

Minnesota Chapter of the Wildlife Society



2016 Annual Meeting
February 9-11, 2016
Mankato, Minnesota



Plenary Speaker Biographical Sketches

And

Oral and Poster Abstracts

Draft 4 February 2016

Fire Ecology Plenary Session

Focus on Fire - A Critical Ecological Process for the Maintenance of Ecosystems, Communities, and Habitats

Plenary Speaker Biographical Sketches

Dwayne Elmore

Wildlife Extension Specialist and Bollenbach Chair in Wildlife Biology, Department of Natural Resource Ecology and Management, Oklahoma State University 008 C Ag Hall, Stillwater, OK 74078-6013; 405-744-9636; Dwayne.elmore@okstate.edu

Specific areas of Dwayne Elmore's interests include wildlife habitat relationships, the role of disturbance in maintaining sustainable ecosystems, and social constraints to conservation. Dwayne works with a team of faculty, students, agencies, and landowners studying grassland birds in tallgrass prairie and their response to the interacting processes of fire and large herbivore grazing. Major findings indicate that both breeding and wintering bird communities are strongly influenced by the fire-grazing interaction with various species selecting for distinct landscape patches characterized by differing times since fire. Migratory species that are present during the breeding season or during the winter, such as Henslow's sparrow, LeConte's sparrow, Sprague's pipit, and upland sandpiper strongly select for areas with distinct vegetation structure reflecting their habitat needs during the period of year they use the habitat. The non-migratory greater prairie-chicken, however, requires a mosaic of habitat patches across a broad landscape that provides the full spectrum of a broad set of habitat conditions required during distinct portions of its yearly cycle. Furthermore, most breeding birds reach their maximum abundance in landscapes with higher levels of landscape patchiness resulting from complex disturbance patterns. Finally, in addition to heterogeneity in vegetation structure, the mosaic of landscape patches generated by the fire-grazing interaction also displays heterogeneity in thermal characteristics and this further affects grassland bird behavior and nest survival.

Lee Frelich

Director, University of Minnesota Center for Forest Ecology, 330F Green Hall, University of Minnesota, 1530 Cleveland Avenue North, St. Paul, MN 55108; 612 624 3671; freli001@umn.edu

Lee Frelich received his Ph.D. in Forest Ecology from the University of Wisconsin-Madison in 1986. He teaches courses in Forest Fire Ecology and Landscape Ecology on the University of Minnesota St. Paul Campus, and has advised 24 graduate students. He has authored more than 140 publications with 120 coauthors from 15 countries, and is listed among the top 1% of all scientists in the world in the Thompson-Reuters Web of Science, Essential Science Indicators, Ecology and Environment Category. Lee's current research interests include fire and wind in boreal forests, old-growth hemlock and maple forests, invasive earthworms in forests, deer and moose browsing, patterns of tree height, and impacts of climate change. His work has identified four historic fire regimes in northern Lake States forests: 1) large crown fires at 50-100 year mean intervals in boreal jack pine-black spruce-birch-aspen on Canadian shield bedrock, and boreal spruce-fir-birch-aspen on deeper soils; 2) a mixed fire regime with surface fires every few decades and crown fires on 100-200 year intervals in boreal red pine-white pine-birch-aspen on shallow soils; 3) moderately frequent surface fire regimes in temperate white pine-red pine and/or northern red and pin oak forests on sandy soils; and 4) frequent fire regimes in temperate jack pine and/or pin

oak-bur oak-aspen barrens, woodlands or savannas. Scattered white pine, paper birch, and northern red oak groves within mesic hemlock and sugar maple forests are also maintained by rare fires as an important component of biodiversity at the landscape scale. Human disturbance caused by European settlement, fire suppression, fire exclusion and climate change have altered the historic regimes over the last century, setting in motion new successional pathways on massive scales. Lee's plenary presentation will feature case studies highlighting historic and contemporary landscape and successional dynamics.

Sam Fuhlendorf

Regents Professor and Groendyke Chair in Wildlife Conservation, Department of Natural Resource Ecology and Management, Oklahoma State University, 008C AGH, Stillwater, OK 74078-6013; 405-744-9646; sam.fuhlendorf@okstate.edu

An overarching theme of Sam's research is the generation of landscape heterogeneity through the interaction of fire and large grazing animals, with research occurring in Great Plains rangelands from Montana to Texas, as well as Midwest tallgrass prairie and Canadian boreal forest. Individual research projects have addressed a broad range of subjects including fire behavior, nutrient cycling, vegetation structural and compositional responses, large herbivore diet and behavior, wildlife habitat selection, and livestock productivity. Sam's research demonstrates how landscape diversity is crucial for the maintenance of biological diversity in grasslands and other ecosystems, and how the interacting processes of fire and large herbivore grazing are critical to the maintenance of landscape diversity.

Greg Nowacki

Regional Ecologist, USDA Forest Service, Eastern Region, 626 E. Wisconsin Avenue, Milwaukee, WI 53202; 414-297-1977; gnowacki@fs.fed.us

Greg Nowacki was born and raised in Wisconsin's "Northwoods" and attended University of Wisconsin-Stevens Point where he received B.S. and M.S. degrees in Forestry and Natural Resources in the mid-1980s. Thereafter, Greg went eastward, successfully attaining a Ph.D. in Forestry at Penn State University. At both institutions, Greg's graduate studies were keenly focused on oak ecology, relating changes in oak abundance to land-use and fire. Following college, Greg served as an old-growth forest ecologist with The Nature Conservancy in the eastern United States and as a Regional Ecologist with the U.S. Forest Service in Alaska. He is currently employed by the U.S. Forest Service as a Regional Ecologist for the eastern U.S. and the national Soils Program Manager. Throughout his career, Greg has dedicated his work to facilitating the transfer of science to land management.

Oral and Poster Abstracts

Abstracts for all oral and poster presentations are arranged in alphabetical order based on first author (presenter).

Use of multiple markers demonstrates the Driftless Region as a refugium and source of postglacial colonizers of the southern red-backed vole (*Myodes gapperi*) - POSTER

Danielle Aaker, Biology Department, 175 W Mark St., Winona State University, Winona, MN 55987, daaker09@winona.edu

Amy M. Runck Biology Department, 175 W Mark St., Winona State University, Winona, MN 55987, arunck@winona.edu

The dynamic climatic events of the Pleistocene have shaped contemporary species distributions, and influenced diversification of taxa through glacial and habitat barriers. During the Last Glacial Maximum, southeastern Minnesota, northeastern Iowa and western Wisconsin were not glaciated (collectively known as the Driftless Area), and served as a refugium for several taxa. This study examined the genetic relatedness of southern red-backed vole (*Myodes gapperi*) populations from recently deglaciated areas of North America. Sequence variation of the mitochondrial cytochrome b gene and six microsatellite loci were examined from 226 voles. Phylogeographic analyses of the cytochrome b gene uncovered three distinct lineages across North America corresponding to refugia of the East and West coasts and the Driftless Area of North America. Furthermore, voles in the recently deglaciated regions of Northwestern North America appear to be descendants of voles from the Driftless Area. While the mitochondrial data establishes the genetic relatedness of the three lineages, the microsatellite data provide insight into whether or not there is contemporary gene flow among the lineages. Our results indicate that these three distinct lineages reflect long-term isolation in separate refugia of the Pleistocene, and that these lineages may be ecologically and evolutionarily distinct from one another.

The identification of the exotic waterfowl trematode *Psilotrema mediopora* (Trematoda: Psilostomatidae) in the United States - ORAL

Tyler Achatz, Department of Biological Sciences, 242 Trafton South, Minnesota State University Mankato, Mankato, MN, 56001, tyler.achatz@mnsu.edu

Dr. Robert Sorensen, Department of Biological Sciences, 242 Trafton South, Minnesota State University Mankato, Mankato, MN, 56001, robert.sorensen@mnsu.edu, 507-389-1280

This study examined the intestines of hunter-shot bufflehead (*Bucephala clangula*), common goldeneye (*Bucephala clangula*), American coot (*Fulica americana*), wood duck (*Aix sponsa*), lesser scaup (*Aythya affinis*), ring-necked duck (*Aythya collaris*), redhead (*Aythya americana*), northern pintail (*Anas acuta*), blue-winged teal (*Anas discors*), and mallard (*Anas platyrhynchos*) from Lake Winnibigoshish, Minnesota from fall 2012 and spring 2013. Intestines were extracted and examined for all trematodes using dissecting microscopes. All examined birds, except American coot and redhead, hosted *P. mediopora*, with larger populations of *P. mediopora* being located in the anterior small intestine and decreasing numbers in posterior regions. *P. mediopora* was originally described only in mallard and northern shoveler from Northern Eurasia by P. G. Oschmarin in 1963. Of the *P. mediopora* found, 1, 2, 2, 10, 12, 92, 129, and 212 individual specimens from *A. acuta*, *A. collaris*, *B. clangula*, *B. albeola*, *A.*

sponsa, *A. platyrhynchus*, *A. affinis*, and *A. discors* were stained and examined using light microscopy. Other individual worms were sequenced using partial 28s rDNA sequences to validate placement within the genus *Psilotrema*. When our specimens were compared to Oschmarin's description, size variations were detected; however, gross morphology matched variation seen in the original description. The 28s DNA sequence that was obtained supported the placement of the samples examined within the genus *Psilotrema*. The life cycle of *P. mediopora* requires the exotic snail *Bithynia tentaculata* as a first intermediate host, which suggests the expansion of the range for these snails explains the presence of *P. mediopora* in our samples.

Zooplankton dynamics in the Minnesota River – POSTER - CANCELLED

Marianne Adamek, Minnesota State University Mankato, 56436 195TH Street, Mankato, MN, 56001,
Marianne.adamek@mnsu.edu 952-594-0917

Nathan Lederman, Minnesota State University Mankato, 135 Trafton Science Center South, Mankato, MN 56001,
Nathan.lederman@mnsu.edu 507-389-5492

Shannon J. Fisher, Minnesota State University Mankato, 136 Trafton Science Center South, Mankato, MN, 56001,
Shannon.fisher@mnsu.edu 507-389-5690

Zooplankton refers to a wide variety of heterotrophic organisms typically found suspended in the water column. As primary consumers zooplankton respond to the frequently rapid changes in primary production associated with water quality. Therefore, zooplankton community composition can be used as an indicator of river condition. A baseline description that includes species richness and diversity using a variety of taxa of zooplankton for every major water body can help us understand the workings of that particular ecosystem. The Minnesota Department of Natural Resources has been documenting the zooplankton communities in Minnesota lakes since 2008 in an effort to document changes associated with environmental variables, such as eutrophication, climate, and/or presence of aquatic invasive species. However, few studies have delved into zooplankton community assessment in flowing-water systems. We therefore, obtained zooplankton samples from multiple sites along the middle portions of the Minnesota River to investigate the community dynamics, particularly in relation to hydrologic stage. Zooplanktons were sampled using a Wisconsin style vertical net with 80--micron mesh and a 12.7--cm mouth. Sampling occurred from April to August in 2015 with zooplankters being identified to the lowest taxonomic-grouping possible using Zooplankton Sonar®. Preliminary data show Copepoda (Cyclopoid, Calanoid, *Macrocyclops* spp. and Harpacticoida), *Daphnia* spp., Ostracoda, *Ceriodaphnia* spp., Rotifera, and Ephemeroptera instar densities (individuals/liter) are significantly different ($p < 0.05$) between locations. This information will be useful for managers evaluating changes that occur from management actions, increased habitat degradation, and/or introduction of exotic species.

Final Monitoring Report; Boundary Waters Canoe Area Wilderness Fuel Treatments Summary - ORAL

Bruce D. Anderson, MN DNR Assistant Wildlife Manager, 1604 South Highway 33, Cloquet, MN 55720; 218-878-5663; bruce.d.anderson@state.mn.us

From 2001 through 2012 we monitored the effects of a 1999 blow down event and subsequent prescribed burns and wildfires on a suite of resources within the Boundary Waters Canoe Area Wilderness. Our findings revealed blow down fuels and ladder fuels initially decreased by 50%. However fuels began to accumulate within five years following wildfires. Regarding prolonged unburned blow down fire risk, blow down with spruce/fir ladder fuels, spruce budworm, continuous fuels and snag recruitment increased the probability of severe wildfire. Conversely blow down dominated by regenerating deciduous trees/shrubs, unsuspended fuels and patchy fuel arrangement, had a lower risk of intense fire. The range of fire severities, soil types, pre disturbance vegetation, and topography resulted in a heterogenic patchwork of vegetation. The most common over-story trees were birch and aspen. White pine persisted within low/moderate severity burns. Red pine showed the greatest decline in all disturbance categories. Balsam

fir/spruce decreased most in the Cavity fir and increased most within unburned plots. Within the understory, aspen, birch, jack pine, and pin cherry increased most across all burn severities. Prominent post burn shrubs were raspberry, willow, dwarf honey suckle, and pin cherry across all burn regimes. Fire effects on the soil organic layer were influenced most by soil moisture content. Despite almost complete depletion of the soil organic layer by fire, landscape recovery was relatively rapid. Invasive species became established following fire and fire management activities. Invasive occurred on sites used for suppression activities such as campsites, safety zones, and sling zones.

Comparing the Efficacy of PVC-pipe versus Wooden Basking Traps in Capturing Painted Turtles in Clay County, Minnesota - POSTER

Robyn O. Aune, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, aunero@mnstate.edu, 218-304-2841

Donna M. Bruns Stockrahm, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, stockram@mnstate.edu, 701-367-3045

As part of a long-term study (2001-2015), western painted turtles (*Chrysemys picta bellii*) have been captured in floating basking traps in Clay County, Minnesota, to study population and behavioral characteristics. Our basking traps were originally made of a PVC- pipe frame, and we have consistently used this trap style from 2001 to 2014. During the summer of 2015, we constructed a new type of trap with a wooden frame and a slanted top in the hope of increasing trap effectiveness because turtles had often been seen escaping from the PVC-pipe traps in recent years. Between 24 May and 23 June 2015, we had each new trap (n=15) paired with an old trap (n = 15) in our 3 study sloughs to test whether or not the painted turtles would be more likely to bask on and be captured in the new traps instead of the old ones. Our objective in this poster is to determine if the new traps were more effective than the old ones in capturing painted turtles. We also analyzed the data for any possible size and gender bias that might have existed between the two kinds of traps. We found that the new traps caught a higher number of turtles (nearly twice as many when counting all recaptures). Our results also showed a higher number of females captured than males, and a higher number of adults captured compared to juveniles for both types of traps. We plan to use the new-style traps exclusively in summer 2016.

