However, assessment of fledgling survival at the termination of parental care provides more accurate documentation of reproductive success in a specific breeding season. We applied these methods to document reproductive success of the Hawai'i Akepa during the 2002 and 2003 breeding seasons at Hakalau Forest National Wildlife Refuge, at 1900 m elevation on the windward slope of Mauna Kea, Island of Hawaii. Hawai'i Akepa care for fledglings for a ten-week period after young leave the nest. This species is also an obligate cavity nester and has used artificial cavities that are readily accessible for documenting egg or nestling mortality. We were thus able to document fledging success, causes of nesting failure, and survival of fledglings to the termination of parental care. Fledging success greatly overestimated reproductive success compared to fledgling survival at the termination of parental care. We investigated fledging success in both natural and artificial cavities and found that birds nesting in artificial cavities had higher success, but this difference was greatly reduced by fledgling mortality. Population wide fledgling mortality was confirmed by censuses and mist-netting. Fledging success was higher in the early portion of the breeding season (March-April) than later (May-June) for nests in each type of cavity. Inspections of cavities and observations of color-banded parents indicated that the later lower success was based on aborted attempts to breed in 2002 and abandoned nestlings in 2003. Both 2002 and 2003 were the least successful of 15 breeding seasons of the Hawai'i Akepa studied at Hakalau Forest National Wildlife Refuge. Over the long term, both fledging success and fledgling survival have decreased significantly. Food and an increase in mosquito-borne diseases such as avian malaria and poxvirus are the two rival hypotheses to account for fledgling mortality.
61. Stopover Biology of Intercontinental Landbird Migrants: An Eastern North American Perspective. FRANK MOORE, Dept. of Biological Sciences, University of Southern

Mississippi, Hattiesburg, MS, and WYLIE BARROW, USGS, National Wetlands Research Center, Lafayette, LA. Roughly two-thirds of all the birds that breed in temperate North America migrate to wintering areas in Mexico, Central and South America and the islands of the Caribbean. Intercontinental migration is an energetically expensive, high risk event that takes toll in increased mortality. The solution to problems that arise during passage depends largely on the migrant's relation to stopover habitat. To begin to think about the biology of migratory birds at this critical time in annual cycle, we must realize that birds make decisions at different scales and different factors operate at different scales. Our objective is two-fold: (1) Emphasize the scale dependent nature of the migrant-habitat relation during passage and (2) examine that relationship from an eastern North America perspective.

62. \*Measuring stress related to predation-induced renesting and its affect on maternal condition and productivity of Indigo Buntings. \*DANA L. MORRIS, Div. Biol. Sci., Univ. MO, Columbia, MO 65211, JOHN FAABORG, Div. Biol. Sci., Univ. MO, Columbia, MO 65211. Habitat fragmentation studies have identified nest predation as an important factor limiting breeding populations of Neotropical migratory birds. While nest predation results in decreased reproductive success, predation-induced renesting likely imposes physiological constraints on parents, particularly females, due to the event itself and the increased energetic effort required to renest. We measured the effect of nest predation on maternal body condition, baseline and acute stress hormone (corticosterone) levels, and reproductive output of female Indigo Buntings (*Passerina cyanea*) breeding in an unfragmented and a fragmented landscape in central Missouri. Both populations are largely single-brooded, however the effort to produce a single brood varied considerably. Most females finished reproduction by mid-late July in the unfragmented landscape while females continued attempts to produce one successful brood into September in the fragmented landscape. The proportion of successful nests was 46.8% (175/374) in the unfragmented landscape and 31.6% (32/101) in the fragmented landscape. Mayfield nest success was higher in the unfragmented landscape than in the fragmented landscape, although not significantly [0.26 (95% C. I.: 0.194-0.32) vs. 0.17 (95% C. I.: 0.007-0.32)]. Females that renested one or more times after nest predation had lower body condition indices and higher baseline corticosterone levels than females that nested once successfully. Maternal body condition indices were lower in the fragmented landscape than in the unfragmented landscape ( $-0.49 \pm 0.10$  vs.  $-0.18 \pm 0.07$ ). Among renesting females in both populations, baseline and acute corticosterone levels were negatively related to body condition. Data will be presented for maternal baseline and acute corticosterone levels between landscapes. Additionally, clutch sizes and nestling condition were lower at late nests (i.e. re-nests) and in the fragmented landscape. We suggest that predation-induced renesting elicits stress in female buntings and this stress renders a decline in productivity and offspring quality.
63. The Idaho Bird Inventory and Survey (IBIS): a coordinated statewide all-bird monitoring plan. COLLEEN E. MOULTON and REX SALLABANKS, Idaho Dept. of Fish and Game, Boise, ID 8707. The Idaho Bird Inventory and Survey (IBIS) is a plan to monitor all birds (waterbirds, shorebirds, waterfowl, and landbirds) throughout the state in a coordinated, standardized manner. Included in IBIS will be a description of high priority management issues, associated bird species, and how IBIS can be used to address each issue. Phase I of IBIS will emphasize aquatic species and habitats, and will focus on determining the distribution and abundance of waterbirds at Idaho's wetland Important Bird Areas (IBAs) and Idaho Department of Fish and Game Wildlife Management Areas (WMAs). Phase II will address terrestrial species and habitats. Restricted habitats that have previously been underrepresented in landbird monitoring will be targeted, such as alpine systems, aspen communities, and pinyon-juniper woodlands. A third component of IBIS will describe species-specific protocols for priority species that would otherwise be inadequately sampled using the general methods proposed for aquatic and terrestrial birds.

Examples include black swifts, long-billed curlews, harlequin ducks, and forest owls. Ultimately, IBIS will establish permanent surveys at Idaho's IBAs, generate much-needed inventories of WMAs, yield baseline data for statewide population trend monitoring, and address high priority management issues using short-term species assessments. IBIS will be implemented during 2004-2006 using a combination of regional coordinators, hired technicians, and volunteer "citizen scientists."

64. West Nile Virus antibodies in central North Dakota Icterids. JENNIFER L. NEWBREY and WENDY L. REED, Dept. of Biological Sciences, North Dakota State Univ., Fargo, ND 58105. The recent spread of the mosquito-borne West Nile virus (WNV) across North America has produced the need for research to better understand the influence of the virus on free-living bird populations. Research of avian WNV infection has focused primarily on the lethal effects of the virus, but has largely ignored the non-lethal effects of the virus on breeding bird populations. Non-lethal WNV infection could influence avian reproduction by compromising female immunity and by shifting maternal limited resources away from reproduction. The objectives of our research are to determine the prevalence of WNV in Icterids breeding in central North Dakota and to determine the effects of WNV infection on Yellow-headed Blackbird reproduction. This study is being conducted on several wetlands located in Stutsman County, North Dakota, where relatively high numbers of WNV positive bird carcasses have been recovered by the North Dakota Department of Health. During the summer of 2003, we collected blood samples from Yellow-headed Blackbirds and three other members of the Family Icteridae, including Red-winged Blackbirds, Common Grackles, and Western Meadowlarks to test for WNV antibodies. Antibodies were detected in Red-winged Blackbird and Western Meadowlark blood samples, but not in samples collected from Yellow-headed Blackbirds and Common Grackles. Based on our preliminary results, we hypothesize that WNV could be lethal in free-living Yellow-headed Blackbirds and Common Grackles. If WNV infection is lethal in these two species, the loss of large numbers of blackbirds would have ecological ramifications in the food-web dynamics of the prairie wetland ecosystems they inhabit. Therefore, further study is needed to test for WNV antibodies and how the virus impacts these two species, avian reproduction, and wetland ecology. We are very intrigued by our findings and will continue to collect more information on the lethal and non-lethal effects of WNV on free-living Icterids breeding in central North Dakota.
65. Evaluating adrenal function in eiders: focus on stress hormones. PETER. B. NILSSON\* Alaska SeaLife Center, Seward, AK and Univ. of Alaska Fairbanks, Fairbanks, AK, and Tuula. E. HOLLMÉN, Alaska SeaLife Center, Seward, AK and Univ. of Alaska Fairbanks, Fairbanks, AK. Glucocorticoids ("stress hormones") are secreted by the adrenal cortex and influence many physiological processes. Whereas a short term increase in circulating levels in response to a stressor (i.e., the stress response) is considered beneficial, chronically high levels are detrimental and may indicate a struggling population. The listing of the Steller's and the spectacled eiders as "Threatened" under the U.S. Endangered Species Act and declines observed in some populations of common and king eiders have focused attention on the health of these sea duck populations. In birds, corticosterone is the major glucocorticoid and we validated the use of a commercially available radioimmunoassay kit to evaluate serum corticosterone levels in the four species of eiders. Furthermore, we determined corticosterone levels in captive Steller's and spectacled eiders in residence at the Alaska SeaLife Center (Seward, Alaska), and evaluated patterns of corticosterone levels in wild eiders by utilizing archived samples from all four species. Differences in corticosterone concentrations were investigated among species, sex, season, year, site, and wild/captive status. Overall, birds in captivity exhibited lower levels than wild birds. No statistically significant differences in corticosterone concentrations among sexes or seasons were found in this study. Mean corticosterone levels in molting Steller's eiders involved in mass drives were similar to those of wild breeding Steller's eiders. Results from wild breeding spectacled and

Pacific common eider females from northern and western Alaska were overall similar. A significant difference was observed between common eiders that were bled within three minutes of capture and common and spectacled eiders bled approximately 5-10 minutes after capture. The results from this study reconfirm the importance of rapid initial sampling when obtaining blood samples for evaluation of baseline stress hormone levels.

