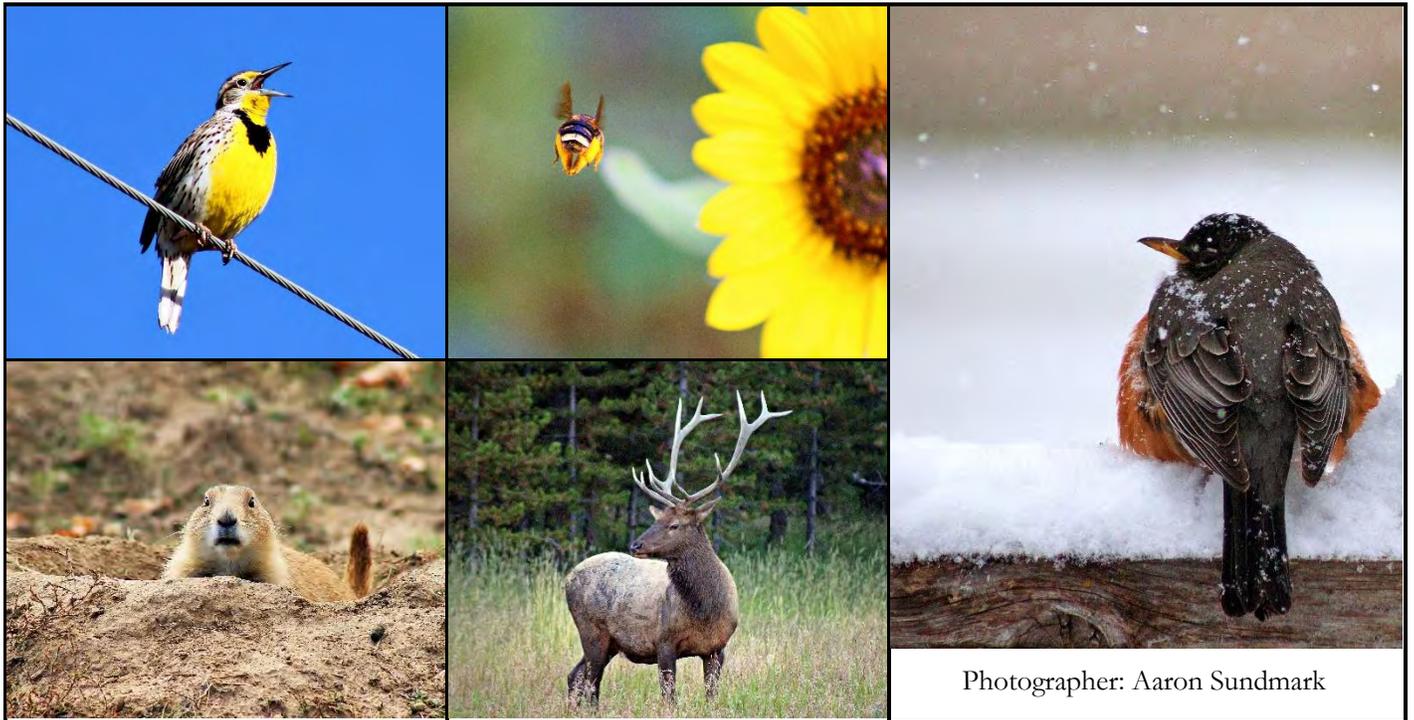


U.S. Geological Survey South Dakota Cooperative Fish & Wildlife Research Unit

2019 ANNUAL REPORT
OCTOBER 2018 – SEPTEMBER 2019



Photographer: Aaron Sundmark

IN COOPERATION WITH:
South Dakota State University
South Dakota Department of Game, Fish & Parks
Wildlife Management Institute
U.S. Fish and Wildlife Service

South Dakota Cooperative Fish and Wildlife Research Unit

FOREWORD

The U.S. Geological Survey, South Dakota Cooperative Fish & Wildlife Research Unit would like to extend our thanks to alumni, cooperators, students and staff for another productive year at South Dakota State University. Unit scientists are fortunate to work with a talented group of graduate students, research associates and agency biologists to address wildlife research needs in our state and region. Since 1963, over 261 students have received graduate degrees working with Unit scientists at the South Dakota Coop Unit.



Research at the South Dakota Coop Unit is conducted primarily by graduate students working in areas related to endangered species biology, wetland ecology, fisheries management, upland game ecology, big game management, and non-game species. The Unit is housed in the Department of Natural Resource Management at South Dakota State University, where we share a large supply of field equipment and laboratory facilities. The USGS EROS Data Center, near Sioux Falls, SD provides unique resources and collaborative opportunities for the South Dakota Coop Unit.

In 2010, Professor Emeritus and Assistant Unit Leader Dr. Kenneth F. Higgins (retired) established the *Kenneth F. Higgins Waterfowl Legacy Research Endowment*, directed at supporting graduate student research that benefits wetland-dependent avian species. Contributions to the endowment can be made by contacting the SDSU Alumni Association (888.735.2257; alumni@statealum.com).

Continuing our long-standing tradition of cooperative research, the South Dakota Coop Unit looks forward to addressing research needs of our state and federal partners to better manage fish and wildlife resources in the Northern Great Plains. Feel free to contact us for more information.

Steven R. Chipps, Unit Leader
Larry M. Gigliotti, Assistant Unit Leader
Joshua D. Stafford, Assistant Unit Leader
Jiyoung Kim, Administrative Support Specialist

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CONTENTS

	Page
<u>Unit Staff and Cooperators</u>	4
<u>Coordinating Committee</u>	5
<u>Research Personnel</u>	5
<u>Cooperating Faculty – SDSU</u>	6
<u>Regional Cooperating Scientists</u>	7
<u>Administrative Support</u>	8
<u>Program Direction Statement</u>	9
<u>Alumni News</u>	10
<u>Completed Projects</u>	11
<u>Ongoing Projects</u>	16
<u>Teaching</u>	28
<u>Awards and Honors</u>	28
<u>Scientific Presentations</u>	30
<u>Workshops and Training</u>	32
<u>Theses and Dissertations</u>	32
<u>Peer-Reviewed Publications</u>	33

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COOPERATORS

South Dakota State University (SDSU); South Dakota Game, Fish and Parks (GFP); U.S. Geological Survey (USGS); Wildlife Management Institute (WMI); and the U.S. Fish and Wildlife Service (USFWS).