Comparison of estimated white-tailed deer (*Odocoileus virginianus*) population densities using distance sampling over two different seasonal periods - ORAL

Michelle L. Barrett, U.S. Fish and Wildlife Service, 51 East 4th Street Rm 200, Winona, MN 55987, michelle_barrett@fws.gov, 507-494-6234

Reduction in natural predation and habitat changes has led to greater abundance of white-tailed deer (*Odocoileus virginianus*), which can pose major environmental and human-wildlife conflicts. In order to manage a deer population to an acceptable carrying capacity it is important to have an accurate measurement of deer density. This study utilized pellet-group distance sampling using transects (varying in length from 500 to 800 meters) at five different sites in order to estimate the deer density in 1,000 acres of eastern broad leaf forest study site. Data was collected over two different seasonal periods which resulted in estimated white-tailed deer population densities of 11.2 deer per km² for the summer and 16.7 deer per km² for the winter. Population sizes usually decreases during the winter due to increase mortality from weather, food related, and human related causes. It is possible that the population density increase due to migration into the study site from surrounding areas or seasonal behavioral differences. Both estimates were higher than the recommended carrying capacity for eastern board leaf forest, which is 7.7 deer per km². It is recommended that the deer population in the study site continued to be monitor and a deer management plan be established in the future.

Analysis of Parasite Community Structure Within *Anas platyrhynchos* Collected at Lake Winnibigoshish, Minnesota During Spring and Fall Migration - ORAL

Holly Bloom, Department of Biological Sciences, 242 Trafton South, Minnesota State University Mankato, Mankato, MN 56001, holly.bloom@mnsu.edu

Dr. Robert Sorensen, Department of Biological Sciences, 242 Trafton South, Minnesota State University Mankato, Mankato, MN, 56001, robert.sorensen@mnsu.edu, 507-389-1280

Mallards (*Anas platyrhynchos*), a common duck in North America, are host to a diverse gastrointestinal parasitic community. However, little is known about the parasites they harbor routinely. Mallards are exposed to a vast diversity of parasites due to their dietary preferences and changes in exposure during migration. During migrations in fall 2012 and spring 2013 we collected a total of 21 gastrointestinal tracts from mallards at a Northern Minnesota lake. The parasites were identified and quantified. Our objective was to determine if there was a significant difference between the species and quantities of parasites present between two seasons. Representative helminths from each category were photographed. Helminths were identified using dichotomous keys. Four classes of parasites were present; cestoda, trematoda, nematoda, and acanthocephalan. Varying parasite infrapopulations and metapopulations were observed among individual birds and well as different seasons. Birds collected in the spring harbored only 5.9% of the total parasites found. Fall birds harbored 12 trematode species where spring birds harbored 8. Only one species of trematode was found in the spring that was not in the fall. Baseline studies of parasitism are important. By gathering baseline information on the parasites within a host species at specified locations and times, we are able to more readily discover abnormalities, such as the presence of novel parasites within a population. Such data have the potential to provide evidence of mortality-associated parasites prior to mortality-events or indicate the presence of novel intermediate hosts in the area.

What's killing Minnesota's moose? - ORAL

Michelle Carstensen, Minnesota Department of Natural Resources Wildlife Health Program, 5463-C West Broadway, Forest Lake, MN, 55025, michelle.carstensen@state.mn.us, 612-390-9979

Véronique St-Louis, Minnesota Department of Natural Resources Wildlife Biometrics Unit, 5463-C West Broadway, Forest Lake, MN, 55025, veronique.st-louis@state.mn.us, 651-296-2704

Erik Hildebrand, Minnesota Department of Natural Resources Wildlife Health Program, 5463-C West Broadway, Forest Lake, MN, 55025, erik.hildebrand@state.mn.us, 651-259-5920

Dawn Plattner, Minnesota Department of Natural Resources Wildlife Health Program, 650 Highway 169, Tower, MN 55790, dawn.plattner@state.mn.us, 218-235-7132

Margaret Dexter, Minnesota Department of Natural Resources Wildlife Health Program, 500 Lafayette Rd., St. Paul, MN 55155, margaret.dexter@state.mn.us, 651-259-5199

Chris Jennelle, Minnesota Department of Natural Resources Wildlife Health Program, 5463-C West Broadway, Forest Lake, MN, 55025, christopher.jennelle@state.mn.us, 651-296-2662

Minnesota's moose (*Alces alces*) are dying at rates much higher than elsewhere in North America, declining 60% in northeastern MN since 2006. In 2013, the Minnesota DNR launched a new study to determine cause-specific mortality by deploying satellite-GPS collars on moose in northeastern MN and investigated mortalities within 24 hours of death. In the first 3 years of this multiyear study, we've collared 173 adult moose (123 females, 50 males), and 45 have died. Annual mortality varied from 19% in 2013 to 12% in 2014; the 2015 mortality rate to date is 13%. Health-related issues have been the leading cause of moose mortalities (64%); whereas wolf predation accounted for the remaining one third (36%) of deaths. Overall proximate causes of death included: 16

confirmed and suspected wolf kills (36%), 10 bacterial infections (22%), 5 brainworm infections (11%), 5 multiple, chronic health issues (11%), 3 winter tick infestations (7%), 1 accident (2%), and 5 undetermined health issues (11%). Parasites and poor body condition are key contributing factors, which may be predisposing moose to predation. Response times from initial mortality notification (e.g., text message or email) to a team in the field at the death site were \leq 24 hours in 28 cases (63%), between 24 and 48 hours in 11 cases (24%), and $>$ 48 hours in 6 cases (13%). Further, preliminary analyses of movement and activity behaviors of moose prior to death may help identify sick moose still on the landscape.

The USFWS Partners for Fish and Wildlife Program – Working with Private Landowners in the Driftless Area of Minnesota and Wisconsin - ORAL

Timothy T. Connolly, USFWS, Upper Mississippi River National Wildlife and Fish Refuge-Winona District, 51 E. 4th Street, Room 203, Winona, MN 55987, timothy_connolly@fws.gov, 507-494-6232

William R. Kiser, USFWS, Upper Mississippi River National Wildlife and Fish Refuge-La Crosse District, N5727 County Road Z, Onalaska, WI 54650, william_kiser@fws.gov, 608-779-2388

More than 85% of land within the Driftless Area of Minnesota and Wisconsin is privately owned. Private land provides important habitat for wildlife. The U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program is a national program that provides technical and financial assistance to private landowners to restore and enhance wildlife habitat on their properties. Working in partnership with private landowners, state agencies, and other conservation groups, the Partners program has focused on bluff prairie and oak savanna restoration, prairie reconstruction, and trout stream habitat improvement projects within the Driftless Area. Projects benefit migratory birds, federal and state threatened and endangered species, pollinators, and other wildlife species.

The Migratory Bird Treaty: Celebrating 100 Years of Migratory Bird Conservation - ORAL

Tom Cooper, U.S. Fish and Wildlife Service, Migratory Bird Program, 5600 American Blvd West, Bloomington, MN 55425, tom_cooper@fws.gov, 612-713-5338

Katie Koch, U.S. Fish and Wildlife Service, Migratory Bird Program, 3090 Wright Street, Marquette, MI 49855, katie_koch@fws.gov, 906-226-1249

The year 2016 marks the centennial of the Convention between the United States and Great Britain (for Canada) for the Protection of Migratory Birds, signed on August 16, 1916. The resulting Migratory Bird Treaty, and the three others that followed, form the cornerstones of our efforts to conserve birds that migrate across international borders. The Treaty connects the U.S. Fish & Wildlife Service (Service) with our Federal, State, private, non-governmental, tribal, and international partners who share our long, successful history of conserving, protecting, and managing migratory bird populations and their habitats. Celebrating the Centennial of the first Treaty allows us to bring together those who have contributed to its success. The four broad goals of the centennial are to create awareness about the importance of migratory bird conservation, promote key actions to help birds, increase support for migratory bird conservation, and expand opportunities for engagement in migratory bird related recreation. Throughout 2016, the Service will work with partners to enhance the conservation of migratory birds by advancing these four goals. Together, we will develop a series of strategies and actions that will launch Midwest bird conservation into the next 100 years. In the Midwest Region of the Service this includes: 1) providing tools to our partners to target conservation; 2) using technology to better understand habitat needs; 3) stressing the importance of full-life cycle conservation; and 4) developing data management tools that assist stakeholders in making science-based management decisions.

Reproductive Ecology of Fisher in Minnesota - ORAL

Pamela L. Coy, Forest Wildlife and Populations Research Group, MN Department of Natural Resources, 1201 E Hwy 2, Grand Rapids, MN 55744, pam.coy@state.mn.us, 218-327-4159

John Erb, Forest Wildlife and Populations Research Group, MN Department of Natural Resources, 1201 E Hwy 2, Grand Rapids, MN 55744, john.erb@state.mn.us, 218-999-7930

Barry Sampson, Forest Wildlife and Populations Research Group, MN Department of Natural Resources, 1201 E Hwy 2, Grand Rapids, MN 55744, barry.sampson@state.mn.us, 218-999-7934

Fishers (*Pekania pennanti*) are a valuable fur-bearing species in Minnesota. As part of a larger fisher and marten (*Martes americana*) ecology project we monitored reproductive success of radio-collared fisher from 2008 - 2015. Objectives of the study were to determine field-based, age-specific, estimates of pregnancy rates, litter size, and when possible, kit survival. Also, to document denning chronology and document structures used for natal and maternal dens. Reproductive success was determined by ground tracking females to natal dens and litter size was determined by placing a video camera in the den cavity while the female was away. Den characteristics (tree species, tree diameter, etc) were recorded. Treating females that were alive during multiple parturition periods as independent units, we confirmed both age and reproductive status for 58 female fishers. Overall pregnancy rate was 81%: 65% for 2-year-olds and 94% for fishers 3 years or older. We examined 45 fisher litters, with an average litter size of 2.5; litter size averaged 2.15 for 2-yr-olds and 2.7 for 3+ year-olds. We located 77 natal and maternal fisher dens; the majority (65%) were in cavities in large diameter aspen. Reproductive parameters from this study will be used for modeling fisher population trends and den characteristics will be used when making forest management recommendations.

Harvest of Canada Geese in Minnesota: Bandings, Recoveries, and Evaluation of Intensive Harvest Goose Zone Regulations – ORAL

Bruce E. Davis, Minnesota Department of Natural Resources, 102 23rd Street NE, Bemidji, MN 56601; bruce.davis@state.mn.us

Canada Geese are the most harvested waterfowl species in Minnesota. Traditional waterfowl hunting seasons begin in September. Years 2010-2014 represent a period of relatively stable goose harvest regulations in Minnesota; the only changes during that time period were the implementation of August goose seasons and expanded bag limits in the Intensive Harvest Goose Zone during 2013 and 2014. During 2010-2014, > 19,000 Canada Geese were banded in Minnesota. I used direct recoveries from these marked birds to examine factors affecting direct recovery rates, harvest locations, and harvest chronology of Canada Geese marked in Minnesota. Best fit models suggest that bird age was the most important factor affecting direct recovery rates of banded Canada Geese.

Winter Nutritional Restriction of Moose in the Declining Population in Northeastern Minnesota, 2013–2015 - ORAL

Glenn D. DelGiudice, Forest Wildlife Populations and Research Group, Minnesota Department of Natural Resources, 5463-C West Broadway Avenue, Forest Lake, MN 55025, glenn.delgiudice@state.mn.us, 651-296-0702

William J. Severud, Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota, 2003 Upper Buford Circle, Suite 135, St. Paul, MN 55108, seve0135@umn.edu, 763-213-2185

Moose (*Alces americanus*) in northeastern Minnesota have declined ~61% since 2006. Nutrition is central to understanding drivers of population performance. Severity of the winter nutritional bottleneck of northern

ungulates varies temporally and spatially with weather, habitat, and other factors, such as winter tick (*Dermacentor albipictus*) epizootics. During winters 2013–2015, we collected 123, 307, and 165 fresh moose snow-urine samples throughout northeastern Minnesota. Overall, mean urea nitrogen:creatinine (UN:C) ratios were 3.7, 2.9, and 2.9 mg:mg, respectively. The population-level UN:C for 2013 was above the threshold indicative of severe nutritional restriction (starvation diet) and accelerated body protein catabolism, whereas during 2014 and 2015 mean UN:C values were just below the moderately severe interval (3.0–3.4 mg:mg). In 2013 the proportion of samples yielding UN:C ratios indicative of severe restriction peaked at ~70% by early February, markedly higher than in 2014 or 2015. Nutritional assessments are closely tracking ($r^2 = 0.970$) annual population estimates of moose. Elevated UN:C values during all 3 winters suggest a level of deprivation not supportive of population stability or growth. We also have documented that the level of severe nutritional restriction is inversely related ($r = -0.91$) to the variation of *natural* winter and winter–summer survival of adult GPS-collared moose. The consistency of these relationships suggests that the study cohort of moose is representative of the free-ranging population in northeastern Minnesota, and collectively these data provide the best empirical evidence that inadequate winter nutrition is intricately related to the declining trajectory of moose.