66. A hierarchical model for analysis of the Christmas Bird Count. DANIEL K. NIVEN, National Audubon Society, Laurel, MD 20708, WILLIAM A. LINK, and JOHN R. SAUER, USGS Patuxent Wildlife Research Center, Laurel, MD 20708. The Christmas Bird Count (CBC) is based on counts from sites (“circles”) selected by local participants. Counts are conducted by a variety of observers using a variety of counting methods. Although many investigators have used CBC data to estimate population change for bird species, site selection issues and differences in observer participation within sites remain as important uncertainties in analyses. Any analysis of CBC data must control for effort, and large increases in effort in recent years have obvious consequences for counts, but unfortunately the relationship between effort and counts can vary among species and over space. We describe a hierarchical model for analysis of CBC data in which effort and other features that influence counts are modeled as covariates. The effort adjustment is defined by fitting effort in the model with an exponent  $p$  that determines the shape of the effort adjustment. In a hierarchical model,  $p$ , along with the coefficient associated with the effort, can be modeled directly as a random effect. We implement this effort adjustment in a hierarchical log-linear model in which stratum (Bird Conservation Regions), circle, and year effects are also treated as random variables. Effort is fit at the stratum level in these analyses. As in any large-scale analysis of survey data, a variety of technical issues must be addressed when implementing the analysis to the continental CBC dataset. We discuss some of these issues, with emphasis on the problem of defining the edge of range of a species.
67. First report on prey consumed at nests of White-throated Hawks (*Buteo albigula*) in Argentina. \*VALERIA OJEDA, ANA TREJO, and MARCELO KUN, Zoology Dept., Universidad Nacional del Comahue, 8400 Bariloche, Argentina. The White-throated Hawk (*Buteo albigula*) is a Neotropical raptor that breeds in the Austral Temperate Forests of Argentina and Chile. Little is known about this species’ diet in any part of its range. Here we report the first data on food habits of the White-throated Hawk during the nesting period, and test how different study methods affect our results. The methods compared were 1) analysis of pellets collected at nests, 2) analysis of prey remains collected at nests, and 3) direct observation of prey delivered to nests. Although the three methods rendered different results, birds were the main prey of both incubating females and nestlings. Of all identified insect taxa, coleopterans comprised 79% and hymenopterans (all ants) 16% of the total. Most birds present in pellets and prey remains were passeriforms, but we also found remains of falcons, owls, psittacids, quails, doves and woodpeckers. Of the three methods, pellets showed the most diverse representation of the diet. In particular, the importance of insects in the hawks’ diet was greatly underestimated when another method was applied. We suggest that: (1) researchers use caution when comparing the diets of birds from studies that used different sampling techniques, and (2) future diet studies should incorporate a variety of approaches to collect data such that the inherent biases may be identified, and possibly corrected. Forests from southern Chile and Argentina are the primary (and probably only) breeding area of *B. albigula*. In order to preserve this raptor from increasing forest loss in its breeding grounds, further information is needed on requirements such as food resources used during its nesting cycle.
68. Egg neglect and embryonic development. C. R. OLSON and C. M. VLECK, Dept. EEOB, Iowa State University, Ames, IA 50010. Maintenance of egg temperature is thought to be crucial to proper embryonic development, although the consequences of sub-optimal temperature are poorly

understood. Because egg temperatures of wild birds regularly fluctuate we examined the consequences of fluctuating temperature regimes on metabolic rate, growth and phenotype in avian embryos. We exposed eggs of zebra finches and house wrens to quantifiable thermal fluctuations reminiscent of those that occur during foraging off-bouts of many single-sex incubating passerines. Eggs were incubated at a constant temperature (37.5°C, control eggs), or were briefly cooled at hourly intervals throughout the day to temperatures varying from 32.5 to 20°C, then rewarmed to 37.5°C. The treatments experiencing periodic cooling therefore had lowered daily mean egg temperatures of between 36.5°C to 34.1°C, thereby delaying ontogeny of metabolism, extending incubation periods, reducing survival, and resulting in smaller, less developed embryos, compared to controls. Wrens, showed fewer adverse effects to periodic cooling than the zebra finch eggs, suggesting differences exist in embryonic thermal tolerance among species and incubation strategies. To estimate the efficiency of development in finch eggs we measured residual nutrient reserves (dry yolk mass) and yolk-free embryo mass in control and experimental eggs. Although periodic cooling resulted in embryos that were 36% smaller than controls after 12 days of incubation, they consumed 27% more yolk over the same time period. In addition, embryos experiencing period cooling showed different developmental trajectories and phenotypes than embryos incubated at a constant temperature. The reduced efficiency of converting yolk to tissue and other phenotypic effects of periodic cooling explain why adults minimize egg neglect during periods of cold ambient temperature. These effects on embryo development should be considered, along with nest predation and parental energy requirements, as major determinants of avian incubation behavior.

69. Distribution of riparian bird species in an urbanizing landscape. \*ONEAL, AMBER S., Department of Biology and Center for Conservation Biology, University of California, Riverside, CA 92521, ROTENBERRY, JOHN T., Department of Biology and Center for Conservation Biology, University of California, Riverside, CA 92521. In coastal southern California, natural riparian corridors occur in a landscape mosaic comprised of an abundance of anthropogenic land use categories interspersed with undeveloped areas, primarily native shrublands. We asked, to what extent does the composition of the landscape surrounding a riparian survey point appear to influence the distribution of birds? We conducted counts at 137 points in Orange County, California, within riparian habitats along a gradient of urbanization. The macrohabitat setting of each point was determined from aerial photographs, and we used logistic regressions to assess species distribution with respect to percent developed and percent riparian landcover out to a 300-m radius of each point. Of 42 species with sufficient detections to analyze, 20 had statistically significant (P less than 0.05) models. Of these, 18 showed a response to the proportion of development, about equally divided between positive (e.g., Northern Mockingbird, Anna's Hummingbird) and negative (e.g., Phainopepla, Oak Titmouse). Only one species (Common Yellowthroat) showed a positive response to the proportion riparian and no response to development. Thus, the landscape matrix in which a survey point is embedded appears to influence bird species occurrences, with direct consequences for reserve design and species conservation.
70. An initial report on the effects of the 2002 Missionary Ridge Fire on breeding bird populations in southwest Colorado. JOSEPH C. ORTEGA, Dept. of Biology, Fort Lewis College, Durango, CO 81301, and CATHERINE P. ORTEGA, Dept. of Biology, Fort Lewis College, Durango, CO 81301. The Missionary Ridge Fire burned 28,525 hectares in a mosaic of fire intensities from 9 June to 17 July 2002 in southwest Colorado. From 19 May to 25 July 2003, we studied various effects of the Missionary Ridge Fire on breeding bird populations in mid-level montane forests. Among other activities, we completed a series of point count censuses to initially compare breeding bird populations in three burned and reseeded forests (these sites were intensely burned), two burned and not reseeded forests (these sites received mostly moderate burning), and three

unburned forests. The three burned and reseeded sites consisted of 8, 15, and 7 plots (sequential plots were spaced at approximately 200 m distance from one another). The two burned and not reseeded sites had 8 and 9 plots, and the unburned sites consisted of 8, 8, and 10 plots, respectively. We obtained data by completing 5-minute point counts in which we identified all birds by sound or sight as to their initial, and closest, distance of observation from the plot center. However, for this report, we have truncated these data to include only those observations in which birds were observed within a distance of 50 m. Mean species richness, species diversity, and number of individuals observed within 50 m of the plot center all differed among the three types of forests. However, the two types of burned sites (i.e., reseeded and not reseeded) did not differ from one another for the above three primary variables. Instead, unburned sites typically had greater mean values for species richness, species diversity, and number of individuals observed within 50 m of the plot center compared to burned sites. Also, avian species typically differed between burned and unburned sites, and a variety of variables describing forest structure were also associated with the above primary variables.