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Daniel Tomasello
Aaron Seitz
Logan Zebro

COOPERATING FACULTY – SOUTH DAKOTA STATE UNIVERSITY

Name	Department	Cooperative Activity
Ms. Sara Bauder	SDSU Extension	Herbicides/cover crops
Mr. Peter Bauman	Natural Resource Management	Land use/change
Ms. Ruth Beck	SDSU Extension	Herbicides/cover crops
Mr. Anthony Bly	SDSU Extension	Herbicides/cover crops
Dr. Michael Brown	Natural Resource Management	Limnology studies
Dr. Jason Clark	Department of Agronomy, Horticulture, and Plant Science	Cover crop production
Mr. Jack. B. Davis	SDSU Extension	Natural Resource Economics
Dr. James Doolittle	Associate Vice President	Administration
Dr. Michele Dudash	Head, Natural Resource Management	Administration
Dr. Brian Graeb	Natural Resource Management	Fish ecology studies
Dr. Christopher Graham	Department of Agronomy, Horticulture, and Plant Science	Cover crop production
Dr. Jonathan Jenks	Natural Resource Management	Wildlife ecology
Dr. Kent Jensen	Natural Resource Management	Bird studies
Dr. Hailong Jin	Ness School of Management & Economics	Natural Resource Economics
Dr. Paul Johnson	Department of Agronomy, Horticulture, and Plant Science	Herbicides residual effects
Dr. Carol Johnston	Natural Resource Management	Wetland ecology
Mr. David Karki	SDSU Extension	Herbicides/cover crops
Dr. Sandeep Kumar	Department of Agronomy, Horticulture, and Plant Science	Natural Resource Economics
Dr. Lora Perkins	Natural Resource Management	Neonicotinoids
Mr. Gared Shaffer	SDSU Extension	Herbicides/cover crops
Dr. Daniel Schöll	Vice President, Research	Administration
Dr. Peter Sexton	Southeast Research Farm	Cover crop production
Dr. Nels Troelstrup	Natural Resource Management	Oak Lake Field station
Dr. Tong Wang	Ness School of Management & Economics	Natural Resource Economics

REGIONAL COOPERATING SCIENTISTS

Name (South Dakota Unit Person)	Agency/University	Subject
Dr. Michael Anteau (Stafford)	USGS – NPWRC	Wetland and waterbird health
Mr. Michael Barnes (Chipps)	SD GFP/SDSU	Salmonid ecology
Dr. Brian Blackwell (Chipps)	SD GFP/SDSU	Fish ecology
Dr. James Breck (Chipps)	MI DNR	Fish bioenergetics
Dr. John Coluccy (Stafford)	Ducks Unlimited, Inc.	Conservation planning
Mr. Jake Davis (Chipps)	SD GFP	Black Hills trout
Dr. David Deslauriers (Chipps)	Canada DFO	Sturgeon bioenergetics
Dr. Michael Eichholz (Stafford)	Southern Illinois University	Migration ecology
Dr. Robert Gates (Stafford)	The Ohio State University	Spring-migration ecology
Dr. James Garvey (Chipps)	Southern Illinois University	Fish ecology
Mr. Rob Holm (Chipps)	FWS-Garrison, ND	Pallid sturgeon
Dr. Daniel James (Chipps)	FWS-Pierre, SD	Pallid sturgeon
Dr. Dylan Kesler (Stafford)	University of Missouri	Avian ecology, modeling
Dr. Wes Larson (Chipps)	University of Wisconsin-S. Point	Fish genetics
Dr. Michael Lehman	USDA – ARS	Cover crop production
Mr. Dave Lucchesi (Chipps)	SD GFP	Small impoundments
Dr. Jonathan Lundgren (Stafford)	Blue Dasher Farms	Pesticides
Dr. Charlie Madenjian (Chipps)	USGS Great Lakes Science Center	Fish bioenergetics
Dr. Brian McLaren (Chipps)	Lakehead University	Lake sturgeon ecology
Mr. Jason Miller	USDA – NRCS	Cover crop production
Mr. Rocco Murano (Stafford)	SD GFP	Waterfowl ecology
Dr. Ben O'Neal (Stafford)	Franklin College	Radar ornithology
Dr. Shannon Osborne	USDA – ARS	Cover crop production
Dr. Aaron Pearse (Stafford)	USGS – NPWRC	Biometrics
Dr. Kevin Pope (Chipps)	University of Nebraska	MOCC training
Mr. Jeff Powell (Chipps)	FWS, Gavins Point	Pallid sturgeon
Dr. James Rice (Chipps)	North Carolina State University	Fish bioenergetics
Dr. Greg Sass (Stafford)	Illinois Natural History Survey	Integrated wetland management
Mr. Greg Simpson (Chipps)	SD GFP	Black Hills trout
Dr. James Stone (Chipps)	SD School of Mines & Technology	Hg Studies
Dr. David Wahl (Chipps)	Illinois Natural History	Bioenergetics
Mr. Matt Ward (Chipps)	SD GFP	Walleye foraging
Dr. Tammy Wilson (Gigliotti)	National Park Service	Wildlife/Human dimensions
Mr. Jeff Zimprich (Chipps)	USDA – NRCS	Cover crops

ADMINISTRATIVE SUPPORT

SOUTH DAKOTA DEPARTMENT OF GAME, FISH & PARKS

The South Dakota Coop Unit works closely with SD Department of Game, Fish and Parks. We thank Tony Leif, Tom Kirschenmann, John Lott, Geno Adams, Chad Switzer, Eileen Dowd Stukel and Emmett Keyser for their administrative assistance. We are particularly grateful to Tanna Zabel for her help and assistance with Federal Aid coordination.

SOUTH DAKOTA STATE UNIVERSITY

The Unit receives administrative support from SDSU and we wish to thank Dr. Michele Dudash, Jiyoung Kim, Beth Byre, and Kathryn Tvedt from the Department of Natural Resource Management. We also thank Martha Aragon, Dr. Nicole Lounsbery, President Barry Dunn, Dr. James Doolittle, Dr. William Gibbons, Shirley Jensen, Dean John Killefer, Dr. Don Marshall, Jill O'Neil, Dr. Daniel Scholl, and Doug Ward for their support of the USGS, South Dakota Coop Unit.

US GEOLOGICAL SURVEY, COOPERATIVE RESEARCH UNIT PROGRAM

The USGS-CRU Headquarters staff in Reston, VA provide guidance and assistance to Unit personnel. We thank Shana Coulby, Brenda Croston, Don Dennerline, Derek Geary, Shauna Leavitt, Amanda Maslowski, Nicholas Oris, Melissa Thode, Mike Tome, John Thompson and John Organ for their advice and assistance.

US FISH AND WILDLIFE SERVICE

We thank the Great Plains Fish & Wildlife Management Office, Gavin's Point National Fish Hatchery, Garrison National Fish Hatchery, and the National Wildlife Refuge offices for continued support of Unit-related research.