Cardiac response of American black bears to roadways - POSTER

Mark A. Ditmer, Department of Fisheries, Wildlife & Conservation Biology, University of Minnesota, 2003 Upper Buford Circle, St. Paul, MN 55108, ditme004@umn.edu, 651-895-9883

Spencer J. Rettler, Department of Fisheries, Wildlife & Conservation Biology, University of Minnesota, 2003 Upper Buford Circle, St. Paul, MN 55108, rett0068@umn.edu, 414-861-4007

John R. Fieberg, Department of Fisheries, Wildlife & Conservation Biology, University of Minnesota, 2003 Upper Buford Circle, St. Paul, MN 55108, jfieberg@umn.edu, 612-301-7132

Paul A. Iaizzo, Department of Surgery, University of Minnesota, 420 Delaware Street SE, Minneapolis, MN 55455, iaizz001@umn.edu, 612-624-7912

Tim G. Laske, Atrial Fibrillation Solutions, Medtronic plc, 8200 Coral Sea Street NE Mounds View, MN 55112, tim.g.laske@medtronic.com, 763-514-9782

Karen V. Noyce (Retired), Minnesota Department of Natural Resources, 1201 US-2, Grand Rapids, MN 55744, karen.v.noyce@gmail.com, 218-259-6686

David L. Garshelis, Minnesota Department of Natural Resources, 1201 US-2, Grand Rapids, MN 55744, dave.garshelis@state.mn.us, 218-327-4146

Roadways produce negative impacts on most wildlife species through vehicular-related mortality, altered movement and foraging behaviors. These impacts are typically quantified through movement rates, presence near roads and habitat selection. Coupling GPS tracking with recent bilogger technology allows measuring physiological responses of wildlife to environmental stressors at fine temporal scales. Many studies have attempted to link stress to fragmented or urban areas, but little progress has been made towards measuring physiological stress responses during discrete behaviors. We deployed GPS-collars and cardiac loggers on eight American black bears (*Ursus americanus*) (10 bear-years) throughout Minnesota. We tested whether bears exhibit acute stress responses, as defined by significant changes in heart rate, during road crossings. We looked for differences among sex and presence of young. We quantified distance from roadways at which bear heart rates were no longer elevated. Road crossings resulted in higher maximum heart rates (9 of 10 bear-years), higher mean heart rates (9 of 10 bear years), and more mean heart rate variation (8 of 10 bears) relative to movements without a road crossing. Bear heart rates became elevated at a mean distance of 118 meters from roadways (range 0-391 meters). Female bears with cubs showed the strongest responses to road crossings, whereas, bears living in areas with lower road densities exhibited stronger cardiac. Our findings suggest that roads cause an acute stress with

impacts largest for females with cubs. Differences among study areas suggest a potential habituation toward roadways by bears that cross them with regularity.

**Modeling Grasshopper Sparrow Density in Southwestern Minnesota: Are Landscape-scale Covariates Sufficient?
- ORAL**

Lisa H. Elliott, Conservation Biology Graduate Program, University of Minnesota, 2003 Upper Buford Circle, Suite 135, St. Paul, MN 55108, harnx012@umn.edu, 301-717-1167

Douglas H. Johnson; USGS Northern Prairie Wildlife Research Center; Fisheries, Wildlife, and Conservation Biology; University of Minnesota; 2003 Upper Buford Circle, Suite 135, St. Paul, MN 55108, Douglas_H_Johnson@usgs.gov, 612-624-4716

Many species distribution models use remotely sensed landscape-scale covariates to determine the suitability of habitat, yet wildlife respond also to local habitat features. This disparity is especially problematic when attempting to identify priority areas for a species across large geographic areas. Grasshopper Sparrows are one such species, having been designated a species in greatest conservation need by the Minnesota Department of Natural Resources. To evaluate the suitability of grassland tracts for Grasshopper Sparrows, we conducted surveys of birds and vegetation at 74 grassland sites in 2013 and 2014. We examined landscape covariates within 400m, 800m, and 1600m of each site. We created candidate sets of models with local-scale covariates only, landscape-scale covariates only, and combinations of local- and landscape-scale covariates. The best model in each group was selected based on Akaike's adjusted information criterion (AIC_c), and these top-performing models were compared, also with AIC_c . The model that combined local and landscape-scale variables outperformed models that contained covariates at a single scale. We used our top-performing landscape-only model to create a predictive map of Grasshopper Sparrow densities across the project area, and compared predicted to observed densities at our study sites. This model explained only 11 percent of the variation in observed Grasshopper Sparrow densities, despite being evaluated with the same data used to create the model. In comparison, our top-performing combined-scale model explained 21 percent of variation in Grasshopper Sparrow density, while the top-performing local-scale model explained 16 percent of variation.

How Wolves Hunt Beavers - ORAL

Thomas D. Gable, Northern Michigan University, Department of Biology, 1401 Presque Isle Avenue, Marquette, MI 49855, tgable@nmu.edu

Steve K. Windels, Voyageurs National Park, 360 Highway 11 E, International Falls, MN 56649, steve_windels@nps.gov, 218-283-6692

John G. Bruggink, Northern Michigan University, Department of Biology, 1401 Presque Isle Avenue, Marquette, MI 49855, jbruggin@nmu.edu, 906-227-2342

Beavers (*Castor canadensis*) can be a significant prey item for wolves (*Canis lupus*) in boreal ecosystems due to their abundance and vulnerability on land. However, how wolves hunt beavers in these systems is largely unknown because observing predation events is challenging. We inferred how wolves hunt beavers by identifying kill sites via clusters from GPS-collared wolves in Voyageurs National Park. We identified 22 sites (12 in the spring and 10 in the fall) where wolves from 4 different packs killed beavers from April 2, 2015 to November 5, 2015. Wolves killed 16 (72%) beavers downstream from dams, and at feeding trails and canals. Seasonal variation existed in types of kill sites as 7 (58%) kills in the spring occurred at sites downstream from dams and on shorelines while 8 (80%) kills in the fall occurred at sites along foraging trails and canals. From these kill sites we deduce that the typical hunting progression appears to be: 1) waiting near areas of high beaver use (e.g., trails) until beavers come ashore, 2) using vegetation or the dam for concealment, and 3)

ambushing beavers by cutting off access to water. However, variability exists in hunting strategy as we identified 6 (27%) kill sites where beavers appeared to have been attacked in the water and then consumed on land. Our results provide the most thorough and complete description of how wolves hunt beavers available.

Food Availability for Wood Turtles (*Glyptemys insculpta*) in Managed and Natural Woodlands - POSTER

Katelin M. Goebel, University of Minnesota Duluth, 9 Howard Gnesen Rd, Duluth, MN 55811, goebe081@d.umn.edu, 320-583-7221

Madaline M. Cochrane, Integrated Biosciences Program, University of Minnesota Duluth, Biology Department, 1035 Kirby Dr, Swenson Science Building 207, Duluth, MN 55812, cochr081@umn.edu, 218-720-4294

Donald J. Brown, West Virginia University, School of Natural Resources, PO Box 6125, Morgantown, WV 26506, donald.brown1@mail.wvu.edu, 304-293-0021

Ronald A. Moen, University of Minnesota Duluth, 317 LSci, 1110 Kirby Dr, Duluth, MN 55812, rmoen@d.umn.edu, 218-726-7774

Wood turtles (*Glyptemys insculpta*) are listed as threatened by the state of Minnesota, and are a species of management concern. These animals are largely terrestrial during the summer months, and use forested areas for foraging. University of Minnesota Duluth scientists and the Minnesota Department of Natural Resources started a study on wood turtles in the spring of 2015 to assess habitat use and responses to management actions. Turtles were affixed with radio transmitters that allowed VHF tracking to their exact location as well as GPS dataloggers. This project compared food availability between known wood turtle locations from VHF telemetry and adjacent clear-cut jack pine (*Pinus banksiana*) regeneration areas. Data collection occurred during the summer and early fall of 2015. Turtles were found in areas with 77% (SD = 26, range 3 to 100) canopy cover, compared to 37% (SD = 37, range 0 to 99) in random locations in managed areas. Earthworm, slug, and berry densities did not differ between the two types of sites. Green plants and raspberry stems had higher densities in managed areas, while mushroom density was greater where turtles were present. Our results indicate the wood turtles could be selecting areas with higher mushroom densities. Alternately, other environmental factors, such as canopy cover or proximity to water, may be driving wood turtle habitat use patterns. Analysis of GPS locations from dataloggers will enable a complete analysis of habitat use.

Use of Roving Crews for Prairie and Wetland Habitat Management by the Minnesota Department of Natural Resources - ORAL

Walt Gessler, Minnesota Department of Natural Resources, Region 4 Roving Crew Supervisor, 3749 State Park Road, Montevideo, MN 56265, Walt.gessler@state.mn.us, 320-752-4394.

In November of 2008, the voters of Minnesota approved an amendment to the states constitution that increased the sales tax rate by three-eighths of one percent, dedicated to Minnesota's outdoor heritage, clean water, parks and trails, and arts and cultural heritage. The Outdoor Heritage portion of these funds has provided supplemental funding to focus efforts to restore, protect and enhance wildlife habitat in Minnesota. In 2011, the Minnesota Department of Natural Resources, Section of Wildlife began using Roving Habitat Crews funded by the Outdoor Heritage Fund to focus efforts on prairie habitat management and expanded the crew's role to wetland habitat in 2013. These crews have greatly increased the capacity of the Section of Wildlife to accomplish habitat enhancement because of the dedicated nature of the funding that keeps the crews focused. This presentation will discuss accomplishments and challenges of the three Roving Habitat Crews in Minnesota.

Too Much Hair? Subsampling to Maximize Bang for the Buck with Spatially Explicit Capture-Recapture Estimates - ORAL

Nick Gondek, Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota

David Garshelis, Minnesota Department of Natural Resources

John Fieberg, Department of Fisheries, Wildlife, and Conservation Biology University of Minnesota

Genetic-based mark–recapture population estimates from hair-snaring are now routinely used for bears. The number of samples obtained typically far exceeds the budget allotted for genetic analysis, and moreover, many samples are likely to be redundant (same visit by same bear). Therefore, it becomes necessary to subsample the data in some way. Subsampling has been shown to bias traditional (non-spatial) capture–recapture estimators low, but we are unaware of any studies that have considered the effects of subsampling on spatially explicit capture–recapture (SECR) estimators. Importantly, researchers often subsample hair samples with the intention of maximizing the number of unique individuals (e.g., by taking at least 1 hair from each unique trap by time session). This method results in disproportionate sampling rates at traps and sampling occasions with few hair samples. As a result, realized capture frequencies will depend not just on an individual’s movements relative to its home range center, as assumed by SECR estimators, but also on the number of other bears leaving hair samples. We discuss this issue within the context of a large SECR study involving black bears in Minnesota. We were able to secure funding to genotype > 90% of the resulting hair-snare data, allowing us the opportunity to compare spatial and non-spatial mark-recapture estimators under various levels of subsampling.

Assessing reproductive efforts, locating pre-migratory roosts, and tracking migration of Purple Martins (*Progne subis*) in Minnesota - POSTER

Cathy Henry, Bemidji State University, 1500 Birchmont Dr NE, Bemidji, MN 56601, chenry@bemidjistate.edu, (503)729-7483

Brian Hiller, Bemidji State University, 1500 Birchmont Dr NE, Bemidji, MN 56601, bhiller@bemidjistate.edu, (218)755-2212

Purple Martins (*Progne subis*) have been experiencing significant population declines throughout Minnesota yet no analysis of baseline reproductive data has been published for this area. This project will collect and analyze reproductive data on purple martins breeding throughout Minnesota. Throughout northwestern Minnesota, we will also seek the roosts used by purple martins prior to fall migration and collect basic habitat data upon discovery. This habitat data will be compared with data collected from other known roosts in the state in an attempt to identify shared habitat characteristics that may be serving as cues to individuals seeking roosting habitat. To locate these nocturnal roosts, we will employ Doppler weather radar. Doppler weather radar data will be downloaded, animated, and viewed daily from late June through mid-September 2015-2016 to identify appearances of ring echoes, indicating concentrations of roosting purple martins. Events occurring during migration have been shown to strongly influence adult and juvenile survival rates among passerines. For the breeding population in northern Minnesota, no known studies have been conducted describing migration ecology. We will mount solar geolocators upon purple martins to track the migration strategies of individuals fledging from colonies in northern Minnesota. The following summer, these individuals will be re-captured in order to retrieve location data. From these data, we will describe any patterns observed in timing, destination, and routes taken during migration.

Calibration of a rumen bolus to measure internal body temperature in moose - ORAL

Andrew Herberg, University of Minnesota, Department of Fisheries, Wildlife, and Conservation Biology, 2003 Upper Buford Circle, Ste. 135, St. Paul, MN, 55108, herbe158@umn.edu, 651-235-2562

Véronique St-Louis, Minnesota Department of Natural Resources Wildlife Biometrics Unit, 5463-C West Broadway, Forest Lake, MN, 55025, Veronique.st-louis@state.mn.us, 651-296-2704

Michelle Carstensen, Minnesota Department of Natural Resources Wildlife Health Program, 5463-C West Broadway, Forest Lake, MN, 55025, Michelle.carstensen@state.mn.us, 612-390-9979

James Forester, University of Minnesota, Department of Fisheries, Wildlife, and Conservation Biology, 201E Green Hall, St. Paul, MN, 55108, jdforest@umn.edu, 612-626-6721

Moose in northeastern Minnesota have exhibited steep population declines from an estimated 8840 individuals in 2006, to 3450 in 2015. Annual non-hunting mortality rates in NE MN have also been shown to be abnormally high (21%) in adult moose compared to populations in Alaska and Canada (10%). Concerns over the potential effect of increasing ambient temperatures on moose behavior and physiology has prompted the deployment of mortality implant transmitters (MITs), rumen boluses capable of measuring heart activity and body temperature, in 61 free-ranging moose in northeastern Minnesota (2013-2015). However, the true relationship between rumen temperature and true core body temperature has yet to be quantified. To validate the MIT-derived body temperature, we fit 10 captive female moose (>2 years old) at the Moose Research Center in Kenai, Alaska, with MITs, as well as vaginal implant transmitters (VITs) capable of measuring true body temperature. Both transmitters collected data in 5 min intervals for 12 months starting in December 2014. To assess how behavior affects rumen-measured temperatures we collected a total of 384 hours of behavioral observations during 4, two-week windows distributed over that 12-month period. Preliminary results suggest that MITs record internal body temperatures approximately 0.25 °C higher than the VITs. We also observed an effect of drinking and ruminating behaviors, among others, on MIT values. This study demonstrates that, with minimal censoring and data correction, minimally invasive MITs can provide unprecedented data related to an animal's physiological response to its environment, with direct applications for understanding moose responses to increasing ambient temperatures in Minnesota.

First statewide survey for trumpeter swans in Minnesota confirms population expansion and success of Minnesota's reintroduction program - ORAL

Christine Herwig, Minnesota Department of Natural Resources, 2115 Birchmont Beach Road NE, Bemidji, MN 56601, christine.herwig@state.mn.us, 218-308-2641

John Giudice, Minnesota Department of Natural Resources, 5463 W Broadway, Forest Lake, MN 55025, john.giudice@state.mn.us, 651-296-2703

The North American Trumpeter Swan survey is the official status assessment for trumpeter swans and has been conducted every 5 years since 1975. During reintroduction efforts in Minnesota, many locations of pairs were known. In recent years, this survey was conducted in Minnesota during winter months as it was believed that most of the population concentrated at a limited number of wintering locations. Beginning in 2015, the U.S. Fish and Wildlife Service requested that surveys be conducted during the breeding season. Seeking a cost-effective way to collect data, we reviewed existing spring bird surveys and opted to use the May Waterfowl Breeding Population Survey supplemented by a survey area covering the remaining known distribution of trumpeter swans in the state. Transects were flown by the Minnesota Department of Natural Resources for the May Waterfowl Survey and the supplemental area. Additionally, Three Rivers Park District collected data in the Minneapolis-St. Paul metropolitan area via ground and aerial counts, and incidental observations. The statewide population estimate for 2015, excluding the metropolitan area was 16,990 swans (90% CI: 12,730- 21,250). Including swans

counted in the metropolitan area that did not overlap with the sampling frames for the Department of Natural Resources surveys, the total trumpeter swan population estimate for Minnesota was 17,021 swans. Highest concentrations of swans were observed west of the metropolitan area and in the north-central part of the state, near the main release sites for the reintroduction efforts.