71. \*Avian Pox in Galapagos Endemics. PATRICIA PARKER, Biology, University of Missouri St. Louis, Saint Louis, MO, TERESA THIEL, UMSL Biology, Noah Whiteman, UMSL Biology, JENNIFER BOLLMER, UMSL Biology, and Tim Walsh, Saint Louis Zoo, MARY DUNCAN, SLZ, ERIC MILLER, SLZ, and GUSTAVO JIMENEZ, Charles Darwin Research Station, Galapagos, Ecuador. Avipoxvirus is a genus of DNA viruses of birds transmitted mechanically by hematophagous insects or through breaks in the skin. Thirteen described strains exhibit taxon specificity and differ in pathogenicity. Pox-like cutaneous lesions had been observed in domestic chickens and in several endemic passerine birds, dating back at least 30 years in museum collections. We confirmed the presence of cytoplasmic inclusion bodies diagnostic of pox in extant island avifauna through histopathology. We amplified DNA from pox lesions of 55 chickens, Galapagos mockingbirds, yellow warblers, and several species of Darwin's finches, and sequenced >800 bp at two loci. The sequences in viral DNA from Galapagos chickens are virtually identical to published sequence of fowlpox virus, while those from passerine birds describe two viral strains that are very similar to each other and to canarypox virus (<5% difference in any comparison among the Galapagos variants and two published canarypox sequences). Canarypox virus and the Galapagos variants are only 70% similar to fowlpox. Both Galapagos viral strains occur in all Galapagos passerine taxa examined. The most parsimonious explanation for this pattern is that there were at least two independent colonizations by pox viruses, one of fowlpox virus infecting the chickens, and one or more of canarypox virus or a close variant, which has differentiated slightly on the islands. This conclusion has large impact on management decisions regarding keeping of domestic poultry in this Ecuadorian National Park and World Heritage Site. Current work involves estimation of pathogenicity relationships among viral strains and hosts, MHC correlates of susceptibility and resistance, and transmission probabilities among species and among islands. Our phylogeographic study of the virus will include avipox sampled from migrants and mainland relatives.
72. Winter Hunting Behavior of Bald Eagles Using Reservoirs in Kentucky. KATY PATTERSON, Eastern Kentucky University. The ecology of wintering Bald Eagles has been well studied, and much is known about their foraging behavior, roosting habits, and responses to human activity. However, the majority of prior studies have been conducted either along natural bodies of water or in areas below riparian lock-and-dam systems. The few studies that have examined Bald Eagle use of reservoirs have not addressed winter foraging behavior. Consequently, relatively little is known about the hunting behavior of Bald Eagles that winter near large reservoirs in the southern United States, even though large concentrations of the species are quite common at such sites. Bald Eagles generally require shallow water for hunting, and the many bays and inlets usually formed when a reservoir is built offer ideal shallow water conditions. I studied the hunting

behavior of Bald Eagles wintering on large reservoirs in western Kentucky during the winters of 2001-2002 and 2002-2003. Age (adult or immature) and sex were recorded when possible, and the outcomes of all hunting and food-finding events were documented. Although Bald Eagles at my study site did feed primarily on fish, they did not take stressed Gizzard Shad as individuals wintering below lock-and-dam systems often do, and they scavenged very little in comparison to other wintering populations. Instead, most prey was caught live by way of aerial attacks. This indicates that reservoirs provide a large amount of habitat suitable for active hunting, which may, in part, explain the large concentrations of Bald Eagles found at such sites on an annual basis.

73. DISTANCE analysis: a look at variation in species behavior and differences in observer ability. \*SHANE S. PATTERSON, Iowa CFWRU, NREM Dept., Iowa State University and ROLF R. KOFORD, USGS, Iowa CFWRU, Iowa State University. Point counts are a common method of sampling birds. A familiar challenge in analyzing point-count data is how to account for both differences in observer ability and the relative "detectability" of each species counted. This is especially true in multiple-species studies and in cases where different observers are required to accomplish many counts in a short window of time. We utilized 100-m radius point transects to survey grassland passerines from 20 May to 4 June in the Prairie Pothole Region of Minnesota and Iowa. Four observers were carefully trained to estimate distances to the nearest 5m for all species of interest detected within a ten-minute time period. As expected, detection functions generated for singing males by program DISTANCE varied considerably among species. Some of this variation can be attributed to behavioral differences exhibited by each species in response to an observer. For instance, Grasshopper Sparrows and Le Conte's Sparrows are known to furtively run away from an oncoming observer in order to find a more suitable singing perch. This phenomenon is reflected by the relative paucity of detections in our sample at closer distances (5, 10, and 15m) compared to the number of detections farther out (20, 25, and 30m). Conversely, other species, such as Savannah Sparrow and Sedge Wren, tend to fly a short distance upon observer approach. Skilled observers are likely to detect these flights, whereas inexperienced counters may fail to notice such birds until after a new perch site has been established farther away. This difference is manifest in our comparison of detection functions for veteran versus less experienced observers. Therefore, because of marked variation in species behavior and observer ability, we judged that program DISTANCE should be incorporated in our analysis of data collected from point counts.
74. Effects of the 2002 record-breaking drought on the Southwestern Willow Flycatcher. EBEN H. PAXTON, USGS Southwest Biological Science Center, Colorado Plateau Research Station, Flagstaff, AZ, APRIL A. TUDOR, Arizona Game and Fish Department, Phoenix, AZ, BARBARA E. KUS, USGS Western Ecological Research Center, San Diego, CA, MARY J. WHITFIELD, Southern Sierra Research Station, Weldon, CA, and MARK K. SOGGE, USGS Southwest Biological Science Center, Colorado Plateau Research Station, Flagstaff, AZ. The endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*) breeds across the southwestern U.S. in dense riparian vegetation. In 2002, the severest drought on record impacted most of the southwestern U.S., negatively effecting breeding populations of many bird species including the Southwestern Willow Flycatcher. Impacts on breeding populations of the flycatchers across their range varied from mild to near total reproductive failure. We will detail the impacts of the drought on productivity and survivorship at four widely distributed breeding populations: Roosevelt Lake and the San Pedro River in Arizona, and Camp Pendleton and the Kern River in California. Finally, we will discuss the aftermath of the 2002 drought on the 2003 breeding populations at these four sites
75. Modeling the past and present habitat of forest warblers: using historical data to estimate species distributions in Wisconsin. ANNA PIDGEON, UW-Madison, LISA SCHULTE, Iowa State

University, DAVID MLADENOFF, UW-Madison. In the northern Lake States, forest conditions have been undergoing succession since the great cutover of the late 1800s. Despite this, bird population trends are often evaluated relative to conditions in the 1960s, when national avian monitoring was instituted. A more ecologically useful baseline is available for estimating habitat conditions for birds just prior to the vast timber harvest at the turn of the last century. We developed a method for estimating habitat conditions for birds in the mid-1800s using data from the Public Land Survey (PLS) records, collected between 1832 and 1866 in Wisconsin. We constructed models of bird habitat relationships from published data, and mapped the pre-Euroamerican settlement and present habitat distribution of three forest birds: the Blackburnian Warbler, Black-throated Green Warbler, and Pine Warbler. Current habitat conditions were modeled from forest inventory data. As a measure of model performance, we compared the current habitat suitability map with current bird distribution, based on actual observations of breeding birds, from the Wisconsin Breeding Bird Atlas. Model fit for Blackburnian and Black-throated Green Warblers was greatly improved with incorporation of a fragmentation index into the model. For current habitat, fragmentation level was derived from National Landscape Pattern Data (Ritters et al.). For presettlement habitat, we developed a fragmentation index from PLS data, looking at forest characteristics at survey corners compared to neighboring survey corners. For all three bird species habitat has degraded in quality. The Pine Warbler has had an expansion in habitat range, largely because of forest incursion into previously open habitats, and the development of pine plantations.

76. Design considerations for detecting treatment effects based on avian point counts. KATHRYN L. PURCELL, Forestry Sciences Lab, 2081 E. Sierra Ave., Fresno, CA 93710, SYLVIA R. MORI, Pacific Southwest Research Station, 800 Buchanan St., Albany, CA 94701, MARY K. CHASE, PRBO Conservation Science, 4990 Shoreline Hwy, Stinson Beach, CA 94970. We used existing data from three oak woodland sites in California to develop guidelines for the design of bird monitoring programs using point counts. We examined the use of count data to test for differences among treatments, using power analysis to determine sample size adequacy when varying the number of visits, stations, years, and effect size. We assumed an overdispersed Poisson distribution for count data and used a normal approximation for comparisons across treatments. Overdispersion in count data had a large effect, with high overdispersion having a negative effect on power. Greater sample size (number of count stations and number of routes) and more visits were both clearly important in maximizing power. Large sample sizes (>200 stations visited multiple times) were needed to detect treatment effects for all but the most common species. As the number of stations that can be completed in one morning is limited, increasing the number of routes and/or visits appears to be the best strategy. For a given level of effort, there was not a clear advantage to increasing the number of routes vs. increasing the number of visits. Both more visits and more routes increased power, allowing logistical concerns to dictate design choices. We recommend using one-tailed tests for a decrease based on a priori hypotheses and the inclusion of explanatory variables such as observer, route, time of year, time of day, and habitat and weather variables to maximize power.
77. Preliminary analysis of yolk androgens in Ruddy duck eggs. LETITIA M. REICHART, WASHINGTON STATE UNIV., School of Biol. Sci., Pullman, WA, MICHAEL S. WEBSTER, Washington State Univ., School of Biol. Sci., Pullman, WA, and HUBERT SCHWABL, Washington State Univ., School of Biol. Sci., Pullman, WA. Concentrations of maternally derived yolk androgens can vary within clutches and/or among clutches from different females. Previous studies suggest that yolk androgens can have a positive influence on chick development and behavior in some species. We measured yolk androgen concentrations in eight Ruddy duck clutches and found significant variation among clutches from different females. We discuss possible implications of this variation for intraspecific brood parasitism in Ruddy ducks.