PROGRAM DIRECTION STATEMENT

The Unit's program direction is reviewed annually by our Coordinating Committee. The overall program direction will be to conduct research to benefit management of Northern Great Plains habitats, biota, and human dimensions. Wetland and upland research in the Prairie Pothole Region will incorporate landscape-level influences of natural and anthropogenic variation on the fish, wildlife, invertebrates, and plant communities in this region. Ecological services – such as water quality, livestock forage, flood reduction, ground water recharge, esthetics, and fishery potential – will be included in research efforts when appropriate. Aspects of wetland and upland research will address conservation needs, production of waterfowl and other avifauna, human dimensions of wildlife management, and integration with agricultural and aquaculture practices. Fisheries research will focus on the management, conservation, and production of native species and sport fishes. The Unit will develop collaborative and integrative research programs with state, federal, and NGO agencies to address emerging issues dealing with climate change, land-use patterns, invasive species, and conservation of fish and wildlife of the Northern Great Plains. Because of its socio-economic and recreational value, the Missouri River provides unique challenges and opportunities in the region. Thus, the study of native, endangered, and introduced fishes and wildlife of the Missouri River will continue to be a focus of Unit research.



ALUMNI NEWS

Cooperators of the South Dakota Coop Unit provide critical support for the Unit program and in return, they benefit from research products and technical training associated with graduate education. Job placement and professional accomplishment are testaments to the success of students and research associates who have moved on to careers with Federal, State, or Non-government (NGO) agencies – as well as academic institutions in the U.S. and Canada. A few recent alumni happenings:



Dr. Lily Sweikert

LILY SWEIKERT (PH.D. 2017) is an AAAS Science and Technology Policy Fellow with a position as an Environmental Protection Specialist and Sustainability Advisor for the USAID Global Development Lab, Center for Development Research working in Washington D.C. Metro Area. Her emphasis is in biodiversity conservation and her work involves coordinating and integrating the USAID's Scientific Research Policy with Agency directives and executive and federal orders regarding the conduct of research funded by the USAID.

AARON SUNDMARK (PH.D. 2019) recently accepted a position (Fisheries Lake IBI Biologist) with the Minnesota Department of Natural Resources, Division of Fish and Wildlife stationed in Brainerd, MN.



Aaron Sundmark

JOSEPH MRNAK (M.S. 2019) recently accepted a doctoral position working on fish community ecology at the University of Wisconsin's Center for Limnology in Madison, WI.



Joe Mrnak

COMPLETED PROJECTS

Investigating the Role of Super-shedders in Respiratory Disease Persistence and Transmission in Bighorn Sheep

Bighorn sheep (*Ovis canadensis*) respiratory disease is a major impediment to recovering bighorn sheep populations in western North America. Current infectious disease epidemiological paradigms depict marked heterogeneities in infectious agent transmission, with a few individuals exhibiting a dramatically greater ability to infect conspecifics. The concept known as “the 20/80 rule” describes 20% of the individuals within any given population are believed to contribute at least 80% to the transmission potential of a pathogen, and therefore, are referred to as super-spreaders. *Mycoplasma ovipneumoniae* (Movi)-induced pneumonia is a devastating respiratory disease that has been implicated as the principal impediment to bighorn sheep recovery for almost a century. Perhaps the greatest bighorn sheep recovery concern, however, is recurrent annual lamb mortality epidemics. The objectives of this study were to implement planned commingling experiments to assess (1) the effects of contact with super-spreader animals, (2) whether lamb survival differs depending on the presence of ewes of different Movi shedding classes, and (3) compare lamb disease dynamics and mortality during years in which pneumonia fatalities were primarily limited to lambs and a severe all-age pneumonia outbreak attributed to novel Movi strain infection. Our analyses indicate bighorn sheep lambs consistently (88%; $n = 22$) experience fatal pneumonia when directly commingled with at least one adult Movi super-spreader. Our models predicted a significant effect on confirmed pneumonia mortality hazard and probability when commingling a bighorn sheep lamb with at least one Movi super-spreader. Further, we documented significant differences in mortality hazard and probability associated with multiple years of fatal pneumonia epidemics in which effects were generally limited to lambs (2014, 2016, and 2017) compared to an all-age fatal pneumonia epidemic caused primarily by unintentional Movi cross-strain transmissions. If these Movi classifications fluctuate (i.e., intermittent shedders become super-spreaders) over any unpredictable duration of time, targeted culls of intermittent shedders may also be necessary for bighorn sheep recovery.

FUNDING

U.S. Geological Survey (RWO # 113)

STUDENT RESEARCHER

Brandi (Crider) Felts, Ph.D. candidate

FACULTY/PRINCIPAL INVESTIGATORS

Jon Jenks (SDSU), Dan Walsh (USGS), Francis Cassirer (IDFG) and Tom Besser (WSU)

COMPLETED

December 2018



Social & Economic Impact of Fishing in Selected Small Lakes & Impoundments in South Dakota

South Dakota Game, Fish and Parks (GFP) has expressed a need for information to estimate the Direct Economic Impact (DEI) of fishing and other water-related recreation in selected small lakes and impoundments to local and state economies. GFP's strategic plan for the East River Fisheries Management Area lists a total of 257 natural lakes and impoundments. The strategic plan for West River Fisheries Management area lists two natural lakes and over 100 small lakes and ponds under GFP management, and the strategic plan for the Black Hills Fisheries Management Area lists 47 small lakes and ponds under GFP management. Over time many of these lakes will require expensive habitat renovation projects (e.g. dam repair, dredging, docks and boat ramps, complete fish renovations, etc.) to improve or maintain quality recreational services. Economic information of the value of fishing and other water-related recreation can help inform decisions regarding expensive habitat renovation projects. Combined with usage information we estimated the economic activity associated with angling visits to seven small fisheries in South Dakota using IMPLAN. The average economic activity associated with fishing at individual lakes in 2016 was \$35,369/lake, which was estimated to support an average of 0.48 jobs and create \$5,572 in tax revenues. We observed that lakes with the highest proportions of ice fishing pressure also had the greatest associated economic activity, even though these had the lowest overall fishing pressure throughout the year. In addition to economic activity, zone of influence for each lake was estimated and compared with the proximity to urban centers. The inclusion of economic information from small fisheries plays an important role in influencing key strategic planning efforts by management agencies and in estimating the overall economic importance of angling on broader scales. This information will be utilized by South Dakota Game, Fish & Parks to make informed decisions for improving amenities and services provided at small fishing lakes in South Dakota.