Secretive Marshbird Response to Wetland Management in Western Minnesota - ORAL

Nina Hill, Minnesota Cooperative Fish and Wildlife Research Unit, Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota, 2003 Upper Buford Circle, 135 Skok Hall, Saint Paul, MN 55108, hillx725@umn.edu, 612-624-2228

Tom Cooper, U.S. Fish and Wildlife Service, 5600 American Blvd. West, Suite 900, Bloomington, MN 55437, tom_cooper@fws.gov, 612-713-5338

Douglas H. Johnson, U.S. Geological Survey (emeritus), Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota, 2003 Upper Buford Circle, 135 Skok Hall, Saint Paul, MN 55108, douglas_h_johnson@usgs.gov, 612-624-4716

David E. Andersen, U.S. Geological Survey, Minnesota Cooperative Fish & Wildlife Research Unit, 200 Hodson Hall, 1980 Folwell Avenue, St Paul, MN 55108, dea@umn.edu, 612-626-1222

Due to the secretive nature of certain marshbirds, they are difficult to detect, and existing avian survey methods (e.g., Breeding Bird Surveys) do not provide reliable estimates of population size or trends. Recent efforts to develop and standardize survey protocols for secretive marshbirds provide a framework for evaluating responses of this group of birds to vegetation management and for assessing information about their distribution and abundance. We use the Standardized North American Marsh Bird Monitoring Protocol to evaluate differences in abundance associated with different management strategies to control invasive wetland vegetation in western and northwestern Minnesota in 2015. Vegetation treatments in western Minnesota included grazing and/or prescribed burning across a range of intensity, and treatments in northwestern Minnesota consisted of application of herbicide to kill hybrid cattail (*Typha x glauca*). We conducted 255 surveys along 16 routes in western Minnesota and surveyed 8 large wetlands in northwestern Minnesota, prior to application of herbicide. We recorded 563 observations of 8 focal species of marshbirds in western Minnesota and 577 observations of 10 focal species in northwestern Minnesota. Preliminary analysis indicates that there is no difference across treatments. Additional data collection in 2016 will allow further analysis. We report on the relative abundance of marshbirds across our survey area in western Minnesota and provide a summary of observations of marshbirds in large wetlands prior to herbicide treatment in northwestern Minnesota.

Prevalence of Gastrointestinal Parasites in Three Fur-Bearing Game Animals in Wisconsin - POSTER

Kelsey Hoffmann, Winona State University, Department of Biology, 220 Pasteur Hall, Winona, MN 55987, khoffmann08@winona.edu, 507-398-7992

Kimberly M. Bates, Winona State University, Department of Biology, 228 Pasteur Hall, Winona, MN 55987, kbates@winona.edu, 507-457-5458

Fishers (*Martes pennanti*), bobcats (*Lynx rufus*), and river otters (*Lontra canadensis*) are all species of interest for the Wisconsin DNR due to fluctuations in population size. The Wisconsin DNR collects carcasses of legally harvested fur-bearing game animals trapped throughout the seasons and then makes them available for research studies. Over the last 4 years the laboratory at Winona State University obtained intestines from these 3 animal species to be examined for parasites. Each intestine was placed in a Ziploc bag and frozen until ready to analyze. The intestines were then dissected and the digested material was separated through sieves of different sizes. The

digested material was then examined microscopically and any parasites that were collected were stored in 70% ethanol. Some parasites were stained for further identification. Parasite prevalence and intensity were determined for each species of furbearer and analyzed in relation to gender, age, and geographic location. Currently, data from all 3 species of animal have been combined to determine relationships of parasitic prevalence/intensities in the different regions of Wisconsin.

~~River otter distribution and habitat use within the Mississippi National River and Recreation Area~~ – POSTER - CANCELLED

Allison Holdhusen, Mississippi National River and Recreation Area, National Park Service, 111 East Kellogg Blvd, Suite 105, St. Paul, MN 55101, allison_holdhusen@nps.gov, 651-293-8466

River otter (*Lontra canadensis*) are charismatic, apex predators, that were largely extirpated from the Upper Mississippi River by the early twentieth century. Local otter populations have since rebounded due to sustainable harvest regulations, habitat and water quality improvements and reintroduction efforts in Minnesota. Otter sightings have become increasingly common in the Twin Cities Metro Area, inciting public and scientific interest to better understand this sentinel species and their linkages to the greater Mississippi River ecosystem. Beginning in 2009, the National Park Service teamed with local partners and volunteers to determine otter distribution and habitat use within the Mississippi National River and Recreation Area. Baseline studies led to the development of a low-cost, low effort occupancy monitoring program for river otter within the park, while fostering a public connection to urban wildlife and river stewardship.

Surveillance for Highly Pathogenic Avian Influenza Virus in Minnesota's Wild Birds in 2015 - ORAL

Chris Jennelle, Minnesota Department of Natural Resources Wildlife Health Program, 5463-C W. Broadway Ave, Forest Lake, MN 55025, christopher.jennelle@state.mn.us, 651-296-2662

Michelle Carstensen, Minnesota Department of Natural Resources Wildlife Health Program, 5463-C W. Broadway Ave, Forest Lake, MN 55025, michelle.carstensen@state.mn.us, 651-296-2663

Erik Hildebrand, Minnesota Department of Natural Resources Wildlife Health Program, 5463-C W. Broadway Ave, Forest Lake, MN 55025, erik.hildebrand@state.mn.us, 651-259-5920

Louis Cornicelli, Minnesota Department of Natural Resources, 500 Lafayette Rd., St. Paul, MN 55155, lou.cornicelli@state.mn.us, 651-259-5202

Since detection of a novel reassortant of highly pathogenic avian influenza A (H5N2) virus (HPAIV) in a poultry facility in Pope County Minnesota on February 27 2015, the Minnesota Department of Natural Resources (MNDNR) partnered with the US Department of Agriculture Wildlife Services, the US Geological Survey National Wildlife Health Center, the US Fish and Wildlife Service, and the University of Georgia Southeast Cooperative Wildlife Disease Study to conduct surveillance for the virus in Minnesota wild birds. From March through June 2015, 101 poultry facilities in MN were confirmed positive with HPAIV, resulting in severe economic losses to producers and local economic disruption. From March through December 2015, the MNDNR collected and tested 3,139 waterfowl fecal samples, 147 wild bird morbidity or mortality cases, 84 spring hunter-harvested wild turkeys (*Meleagris gallopavo*), 619 Canada geese (*Branta canadensis*), and 1,856 dabbling ducks for detectable HPAIV. Only 1 HPAIV positive case was confirmed on April 29 2015 from a wild bird mortality event; a Cooper's hawk (*Accipiter cooperii*) in Yellow Medicine County. Cases of low pathogenic avian influenza virus (LPAIV) were more prevalent with 91 fecal samples, 2 wild bird mortalities, 2 Canada goose, and over 300 dabbling ducks testing positive. Despite the rarity of detecting HPAIV in wild birds nationwide, MNDNR will continue to monitor the health of wild birds by testing wild bird morbidity and mortality cases, and screening for HPAIV when appropriate.

Biogeographic variation in rest site selection by martens and fishers: impact of thermal stress and predation risk - ORAL

Michael J. Joyce, Integrated Biosciences Graduate Program, University of Minnesota Duluth, 5013 Miller Trunk Hwy, Duluth, MN 55811, joyc0073@d.umn.edu, 218-720-4260

Andrzej Zalewski, Mammal Research Institute, Polish Academy of Sciences, Białowieża, Poland, zalewski@ibs.bialowieza.pl

John D. Erb, Minnesota Department of Natural Resources, 1201 E. Hwy 2, Grand Rapids, MN, 55744, john.erb@state.mn.us, 218-999-7930

Ron A. Moen, Natural Resources Research Institute and Department of Biology, University of Minnesota Duluth, 5013 Miller Trunk Hwy, Duluth, MN 55811, rmoen@d.umn.edu, 218-720-4372

Species in the *Martes* complex (fishers, martens, and wolverines) occupy broad geographic ranges with significant regional variation in climate regime, forest type, and community structure. Throughout their respective geographic ranges, species in the *Martes* complex respond to spatio-temporal variation in environmental conditions by selecting habitat based on local factors such as resource availability, thermal environment, and predation risk. We evaluated geographic variation in rest site selection by fishers (*Pekania pennanti*) and boreal martens (American marten [*Martes americana*], Eurasian pine marten [*M. martes*], pacific marten [*M. caurina*], and sable [*M. zibellina*]). We hypothesized that geographic variation in thermal environment and predation risk influences rest site use. Both boreal martens and fishers used ground resting structures more frequently in areas with lower annual temperatures and more persistent snow cover. Rest sites in and on the ground provide the best thermal protection but are less protective against predators than arboreal rest sites. Boreal martens showed a stronger response to thermal stress than fishers, consistent with morphological differences that affect sensitivity to cold temperatures. Our results suggest that thermal stress is more important than predation risk for boreal martens and that boreal martens may be more susceptible to predation in cold areas where thermally protective rest sites in and on the ground must be used despite higher risk of predation. Because fishers are less sensitive to cold temperatures, they do not need as much thermal protection and prefer arboreal structures to avoid predation.

Urban Canada Geese in Moorhead, Minnesota: What do We Know after Six Years of Population Control? - POSTER

Jaime L. Kallstrom, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, kallstroja@mnstate.edu, 651-788-6753

Scott T. Buchholz, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, buchholzsc@mnstate.edu, 701-793-4863

Donna M. Bruns Stockrahm, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, stockram@mnstate.edu, 701- 367-3045

Canada geese (*Branta canadensis*) are becoming abundant and troublesome in many urban areas, including the Fargo/Moorhead area. *Escherichia coli* (*E. coli*) is a microorganism existing in a variety of forms that can be either harmless or damaging to humans, potentially causing urinary, gastrointestinal, and respiratory illnesses. *E. coli* is a common pathogen in the feces of Canada geese, which can result in detectable levels in water systems. Due to this, American Crystal Sugar (ACS) located in Moorhead, MN, contacted Minnesota State University Moorhead in 2010 about a partnership to help control the goose population at their grounds where they have water-holding ponds that remain open year-round, providing a viable source of water and nesting habitat for the geese. We have conducted studies each spring (Mar-May) since 2010 which included quantifying goose numbers, monitoring nests,

and oiling eggs. From 2010-2012, nest numbers declined from 123 to 28, jumped to 52 in 2013, then declined again to only 5 in 2015 with a corresponding drop in goose numbers. Completely separate from our study, in late June of each year, any remaining adult geese and/or hatchlings still present are removed. The combination of egg oiling and goose removal has reduced the overall numbers of nests and geese, but long-term effects of this management process are unknown. It appears that as goose numbers have declined, duck numbers, especially in mallards (*Anas platyrhynchos*), have increased. We hope to conduct more thorough duck counts in 2016 to further investigate.

Comparative trematode biota of healthy American coot and ring-necked duck harvested from Lake Winnibigoshish, MN - POSTER

Okhumhekho Kassim, Department of Biological Sciences, 242 Trafton South, Minnesota State University Mankato, Mankato, MN, 56001, tyler.achatz@mnsu.edu

Jacob Rachuy, Department of Chemistry and Geology, 241 Ford Hall, Minnesota State University Mankato, Mankato, MN, 56001, jacob.rachuy@mnsu.edu

Timothy Christopherson, Department of Psychology, 23 Armstrong Hall, Minnesota State University Mankato, Mankato, MN, 56001, timothy.christopherson@mnsu.edu

James Mitchell, Department of Biological Sciences, 242 Trafton South, Minnesota State University Mankato, Mankato, MN, 56001, james.mitchell@mnsu.edu

Connor Hutton, Department of Biological Sciences, 242 Trafton South, Minnesota State University Mankato, Mankato, MN, 56001

Miriah Linville, Department of Biological Sciences, 242 Trafton South, Minnesota State University Mankato, Mankato, MN, 56001, miriah.linville@mnsu.edu

Dr. Robert Sorensen, Department of Biological Sciences, 242 Trafton South, Minnesota State University Mankato, Mankato, MN, 56001, robert.sorensen@mnsu.edu, 507-389-1280

Parasitic surveys are important to gauge the normal parasitic biota within a population of hosts. In the Midwest United States, few survey studies have been conducted on the healthy parasitic biota of waterfowl. This study examined the trematode biota of apparently healthy American coot (*Fulica americana*) and ring-necked duck (*Aythya collaris*). In the fall of 2012, 10 *F. americana* and 12 *A. collaris* were hunter shot and harvested from Lake Winnibigoshish, Minnesota along with 7 *A. collaris* in Spring of 2013. All of the birds harvested were assumed healthy prior to being shot by hunters. The intestines were extracted, rinsed, and examined for trematodes. Trematodes found were frozen for genetic analysis or fixed in formalin for morphological analysis. There were 8 trematode species found in *F. americana* and 10 were found in fall *A. collaris*. There were 2 trematode species found in both *F. americana* and *A. collaris*. These were *Zygodontylenus limicola* and *Sphaeridiotrema pseudoglobulus*. Three trematodes associated to waterbird mortality events were also identified. They are *Leyogonimus polyoon*, *Cyathocotyle bushiensis*, *S. pseudoglobulus*. *L. polyoon* was found only in *F. americana* and had the greatest intensity of all trematodes found. This is a base line study representing the normal parasitic biota found in *F. americana* and *A. collaris*.