78. **KEEPING COMMON BIRDS COMMON: IDENTIFYING STEWARDSHIP SPECIES FOR NORTH AMERICAN AVIFAUNAL BIOMES.** TERRELL D. RICH, USFWS, Division of Migratory Bird Management, Boise, ID. Partners in Flight (PIF) has identified 100 species of landbirds in North America for its Watch List of species of greatest conservation need. However, conservation of threatened, endangered, rare, and other special status species is no longer a sufficient strategy in many cases. A part of the mission of PIF that reflects a more holistic approach is to "Keep Common Birds Common." But how do you define "common" birds without simply asking for the conservation of everything? While the latter is desirable, it does not lead to the priority setting necessary for real-world conservation action. We have developed an idea originating with Canadian ornithologists which is to recognize the importance of responsibility or "stewardship," whereby conservation responsibilities are highlighted for species that have a high proportion of their global population or range within a particular regional planning area. To identify Stewardship Species (SS), we produced a cluster analysis of Bird Conservation Regions (BCR) based on the percentage of the total global breeding population of each landbird species that occurs in each BCR. We refer to the resulting clusters as "Avifaunal Biomes." Next, we defined SS as species that have a relatively high percentage of their world population within a single Avifaunal Biome during either the breeding or wintering season. The seven Avifaunal Biomes and the number of SS in each are: Arctic (11), Northern Forest (30), Pacific (26), Intermountain (18), Southwest (30), Prairie (15), and Eastern (33). The number of species by season for which SS were defined varied. For example, the Northern Forest and Intermountain Avifaunal Biomes had no SS defined only based on the winter period whereas the Southwest had 8. By highlighting Stewardship Species, we pursue a more complete set of conservation strategies. Taking actions for common species is an idea that still needs discussion and support - this approach stretches much traditional conservation thinking.
79. The global importance of avian botulism. TONIE E. ROCKE, USGS National Wildlife Health Center, Madison, WI. On a worldwide basis, avian botulism is the most significant disease of migratory birds, especially waterfowl and shorebirds. Type C botulism outbreaks have been reported in wild birds from every continent, except the Antarctic, and from at least 28 countries or territories. Outbreaks of type C botulism that result in a million or more waterbird deaths have been reported in some wetlands in the U.S., Canada, and Russia, and losses of 50,000 birds or more are relatively common. Type E botulism, which primarily afflicts fish-eating waterbirds, occurs with less frequency and is less widespread. However, botulism losses vary a great deal from year to year and from species to species. Only a few hundred birds may die in a wetland one year, whereas tens of thousands or more may die the following year at the same location. Unfortunately, population impacts of avian botulism have not been well studied. Some species that are numerous and geographically widespread with a high reproductive potential (e.g. mallards) may be able to withstand sporadic high losses, while populations of other less common species whose populations are disproportionately exposed to botulism may not be as resilient (e.g. Northern pintails in North America, Black-faced spoonbills in Taiwan). The effect of botulism on local or regional populations is also significant, as many waterbird species demonstrate breeding, molting and wintering-site philopatry. One botulism outbreak at Salton Sea in southern California in 1996 killed nearly 15% of the western population of American white pelicans. Because the occurrence of avian botulism is largely controlled by environmental factors and is not dependent on waterbird density, this disease has the potential to cause significant population declines in some species and could seriously impede conservation efforts.
80. Riparian and upland forest stopover habitats for landbirds in urban and agricultural ecosystems. PAUL G. RODEWALD, School of Natural Resources, Ohio State University, Columbus, OH. Stopover habitat relationships of landbirds are not well known and this constitutes a shortcoming

in conservation plans for migratory birds. I compared migrant use of upland and riparian forests during spring and evaluated local- and landscape-level habitat characteristics in central Ohio. I surveyed migrants along 250-meter transects and quantified foraging behavior, habitat characteristics, and percent cover by forest, urbanization, and agriculture. Percent urbanization within 1-km of riparian (19.9%) and upland sites (22.2%) did not differ. There was a trend toward higher forest cover in landscapes surrounding riparian sites (42.0%) than in upland sites (30.5%). Forest cover did not differ between rural (39.3%) and urban (35.1%) landscapes. Habitat structure was statistically similar between upland and riparian areas, but riparian sites tended to have less understory vegetation. Species richness and abundance of transient Neotropical migrants did not differ by landscape type (urban vs. rural), and were much higher in upland forests in both landscapes. Of 23 transient species, 14 species differed in their use of riparian and upland forests, and 13 of these were most abundant in upland forest [e.g., Nashville (*Vermivora ruficapilla*), Magnolia (*Dendroica magnolia*), Black-throated Green (*D. virens*), Bay-breasted warblers (*D. castanea*)]. Conservationists value riparian forests in midwestern states because they provide wildlife habitat and protect water quality, however, these data suggest that upland forest woodlots are potentially important for migrating songbirds.

81. Ecology and Demography of East-West Differences in Molt Scheduling of Neotropical Migrants. SIEVERT ROHWER. Burke Museum, University of Washington, Seattle. Among North American Neotropical migrants, most eastern breeders molt before the fall migration. In contrast many western breeders molt after migrating. I summarize comparative data that address these differences, and use phylogenetically independent contrasts to establish multiple evolutionary origins for these two molt strategies. Postponing the molt until after migration has commonly been attributed to the advantage of prior residency for early migrants in species that defend winter territories. I question the logic of this argument and find no empirical support for it. Instead, late summer aridity in the west apparently “pushes” lowland insectivores away from their breeding range for molting, while the monsoon rains of the American Southwest simultaneously “pull” some species there for molting. In most Neotropical migrants adults and juveniles follow the same scheduling of fall molt and migration. When they differ, juveniles molt before migrating, while adults molt after migrating. Age class concordance and discordance in molt scheduling seems associated with the quality of the juvenile plumage, which may be driven by rates of nest predation.
82. Comparative reproductive ecology of the Cooper's Hawk among three North American populations. ROBERT N. ROSENFELD, Dept. Biology, Univ. of Wisconsin, Stevens Point, WI 54481, JOHN BIELEFELDT, Park Planning, Racine Co. Public County Works Div., Sturtevant, WI 53177, LAURA J. ROSENFELD, Wisc. Coop. Fishery Unit, Univ. of Wisconsin, Stevens Point, WI 54481, ANDREW C. STEWART, BC Environ., P.O. Box 9344, Victoria, BC V8W 9M1, MELVIN P. NENNEMAN, USFWS, Valentine Natl. Wildl. Refuge, HC 37 Box 37, Valentine, NE 69201, ROBERT K. MURPHY, USFWS, Des Lacs Natl. Wildl. Refuge, Kenmare, ND 58746, and Michael A. Bozek, Wisc. Coop. Fishery Unit, Univ. of Wisconsin, Stevens Point, WI 54481. There is continuing concern for the long-term viability of Cooper's Hawk populations across this species' broad North American distribution because of its designation as an area-sensitive, forest-interior species. There thus is a need for ecological information that may benefit conservation efforts on behalf of the Cooper's Hawk - efforts that may need to be targeted to specific populations that are presumably adapted to local/regional habitats. Our results show that indices for clutch size, brood size, and nest success differ significantly among or between three spatially and morphometrically diverse breeding populations of the Cooper's Hawk in British Columbia, North Dakota, and Wisconsin. We speculate about the ecological factors that may have led to demographical variation in regional populations of a continentally widespread species

that has only recently become a common breeding bird in the grassland-dominated landscape of North Dakota.