FUNDING

South Dakota Department of Game, Fish & Parks

STUDENT RESEARCHER

Aaron Sundmark, Ph.D. candidate

FACULTY/PRINCIPAL INVESTIGATOR

Larry Gigliotti (USGS)

COMPLETED

August 2019



Structured Decision Support for Bald Eagle Monitoring in Alaska

Bald eagle (*Haliaeetus leucocephalus*) populations are susceptible to environmental contaminants. Consequently, bald eagles are a “vital sign” monitored by the Southwest Inventory and Monitoring Network (SWAN) in cooperation with Lake Clark National Park and Preserve (LACL), Katmai National Park and Preserve (KATM), and Kenai Fjords National Park. Inconsistencies in objectives and perceptions of state-variable importance between parks have made it difficult to integrate sampling designs under a regional protocol. It is important for the sustainability of the bald eagle monitoring program to conduct a formal process involving scientists and resource managers at the National Parks in Alaska that elucidates common objectives and fosters consensus and buy-in. Since monitoring decisions involve multiple objectives and stakeholders, there was a need for a structured approach to identify an optimal monitoring program. We used a structured decision making process and an iterative, four-round Delphi Process to collect information about long-term bald eagle monitoring from experts. We collected information about important stressors to bald eagles, and information about various monitoring metrics and identified four fundamental objectives for decisions about the long-term bald eagle monitoring, which are: 1) Minimize cost; 2) Minimize effort; 3) Maximize amount of accurate information collected about bald eagles; 4) Maximize the ability to detect change in bald eagle populations. We used a consequence table to compare monitoring metrics and reduce the list of metrics to consider for the program. Our Bayesian Decision Net model identified a comprehensive monitoring scenario, which includes all feasible monitoring metrics, as the most optimal decision, followed by the current monitoring scenario. We performed a cross-stakeholder sensitivity analysis and an additional sensitivity analysis by varying objective weights. We also performed a sensitivity analysis using a two-function decision model, combining similarly weighted objectives into two objectives. We found that the cost and effort of the comprehensive monitoring scenario must be 4.69 times greater than the cost and effort of the current scenario, for the current monitoring scenario to become the most optimal decision.

FUNDING

National Park Service (RWO #115)

STUDENT RESEARCHER

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FACULTY/PRINCIPAL INVESTIGATORS

Tammy Wilson (NPS), Larry Gigliotti (USGS), and Michele Dudash (SDSU)

COMPLETED

May 2019



Effect of water velocity and temperature on energy reserves, growth, and survival of larval Pallid Sturgeon *Scaphirhynchus albus*

Pallid Sturgeon *Scaphirhynchus albus* are a federally endangered species endemic to the Missouri River basin. Natural reproduction has been limited for decades and a recruitment bottleneck is hypothesized to occur during the larval stage of development. Understanding factors that affect survival of Pallid Sturgeon larvae is key given their critical status and ongoing recovery efforts. In this study, we evaluated the effects of water velocity and temperature on energy use, behavior, and mortality of endogenously feeding Pallid Sturgeon larvae (<25 mm TL). In the first experiment, we examined the effect of water velocity (0 – 8.3 cm s⁻¹) on larval growth, energy density, swimming activity, and mortality. Larval growth rate was similar across treatments, but energy reserves of larvae reared at 0 cm s⁻¹ decreased significantly compared to larvae reared at velocities of 3.5 or 8.3 cm s⁻¹. Larvae maintained at zero to low water velocities exhibited significantly greater activity and mortality than those maintained at greater velocities. In the second experiment, we examined the effect of water temperature (18.7, 20.4, or 23.3 °C) on larval growth, energy density, and rheotactic behavior at water velocity averaging 8.8 cm s⁻¹. Larvae reared at 23.3 °C exhibited a significantly greater growth rate (0.85 mm d⁻¹) than at 18.7 or 20.4 °C (0.55 and 0.65 mm d⁻¹, respectively). Energy reserves of larvae maintained at 23.3 °C decreased significantly compared to those maintained at cooler temperatures. Additionally, larvae reared at 23.3 °C made a behavioral transition from negative to positive rheotaxis (drifting to settling) significantly faster than larvae in other treatments. With regard to shallow water habitat restoration, it is important to note that areas with water velocity <10 cm s⁻¹ may pose a significant source of mortality to Pallid Sturgeon larvae, owing to their negative rheotactic behavior. Similarly, the manipulation of dam releases to increase water temperature may aid survival of Pallid Sturgeon larvae by decreasing the extent of spatial and temporal drift prior to settling.

FUNDING

U.S. Department of Energy (WAPA)

STUDENT RESEARCHER

Joseph Mrnak, M.S. candidate

FACULTY/PRINCIPAL INVESTIGATORS

Steven Chipps (USGS) and Dan James (FWS)

COMPLETED

September 2019



Public Opinion of Native Fishes in the Black Hills, South Dakota

Maintaining in-tact native fish communities in the Black Hills is difficult due to stocking of game fishes throughout the area. In addition to biological constraints in maintaining some areas with only native fishes public opinion may be contentious since none of the native fishes in the Black Hills are targeted by anglers. Given the importance of fishing in the Black Hills, having an understanding of the publics' attitudes and values related to native fishes and their management will be essential if a goal of maintaining some selected areas containing only native fishes is important. Our survey results concluded that most of the Black Hills residents did not have strong negative opinions of the type of native fish management proposed by the South Dakota Game, Fish and Parks Department.

FUNDING

South Dakota Game, Fish & Parks

INVESTIGATOR

Seth Fopma, Ph.D. candidate

FACULTY

Larry Gigliotti

COMPLETED

September 2019



ONGOING PROJECTS

An assessment of neonicotinoid exposure on USFWS high diversity grasslands in the Prairie Pothole Region

Neonicotinoids are a class of neuro-active insecticides developed in the 1990s because of widespread pest resistance and environmental objections to organophosphorus insecticides. In developed countries, neonicotinoids are predominantly used as seed treatments but their widespread use is partly due to their flexibility of use (i.e., foliar sprays on horticultural crops, direct applications to soil and water). Neonicotinoids are now the most widely used class of insecticides world-wide. However, the amount of insecticide that reaches its intended target is generally low at 2-20.0%; the remaining 80-98% accumulates in soil and water. Recent concern over neonicotinoids is, in part, due to their acute toxicity to non-target species such as birds, mammals, bees, butterflies, and aquatic invertebrates. However, limited data exists concerning the uptake of neonicotinoids on non-target plants. Given the persistence and accumulation of neonicotinoids in soil and water, uptake by non-target plant species would be expected. However, data on persistence of neonicotinoids once absorbed by plants are sparse and accumulation in plant tissue may be species-specific. In this study we will estimate rate of uptake and accumulation of neonicotinoids in native plants in South Dakota on U.S. Fish and Wildlife Service remnant native and restored grasslands as a function of surrounding land use. In addition, we will estimate presence and concentration of neonicotinoids in soils, and estimate the decay of neonicotinoids as it relates to the distance from crop fields. These data will provide important information to guide management of native and restored grasslands, especially those intended to promote the health and persistence of pollinating insects.