Fire created habitat partitioning and isolation between hybridizing warblers - ORAL

Richard S. King, Upper Mississippi River National Wildlife and Fish Refuge – McGregor District, 470 Cliffhaven Road, Prairie du Chien, WI 53821; 608-326-0515; richard_king@fws.gov

Hybridization between the golden-winged warbler (*Vermivora chrysoptera*) and blue-winged warbler (*Vermivora cyanoptera*) has received extensive study across North America for more than a century and indicates widespread, bi-directional genetic introgression. We found evidence fire is creating habitat partitioning between nesting golden-winged warblers and blue-winged warblers. In addition to minimizing contact between the species, fire is creating habitat conditions on mixed sites that greatly favor golden-winged warblers over blue-winged warblers. Fire provides a plausible explanation for the original split in these sister species and could be used as a conservation tool in the future. If nesting populations can be isolated with the use of fire, relatively rapid phenotypic sorting can be expected.

Investigating Visitor Use Trends and Management Preferences at Minnesota Wildlife Management Areas - ORAL

Kelsie LaSharr, University of Minnesota and Minnesota Cooperative Fish and Wildlife Research Unit, 1980 Folwell Ave, 200 Hodson Hall, St. Paul, MN 55108, kelsielasharr@umn.edu, (612) 625-3718

David Fulton, U. S. Geological Survey and Minnesota Cooperative Fish and Wildlife Research Unit, 1980 Folwell Ave, 200 Hodson Hall, St. Paul, MN 55108, dcfulton@umn.edu

Lou Cornicelli, Minnesota Department of Natural Resources, 500 Lafayette Road, Box 20, St. Paul, MN 55155-4020, lou.cornicelli@state.mn.us

State-owned land, held in trust for the public, is used for many different purposes by both state agencies and the public. In particular, Minnesota Wildlife Management Areas (WMAs) maintain high-quality wildlife habitat and provide opportunities for hunting and wildlife watching. Wildlife managers want to understand who uses these areas and which recreational activities they are seeking. These data can be used to estimate economic benefits to local communities, help determine which recreational activities are sought, and give insight into how hunter recruitment and retention can be improved across the state. We are conducting a two-part research project that will help WMA district managers achieve management goals in Western Minnesota. First, we are estimating visitor-use levels through on-site intercepts and mail-back surveys, and then collecting detailed information about visitor expenses, experiences, and management preferences using a multi-modal survey targeting WMA users during the 2015 fall season.

Conservation Partners Legacy Grant Program - ORAL

Jessica Lee, MN DNR, CPL Grant Program Coordinator, 500 Lafayette Road, Box 20, St. Paul, MN 55155
Jessica.Lee@state.mn.us 651-259-5233

Alexander Egan, MN DNR, CPL Natural Resource Specialist, 500 Lafayette Road, Box 20, St. Paul, MN 55155
Alexander.Egan@state.mn.us 651-259-5174

The Conservation Partners Legacy Grant (CPL) Program began with the approval of the Legacy Amendment and is funded through the Outdoor Heritage Fund recommended to the legislature by the Lessard-Sams Outdoor Heritage Council. The CPL Program provides competitive matching grants from \$5,000-\$400,000 to nonprofits and government entities for habitat projects that restore, protect, or enhance forests, prairies, or wetlands for fish, game and wildlife in Minnesota. Work can be done on lands under public ownership, lands under a permanent conservation easement and in public waters. The CPL Program now has 3 grant cycles; the Traditional Grant Cycle, the ongoing Expedited Conservation Project (ECP) Grant Cycle (for frequently funded, standard-practice habitat projects), and the new Metro Grant Cycle (for projects occurring in the 7 county metro area and within the city limits of Duluth, Rochester or St. Cloud). CPL is a great way to get funds for on-the-ground habitat projects.

Starting an LCCMR Prairie Restoration Grant: Monitoring of Small Mammals - POSTER

Jessica M. Lindstrom, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, lindstroje@mnstate.edu, 218-443-4531

Annika M. Bordak, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, bordakan@mnstate.edu, 763-592-9666

Elisabeth C. Teige, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, teigeel@mnstate.edu, 715-815-0213

Donna M. Bruns Stockrahm, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, stockram@mnstate.edu, 701-367-3045

Minnesota State University Moorhead (MSUM) was recently awarded a Legislative-Citizen Commission on Minnesota Resources (LCCMR) grant to restore old farmland (called the "Houston Property" HC) owned by the MSUM Regional Science Center (near Glyndon, MN) and an adjoining former Golf Course (GC) back to native prairie habitat. One main grant objective is to live-trap small mammals to determine species composition, abundances, habitat use, and behaviors before, during, and after restoration. During summer 2015, small mammals were live-trapped on HP and GC to monitor "pre-restoration" populations. For comparison, 2 reference sites were also live-trapped on the nearby Bluestem Prairie (under SNA and TNC protection). Trapping was conducted from 2nd July - 6th August 2015. HP was re-trapped in September as part of the LCCMR grant to integrate restoration efforts into related college courses. Each site had 2 transects with 30 or 50 trap stations depending on site size, with trap stations 10 m apart along each transect. Small Sherman traps were placed at all trap stations, with an additional larger Sherman trap at odd-numbered stations. HC had the highest species diversity, including masked shrews (*Sorex cinereus*), a meadow jumping mouse (*Zapus hudsonius*), meadow voles (*Microtus pennsylvanicus*), deer mice/white-footed mice (*Peromyscus* spp.), and thirteen-lined ground squirrels (*Ictidomys/Spermophilus tridecemlineatus*). Not surprisingly, the GC yielded only 1 *Peromyscus* spp. and 1 meadow vole. Surprisingly, 1 of the reference sites yielded only *Peromyscus* spp and thirteen-lined ground squirrels. The other reference site had higher diversity including 2 Richardson's ground squirrels (*Uroditellus richardsonii*), and 1 short-tailed weasel (*Mustela erminea*).

Monitoring Painted Turtle Movements in Clay County, Minnesota, with a New Style of Trap - POSTER

Jessica M. Lindstrom, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, lindstroje@mnstate.edu, 218-443-4531

Scott T. Buchholz, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, buchholzsc@mnstate.edu, 701-793-4863

Sarah S. Sanderson, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, sandersosa@mnstate.edu, 218-329-8918

Jessica L. Loeffler, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, loefflerje@mnstate.edu, 218-791-6256

Elisabeth C. Teige, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, teigeel@mnstate.edu, 715-815-0213

Marissa M. Reeves, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, reevesma@mnstate.edu, 507-720-4657

Eberardo C. Barragan, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, eddie.cubillo@gmail.com, 626-234-1844

Jordan J. White, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, whitejo@mnstate.edu, 320-583-0500

Donna M. Bruns Stockrahm, Minnesota State University Moorhead, 1104 7th Avenue South, Biosciences Department, Moorhead, MN 56563, stockram@mnstate.edu, 701-367-3045

In our long-term study (2001-2015), nearly 1,000 western painted turtles (*Chrysemys picta bellii*) have been live-trapped with PVC-pipe floating/basking traps in Clay County, Minnesota, to study population characteristics and behaviors. Captured turtles were weighed, sexed, measured, marked by scute notches (and PIT tags starting in 2006), and released on the shoreline of the slough of capture. We are currently trapping 3 sloughs with <1 km between the 2 most distant sloughs. In 2015, we built 15 new wooden traps with a slanted top to prevent/hinder escape. From late May to 23 June 2015, 15 PVC-pipe traps and 15 wooden traps were placed in shallow water and spread out more so than in previous years. After 23 June, only the wooden traps were used. Trapping success was phenomenal with over 400 captures of 174 different turtles. Our purpose here is to quantify movements of turtles captured multiple times. For adult PIT-tagged adults, 21 male and 27 female turtles were captured multiple times at multiple locations, with only 2 males and 4 females captured repeatedly in the same trap. These recaptures accounted for 262 of the total captures. For turtles of unknown sex (too small to tell), corresponding numbers were 25 and 2, indicating turtles often moved between traps. Repeated captures were often in a nearby trap, but not always. Only males (n = 3) were captured in multiple sloughs. Females in the Stockrahm Slough, however, were often documented in the Stockrahm Yard (n = 5), usually during egg-laying season.

Blending Fire Ecology and Fire Management with Invasive Species Removal - ORAL

Craig Maier, Tallgrass Prairie and Oak Savanna Fire Science Consortium, 70 Science Hall, 550 North Park Street, Madison, WI, 53706, cmaier.tpos.firescience@gmail.com, 608-890-4713

Many land managers have experienced that prescribed fire is an imperfect tool for suppressing invasive plant species, frustrating their attempts to restore an ecological process in fire-dependent systems that is vital to native plant communities, wildlife, and ecosystem function. Land managers are facing three prevailing scenarios that complicate the application of prescribed fire: 1) some invasive species drastically alter fire behavior by changing fuel loads, fire spread, intensity, and severity; 2) some invasive species exhibit fire-adapted traits, and can increase in dominance or colonize new sites following fire; and 3) improper timing, or not achieving a needed intensity and/or severity of prescribed fire, can fail to meet objectives for suppressing invasive species that are sensitive to fire under certain conditions. Case studies highlight land managers' innovations, with two complementary themes: 1) pre-burn management using other tools to foster more desirable fuel loads, and 2) planning and implementing prescribed fires of the appropriate timing, intensity, severity, and/or frequency to suppress invasive species and enhance fire-dependent natural communities.

Gastrointestinal Trematodes from Apparently Healthy Waterfowl Species Harvested from Lake Winnibigoshish, Minnesota - ORAL

Scott Malotka, Department of Biological Sciences, 242 Trafton South, Minnesota State University, Mankato, MN, 56001, scott.malotka@mnsu.edu

Dr. Robert Sorensen, Department of Biological Sciences, 242 Trafton South, Minnesota State University Mankato, Mankato, MN, 56001, robert.sorensen@mnsu.edu, 507-389-1280

This study examined the intestinal trematode community from nine species of waterfowl: blue-winged teal (*Anas discors*), bufflehead (*Bucephala albeola*), common goldeneye (*Bucephala clangula*), greater scaup (*Aythya marila*), green-winged teal (*Anas carolinensis*), lesser scaup (*Aythya affinis*), northern pintail (*Anas acuta*), redhead (*Aythya americana*), and wood duck (*Aix sponsa*) collected from Lake Winnibigoshish in northern Minnesota. In the fall of 2012, 15 blue-winged teal, 3 bufflehead, 10 lesser scaup, 1 northern pintail, 1 redhead, and 7 wood duck were collected during the waterfowl-hunting season from licensed hunters. Additional birds were collected in spring of 2013 which included 2 blue-winged teal, 2 bufflehead, 4 goldeneye, 1 greater scaup, 1 green-winged teal, 1 lesser scaup, and 3 wood duck were collected. All birds were healthy enough to fly at the time of collection. The intestinal tracts were collected from ducks and were frozen until examination. Intestines were processed under a dissecting microscope. Trematodes that were collected were fixed in formalin for morphological analysis or frozen for genetic analysis. Mortality-related trematodes, *Sphaeridiotrema pseudoglobulus* and *Cyathocotyle bushiensis*, were found in blue-winged teal, bufflehead, greater scaup, lesser scaup, and redhead. The number of non-mortality related trematode individuals was greater in all bird species other than lesser scaup and redhead. These efforts to describe baseline parasite community structure are deemed necessary to future studies given the numerous environmental changes that are forecast, including introduced species, habitat loss, and climate change.

Factors Affecting Elk (*Cervus elaphus*) Encounter Rate by Gray Wolves (*Canis lupus*) in Yellowstone National Park - ORAL

Hans Martin University of Minnesota-Twin Cities, Fisheries, Wildlife/ Conservation Biology, Room 135, Skok Hall, 2003 Upper Buford Circle, St Paul, MN 55108 mart3420@umn.edu, 920-493-4267

L. David Mech, U.S. Geological Survey, Northern Prairie Wildlife Research Center, 8711 – 37th St. SE, Jamestown, ND 58401, mechx002@umn.edu, 651-649-5231

John Fieberg, University of Minnesota-Twin Cities, Fisheries, Wildlife/ Conservation Biology, Room 135, Skok Hall, 2003 Upper Buford Circle, St Paul, MN 55108 jfieberg@umn.edu, 612-301-7132

Daniel MacNulty, Utah State University, Natural Resources 330, 5200 Old Main Hill Logan, UT 84322-5200 dan.macnulty@usu.edu, 435-797-7442

Daniel Stahler, Yellowstone Center for Resources, PO Box 168, Yellowstone National Park, WY 82190 Dan_Stahler@nps.gov, 307-344-2719

Douglas W. Smith, Yellowstone Center for Resources, PO Box 168, Yellowstone National Park, WY 82190 doug_smith@nps.gov, 307-344-2242

The probability of a prey animal being killed is the product of the probability of encounter between a predator and a prey and the probability of a successful attack. Despite numerous studies of wolf predation, few have quantified encounter rates and the factors that influence them. Some studies suggest that wolf-prey encounters influence prey pregnancy rates, displacement, movement, and behaviorally-mediated trophic cascades. The Northern Range wolf and elk populations in Yellowstone National Park are well studied, and elk population decline, stochastic weather events, and changing wolf-pack dynamics provide a unique opportunity to examine factors affecting wolf-elk encounter rates. Previous studies in Yellowstone have shown that the biomass of prey killed per wolf is influenced by winter severity, which increases prey vulnerability, but not by elk density. However, we found that wolf-elk encounter rates in Yellowstone appear to be primarily driven by elk density with encounter rates having a weak, positive correlation with the number of elk killed per pack during early winter. Decomposing wolf predation in this way suggests that elk vulnerability and not the number of elk encounters is a primary driver of wolf predation of elk.

Seasonality of Prescribed Fire: Fire in Oak-Pine Barrens and Jack Pine Barrens - ORAL

Jack McGowan-Stinski, Lake States Fire Science Consortium, PO BOX 267, Grand Marais, MN 55604, mcgowan-stinski.1@osu.edu, 989-287-1734

Prescribed fire is often implemented only during the dormant season (i.e. during a short portion of the entire seasonal burn window). First and second-order fire effects were compared to dormant season burns conducted in oak barrens and savanna, and jack pine barrens, from burns conducted 1998 through 2013. Summer burning provided: 1) an opportunity to expand the burn window; 2) increased the rate of restoration; 3) increased sub-dominant species diversity (including threatened and endangered plant and animal species); 4) negatively-impacted invasive and competitive plant species; and 5) allowed fires to be conducted in some fuels that were too hazardous to burn during dormant season weather conditions. Burning during the growing season requires different prescriptions and smoke modeling considerations.