83. Egg morphology is an unreliable indicator of intraspecific nest parasitism in Wood Ducks. \*CHARLOTTE ROY NIELSEN, Dept. of Biology, Univ. of Missouri-St. Louis, St. Louis, MO, PATRICIA PARKER, Dept. of Biology, Univ. of Missouri-St. Louis, St. Louis, MO, and ROBERT GATES, School of Natural Resources, The Ohio State University, Columbus, OH. Studies on numerous avian taxa have reported widely disparate conclusions about the accuracy of using egg morphology to detect intraspecific nest parasitism. Morphology based techniques are dependent on greater egg size variation among females than among eggs laid by a single female. When this condition is true, a parasitized clutch should have greater variation in egg size than a clutch laid by a single female. We examined the utility of methods developed for goldeneyes (*Bucephala clangula*) to detect parasitism in wood ducks from egg morphology (*Aix sponsa*) (Pöysä et al. 2001 J. Avian Biology 32:79-82). This method uses Euclidean distances between z-score standardized egg measurements of length, breadth, and mass of the 2 most different eggs within a clutch. These distances are then used to identify a threshold criterion that distinguishes between parasitized clutches and those laid by a single female. We also used cluster analysis to determine whether unique female contributions to clutches could be identified from egg morphology. Five polymorphic microsatellite loci were used to identify parasitized clutches and contributions by multiple females. Although variation in egg morphology was greater in parasitized clutches than among eggs laid by 1 female ( $p = 0.039$ ), extensive overlap in the distributions precluded the identification of a clear boundary to distinguish between parasitized and unparasitized clutches. Three egg clutches randomly constructed from eggs of either 1 or 3 females were similar ( $p = 0.301$ ), indicating that variation within females was similar to variation among females when controlling clutch size. Cluster analysis failed to identify unambiguous clusters for 25% of clutches and invariably grouped eggs from different females together. Our results suggest that egg morphology should not be used to detect parasitism or classify maternity in wood ducks.
84. Fitting hierarchical models to data from the North American Breeding Bird Survey. JOHN R. SAUER and WILLIAM A. LINK, USGS Patuxent Wildlife Research Center, Laurel, MD. The very large area of coverage and the sampling procedures used in the North American Breeding Bird Survey (BBS) present unique challenges for analysis. Hierarchical models can be used to accommodate many of these sampling issues, and Markov chain Monte Carlo methods allow for the estimation of derived variables that historically had been estimated using ad-hoc weighting procedures. We describe a hierarchical model for estimation of population year effects and trend from the BBS. Observer, overdispersion, and year effects are treated as random variables. Stratum and start-up (low counts associated with first year of counting) effects are also fit by the model. Annual indices and trend are derived variables, estimated as functions of the model parameters. We discuss the consequences of our choices of modeling year, observer/route, and strata effects on the analysis. Fitting this hierarchical model to data for the 421 species surveyed by the BBS poses a variety of additional methodological issues, and we provide results from an ongoing project to fit hierarchical models to all species for which the BBS provides information. Comparisons of hierarchical model results to the standard route regression analysis results document the advantages of the hierarchical model approach, as confidence intervals are readily available for annual indices based on hierarchical models.
85. Immunocompetence as a life history character: a comparative study of humoral and cellular innate immunity in birds. ALEXANDER SCHEUERLEIN Department of Biology, UM-St Louis, St Louis, MO 631211; KEVIN MATSON, Department of Biology, UM-St Louis, St Louis, MO 631211; RAYMOND PENG; UC-Davis, Department of Animal Science, Davis, CA 956162;

KIRK KLASING UC-Davis, Department of Animal Science, Davis, CA 956162. Life history theory predicts that current reproductive effort adversely affects future reproduction of an individual. Across bird taxa, lower reproductive effort is found in species with longer maximum lifespan. If the trade-off between current and future reproductive effort within an individual relates to trade-offs within taxa, we expect long-lived species to show greater investment in maintenance- and protection-related mechanisms that help ensure future reproductive success. Encoded in the germ-line, components of the innate immune system are likely to play an important role in the diversification of life histories. To compare innate immunocompetence across taxa, we subjected individuals of 5 bird species to a set of protocols aimed at assessing innate immunity. We assessed humoral and cellular innate immunity using assays developed for non-model avian organisms. Specifically, we measured both constitutive (natural antibodies to exogenous red blood cells) and inducible (elevation of acute phase proteins and zinc clearance after challenges, chemotaxis of macrophages) responses. We found that the general expectation was fulfilled, with short-lived having low innate immunocompetence. In some species cellular immunity was elevated relative to humoral immunity (Cockatiel), whereas in other species the opposite was found (Mallard, Pheasant, Quail). More work is required to determine whether these patterns are the result of phylogenetic constraints or trade-offs between innate immunity and other life-history traits.

86. Proximate factors that mediate timing of reproduction in Florida Scrub-Jays. STEPHAN J. SCHOECH, Dept. of Biology, Univ. of Memphis, Memphis, TN 38152, and REED BOWMAN, Archbold Biological Station, Lake Placid, FL 33862. Long-term studies of two populations of Florida Scrub-Jays have found that suburban jays always breed earlier than jays in wildlands. We hypothesize that early breeding is due to the year-round availability of human-provided foods that are spatially and temporally predictable in the suburbs. A previous study suggests that wildland jays are protein-limited when compared with suburban jays. We experimentally addressed the role of protein in timing reproduction from 2000 to 2003 by providing supplements to wildland jays that were high in fat and protein (HFHP) or high in fat and low in protein (HFLP): control jays (CNT) were unsupplemented. Both treatments advanced laying over CNT, and HFHP-supplemented jays laid the earliest. To assess the endocrine correlates of advanced laying, we measured testosterone (T), estradiol (E2), and corticosterone (CORT). HFHP males had higher T levels than did HFLP and CNT males. However, E2 levels of females were not affected by treatment. While our initial hypothesis was that suburban jays would have elevated CORT levels as a result of human-derived disturbances, a pilot study found very low baseline levels of CORT in suburban jays. To better examine the relationship between nutrition, CORT, and early breeding, we collected samples from suburban jays and included these as a separate treatment in our analyses. Suburban jays had CORT levels that were lower than all three treatments in the wildlands. Further, HFHP-supplemented jays had lower levels than HFLP and CNT jays. The differences in the timing of breeding, between suburban and wildland populations and between food-supplemented wildland jays, may result from nutritional differences in diets, differences in the predictability of food, or both. We postulate that CORT, nutrient availability (especially protein), and initiation of reproduction are inextricably linked.
87. Host-specificity and prevalence of blood parasites in African rainforest birds: Conservation perspectives from a molecular approach. RAVINDER SEHGAL, Dept. of Biology, San Francisco State University, San Francisco, CA., 94132, HUGH I. JONES, University of Western Australia and TOM B. SMITH, Center for Tropical Research, UCLA, Los Angeles, CA. Studies of host-parasite interactions in birds have contributed greatly to our understanding of the evolution and ecology of disease. Here we employ molecular techniques to determine the prevalence and study the host-specificity of four different parasites in the African avifauna. The four blood parasites studied here are Plasmodium and Haemoproteus, which cause avian malaria,

Trypanosoma, and microfilarial nematodes. We developed polymerase chain reaction (PCR)-based diagnostic tests to amplify parasite-specific genes from avian blood samples. We use these tests to describe the prevalence of these parasites within over seventy bird species collected from rainforests in Equatorial Guinea, Cameroon, and Ivory Coast. In addition, by sequencing the gene products, we determine phylogenetic relationships between individual bird species and their parasites. For example, in Trypanosoma, we found little trypanosome-lineage specificity across either avian hosts or geographic locations. We found that birds from different habitats, collected over a wide distance range, were infected with a single haplotype, and several haplotypes could be detected at a single location. On the other hand, with nematode microfilaria, we found one bird species, the Fire-crested Alethe, was particularly prone to this parasite, and the parasite exhibits a high degree of host- but not geographic specificity. We discuss the possible ecological and conservation implications of these host-parasite interactions and in addition, since blood samples were collected from birds over a wide range of habitats, we can now address how environmental factors affect the prevalence of these vector-borne parasites.

88. Migration stopover ecology of western avian populations: a southwestern workshop. SUSAN K. SKAGEN, USGS, Fort Collins Science Center, Fort Collins, CO. 80525. Many avian species that breed across the western United States require intermediate stopover sites in the arid southwestern United States, where riparian forests may be especially important as spring stopover habitat. Recently, more than 40 scientists, avian conservation professionals, and land managers convened to discuss future research and management needs for the conservation of western en route migratory land birds. Workshop participants reviewed current knowledge on migration systems across the southwest and discussed a recent synthesis of existing survey and banding information on distribution and habitat use of migrating land birds. Several evolving techniques that promise to facilitate future research in the migration arena were explored, including genetic analyses, stable isotope analyses of feathers, evaluation of blood metabolites, bird banding, and radar imagery. Participants developed a set of immediate research needs that spanned topics of habitat and landscape relationships, migration models, genetic variability, defining demographic units and standardizing protocol, and long-term monitoring. The participants agreed that a large scale coordinated field effort is necessary to fill gaps in our knowledge about locations and habitats used by western migratory land birds while en route during migration. With substantial interest, a 2-3 year coordinated effort was initiated.
89. Multilevel variation in the stable isotope composition of feathers: relevance to the prediction of breeding and natal origins of migrating Northern Goshawks. \*ADAM D. SMITH and ALFRED M. DUFTY, JR., Department of Biology, Boise State University, Boise, ID. Studies predicting the origins of avian migrants using models based on naturally occurring patterns of stable isotopes in the environment have become increasingly common. Nonetheless, the natural variation of stable isotope signatures within an individual as well as among individuals from the same nest has yet to be examined with any rigor. Furthermore, the effects of intra- and inter-individual variation on the predictive abilities of such models remains undemonstrated. We used a hierarchical linear model (HLM) to examine intra- and inter-individual variation in the stable isotopic composition of northern goshawk feathers. We discuss the relevance of this multilevel variation to our ability to predict the natal and breeding origins of migrant goshawks.
90. Cavity-nesting bird use of snags in managed ponderosa pine stands. \*DAVID J. SPIERING, Graduate Degree Program in Ecology, Colorado State University, Fort Collins, CO and RICHARD L. KNIGHT, Dept. of Forest, Rangeland, & Watershed Stewardship, Colorado State University, Fort Collins, CO. We examined whether cavity-nesting bird occurrence was related to the density of snags in managed stands of ponderosa pine on the Black Hills National Forest. We also examined whether snag variables were related to the use of snags as nest sites.