FUNDING

U.S. Fish and Wildlife Service (RWO #114)

INVESTIGATOR

Jonathan Lundgren, Blue Dasher Farm and the Ecdysis Foundation

Kyle Kelsey (FWS)

Kassidy Weathers, student researcher

Michael Bredeson, student researcher

FACULTY

Joshua Stafford (USGS)

EXPECTED COMPLETION

March 2020



Evaluation of cover crops for grassland nesting waterfowl and upland game birds in Eastern South Dakota

Eastern South Dakota lies in the Prairie Pothole Region, and is the primary breeding ground for most (50-80%) North American waterfowl. Historically, the region was dominated by mixed and tallgrass prairies, interspersed with wetlands, resulting in exceptional breeding habitat for waterfowl and other grassland nesting birds. Widespread conversion to cropland, however, has resulted in the loss of >70% of native grasslands, with concomitant declines in many grassland obligate avifauna. Government conservation programs, such as the Conservation Reserve Program (CRP), have resulted in the restoration of croplands to perennial grass cover, with beneficial results for birds. However, high commodity prices have led many landowners to convert expiring CRP contracts back to row crops, resulting in widespread loss of suitable habitat. One important method that may provide cover for grassland dependent wildlife is the use of cover crops. Cover cropping involves planting supplemental stands of annual grasses and/or broadleaf vegetation in conjunction with growing crops or in between conventional cash crop rotations. Agronomic and environmental benefits to cover cropping systems are diverse including increased soil quality, nutrient scavenging, reduced soil loss, nitrogen fixation, water management, and reduced compaction. Although the economic and environmental impacts of cover cropping have been documented, potential benefits to ground nesting birds have not been evaluated.

FUNDING

Ducks Unlimited, Inc.; South Dakota
Department of Game, Fish & Parks

STUDENT RESEARCHER

Charles "Will" Gallman, M.S. candidate

FACULTY/PRINCIPAL INVESTIGATOR

Joshua Stafford (USGS)

EXPECTED COMPLETION

June 2020



Influence of mink predation on Brown Trout survival and size-structure in Rapid Creek, South Dakota

Beginning in the early 2000s, declines in brown trout (*Salmo trutta*) abundance in Rapid Creek, South Dakota concerned fisheries managers. Annual population surveys indicated that abundance of adult brown trout (> 200 mm total length) had declined by approximately 70%. Although environmental conditions such as drought can influence standing stock of brown trout, factors affecting trout survival are poorly known. Recent data from Rapid Creek shows that growth and condition of adult trout is high compared to other populations in the Black Hills. Additionally, diet analysis of brown trout in Rapid Creek shows that food availability is an unlikely source of mortality. However, recent work by Davis et al. (2016) showed that predation by mink (*Mustela vison*) accounted for up to 32% of brown trout mortality in Rapid Creek, with over 83% of mink-related predation events occurring during the spring. Limited refuge habitat (e.g., deep pools) combined with high water clarity in Rapid Creek may enhance capture and foraging success by mink on adult trout. Moreover, the lack of stationary ice cover in tail water reaches such as that below Pactola Reservoir has been linked to increased predation on trout by predators such as mink and river otter (*Lutra lutra*). At present, factors affecting mink-trout interactions within and downstream of the catch-and-release area is unknown. The purpose of this project is to assess impacts of mink predation on trout populations in Rapid Creek, Pennington County, South Dakota. Data gathered in this study will provide insight into the effectiveness of management techniques such as instream habitat improvements and (or) predator block management on trout populations.

FUNDING

South Dakota Department of Game, Fish & Parks

STUDENT RESEARCHER

Austin Galinat, M.S. candidate

FACULTY/PRINCIPAL INVESTIGATORS

Steven Chipps (USGS) and Jon Jenks (SDSU)

EXPECTED COMPLETION

December 2019



Post-fledging ecology of hatch year mallards in North and South Dakota

Mallards (*Anas platyrhynchos*) are one of the most studied waterfowl species, yet sparse research investigated their ecology during the post-fledging period, prior to fall migration. The behavior and physiology of young mallards during this time may be unique as they learn to fly and navigate, exploit new forage and wetland types, develop settling and social cues, molt, avoid predators, change social status and bonds, and anticipate migration. Indeed, these life-history events differ considerably from those of adult mallards, suggesting there may be important differences in movement patterns and habitat requirements between adults and juveniles. Past waterfowl studies of movement ecology faced technical limitations due to transmitter size, strength and range of tracking equipment, and cost. However, the advent of new satellite technology, reduced transmitter size and cost, and increased battery life now allows investigation of avian movements over larger spatial and temporal extents. Survival of juvenile mallards during the autumn is also an integral component of recruitment to the breeding population, and the ability to use these new technologies, specific to hatch year mallards during this sensitive time, will provide critical information to inform management decisions in North and South Dakota.

FUNDING

North Dakota Game and Fish Department; South Dakota Department of Game, Fish & Parks

STUDENT RESEARCHER

Cynthia Anchor, M.S. candidate

FACULTY/PRINCIPAL INVESTIGATOR

Joshua Stafford (USGS)

EXPECTED COMPLETION

December 2020



Predator Dynamics and Nest Success: Changes in Foraging Patterns as a Function of the Predator Community and Landscape Composition

Predator-prey interactions influence vital rates and predation is a major cause of nest failure of ground-nesting birds (i.e., ring-necked pheasants, waterfowl). Understanding the ecology of predation and predator movements is critical to explain predator-prey interactions, habitat use (spatial and temporal), and foraging of nest predators. Predator movements are influenced by patch dynamics and spatial configuration of patches on the landscape and grassland patch dynamics are known to influence nest success of ground-nesting birds. Larger blocks of grassland have been associated with increased nest success of waterfowl, whereas multiple patches of intermediate-sized grassland within agricultural landscapes were associated with low nest success, most likely from predation. Finally, variation in the composition of the predator community can influence nest survival and influence nest-site selection. Identifying habitat characteristics associated with high reproduction and survival of grassland-nesting birds is an important research priority, particularly with respect to the “predator context”. Understanding how habitat dynamics influence predator-prey interactions and nest success of ground-nesting birds will improve development of comprehensive management recommendations for remaining grasslands, restoration or reclamation efforts, and for active management programs that wish to modify grassland regimes or predator communities themselves to improve nesting habitat and nest survival.

FUNDING

South Dakota Department of Game, Fish & Parks, Ducks Unlimited Canada (Bonnycastle Fellowship), & Ducks Unlimited, Inc.

STUDENT RESEARCHER

Samantha Fino, Ph.D. candidate

FACULTY/PRINCIPAL INVESTIGATOR

Joshua Stafford (USGS)

EXPECTED COMPLETION

June 2021



Breeding Ecology of Overwater nesting ducks in Southwestern Manitoba.