Deer migration and habitat use within moose range in northeast Minnesota - ORAL

Amanda McGraw, Integrated Biosciences Graduate Program, University of Minnesota, 1035 Kirby Drive, Swenson Science Building, Duluth, MN 55812; mcgr0199@d.umn.edu, 218-788-2720

Ron Moen, Natural Resources Research Institute, Biology Department, Swenson College of Science and Engineering, University of Minnesota Duluth, 1035 Kirby Drive, Swenson Science Building, Duluth, MN 55812; rmoen@d.umn.edu, 218-788-2610

Interactions between moose (*Alces alces*) and deer (*Odocoileus virginianus*) are of particular interest in Minnesota in light of moose population declines and because of the potential for deer to negatively affect moose populations through resource competition and disease transmission. Because moose and deer forage on similar vegetation, there is concern that restoring foraging habitat could lead to increased contact between the two species. We used activity data from GPS radiocollared deer ($n = 53$) to examine movement patterns and habitat use across multiple scales. Deer in interior northeast Minnesota displayed two migratory strategies: no migration (65%) and migration (35%). Migratory deer moved 7.7 km (range: 1.0-15.6 km) and did not leave moose range. Winter home ranges during the more severe winter of 2014 ($1.05 \text{ km}^2 \pm 0.15$) were smaller than summer home ranges ($1.65 \text{ km}^2 \pm 0.36$) and 2015 winter home ranges ($1.75 \text{ km}^2 \pm 0.20$), though differences between seasons and years were not statistically significant ($p = 0.56$). Use of conifer and mixed forests was higher during winter, while use of deciduous forest was predominant in summer. Woody wetlands were avoided at all times of year. Additionally, a concurrent project assessing the effectiveness of moose habitat restoration suggests overlapping occurrence of moose and deer ranging from 15-40% in areas believed to be attractive to moose because of ample forage availability. Thus, deer in interior northeast Minnesota may pose a risk to moose throughout the year in terms of resource competition and disease transmission regardless of migratory strategy.

Restoration of Hybrid Cattail Dominated Wetlands in Voyageurs National Park - ORAL

Bryce T. Olson, Voyageurs National Park, 360 Highway 11 E, International Falls, MN 56649, bryce_olson@nps.gov, 218-283-6694

Steve K. Windels, Voyageurs National Park, 360 Highway 11 E, International Falls, MN 56649, steve_windels@nps.gov, 218-283-6692

The non-native narrowleaf cattail (*Typha angustifolia*) has the ability to hybridize with native broadleaf cattail (*Typha latifolia*) creating what is commonly known as 'hybrid cattails' (*Typha x glauca*). This aggressive hybrid is known to disrupt ecosystem balance by creating dense monotypic stands which displace native species and reduce biological diversity. Hybrid cattail is the dominant species in most wetlands in Voyageurs National Park, MN. A

new project starting in 2016 aims to reduce cattail abundance to help restore these wetlands to more diverse, natural states to improve habitat for wildlife, fish, and other taxa. We plan to test various methods to remove invasive cattails and restore native plant species in Rainy and Kabetogama Lakes, designated as "Outstanding Resource Value Waters" where the use of herbicide is prohibited. Proposed methods of treatment include: harvest barges, hand tools, burning, freezing, and combinations of these methods timed with water level changes which are regulated under specific rule curves. We also are exploring the role of muskrats (*Ondatra zibethicus*) as natural biocontrol of cattails, including their role in creating and maintaining open water in large patch of cattails.

Elucidating local bee species diversity using DNA barcoding in Clay County - POSTER

Marissa Reeves, Minnesota State University Moorhead Biosciences Department, 1033 43 ½ St S, Apt 301, Fargo, ND, 58103 reevesma@mnstate.edu, 701-630-5189

Sara Anderson, Minnesota State University Moorhead Biosciences Department, 1104 7th Ave S, Moorhead, MN anderson@mnstate.edu, 218-477-2572

Bees are important to the ecosystem as a crucial group of pollinators. The decrease in number of bee pollinators is an important issue that has led to research in bee populations. DNA barcoding is a fast, reliable method used for identification of cryptic species (those too similar to identify by looks alone). There are approximately 20,000 to 30,000 species of bees worldwide. In our study we are using DNA barcoding to find out how many bee species are prominent in the prairie at the Regional Science Center, 20 miles east of Moorhead, MN (Clay County, Minnesota) and neighboring protected lands. After collecting bee samples at the Regional Science Center, a prairie remnant site, and 2 prairie reconstructed sites, a direct PCR will be used in order to amplify the DNA and undergoing DNA sequencing to properly identify each unique species. Results are expected to show that there are more bee species present than can be morphologically identified due to cryptic species, and identification reliability will be assessed compared to expertly-identified specimens.

Incidental Take of Bald Eagles While Trapping Furbearers in Wisconsin - POSTER

Mags G. Rheude, US Fish and Wildlife Service, Twin Cities Ecological Services Field Office. 4101 American Blvd E, Bloomington, MN 55425, Margaret_rheude@fws.gov, 612-725-3548 x2202

Federal permits for incidental take of eagles have been available since 2009. Much of the focus on federal eagle management has been on the wind industry and issuance of eagle take permits for the associated facilities. However, there exist other sources of non-purposeful eagle take outside of the energy industry. Wildlife Services, a federal agency and partner of the Fish and Wildlife Service, is currently applying an incidental take permit for bald eagles. Wildlife Services (WS) provides wildlife damage management services for the protection of property, agriculture, aviation, and human safety. Since 1988, Wildlife Services has been preventing wildlife damage in Wisconsin, and in that time has 5 non-target catches of bald eagles. We wanted to determine the relative risk to bald and golden eagles by WS activities, taking into account a rapidly increasing eagle population as well as an increasing need for wildlife damage management. We determined that risk to Golden Eagles was low and predictable due to their areas of concentration versus areas where WS conducts management activities. However, the risk to non-target catch to bald eagles was slightly higher and risk varied more across seasons and eagle densities. We estimated a take permit of 3 eagles every five years, which would constitute an impact on 0.01% of the local area eagle population. Additionally, we explored how best to implement Advanced Conservation Practices (ACPs) to reduce the likelihood of eagle capture while still allowing WS to fulfill its mission of wildlife damage management.

Designing a survey for spruce grouse in Minnesota: a pilot study (2014–2015) - ORAL

Charlotte Roy, Minnesota Department of Natural Resources, 1201 East Highway 2, Grand Rapids, MN 55744, charlotte.roy@state.mn.us, 218-327-4132

John Giudice, Minnesota Department of Natural Resources, 5463 West Broadway, Forest Lake, MN 55025, john.giudice@state.mn.us, 651-296-2703

Chris Scharenbroich, Minnesota Information Technology Services, Minnesota Department of Natural Resources, 2115 Birchmont Beach Rd NE, Bemidji, MN 56601, chris.scharenbroich@state.mn.us, 218-308-2669

Minnesota is unique among Lake States in having a spruce grouse hunting season. Yet, we have sparse data on spruce grouse distribution and no data on population size or trends. Data collection began in 2014 for a 2-year pilot study to develop survey methodology for spruce grouse in Minnesota. We examined 2 methods of detection along road-based points, broadcast of a cantus call and a pellet survey. Spruce grouse responses to the cantus call were more frequently detected earlier in the day, earlier in the broadcast period, earlier in the season, and when habitat occurred on both sides of the road. Pellet surveys along circular transects centered on call survey points (i.e., 100 m radii) had 5 times the apparent detection rate of call surveys in 2014 and were more flexible in implementation. In 2015, we refined our methodology to increase detection, added a study area to include both peripheral and central portions of the distribution, and conducted pellet and call surveys at paired points on and off roads. The apparent detection rate of both surveys was higher in 2015 in the peripheral area, and was similar both on and off roads. In the central study area, apparent detection was higher off roads with both methods, but detection on roads was similar to the peripheral area. We will pilot a road-based pellet survey at a large scale in 2016. A pellet survey may overcome practical limitations of call-based surveys to provide a regularly repeating index to spruce grouse populations.

Enhancing future forest conservation using Gullion's historic grouse research - POSTER

Owen Scherping, Central Lakes College, Dept. Of Natural Resources, 501 W. College Dr., Brainerd, MN 56401

Frank Svoboda, Svoboda Ecological Services, Nelsine Dr., Excelsior, MN 5331

Kent Montgomery, Central Lakes College, Dept. Of Natural Resources, 501 W. College Dr., Brainerd, MN 56401, kmontgomery@clcmn.edu, 218-855-8155

William E. Faber, Central Lakes College, Dept. Of Natural Resources, 501 W. College Dr., Brainerd, MN 56401, wfaber@clcmn.edu, 218-855-8082

Dr. Gordy Gullion began his landmark research study on ruffed grouse (*Bonasa umbellus*) in 1958. Gullion's study revolved around grouse ecology and habitat management at the Cloquet Forestry Center. He conducted his study until he passed away in 1990. Over the time that he was able to study grouse, Dr. Gullion compiled over 69,000 individual data records on food habits, reproductive success and mortality factors. All of these records are in paper copies. Fortunately, natural resources students that are attending Central Lakes College have been given the opportunity to digitalize over 30 years of data. The compilation of data will take place over two years. Once the project is finished the data will be available for researchers and interested parties through the internet.

An Alternate Method to Determine Moose Calving and Cause-specific Mortality of Calves in Northeastern Minnesota - ORAL

William J. Severud, Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota, 2003 Upper Buford Circle, Suite 135, St. Paul, MN 55108, seve0135@umn.edu, 763-248-8679

Glenn D. DelGiudice, Forest Wildlife Populations and Research Group, Minnesota Department of Natural Resources, 5463-C West Broadway Avenue, Forest Lake, MN 55025, glenn.delgiudice@state.mn.us, 651-296-0702

Tyler R. Obermoller, Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota, 2003 Upper Buford Circle, Suite 135, St. Paul, MN 55108, oberm042@umn.edu, 651-296-2704

Adult survival and recruitment are important drivers of large herbivore population dynamics. The northeastern Minnesota moose (*Alces americanus*) population has been exhibiting a downward trend since 2006. Our research was initiated because survival of neonates, seasonal survival rates, and specific causes of mortality of calves are largely unknown. Due to the Governor of Minnesota's Executive Order 15-10, we were unable to continue handling or collaring neonates in 2015. Beginning 1 May 2015 we monitored 60 adult female moose fitted with global positioning system (GPS) collars for long-distance calving movements followed by localization. Additionally, we used movement patterns of collared cows to investigate potential calf mortalities. Calving was indicated by 50 of 60 cows localizing. Of these 50 cows, 13 were confirmed pregnant, and 37 that had been collared in 2013 or 2014 were of unknown pregnancy status. Median calving date in 2015 was 10 May (range = 29 April–14 June), 4 days earlier than in 2013 and 8 days earlier than in 2014. Seventy-six percent of births occurred during 3–15 May. We retrieved calf remains from suspected calf mortality sites and estimated proximate causes of mortality on site. Nine confirmed calf mortalities occurred during 3 May–2 June; causes included 6 wolf (*Canis lupus*) kills, 1 bear (*Ursus americanus*) kill, and 2 unknown predator kills. Identifying specific causes of calf mortality should yield insight into mechanisms contributing to the declining moose population and serve as part of the basis for an ecologically sound management response.

Differential responses of prairie rodents to edge effects from recreational trails – POSTER

Cameron Meyer Shorb, Carleton College Biology Department, 300 North College St., Northfield MN 55057, cmshorb@gmail.com, 781-686-5333

Laura A. Freymiller, 309 W Washington St, Culver, IN 46511, lfreymiller@gmail.com, 574-360-3191

Daniel L. Hernández, Carleton College Biology Department, 300 North College St., Northfield MN 55057, hernand@carleton.edu, 507-222-5643

Edge effects are a common phenomenon in which an ecological variable changes with respect to distance from a habitat edge. Recreational trails may constitute a habitat edge for prairie rodents because of increased human presence, increased predator presence, or reduced shelter from predators compared to the prairie core. Despite the prevalence of trails in conservation parcels, their effect on wildlife distribution remains largely unstudied. We examined the impacts of recreational trails on small mammal visitation in the restored prairies of the Cowling Arboretum at Carleton College. The prairies were restored from 1995-2008 and now consist of a contiguous prairie block of approximately 155 ha. In two consecutive summers, we used infrared motion-sensing cameras to record the relative amount of time rodents spend at baited stations placed at different distances from the trail. The results varied among taxa: voles avoided trail edges (frequency at 0m significantly less than at 4m, 8m, 16m, and 64m) while mice and thirteen-lined ground squirrels visitation was unaffected by trail proximity. Trails may therefore have species-specific effects on small mammals, with consequences for the connectivity and distribution of populations.

A brief introduction to insect biology and conservation for land managers with special attention to prescribed fire effects - ORAL

Christopher E. Smith, Wildlife Research & Consulting Services, LLC, PO Box 803, Lakeland, MN 55043, Christopher.Smith@FieldEcology.com, 612-275-9737

Growing awareness for insect conservation, especially prairie butterflies and other pollinators, has renewed interest in managing lands to maintain and increase insect populations. However, simply managing for native floristic components within a property may not guarantee the conservation of insect populations, especially already imperiled species in greatest conservation need (SGCN). This presentation will provide a *brief* introduction to: insect biology; their importance in the environment; how management activities (e.g., Rx fire) can impact population abundance and persistence; and suggestions for mitigating these impacts.

HerpMapper.org - POSTER

Christopher E. Smith, HerpMapper.org, PO Box 803, Lakeland, MN 55043, Christopher.Smith@herpmapper.org, 612-275-9737

One of the most basic needs of conservation and research organizations is access to high-quality data for where species occur. HerpMapper is a cooperative project, designed to gather and share information about reptile and amphibian observations across the planet. Using HerpMapper, users can create records for herp observations and keep them all in one place. In turn, data are made available to HerpMapper Partners – groups who use your recorded observations for research, conservation, and preservation purposes.

Minnesota Furbearer Harvest Dynamics on the Upper Mississippi River National Wildlife and Fish Refuge - POSTER

Brian Stemper, USFWS, Upper Mississippi River National Wildlife and Fish Refuge, HQ Office, Winona, MN 55987, brian_stemper@fws.gov, 507-494-6221.

Stephen Winter, USFWS, Upper Mississippi River National Wildlife and Fish Refuge, HQ Office, Winona, MN 55987, stephen_winter@fws.gov, 507-494-6214.