Randomly placed study plots (n = 144 plots) were established throughout the forest in managed ponderosa pine stands and data on the density, size, and condition of 2,937 snags on these plots was recorded. Snags were searched for cavities and surveys for cavity-nesting birds (n = 272 counts) were conducted on these plots. An information-theoretic model selection approach (Akaike's Information Criterion) was used to evaluate a priori logistic regression models to predict the presence of a cavity-nesting bird at the plot and the occurrence of a cavity in a snag. We found that the presence of a cavity-nesting bird at a plot was independent of snag density. Larger dbh, greater height and early stages of decay were positively associated with the presence of a cavity, and the presence of a broken top had a negative association. While our study found little relationship between the presence of a cavity-nesting bird and snag density across the range of snag densities, sizes, and conditions measured, the densities of high quality snags, especially large snags, was very low and may have been too low to be affecting the presence of birds or our ability to detect such an affect.

91. Effect of restoration treatments on grassland birds in the Rainwater Basin region, Nebraska. \*JILL M. SPORRONG, 430 Life Sciences West, Oklahoma State University, Stillwater, OK 74078, and CRAIG A. DAVIS, Oklahoma State University, Stillwater, OK 74078. Because of the historic losses of native grasslands, the restoration of grasslands has become a crucial tool in the conservation of declining grassland bird populations. Restoration of upland grasslands in the Rainwater Basin Region in south-central Nebraska has focused on high-diversity (>20 forb and grass species) or low-diversity plantings (4–5 grass species) without regard to specific grassland bird habitat requirements. Our objectives were to determine grassland bird habitat-use and nest productivity in restored grasslands and evaluate the response of the grassland bird community to restoration treatments (high- and low-diversity plantings). We conducted bird surveys using transects, nest searches using random searching and rope-dragging, and measured vegetation characteristics (percent cover, maximum vegetation height, litter depth, and visual obstruction) on restored grasslands during summer 2002 and 2003. We found no difference in mean avian abundance between years, but did find higher mean avian abundance in low-diversity than in high diversity sites (p= 0.039). Mean avian species richness differed between years, but not between restorations. Of our vegetation measurements, percent grass cover and mean maximum vegetation height were the only variables that differed between years, and only vegetation height differed between restorations, with height for high-diversity plantings being higher (56.28 cm, S.E.=3.41) than for low-diversity plantings (63.13 cm, S.E.=3.29; p=0.012). For overall nest productivity, 26% of the nests were successful, 65% failed, and 9% were unknown fate. We used the Mayfield method to calculate probability of nest survival and found that the probability of nest survival for all species was higher in high-diversity (25.14%) than low-diversity plantings (16.05%). Since there was a lack of difference in vegetation characteristics between restoration treatments, a variety of other factors (e.g., basin size, surrounding landscape, amount edge habitat) likely influence bird habitat-use and nest productivity on these upland grasslands.
92. Habitat correlates of nest success and cowbird parasitism in a population of Southwestern Willow Flycatchers. SCOTT H. STOLESON, USFS, Northeastern Research Station, Irvine, PA, KATHY BRODHEAD and DEBORAH M. FINCH, USFS Rocky Mountain Research Station, Albuquerque, NM. Development of recovery guidelines for the endangered Southwestern Willow Flycatcher has been hindered by the wide variation in riparian habitats occupied across its range, including many degraded areas dominated by exotic saltcedar. Further, little effort has been made to relate apparent habitat preferences to fitness. We assessed habitat correlates of nest success and brood parasitism in the large population on the Gila River, NM, which lives in a mostly native, diverse riparian forest. Nest success increased with laying date, nest height, and distance from open water. Success also varied among nest tree species independently of height, tending to be highest in boxelder, the preferred nest substrate at this site, and lowest in willows.

Mean nest success by year was strongly and inversely correlated with overall population size ( $R^2=0.89$ ,  $P=0.01$ ). Brood parasitism showed similar patterns: the likelihood of parasitism was lower in boxelder than other nest trees, and decreased with greater nest height, nest tree size, and distance from open water. Our results suggest riparian managers should strive to maintain large and floristically diverse habitat patches. At middle elevations, promoting boxelder and eliminating exotic Russian olive may improve habitat quality for this endangered species.

93. Natal dispersal in Yellow-eyed Juncos. KIM SULLIVAN, Dept. of Biology, USU, Logan UT 84322-5305 Dispersal patterns can affect genetic variability, effective population size, genetic drift and the opportunity for group selection, kin selection and local adaptation. I studied natal dispersal in a population of Yellow-eyed Juncos in southeastern Arizona over 8 breeding seasons. Fifty individuals that were banded as nestlings were located on their first breeding territory as adults. Unlike many avian species, Yellow-eyed Junco females did not disperse farther than males. Most males and females bred within 800 meters of their natal nest site. Birds hatched during drought years roamed farther as independent juveniles and dispersed farther than birds hatched in wetter years. Yellow-eyed Juncos tended to establish territories in areas they spent time in as independent juveniles. Siblings often shared territory boundaries. Pairs consisting of two first year breeders were generally captured together or observed foraging together as independent juveniles.
94. PATTERNS AND MECHANISMS OF SEASONAL THERMOREGULATION AND METABOLIC VARIATION IN SMALL BIRDS. DAVID L. SWANSON, Department of Biology, University of South Dakota, Vermillion, SD. For small birds wintering in cold climates, the cold temperatures, short days for foraging, and relative scarcity of food in winter combine to produce potentially challenging thermoregulatory conditions. These birds undergo a process of winter acclimatization that results in markedly improved cold tolerance. In those birds showing marked improvements in cold tolerance, a general upscaling of organismal metabolism in winter, including basal (BMR) and/or summit ( $M_{sum}$ , maximum cold-induced metabolic rate) metabolic rates, accompanies the enhanced cold tolerance. Winter increments of  $M_{sum}$  typically range from about 15-50% and are correlated with improved shivering endurance and cold tolerance. The likely significance of winter increases in  $M_{sum}$  is to allow winter birds to generate higher rates of heat production for a given fraction of  $M_{sum}$  compared to their summer counterparts, which presumably allows them to sustain higher levels of shivering thermogenesis. Such an increment of  $M_{sum}$  could be accomplished by either, or both, increases in the masses or the mass-specific metabolic intensity of thermogenic tissues. Current data suggest that masses of flight muscles, the principal shivering organ, and sometimes leg muscles, are larger in winter than in summer in small birds residing in cold climates. However, mass-specific metabolic intensity of skeletal muscles appears, generally, to remain seasonally constant in birds examined to date. This implies that seasonal changes in flight muscle masses contribute substantially to seasonal variations in  $M_{sum}$  and cold tolerance. Preferential use of fats relative to carbohydrates to support shivering under cold exposure is also a regular component of winter acclimatization in these birds.
95. A hierarchical spatial count model with application to imperiled grassland birds. WAYNE E. THOGMARTIN, USGS, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603; JOHN R. SAUER, USGS Patuxent Wildlife Research Center, Laurel, MD, 20708; and MELINDA G. KNUTSON, USGS, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603. We utilized a Markov Chain Monte Carlo approach to spatially predict abundance of 5 rare grassland birds (Bobolink, Grasshopper Sparrow, Sedge Wren, Upland Sandpiper, and Henslow's Sparrow) in the upper midwestern US. Twenty-one years of North American Breeding Bird Survey counts ( $n = 1840$ ) were modeled as a hierarchical loglinear function of explanatory variables describing habitat, spatial relatedness between route counts, year effects,

and nuisance effects associated with differences in observers. The model hierarchy was due to differences in route counts between observers over time. A conditional autoregressive term representing the correlation between adjacent routes accommodated potential spatial correlation in counts. Environmental determinants of bird counts included suites of habitat variables such as land cover composition and configuration, climate, terrain physiognomy, and human influence. We fitted these models with WinBUGS. Preliminary evaluation of the models based on independent data suggested generally good agreement with model predictions and generally supported a priori notions of important habitat relations. Discrepancies between evaluation data and model predictions were due, in some unknown measure, to insertion of errors when translating the statistical model into a mapped model. The most note-worthy practical application of this spatial modeling approach is the ability to map unbiased estimates of relative species abundance, which in turn may provide a basis for the development of management programs and may serve to focus management and monitoring on areas and habitat variables important to imperiled grassland birds.