Canvasbacks (*Aythya valisineria*) and Redheads (*Aythya americana*) are considered trophy species by most waterfowl hunters. They have been studied extensively due to their similar life histories and social, economic, and ecological importance. Redhead populations have grown over the last 30 years, whereas Canvasback populations have remained stable or declined slightly during this period. This study will be conducted in the historical Prairie Pothole Region of Minnedosa in Southwestern Manitoba, Canada, where land use is primarily agriculture and has led to considerable losses of native uplands and wetlands. This region has been the site of many Canvasback and Redhead studies due to the relatively high nesting densities of these species and other overwater nesting ducks. A primary research interest in the region is understanding factors contributing to variation in nest survival for these species because duck population dynamics are partially driven by this factor. Nest predators, such as mesocarnivores and corvids, are the primary causes of nest failure in most waterfowl species in this region. Experimental lethal removal of nest predators has been shown to increase nest survival in upland nesting waterfowl. However, no research has examined the potential of removing nest predators to improve over water nest survival. Further, conspecific nest parasitism is another hypothetical cause of variation in nest survival in Canvasbacks, and prevalence of nest parasitism by Redheads on Canvasbacks has been increasing over time. For example, studies during the 1960s and 1970s indicated rates of nest parasitism by Redheads on Canvasbacks were 50-60%, whereas recent data indicate 80-90% of Canvasback nests are parasitized by Redheads. Our study intends to evaluate the utility of lethal predator removal to increase nest survival in Canvasbacks, as well as quantify potential impacts of nest parasitism on nest survival. Further, we hope to use molecular techniques (DNA from eggs) to understand maternity of parasitized eggs and variation in individual contributions to parasitism. Results of this work will provide managers with information to make informed decisions regarding potential management practices that maximize Canvasback nest survival.

FUNDING

Delta Waterfowl Foundation

INVESTIGATOR

Trent Rohrer, M.S. candidate

FACULTY

Joshua Stafford (USGS)

EXPECTED COMPLETION

August 2021



Evaluating avian use of cover crop fields in the Corn Belt.

Cover crops are widely accepted for their potential to improve soil health and water quality in row crop production systems. However, their potential to provide additional ecological benefits in these systems, such as provision of breeding habitat for birds of economic or conservation concern, are less understood and of interest to conservation planners, farmers, and wildlife biologists. To evaluate the potential benefits of cover crops to breeding birds we will conduct field investigations of bird use of cover cropped fields in southeastern Iowa. Across the Corn Belt cover crops and breeding birds are suitably abundant to develop possible responses and management strategies for cover crops. This project will be led by South Dakota State University and focus on the use of cover cropped fields by avifauna considered species of greatest conservation need (SGCN) in Iowa. The SGCN list includes 112 bird species; 78 are considered as breeding or potentially breeding in Iowa, and 34 as non-breeding but may rely on important habitat types in Iowa during migration. This study will document and compare use of fields with cover crops, perennial vegetation (i.e., Conservation Reserve Program lands or other, similar lands not subject to crop production or grazing), and active croplands to evaluate the relative importance of these cover types, with respect to management practices and other characteristics, to Iowa's avian SGCN. Results of this work will elucidate the relative impacts of cover crops on these species, guide best management practices, and be used to inform conservation delivery through guiding resource allocation that maximizes wildlife benefits.

FUNDING

U.S. Department of Agriculture, Natural Resource Conservation Service

INVESTIGATOR

Megan Figura, M.S. candidate

FACULTY

Joshua Stafford (USGS)

EXPECTED COMPLETION

July 2021



Transition of conventional crop fields to a regenerative model: Evaluation of functional biodiversity and insect ecosystem services

Monoculture row crops are a predominant form of agriculture in the U.S., but many farmers acknowledge that biodiversity and soil health are important to the productivity of their farms. Regenerative agriculture is a different way to farm the land and sustainably grow our food, fuel and fiber. It encourages biodiversity, increases carbon sequestration, reduces erosion, improves water balance in the soil, and rebuilds soil organic matter. This study will investigate key ecosystem services that insects provide in agriculture, including pollination, predation of herbivorous insects, weed seed granivory and crop residue decomposition, and compare the differences in conventional and regenerative farms. We will also monitor the effects of different management practices on the biodiversity of wildlife in these agroecosystems, focusing on insects and birds. This work will also trophically link insect and bird biodiversity with bird diets.

FUNDING

General Mills and Ecdysis Foundation

STUDENT RESEARCHER

Alexandrea Michels, M.S. Candidate

FACULTY

Steven Chipps (USGS)

PRINCIPAL INVESTIGATOR

Jonathan Lundgren, Blue Dasher Farm and the Ecdysis Foundation

EXPECTED COMPLETION

May 2021



Post-stocking survival of Rainbow Trout in Black Hills impoundments

Harvest rate of stocked Rainbow Trout in small lakes and reservoirs (<40 acres) of the Black Hills, South Dakota is often below management objectives, raising concerns about the costs (trout production) and benefits (angler use) of the Rainbow Trout stocking program. To improve the cost/benefit of the Rainbow Trout stocking program, a better understanding is needed of factors affecting survival of post-stocked trout. The influence of stocking density, food availability, water quality and catch-and-release fishing on survival of stocked Rainbow Trout are poorly understood. Low survivorship of stocked trout may be linked to physiological and behavioral attributes of hatchery-reared trout when stocked into natural environments. The goals of this study are to evaluate factors affecting mortality of stocked Rainbow Trout in Black Hills lakes and make recommendations that enhance Game, Fish & Parks put-and-take stocking program.

FUNDING

South Dakota Department of Game, Fish & Parks

STUDENT RESEARCHER

Charles Mordhorst, M.S. candidate

FACULTY/PRINCIPAL INVESTIGATORS

Steven Chipps (USGS), Jake Davis (GFP), Mike Barnes (GFP), Jeremy Kientz (GFP)

EXPECTED COMPLETION

June 2021



Soil health economics in South Dakota

Healthy soil is the foundation of sustainable agriculture. Following conservation practices such as conservation tillage, diversified crop rotations, cover crops, and integrated livestock crop production systems can help directly improve soil health. They can reduce soil erosion, maximize water infiltration, improve nutrient cycling, reduce environmental problems, help in saving money on inputs, and improve soil resilience. However, when it comes to adoption decisions, agricultural producers care about not only soil health but also the economic feasibility of these new conservation practices. Therefore, the goal of the project is to analyze the economics and risks associated with conservative farming practices, in addition to quantifying and characterizing the soil health impacts of such practices. So far, we have sampled more than 20 producer's farms with different agricultural practices across South Dakota in 2018 and 2019. In this study, we examined the soil health of different conservative practices. Soil samples have been analyzed for more than 26 soil health parameters (soil labile carbon and nitrogen fractions, microbial biomass carbon and nitrogen, soil enzymes, glomalin, phospholipid fatty acid analysis, water infiltration, etc.). Cost and net revenue comparisons between conventional practice and conservation practice were made using data collected from neighborhood farmers and experimental stations. Our results indicate that on average conservation farms lower input cost and generate more resilient yields during climate extreme years in comparison to conventional farm, which produces higher crop yields in normal years but the yield advantage has been largely offset by the high input costs. In addition to the neighborhood farm comparison study, we will also study the interaction between 1) climate and soil variables, and 2) farmers' adoption behavior and the perceived change in profitabilities utilizing South Dakota farm survey data.