The Upper Mississippi River National Wildlife & Fish Refuge was established in 1924 and currently encompasses 97,125 ha (15,701 ha in Minnesota) of property along 420 km (142 km in Minnesota) of the Mississippi River. Regulated harvest of furbearers has occurred on the refuge since 1929 and furbearer harvest is administered through the issuance of Special Use Permits to individually-licensed trappers. Special Use Permits require trappers to submit information on the numbers of each species harvested, geographic locality of harvest, and trapper effort. This has resulted in a long-term dataset that has potential for illuminating trends which may be related to population dynamics, habitat conditions, and socio-economic variables in Minnesota as well as the other three States that the refuge lies within.

Returning American Plains Bison to a Minnesota State Park- Project Overview and Lessons Learned - ORAL

Molly Tranel Nelson, Minnesota Department of Natural Resources, Parks and Trails, 21371 State Hwy 15, New Ulm, MN 56073, mollytranel@state.mn.us 507-359-6065

Ed Quinn, Minnesota Department of Natural Resources, Parks and Trails, 500 Lafayette Road St. Paul, MN 55155, Edward.Quinn@state.mn.us 651-259-5594

Minneopa State Park was selected as a bison reintroduction site in an effort by MNDNR State Parks and Trails and the Minnesota Zoological Gardens (MZG) to assist North American bison conservation efforts through establishment of a statewide Minnesota Bison Conservation Herd. Goals of this partnership include: conserving bison genetics and populations, managing bison to insure sustainability of both the herd and prairie communities, providing opportunities for interpretation of bison and prairie communities, and exploring cultural resource management opportunities. Results of genetic testing of the Blue Mounds State Park herd documenting high genetic diversity and very little cattle introgression greatly accelerated this effort. Monitoring of grassland vegetation was conducted for three years prior to bison arrival to establish a baseline. Forage estimates indicated that 12.6-11 Animal Units, or a maximum of 40 animals, could be supported at 50% forage utilization in the Minneopa range. A conservation grazing plan utilizing patch burn grazing was developed and units were burned in spring, summer, and fall of 2015. In preparation for the reintroduction three hundred thirty acres were fenced, a well/waterer was installed and safety/information signage posted. A bison handling facility, "prairie pothole" watering pond and improvements to the wildlife drive will be completed by 2017. As the next step in expanding the current herd of ~100 animals to a statewide population of 500, 11 animals were reintroduced to Minneopa in September 2015. The partnership with the Minnesota Zoo provided resources to animal health and genetics experts not typically found in this type of reintroduction project. Overwhelming popularity of the bison viewing range created human/wildlife conflict challenges for park staff.

Experiences from the Long-term Monitoring of an American Black Bear Population using Various Harvest Sex–Age Models: And the Winner is? - ORAL

Andrew N. Tri, Minnesota Department of Natural Resources, 1201 E. Highway 2, Grand Rapids, MN 55744, andrew.tri@state.mn.us, 218-327-4133.

David L. Garshelis, Minnesota Department of Natural Resources, 1201 E. Highway 2, Grand Rapids, MN 55744, dave.garshelis@state.mn.us, 218-327-4146.

Karen V. Noyce, Minnesota Department of Natural Resources, 1201 E. Highway 2, Grand Rapids, MN 55744, karen.v.noyce@gmail.com, 218-259-6686.

Estimating population size and trend of bears has long been a challenging prospect. This is especially so for large areas, where commonly-used mark–recapture approaches are costly and logistically complex. Sex and age data from harvested animals are readily available and less expensive to collect. We present a historical perspective (1983–2014) of our attempts to deal with this challenge for a harvested population of American black bears (*Ursus americanus*) in Minnesota, USA. We used (1) a method posed by Paloheimo and Fraser (1981) based on change in age-specific harvest sex ratios, (2) a deterministic sex-age model that included ancillary data on reproduction and non-harvest mortality, (3) integrated population models, (4) Downing (1980) population reconstruction, and (5) statistical population reconstruction. Each attempt to improve the method produced new problems, required heroic assumptions or unobtainable ancillary data. We compared abundance estimates and trends from all 5 methods with 4 statewide tetracycline-based mark–recapture estimates. Mark–recapture estimates indicated a mound-shaped population trend in which the population increased by >30% from 1991 to 1997, remained high through 2002, then declined >30% by 2008. The modelling-based estimates varied in the degree to which they matched these mark–recapture estimates. All methods failed to generate estimates that fell within the 95% confidence bands of all 4 mark–recapture estimates. Not knowing which, if any, results were accurate made management decisions difficult, and led to some poor management decisions. Our findings serve as a cautionary tale about model assumptions for others using reconstruction methods.

Seasonal Survival in a Black-capped Chickadee (*Poecile atricapillus*) Population in Central Minnesota 1969-2012 - POSTER

Molly E. Tuma, University of Minnesota (Student), 824 Essex Street SE, Minneapolis, MN 55414.
Tumax032@umn.edu. 1-612-481-9998

Todd W. Arnold, Ph.D., Department of Fisheries, Wildlife and Conservation Biology, University of Minnesota. B51A Skok Hall 2003 Upper Buford Circle, Saint Paul, MN 55108. Arnold065@umn.edu. 1-612-624-2220

Annual survival rates are a source of important information on the ecology, and conservation needs of birds; however, little has been done to investigate seasonal survival rates. There are two reasons for this: 1) for migratory species, it means following birds spatially throughout their full migrational cycle, which is logistically challenging; and 2) it requires collecting either continuous time data (e.g. satellite telemetry) or have multiple banding and encounter events per year. Using an extensive mark/recapture dataset of black-capped chickadees (*Poecile atricapillus*) from Lowry Nature Center in Victoria, Minnesota, we addressed these issues using a non-migratory passerine with multiple band/encounter events per year. We analyzed data from 2,346 chickadees collected bimonthly from 1969-2012 using Cormack-Jolly-Seber (CJS) models as implemented in Program Mark. Apparent survival (ϕ) and capture probability (p) varied both annually and seasonally in the best-supported model, showing lower apparent survival rates and higher capture rates in the fall and winter and for juvenile birds versus adult birds. Because CJS models measure apparent survival, where the complement can be either mortality or permanent emigration, it is difficult to make inferences about true survival during the fall and winter because this is when dispersal is highest for juvenile birds. We also observed low apparent survival for adults during June and July, which occurs during the breeding period, when dispersal is unlikely. Our results give insight into the risks that a chickadee faces in a year, and open up the possibility of similar analysis for species with declining populations.

A Case Study of Assigning Conservation Value to Dispersed Habitat Units for Conservation Planning - ORAL

Sara Vacek, USFWS, Morris WMD, 43875 230th St, Morris MN 56267, sara_vacek@fws.gov, 320-589-4973

Jason Rohweder, USGS, Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Rd, La Crosse, WI 54603, jrohwerder@usgs.gov, 608-781-6228

Shawn Crimmins, USGS, Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Rd, La Crosse, WI 54603, scrimmins@usgs.gov, 608-781-6396

Wayne Thogmartin, USGS, Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Rd, La Crosse, WI 54603, wthogmartin@usgs.gov, 608-781-6309

Resource managers are increasingly tasked with developing habitat conservation plans in the face of numerous, sometimes competing, objectives. These plans must often be implemented across dispersed habitat conservation units that may contribute unequally to overall conservation objectives. Using U.S. Fish and Wildlife Service waterfowl production areas (WPA) in western Minnesota as our conservation landscape, we developed a landscape-scale approach for evaluating the conservation value of dispersed habitat conservation units with multiple conservation priorities. We evaluated conservation value based on a suite of variables directly applicable to conservation objectives, thus providing a direct link between conservation actions and outcomes. We developed spatial models specific to each of these conservation objectives (waterfowl, grassland birds, threatened and endangered species, tallgrass prairie, and prairie wetlands) and also developed two freely available prioritization tools to implement these analyses. We found that some WPAs provided high conservation value across a range of conservation objectives, suggesting that managing these specific areas would achieve multiple conservation goals. Conversely, other WPAs provided low conservation value for some objectives, suggesting they would be most effectively managed for a distinct set of specific conservation goals. Approaches such as ours provide a direct

means of assessing the conservation value of dispersed habitat conservation units and could be useful in the development of habitat management plans, particularly when faced with multiple conservation objectives.

***Fascioloides magna* and *Taenia hydatigena* from Hunter Harvested White-tailed Deer - ORAL**

J. Trevor Vannatta, Integrated Biosciences Program, University of Minnesota – Duluth, Biology Department, 1035 Kirby Drive, Swenson Science Building 207, Duluth, MN, 55812, vanna006@d.umn.edu, 218-788-2760

Ron Moen, Department of Biology, University of Minnesota – Duluth, 1035 Kirby Drive, Swenson Science Building 207, Duluth, MN, 55812 and ^bNatural Resources Research Institute, 5013 Miller Trunk Highway, Duluth, MN, 55811, rmoen@d.umn.edu, 218-788-2610

Fascioloides magna is a trematode parasite of emerging concern for deer and moose management. Some authors have suggested *F. magna* may be a contributing factor to moose mortality in Minnesota's declining population. Since the 1930s, *F. magna* prevalence has increased from 6% to 58% in Minnesota's moose population. Over this same period, *F. magna* in deer has increased from 21% to 43%. In contrast, prevalence of *Taenia hydatigena* (15%) has not changed over the past 70 years. In Fall 2014 and 2015, 115 deer livers were collected in and around Duluth, MN, USA in cooperation with the city bow hunt. Livers were sectioned and examined for *F. magna* and *T. hydatigena* infections. Deer infected with *F. magna* had higher liver volumes than uninfected individuals (mean = 1178 and 842 cm³, respectively; $p < 0.0001$). Liver volume was not different between deer infected and uninfected with *T. hydatigena* (mean = 1117 and 963 cm³, respectively; $p = 0.054$). Coinfection was common and statistically significant. 80% of *T. hydatigena* infected deer were also infected with *F. magna* compared to only 36% of deer not infected with *T. hydatigena* being infected with *F. magna* ($p = 0.005$). Our results suggest that behaviors leading to *F. magna* infection may be age related, whereas *T. hydatigena* does not show an age related component. Additionally, behavioral and/or immunological differences may contribute to platyhelminth infections. Continued monitoring of *F. magna* infection in Minnesota's deer and moose is highly recommended as the prevalence of *F. magna* continues to increase.

Snail-Trematode Habitat Associations in Northeastern Minnesota - POSTER

J. Trevor Vannatta, Integrated Biosciences Program, University of Minnesota – Duluth, Biology Department, 1035 Kirby Drive, Swenson Science Building 207, Duluth, MN, 55812, vanna006@d.umn.edu, 218-788-2760

Ron Moen, ^aDepartment of Biology, University of Minnesota – Duluth, 1035 Kirby Drive, Swenson Science Building 207, Duluth, MN, 55812 and ^bNatural Resources Research Institute, 5013 Miller Trunk Highway, Duluth, MN, 55811, rmoen@d.umn.edu, 218-788-2610

Lymnaeid snails are important vectors for many vertebrate parasites, but little is known about their habitat associations. Lymnaeid snail surveys were conducted across St. Louis and Lake Counties in 2015. 84 locations were sampled for snails and several habitat variables were measured (calcium carbonate, substrate type, littoral area, transparency, etc.). ArcGIS data was queried to obtain landscape variables such as cover type near sampling locations. *Lymnaea megasoma*, *L. stagnalis*, and *L. elodes* were found in the study area. All three species were associated with higher CaCO₃ concentrations compared to locations without snails. Substrate type was also important with *L. megasoma* often found on organic substrates and *L. elodes* found on mud. *L. stagnalis* was found on several substrates including mud, organic, sand, and rock. Armatae and Strigea cercariae were found in the study area. Armatae cercariae were only found associated with organic substrates and CaCO₃ concentration was not different from areas without armatae cercariae (mean with cercariae = 59 ppm; without cercariae = 58 ppm). Strigea cercariae were found on a variety of substrates and were associated with higher CaCO₃ concentrations (mean with cercariae = 91 ppm; without cercariae = 58 ppm). Both trematode groups were found in water bodies with low surface area that were classified as stagnant. Our results indicate that vertebrates such as ducks and

amphibians are most likely to encounter trematode parasites in small stagnant water bodies and CaCO₃ concentration may be a factor in some of these encounters.

Identifying and Quantifying Attributes of Drained Wetlands in the Red River Basin Using LiDAR - ORAL

Henry Van Offelen, Red River Basin Coordinator, MN DNR Ecological and Water Resources; 218-846-8406; Henry.Van.Offelen@state.mn.us

Light detecting and ranging (LiDAR) provides powerful data to assess hydrologic features of Minnesota's landscape. Natural resource professionals traditionally have relied on a variety of GIS resources as qualitative planning tools for wetland restoration. More recently, statewide efforts have used LiDAR-derived data to identify existing wetlands. However, the effectiveness of these method is limited in areas with extensive surface drainage. New techniques were developed and tested to remove surface drain and road features to create a modified DEM as a basis to identify drained basins. Applying these techniques in combination with landscape retention analysis results in the development of drained wetland data with quantitative attributes such as volume, depth, and runoff capacity. These new data are being used to prioritize wetland restoration sites at a watershed scale for flood damage reduction, wildlife habitat restoration, and water quality improvement.

Factors Impacting Hunter Access to Private Lands in Southeastern Minnesota - ORAL

Eric M. Walberg, Minnesota Cooperative Fish and Wildlife Research Unit, University of Minnesota, 1980 Folwell Ave., 200 Hodson Hall, St. Paul, Minnesota, 55108, walbe032@umn.edu, 320-250-8477

Louis J. Cornicelli, Minnesota Department of Natural Resources, Division of Fish and Wildlife, 500 Lafayette Rd., St. Paul, Minnesota, 55155, lou.cornicelli@state.mn.us, 651-259-5202

David C. Fulton, U.S. Geological Survey, Minnesota Cooperative Fish and Wildlife Research Unit, University of Minnesota, 1980 Folwell Ave., 200 Hodson Hall, St. Paul, Minnesota, 55108, dcfulton@umn.edu, 612-625-5256

Within the United States, white-tailed deer have important socioeconomic and ecological impacts. Hunting is important for the effective management of deer and relies on access to privately owned forests. Hunting access for friends and family is allowed at a high rate but relatively few landowners allow access to strangers. We used the results of a 2013 mail survey of southeastern Minnesota landowners to examine factors that influence landowners' decision to allow hunting access to strangers. We found that landowners' who posted their property were less likely to allow access for strangers, while landowners' of larger properties were more likely to allow hunting access to strangers. Large-sized property landowners present the greatest potential for improving hunting access for strangers in the future due to the number of hunters that can be provided access without crowding and they were found to be more likely to allow hunting access for strangers.