96. Fall stopover duration and energetic condition of three shorebird species in the northern prairie pothole region. NATHAN E. THOMAS, Dept. of Biology, Univ. of South Dakota, Vermillion, SD 57069 and DAVID L. SWANSON, Dept. of Biology, Univ. of South Dakota, Vermillion, SD 57069. The stopover biology of migrating shorebirds in the mid-continent of the United States is relatively unknown, particularly during fall migration. We investigated stopover duration and energetic condition of shorebirds at several small natural wetlands and a large managed wetland (Big Stone National Wildlife Refuge) in eastern South Dakota and western Minnesota. We predicted that stopover duration at mid-continent sites should be shorter than at coastal sites, due to the ephemeral nature of mid-continental wetlands and the shorter distance between successive stopovers. Additionally, we predicted that stopover duration at the large managed wetland would be longer than the small natural wetlands due to the abundance of high-quality habitat. Stopover duration for Least Sandpipers, as measured by radio-tracking, averaged  $6.2 \pm 0.8$  (SE) (n=15) days at natural wetlands and  $9.7 \pm 1.6$  (n=50) days at Big Stone NWR. For Pectoral Sandpipers, stopover duration averaged  $5.3 \pm 1.1$  (n=22) days at natural sites and  $6.6 \pm 1.1$  (n=17) days at Big Stone NWR. Stopover durations in natural and managed stopover sites did not vary significantly. Moreover, neither mass nor a coarse measure of energetic condition (mass/wing chord) differed significantly for Least, Semipalmated, or Pectoral sandpipers in natural and managed sites or between age classes, suggesting that both natural and managed sites provide similar stopover habitat quality. These data suggest that Big Stone NWR and the surrounding natural wetlands serve equally well as stopover sites for these sandpiper species.
97. Modeling West Nile Virus in Arizona: Potential state-wide influences on birds, humans and, neotropical migrant birds. CHARLES VAN RIPER III, USGS/SBSC Sonoran Desert Research Station University of Arizona, Tucson, AZ; RYAN STEVENS, USGS Colorado Plateau Research Station, Flagstaff AZ; DOUGLAS E. DOCHERTY, USGS NWHL, Madison, WI; LAURA M. MCGRATH and KRISTINA L. ECTON, USGS Colorado Plateau Research Station and Northern AA Univ, Flagstaff AZ. CHRISTOPHER O'BRIEN, USGS Sonoran Desert Research Station and Univ. of Arizona, Tucson AZ. We examined Geographic Information System (GIS) data themes for habitat, vegetation, vectors and potential hosts throughout Arizona. The resulting model suggests certain locations where West Nile Virus (WNV) prevalence should be higher. In that the avian group Corvidae seems to be most greatly impacted by the introduced WNV pathogen, we examined their distributional patterns throughout Arizona and developed predictive models where transmission should be greatest. We also documented the foraging ecology of spring and fall migrant birds in native and introduced vegetation habitat patches along the Lower Colorado River corridor, in an effort to predict future risks of West Nile Virus infections. From our census and mist-net capture data, we found that plant species abundance and phenology

patterns dramatically influenced location of avian foraging. Preliminary analysis of invertebrate samples (vectors) revealed significant differences, among tree species and particularly between native and introduced plant species. Hence, vector access to different bird species in a vegetation patch may be important factor in West Nile Virus transmission to foraging birds. We found that birds partitioned foraging habitat in similar manners during migration periods, thus potentially impacting WNV prevalence. It thus appears that vegetation species, structure, phenology, abundance, and responses to insects all appear to potentially play a role in determining resident and migrating bird susceptibility to WNV infection along the lower Colorado River corridor.

98. Stopover ecology of migrating landbirds in riparian forests of arid southwestern North America. CHARLES VAN RIPER III, USGS/SBSC Sonoran Desert Research Station, Univ. AZ, Tucson AZ; SUSAN K. SKAGEN, USGS Fort Collins Science Center, Fort Collins, CO; DAVID J. KRUEPER, USFWS Region 2, Albuquerque, NM; and DEBORAH M. FINCH, USFS Rocky Mountain Research Station, Albuquerque, NM. Research on migration stopover ecology has focused on riparian corridors in arid southwestern North America. We review the findings of studies conducted along the Lower Colorado River corridor, the San Pedro River and nearby riparian oases, and the Rio Grande. Species composition differed considerably among these sites. Along the lower Colorado River, vegetative species and structure, plant phenology, and insect prey base appear to influence migrating warbler foraging patterns. (1) Plant species abundance and phenology patterns dramatically influenced location of warbler foraging within the vegetative strata; (2) abundances of foliage invertebrates was significantly different among tree species and between native and introduced plants; (3) warbler species partitioned foraging habitat relative to foraging height and preferred native to introduced vegetation; and (4) a threshold of native plant species composition appears to influence migrating warbler abundance within differing vegetation patches. Along the San Pedro River and neighboring oases, (1) peak densities of migrants were very high in riparian forest and in adjacent riparian-associated habitats, (2) small isolated patches were heavily used by migrating birds, (3) negative associations between early-arriving breeding birds and later-arriving migrants suggest possible competition for foraging resources during spring migration, and (4) relative abundance rankings of species remained similar between spring and fall migration seasons. Rio Grande studies found (1) age and sex related variation in intraspecific stopover patterns and (2) high consistency between mist-netting and point counts. In general, few of the research findings clearly generalize across species, habitats, and the broader Southwest region. Migrating landbirds exhibit extreme behavioral plasticity and opportunism in their search for stopover resources in the harsh environments of the arid Southwest. Important questions for future investigations may include: what determines the limits to this plasticity, and are we pushing the birds to these limits?
99. Systematics and biogeography of the genus *Turdus*. GARY VOELKER, Department of Biology, University of Memphis, Memphis, TN, and SIEVERT ROHWER, Burke Museum, University of Washington, Seattle, WA. Using 2368 bp from the mitochondrial cytochrome b, ND2 and ND3 genes, we have begun to analyze the molecular systematics of the genus *Turdus*. Preliminary bayesian phylogenetic analysis of this dataset, which is complete for 54 of 65 extant *Turdus* species (following Sibley and Monroe), suggests 1) that *viscivorous* + *philomelos* (Eurasia) are the oldest extant *Turdus* species, 2) that *kessleri* (Asia) and *rufopalliatu*s (Central America) are sister to the remaining species, and 3) that these remaining *Turdus* species fall into three groups. The first of these is a clade consisting of 24 species (23 Neotropical + 1 African (basal)). The second is a clade of 12 Eurasian species. The third clade consists of 14 species from the Caribbean, Africa, Asia, and North America. The second and third clade are sisters relative to clade one. The genera *Nesocichla* (Tristan da Cunha), *Platycichla* (South America), and *Cichlherminia* (West Indies) are all firmly placed within *Turdus*; the former two fall within the largely Neotropical clade (group one), while *Cichlherminia* falls within clade three.

100. Response of grassland songbirds to prairie restoration in the Loess Hills, Iowa. TRACY A. WALKER, Dept. of Natural Resource Ecology and Management (NREM), Iowa State Univ., Ames, IA, 50011 and JAMES R. MILLER, Dept. of NREM and Dept. of Landscape Architecture, Iowa State Univ., Ames, IA, 50011. In the rugged Loess Hills of western Iowa, fire suppression and land use changes have led to the loss and fragmentation of grassland habitats. We studied the effects of prairie restoration on native plants and on habitat use by grassland birds in and around The Nature Conservancy's Broken Kettle Grasslands (BKG) Preserve in the northern Loess Hills. BKG is the largest contiguous prairie in Iowa and forms the core of a recently dedicated Bird Conservation Area. We examined the effects of four management treatments: burning, grazing, burning and grazing recent (post-spring 2001), and burning and grazing older (pre-spring 2001). First-year data analyses indicated that overall plant species richness did not differ among treatments. Burned plots, however, consisted of more native species and a higher percentage of bare ground compared to other treatment types. In addition, treatments varied significantly in the occurrence of native vs. non-native species. For the three treatments that included grazing, non-native species accounted for 35-40% of the occurrences. In contrast, non-natives accounted for 7% of the occurrences in burned plots. Grazed plots also tended to have fewer occurrences of shrubs than burned plots. Overall, 32 bird species were detected within 50-m radius point count surveys. Of these, Grasshopper Sparrows (*Ammodramus savannarum*), Dickcissels (*Spiza americana*), Western Meadowlarks (*Sturnella neglecta*), and Bobolinks (*Dolichonyx oryzivorus*) are considered to be grassland obligate species; Lark Sparrows (*Chondestes grammacus*) and Brown-headed Cowbirds (*Molothrus ater*) are also known to use grassland habitats. ANCOVA analysis using covariates such as slope and distance to nearest tree revealed that grassland-obligate species were less abundant in burned versus all other treatments, while grassland-edge species were more abundance in burned versus all other treatments. These species-specific responses suggest that grassland-obligate birds may be sensitive to the amount of litter and proportion of shrubs present, but less sensitive to variation in vegetation composition.
101. Effect of imported fire ants on arthropod communities and Eastern Bluebird reproductive success in northwest Georgia. \*AMANDA WATKINS, Dept of Biology, Berry College, Mount Berry, GA 30149, BETHANY DANIEL, and RENEE CARLETON, Dept of Biology, Berry College, Mount Berry, GA 30149. Imported fire ants are serious threats to native ants, other arthropods, and small vertebrates living in areas subject to invasions. Eastern Bluebirds, as arthropod predators, could be negatively impacted by the presence of fire ants. To determine the effect of fire ants within Eastern Bluebird territories, we counted fire ant mounds located within 150 meters of 20 active nest boxes. The number of mounds per territory ranged from 1 to 20. Arthropods were collected by sweep nets and pitfall traps, counted and identified. Bluebird nests were monitored for number of eggs produced, number hatched, and number of chicks fledged. Nestlings were weighed at 10 days of age. We found no correlation between the number of mounds and the number of arthropods collected, bluebird reproductive success or chick weight.
102. Site fidelity and return rates of Grasshopper Sparrows in Northwest Illinois \*DAN WENNY, Illinois Natural History Survey, Savanna, IL. Grasshopper sparrows were captured and colorbanded in spring and summer of four years (2000-2003) at three sand prairies in northwest Illinois. The objectives were to determine return rates, site fidelity, and movements of birds between prairies. I mapped territories, determined mating status, and searched for nests to determine if return rates and site fidelity were related to reproductive success. Of 205 birds captured, 25% were recaptured or resighted in one or more subsequent years. Return rates were higher for males than for females and higher for adults than young. Of 36 birds banded as fledglings only 2 returned. Returning males usually occupied nearly the same territory as the

previous year. Returning females were equally likely to occupy the same or different territory. The two birds banded as fledglings that returned occupied territories over 100 m from the natal territory. No birds captured at one site were captured or observed at another site, suggesting natal dispersal is on the order of several hundred meters. Grasshopper sparrow population sizes were stable, suggesting substantial immigration each year from outside the study plots. Differences in return rates, territory sizes, and mating status among the three sites suggest one site was a population sink.