FUNDING

USDA, Natural Resources
Conservation Service (RWO 116)

STUDENT RESEARCHERS

Hanxiao Feng and Jasdeep Singh,
Ph.D. candidates; Udayakumar Sekaran
and Gandura Abagandura, Postdocs

EXPECTED FACULTY/PRINCIPAL INVESTIGATORS

Tong Wang (SDSU), Sandeep Kumar
(SDSU),
Jack B. Davis (SDSU), Anthony Bly
(SDSU), Hailong Jin (SDSU)

EXPECTED COMPLETION

December 2020



Cover crop nutrient cycling in South Dakota

Cover Crop use is steadily becoming a field practice on South Dakota croplands. The many reasons for using a cover crop include forage for livestock, wildlife habitat, capture of inorganic nutrients that might harm the environment, and building of soil health through additions of carbon, and formation of beneficial soil structure and aggregates. A popular question from agriculture producers is how do cover crops affect the cycling of soil nutrients and how does this influence the growth and yield of cash crops? A three-year project evaluating the nutrient cycling in the soil began in the fall of 2017 on 30 farm fields across South Dakota. The on-farm sites encompass three objectives that include (1) determine the influence of cover crop composition on nutrient cycling and production of cash crops, (2) quantify how cover crop composition and rate of nutrient loss effect crop yield and soil moisture and (3) evaluate how cover crop C:N ratio effects corn and sorghum nitrogen requirements. Cover crop residue and soil samples were obtained from plots during the fall of 2017 and spring of 2018. Nitrogen rates applied for corn were measured in the spring of 2018 and corn plots monitored for response to nitrogen addition. Soil moisture monitoring is currently underway at three locations across South Dakota.

FUNDING

USDA, Natural Resources Conservation Service
(RWO #117)

STUDENT RESEARCHER

Justin Brown, M.S. candidate; Amine Rahhal, M.S. candidate; Hunter Bielenberg, M.S. candidate.

FACULTY/PRINCIPAL INVESTIGATORS

Anthony Bly (SDSU), David Karki (SDSU), Ruth Beck (SDSU), Chris Graham (SDSU), Howard Woodard (SDSU), Peter Sexton (SDSU), Shannon Osborne (USDA), Michael Lehman (USDA) and Jason Miller (USDA)

EXPECTED COMPLETION

December 2020



Herbicide residual effects on cover crops after corn silage and wheat

Interest in cover crops among South Dakota crop growers has increased in recent years. Producers have realized the need for scientific information on residual effects of commonly used herbicides on cover crops for proper incorporation of these species into their cropping systems. Therefore, it is imperative that information about herbicide residuals effects on cover crops is investigated in South Dakota. Surrounding states that include Minnesota, Iowa, Nebraska and Wisconsin have researched this topic to give their producers educational opportunities in learning how to integrate cover crops into their operations. This research assists producers and consultants to continue making wise and informed decisions in common South Dakota cropping systems. Seven research sites were established for the 2018 growing season. Four wheat stubble locations were sprayed and drilled with cover crops. Three corn silage plot locations were established with herbicide treatments and cover crops. Six research sites were established for the 2019 growing season. Three wheat stubble plots were sprayed and drilled with cover crops. Three corn silage plot locations were established with herbicide treatments and cover crops plan to be drilled within the next month.

FUNDING

USDA, Natural Resources Conservation Service
(RWO #118)

STUDENT RESEARCHER

Sarah Potthoff, M.S. candidate

FACULTY/PRINCIPAL INVESTIGATORS

Gared Shaffer (SDSU), David Karki (SDSU), Anthony Bly (SDSU), Sara Bauder (SDSU), Ruth Beck (SDSU), and Paul Johnson (SDSU)

EXPECTED COMPLETION

December 2020



TEACHING

STEVEN CHIPPS

FALL 2018: WL 791 *Independent Study* (3 Credits)

This course familiarized students with data management and manipulation function of the R platform. Students learned basic functions such as merging and combining data sets, extracting subsets of data, sorting/ranking data, and basic loop functions using R. The course was developed by Dr. Thomas Edwards, USGS, Utah Cooperative Fish and Wildlife Research Unit.

JOSHUA STAFFORD

SPRING 2019: WL 715 *Wildlife Research Design* (3 Credits)

This course provided students with exposure to the philosophy of science and critical thinking, important foundational work regarding wildlife study design and an understanding of basic statistical tools and techniques that may be useful in their own research.

SPRING 2019: WL 791 *Independent Study* (3 Credits)

This course taught participants the modeling process, how to think like a modeler, and how modeling fits into management decision making. Topics included spreadsheets, population modeling, decision analysis, ecosystem modeling, and use of models in making conservation decisions. The course was developed and instructed online by Dr. Terri Donovan, USGS, Vermont Cooperative Fish and Wildlife Research Unit.

AWARDS AND HONORS

CYNTHIA ANCHOR, 2019 *Outstanding Wildlife M.S. Student Award*

Department of Natural Resource Management, South Dakota State University

CYNTHIA ANCHOR, 2019 *Waterfowl Research Foundation Fellowship*

Ducks Unlimited, Canada (Funding for 2 years)

SAMANTHA FINO, 2019 *Outstanding Wildlife Ph.D. Student Award*

Department of Natural Resource Management, South Dakota State University

REBECCA KOLSTROM, 2019 *Outstanding Biological Science M.S. Student Award*

Department of Natural Resource Management, South Dakota State University

JOSEPH MRNAK, 2019 *Great Plains Fishery Workers Association Scholarship*

Great Plains Fishery Workers Association

JOSEPH MRNAK, 2019 *Janice Lee Fenski Memorial Award*

American Fisheries Society, North Central Division

FRED OSLUND, 2019 *Susan "Gay" Simpson Memorial Award*

Central Flyway Technical Section Committee



Cynthia Anchor with her advisor,
Dr. Joshua Stafford.



Rebecca Kolstrom with her advisors,
Dr. Larry Gigliotti (left) and Dr. Tammy
Wilson (right)



Samantha Fino with her advisor,
Dr. Joshua Stafford



Joseph Mrnak with his advisor,
Dr. Steven Chipps.