Little Trees Need Hugs Too! Challenges and Opportunities for Young Forest Management in The Driftless Region - ORAL

Scott E. Walter, Regional Wildlife Biologist, Ruffed Grouse Society, 16885 County Highway U, Viola, WI 54664, ScottW@ruffedgrousesociety.org, 608-538-3840

Ted Dick, Forest Game Bird Coordinator, Minnesota Department of Natural Resources, 1201 E Highway 2, Grand Rapids, MN 55744, Ted.Dick@state.mn.us, 218-999-7870

Meadow Kouffeld-Hansen, Regional Wildlife Biologist, Ruffed Grouse Society, 1202 SE 7th Street, Grand Rapids, MN 55744, Meadowk@ruffedgrousesociety.org, 218-398-1076

Owing to its unique topography, the Driftless Region of Wisconsin, Minnesota, Iowa, and Illinois retains the greatest acreage of deciduous forest, south of the tension zone, in the upper Midwest. This provides exceptional opportunities to manage for a healthy, diverse forest system that provides habitat for the full local wildlife community. However, varying land use in the last 150 years has led to dramatic long-term changes in the species composition and physical structure of these forests, with concurrent changes in the wildlife community. Current land use patterns and forest management activities have led to mesophication, and resulted in unstable age distributions for oak and aspen and an overall decline in young forest habitat. The land use history of this unique ecological region will be discussed, focusing on how agricultural development and parcelization have altered the region's forests. Results from a 4-year study of ruffed grouse ecology in southwest Wisconsin will be used to illustrate how these changes have impacted early-successional wildlife. Current efforts to increase engagement by private landowners in the Driftless Region will be outlined, and the potential benefits of a more unified approach to active forest management will be discussed.

Behavioral responses of red-winged blackbirds to simulated Unmanned Aerial System scare tactics: evidence of potential habituation to video stimuli - POSTER

Lucas J. Wandrie, NDSU, Department of Biological Sciences, Fargo, ND 58102, lucas.wandrie@ndsu.edu, 701-446-6323

Wendy Reed, NDSU, Department of Biological Sciences, Fargo, ND 58102, wendy.reed@ndsu.edu

Mark Clark, NDSU, Department of Biological Sciences, Fargo, ND 58102, m.e.clark@ndsu.edu

Kira Karels, NDSU, Department of Criminal Justice and Political Science, Fargo, ND 58102, kira.karels@ndsu.edu

Page Klug, USDA-APHIS-WS NWRC, North Dakota Field Station, NDSU, Department of Biological Sciences, Fargo, ND 58102, page.e.klug@aphis.usda.gov

George Linz, USDA-APHIS-WS NWRC, Bismarck, ND 58501, George_m_linz@yahoo.com

Wildlife damage to crops has a significant impact on crop productivity, and mitigating the impacts of damage requires managers to employ multiple and creative solutions. The development of readily available Unmanned Aerial Systems (UAS, drones) provides a new tool that may be effective in managing bird damage to crops. We used multisensory video/audio playback to assess the behavioral responses of red-winged blackbirds (*Agelaius phoeniceus*) to videos of UAS. Captive birds were individually exposed to movies comprised of five video clips that varied in stimulus content on two occasions. Video stimuli included a known predator, UAS and avian controls (birds that are not predators of red-winged blackbirds). Although all test birds interacted with the movies, not all displayed the behaviors that were measured. Of those that did display the behaviors measured, responses to most video stimuli were reduced during the second trial compared to the first. These findings suggest that blackbirds are responding to videos, however they habituate to video stimuli perceived as a non-threat and adjust their behavioral responses accordingly. The results from this study suggest that blackbirds have the potential to rapidly habituate to novel scare stimuli, warranting the field-testing of the effectiveness of UAS used as a scare tactic to deter avian crop pests from crops.

Evaluating the Migratory Bird Habitat Initiative after the Deep Water Horizon Oil Spill: Waterbird and Seed Abundances - ORAL

Matthew M. Weegman, Minnesota Department of Natural Resources, Bemidji, Minnesota, 56601, USA, matthew.weegman@state.mn.us

Jessica L. Tapp, Missouri Department of Conservation, Kirksville, Missouri, 63501, USA, jessica.tapp@mdc.mo.gov

Richard M. Kaminski, James C. Kennedy Waterfowl and Wetlands Conservation Center, Baruch Institute of Coastal Ecology and Forest Science, Clemson University, Georgetown, South Carolina, 29440, USA

J. Brian Davis, Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Mississippi State, Mississippi, 39762, USA

Elisabeth B. Webb, Missouri Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife Sciences, University of Missouri, Columbia, Missouri, 65211, USA

Kevin D. Nelms, Natural Resources Conservation Service, Greenwood, Mississippi, 38930, USA

The USDA Natural Resources Conservation Service (NRCS) implemented the Migratory Bird Habitat Initiative (MBHI) in summer 2010 after the Deepwater Horizon Oil Spill to provide habitat inland from potential oil impacted wetlands. We studied waterfowl and other waterbird use and seed resources in NRCS Wetland Reserve Program (WRP) easements enrolled in MBHI and non-managed WRP easements in the Mississippi Alluvial Valley of Arkansas, Louisiana, Mississippi, and Missouri. We conducted waterfowl and other waterbird surveys from August 2011–April 2012 in Mississippi and from October 2011–April 2012 in Louisiana. In Arkansas and Missouri, we conducted waterfowl surveys from November 2011 through February 2012. In Louisiana and Mississippi, nearly 3 times more dabbling ducks and all ducks combined were observed on MBHI than non-managed wetlands. Additionally, waterbirds other than waterfowl and shorebirds were nearly twice more abundant on MBHI than non-managed wetlands. In Arkansas and Missouri, MBHI wetlands attracted over 2 times more dabbling ducks and 1.7 times more waterbird species than non-managed wetlands. Wetlands enrolled in MBHI in Mississippi and Louisiana contained ≥ 1.3 times more seeds (mass) known to be consumed by waterfowl than non-managed wetlands. In Arkansas and Missouri, seed mass estimates did not differ among MBHI, non-managed, and publicly managed wetlands. Additionally, seed mass did not differ among management practices of mowing, disking, or fall-winter inundation in these states. While other studies have documented greater waterbird densities on actively than non-managed or passively managed wetlands, our results highlighted the potential for MBHI and similar initiatives to increase waterbird use and energetic carrying capacity of privately owned wetlands for waterbirds. Our results complement other NRCS-supported research in the MAV and elsewhere in the USA that actively managed WRP wetlands received significantly greater use by waterbirds than passively or non-managed WRP wetlands.

An Information Exchange for Wildlife in Fire-Dependent Ecosystems of the Northern Lake States - POSTER

Shelby A. Weiss, The Ohio State University, 210 Kottman Hall, 2021 Coffey Rd. Columbus, OH 43210, shlbweiss@gmail.com, 314-629-4653

R. Gregory Corace, III, Applied Sciences Program, Seney National Wildlife Refuge, 1674 Refuge Entrance Road, Seney, MI 49883, greg_corace@fws.gov, 906-586-9851 ext. 14

Lindsey M. Shartell, Minnesota Department of Natural Resources, 1201 East Highway 2, Grand Rapids, MN 55744, Lindsey.Shartell@state.mn.us, 218-999-7932

Dawn S. Marsh, U.S. Fish and Wildlife Service, Ecological Services, 3090 Wright Street, Marquette, MI 49855, dawn_marsh@fws.gov, 906-226-1212

Eric L. Toman, The Ohio State University, 210 Kottman Hall, 2021 Coffey Rd. Columbus, OH 43210, toman.10@osu.edu, 614-292-7313

In the northern Lake States, a recent gap analysis of peer-reviewed literature has shown that our knowledge of the interactions among disturbances, vegetation, and wildlife in fire-dependent ecosystems is generally lacking. Some wildlife species may themselves be considered fire-dependent if their regional distribution and abundances were historically (or are currently) linked with fire-dependent ecosystems. Starting in 2013, the Lake States Fire Science Consortium (LSFSC) began an effort to identify what wildlife species should be considered fire-dependent. Our working list of 70 species includes 40 bird, 15 mammal, and 15 reptile species associated with 20 fire-dependent ecosystem types in Michigan, Wisconsin, and Minnesota. To investigate how these species are prioritized for management in the region, their conservation status, game status, and other designations were noted. Additionally, how they and their habitats were addressed in state wildlife action plans was evaluated. We present some of these results and maps showing diversity across space and ownership types for the different taxa. Despite their reliance on fire-dependent ecosystems, our findings suggest that few wildlife species or their primary associated ecosystem types are thought of by wildlife professionals as being fire-dependent, presenting a challenge for future management. Our ongoing efforts will continue to integrate awareness, comprehension, and commitment as it pertains to our fire-dependent wildlife communities in the northern Lake States.

Do transmitters affect fitness indices of American beavers (*Castor canadensis*)? - ORAL

Steve K. Windels, Voyageurs National Park, 360 Hwy. 11 E, International Falls, MN 56649, USA, steve_windels@nps.gov.

Joshua B. Smith, Savannah River Ecology Laboratory, PO box drawer E, Aiken, SC, 29803, USA, fax: 803-725-3309, jsmith77@uga.edu.

Tiffany Wolf, Minnesota Zoo, 13000 Zoo Boulevard, Apple Valley, MN 55124; Veterinary Population Medicine, University of Minnesota, 1988 Fitch Ave., St. Paul, MN, 55108, wolfx305@umn.edu.

Robert W. Klaver, U.S. Geological Survey, Iowa Cooperative Fish and Wildlife Research Unit and Department of Natural Resource Ecology and Management, Iowa State University, Ames, IA, 50011, USA, bklaver@iastate.edu.

Jerrold L. Belant, Carnivore Ecology Laboratory, Forest and Wildlife Research Center, Mississippi State University, Box 9690, Mississippi State, Mississippi 39762, USA, j.belant@msstate.edu.

One key assumption that is often inferred with using radio-equipped individuals is that the transmitter itself has no effect on the metric of interest. To evaluate this assumption, we 1) used a known fate model in Program MARK to assess the effect of transmitter type (i.e., tail-mounted or peritoneal implant) on short-term (1 y) survival and 2) used a joint live-dead recovery model and results from a mark-recapture study to compare long-term (8 y) survival, body condition, and reproductive performance of ear-tagged only American beavers (*Castor canadensis*) to those equipped with radio-transmitters in Voyageurs National Park, Minnesota, USA. Results of survival analysis indicated survival was not influenced by transmitter type ($w_i = 0.65$) or whether an animal was fitted with a transmitter (annual survival = 0.76; 95% CI = 0.47-0.91) vs ear tagged only (annual survival = 0.78; 95% CI = 0.47-0.92). Additionally, we found no difference ($t_{75} = 0.28, P = 0.78$) in number of kits between lodges containing transmitter-equipped ($= 0.21, SE = 0.17$) or ear-tagged only ($= 2.15, SE = 0.13$) beavers, and no difference in weight gain ($t_9 = 0.25, P = 0.80$) or tail area ($t_{11} = 1.25, P = 0.24$) from spring to summer between the two groups. In contrast, we found winter weight loss ($t_{22} = -2.03, P = 0.05$) and tail area ($t_{30} = -3.04, P = 0.01$) decreased significantly between transmitter-equipped (weight = $-3.09, SE = 0.55$; tail area = $-33.71 \text{ cm}^2, SE = 4.80$) and ear-tagged only (weight = $-1.80, SE = 0.33$; tail area = $-12.38 \text{ cm}^2, SE = 5.13$) animals. Our results tend to support the continued use of transmitters on beavers for estimating demographic parameters, although we encourage other researchers to test the effect of transmitter type under different environmental conditions.

Spatial Ecology of Sandhill Crane Populations in Minnesota - POSTER

David Wolfson, Minnesota Cooperative Fish and Wildlife Research Unit, University of Minnesota

David Andersen, Minnesota Cooperative Fish and Wildlife Research Unit, University of Minnesota

Tom Cooper, U.S. Fish and Wildlife Service, Division of Migratory Bird Management

Jeff Lawrence, Minnesota Department of Natural Resources, Wetland Wildlife Population and Research Group

John Fieberg, Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota

Minnesota is one of the few states to contain two distinct breeding populations of sandhill cranes, the Mid-Continent Population (MCP) and the Eastern Population (EP). Historically, there was a large area between the breeding range boundaries of the two populations. Recent increases in crane numbers have resulted in much more widespread and abundant crane numbers throughout much of Minnesota. Management options in the state are currently limited because the boundary between MCP and EP cranes is not clearly delineated. Furthermore, additional information concerning how cranes use habitat at local and landscape scales is required to effectively manage sandhill cranes in Minnesota. We captured sandhill cranes during the 2014 and 2015 field seasons in the potential tension zone between the historic breeding range boundaries. Captured cranes were fitted with cellular-based GPS transmitter to monitor their locations throughout the year. Location information will be used to assess current range boundaries, migration chronology, and habitat use. Subsequent location data from cranes captured in 2014 indicate potential novel migration corridors as well as provide evidence for the possibility of range overlap between the two populations. Analysis of crane movement data will provide a quantitative evaluation of a priori hypotheses of behavioral landscape use during different life history stages throughout the year.

Nesting Ecology of Red-headed Woodpeckers - POSTER

Brittney Yohannes, University of Minnesota, 669 13th Ave NE, Apt 1, Minneapolis, MN 55413, lars4909@umn.edu, 651-442-6027

Todd Arnold, University of Minnesota, 135 Skok Hall, 2003 Upper Buford Cir, St. Paul, MN 55108, arnol065@umn.edu

Red-headed Woodpeckers (RHWO, *Melanerpes erythrocephalus*) were once a common sight across much of their range, but have declined in recent decades earning them a near-threatened status from the IUCN. Habitat loss is often cited as the main cause for their decline, but few studies have explored what goes on inside the RHWO nests themselves. Analysis of nest habits, success, and phenology of this species is important to understanding what conservation efforts might be needed to reverse its population trend. The population of RHWO nesting at Cedar Creek Ecosystem Science Reserve in East Bethel, MN was monitored in 2014 and 2015. Using a nest cavity camera mounted on a telescoping pole, nests were monitored and photographed three times a week for the entire nesting season. Nest success and analysis of brood reduction were obtained from these data. A portion of the adult population has been color banded each year since 2012 in order to determine trends of nest site fidelity and mate fidelity. The documentation of these reproductive attributes will help complete the recorded natural history for this species, as well as potentially inform conservation efforts.