103. Nesting success and habitat associations of the altamira oriole, a species at risk, in the Lower Rio Grande Valley, Texas. \*SCOTT M. WERNER, Dept. of Wildlife and Fisheries Sciences, Texas A&M Univ., College Station, TX, 77843, and SALLIE J. HEJL, Dept. of Wildlife and Fisheries Sciences, Texas A&M Univ., College Station, TX, 77843. In recent decades, most populations of Altamira Oriole (*Icterus gularis*) in the Lower Rio Grande Valley (LRGV), Texas, have been declining. Succession of vegetation communities from evergreen forest to thorn-forest and thorn-scrub, resulting from a lack of flooding, has probably caused loss of Altamira Oriole habitat, but aspects such as nesting success and nest-site selection have not been studied in detail. We monitored 83 nesting attempts at 76 nests and measured habitat variables on the largest remaining tracts of native vegetation in the middle LRGV during 2002 and 2003. A nest-inspection video camera enabled us to estimate the previously unpublished periods of incubation and nestling stages at 12.5 and 15.5 days, respectively. Of the 83 nesting attempts, 59% were successful, 8% failed during egg-laying, 20% failed during incubation, and 5% failed during the nestling stage. Many nests experienced a low number of fledglings because of partial clutch losses during the incubation stage, perhaps due to cowbird parasitism. Six nesting attempts resulted in Bronzed Cowbird (*Molothrus aeneus*) fledglings, but 2 of these 6 nests also fledged Altamira Orioles. We found a greater number of second-year Altamira Orioles in the breeding population than was found in any previous study. Orioles built their nests in 9 different tree species and on low-voltage power lines, and nest plots nearly always had taller vegetation than paired non-use plots. Our results suggest that the continued loss of suitable nesting trees and Bronzed Cowbird parasitism are the two main factors limiting Altamira Oriole population growth in the middle Lower Rio Grande Valley.
104. Effects of habitat edge, understory vegetation density and tree diameter on patch use by bark-foraging birds. CHRIS WHELAN, Wilmington, IL 60481, Gitogo Maina, Biology Dept, Trinity Christian College, Palos Heights, IL 60463. Most studies of the effects of habitat alteration such as fragmentation or clearing on birds focus on responses at the community or population level. In contrast, we studied patch use intensity, a measure of foraging preference, of bark-foraging bird species with respect to woodland-field edges, understory vegetation density, and tree diameter, in a deciduous oak woodland in northeastern Illinois, U.S.A., in both the breeding and winter seasons. Overall, patch use intensity was greater in summer than in winter, and in interior than in edge habitat. In addition, we found complex interactions among these habitat variables. For instance, these bird species showed significant preferences for foraging in woodland interior habitat and on large-diameter trees in summer, but not in winter. Those foraging preferences were further affected by understory clearing, with the preference for interior over edge habitat reversed in the cleared habitat in winter, and the preference for large over small-diameter trees existing only in the uncleared habitat. The results suggest that patch use in these bird species is influenced by effects of vegetation variation from edge to interior habitat on both microclimate and predation risk. Those effects of vegetation disappear or are diminished when understory vegetation is removed.

105. Low incidence of cowbird parasitism on Swainson's Thrushes in central coastal California. JENNIFER D. WHITE, Div. Biol. Sci., Univ. Missouri, Columbia, MO, and THOMAS GARDALI, PRBO Conservation Science, Stinson Beach, CA. We found a low incidence of observed cowbird parasitism (4%) on the Swainson's Thrush (*Catharus ustulatus*) in central coastal California despite high rates (33%) for sympatric Wilson's Warblers (*Wilsonia pusilla*). Both species are shrub nesters, but thrush nests had significantly greater mean percent concealment than warbler nests. No cowbirds fledged from thrush nests; the only cowbird nestlings observed in thrush nests were last seen at 4 and 7 days old while host nestlings fledged. Parasitism significantly reduced thrush clutch size, nestling and fledgling number. We experimentally parasitized four thrush nests with real Brown-headed Cowbird (*Molothrus ater*) eggs to test if this thrush shows rejection behavior. No rejection response was observed for naturally or experimentally parasitized nests. We discuss two potential reasons for a low incidence of cowbird parasitism on the Swainson's Thrush: (1) cowbird host selectivity and (2) the potential difficulty for cowbirds to locate thrush nests.
106. Water and energy balance of a Desert Bird Community: the Functional Importance of Columnar Cacti, WOLF, B.O & MCKECHNIE, A.E., Biology Department, The University of New Mexico, Albuquerque NM. Columnar cacti are prominent features of arid and semi-arid ecosystems in the Neotropics. Cacti are unusual in that they offer an abundance of succulent, energy rich fruit to vertebrates in an environment where water and nutrient abundance may limit animal function. Identifying the importance of these resources to consumers provides important insight into the role that cacti play in structuring communities and food webs. We are looking at one such system in the Sonoran Desert of Arizona, where the saguaro cactus *Carnegiea gigantea* provides extensive water and energy resources to the bird community during the hottest and driest periods of the annual cycle. Between May and August, the saguaro releases a huge pulse of nutrients (400,000+ kJ/ha) into the ecosystem in the form of floral nectar, pollen and fruit pulp. This nutrient pulse can be tracked into the bird community because the saguaro uses a form of photosynthesis that differentiates it isotopically from other resources in the environment. Plants such as saguaro use CAM photosynthesis, and have a carbon isotope signal that differs strongly from the C3 photosynthetic signal produced by the majority of plants in this community (saguaro -13.0‰ VPDB versus -25.0‰ VPDB average for seeds of seven C3 food plants). During the peak period of fruit production, stable isotope analysis of avian plasma indicates that saguaro fruit represents approximately 43% of the bird community's carbon intake. The saguaro resource penetrates deeply into both insectivorous and granivorous foraging guilds where it provides water, energy and nutrients. These studies provide the first insights into the functional importance of cacti to communities and ecosystems.
107. Where would a wood warbler wrest in the west: an eclectic review. JEFF KELLY, and RICHARD L. HUTTO, Oklahoma Biological Survey and Department of Zoology, University of Oklahoma, Norman, OK and Department of Biological Sciences, University of Montana, Missoula, MT. Of passerine migrants in North America, parulid warblers have perhaps received the most attention. Nonetheless, our understanding of their migration remains more heuristic than mechanistic. We draw from previously published research to highlight patterns in stopover ecology that we think make the western system unique and, if examined in greater detail, might yield a more mechanistic understanding of avian migration in western North America. In particular, we compare: (1) variation between stopover habits in western and eastern North America; (2) variation in stopover ecology among habitats within the West; (3) and intra and interspecific variation in stopover and wintering biogeography. From this background we elaborate our view that large-scale coordinated efforts would be the most effective and efficient strategy for advancing our knowledge of passerine migration in the West.

108. The Plans for a Migration Monitoring Network in the United States. C. JOHN RALPH and MATTHEW D. JOHNSON\*. U.S. Forest Service, Redwood Sciences Laboratory and Humboldt State University, Arcata, California. Following the lead of the Canadian Migration Monitoring Network, we seek to establish with multiple cooperators, a similar, companion pilot network for the rest of the continent, operating primarily in both migration seasons when short and long-distance migrants, as well as birds largely considered to be 'resident' are moving into and out of areas for the northern winter, and are subject to stresses of such displacement, as well as amenable to certain monitoring techniques. The Network is intended to close important gaps in the present knowledge of migratory and resident birds and promote cooperation and collaboration throughout the Americas. Basic questions that can be addressed are the life histories, migration patterns, species composition, population size, composition and demographics, habitat relationships, trends, biology, and ecology of resident and migratory birds. The formation of the network recognizes the urgent need for coordination among these stations and, in particular, a mechanism for central coordination of providing support, data management, and analysis.

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