SCIENTIFIC PRESENTATIONS

1. Anchor, C.E., M.L. Szymanski, R.J. Murano, A.T. Pearse, and J.D. Stafford. 2019. Evaluating Post-fledging Movements of Hatch Year Mallards in the Dakotas. Poster. North American Duck Symposium 8, Winnipeg, Manitoba, Canada.
2. Chipps, S.R. 2019. Long-term effects of climate variation on water level fluctuations and angler harvest in Lake Oahe, South Dakota. Fisheries and Oceans Canada, Freshwater Institute, Arctic and Aquatic Research Division, Winnipeg, CA.
3. Chipps, S.R., and M.J. Fincel. 2018. Modeling effects of climate variability on angler use in the Missouri River. Missouri River Institute, University of South Dakota, Vermillion, SD.
4. Chipps, S.R. 2018. Stream habitat restoration and reintroduction of brown trout in Gary Creek, SD. Trout Unlimited, Sioux Falls, SD.
5. Darnell, T., B. Darby, L. M. Gigliotti, W. Jensen, and J. Boulanger. 2019. A public opinion survey of mountain lions in North Dakota. North Dakota Chapter of the Wildlife Society Annual Meeting, Mandan, ND.
6. Fino, S.R., J.D. Stafford, A.T. Pearse, J.A. Jenks, and R.C. Lonsinger. 2019. Relating predator community dynamics and duck nest survival in eastern South Dakota. North American Duck Symposium. Winnipeg, Manitoba, Canada.
7. Fopma, S., and L. M. Gigliotti. 2019. Assessing opinions toward native fish management in the Black Hills region of South Dakota. Presented at the 79th Midwest Fish & Wildlife Conference, Cleveland, OH.
8. Galinat, A.G., S.R. Chipps, J.A. Jenks, J.L. Davis, and G. Simpson. 2019. Mink movement and predation on brown trout in Rapid Creek, South Dakota. 79th Midwest Fish & Wildlife Conference, Cleveland, OH.
9. Galinat, A.G., S.R. Chipps, J.A. Jenks, J.L. Davis, and G. Simpson. 2019. Use of radio telemetry to determine movements and mortality sources of brown trout in Rapid Creek, SD. 55th Annual Meeting of the Dakota Chapter-Minnesota Chapter American Fisheries Society, Fargo, ND.
10. Gallman, C.W., J.D. Stafford, and E.S. Michel. 2019. Evaluating fall-seeded cover crops for nesting waterfowl in eastern South Dakota. North American Duck Symposium, Winnipeg, Manitoba, Canada.
11. Gallman, C.W., and J.D. Stafford. 2019. The evaluation of cover crops for grassland nesting waterfowl in eastern South Dakota. 2019 South Dakota Soil Health Coalition Annual Meeting, Brookings, SD.
12. Gallman, C.W., and J.D. Stafford. 2019. The evaluation of cover crops for grassland nesting waterfowl in eastern South Dakota. 2019 South Dakota Ducks Unlimited State Convention, Pierre, SD.

13. Gigliotti, L.M. 2019. Understanding MN landowners' values, attitudes & behaviors towards wildlife & wildlife habitat. 2019. Red River Watershed Management Board & Flood Damage Reeducation Workgroup: 21st Annual Joint Conference, Moorhead, MN.
14. Gigliotti, L.M., L.A. Sweikert. 2019. Age, succession planning, and wildlife values of landowners from three upper Midwest states. Pathways: Human Dimensions of Wildlife Conference, Estes Park, CO.
15. Kolstrom, R. L., L. M. Gigliotti, and T. L. Wilson. 2018. Developing an optimal bald eagle monitoring program for Southwest Alaska National Parks. 25th Annual Conference of The Wildlife Society, Cleveland, OH.
16. Mrnak, J.T., S.R. Chipps, and D.A. James. 2019. Effect of water temperature on growth and settling time of endogenous pallid sturgeon (*Scaphirhynchus albus*) larvae. Missouri River Natural Resources Conference, Pierre, SD.
17. Mrnak, J.T., S.R. Chipps, and D.A. James. 2019. Effect of temperature on growth and settling time of endogenous pallid sturgeon (*Scaphirhynchus albus*) larvae. 55th Annual Meeting of the Dakota Chapter-Minnesota Chapter American Fisheries Society, Fargo, ND.
18. Mrnak, J.T., S.R. Chipps, and D.A. James. 2019. Effect of temperature on growth and settling time of endogenous pallid sturgeon (*Scaphirhynchus albus*) larvae. 79th Midwest Fish & Wildlife Conference, Cleveland, OH
19. Mrnak, J.T., S.R. Chipps, and D.A. James. 2018. Influence of water velocity on rheotactic behavior and energy reserves of endogenous Pallid Sturgeon (*Scaphirhynchus albus*) larvae. Missouri River Institute, University of South Dakota, Vermillion, SD.
20. Stafford, J.D. 2019. Current waterfowl research at South Dakota State University. Prairie Pothole Joint Venture Technical Section Meeting. Aberdeen, SD.
21. Sundmark, A. P., and L. M. Gigliotti. 2019. Understanding stakeholder desires for small South Dakota lakes. 2019 Joint Meeting of the Dakota Chapter and Minnesota Chapter of the American Fisheries Society, Fargo, ND.
22. Sundmark, A., and L. M. Gigliotti. 2018. Factors shaping the social value of small lakes to local communities in South Dakota. Presented at the 2018 Annual SD Cooperators Meeting, Brookings, SD.
23. Sundmark, A., and L. M. Gigliotti. 2019. Framing social values: How small fisheries can improve quality of life in South Dakota. Presented at the 79th Midwest Fish & Wildlife Conference, Cleveland, OH.
24. Sundmark, A., and L. M. Gigliotti. 2019. Evaluating fishing at small lakes in South Dakota. Presented at the 2019 Summer Fisheries Meeting, Webster, SD.

WORKSHOPS AND TRAINING

STEVEN CHIPPS: DEPARTMENT OF INTERIOR, MOTORBOAT OPERATORS CERTIFICATION COURSE. Instructor, South Dakota State University, Brookings, SD, June 2019.

LARRY GIGLIOTTI: South Dakota Game, Fish, and Parks, UNDERSTANDING SOUTH DAKOTA LANDOWNERS' VALUES, ATTITUDES AND BEHAVIORS TOWARDS WILDLIFE AND WILDLIFE HABITAT. Pierre, South Dakota, March, 2019.

JOSHUA STAFFORD: U.S. Department of Interior, ATV/UTV CERTIFICATION COURSE. Brookings, South Dakota, April 2019 (2 courses)

THESES AND DISSERTATIONS

KOLSTROM, R.L. 2019. Identifying an Optimal Bald Eagle Monitoring Program for Southwest Alaska National Parks. M.S. Thesis. South Dakota State University. 116 pp.
<https://openprairie.sdstate.edu/etd/3176/>

MRNAK, J. 2019. Effect of Water Velocity and Temperature on Energy Use, Behavior, and Mortality of Pallid Sturgeon *Scaphirhynchus alba* Larvae. M.S. thesis, South Dakota State University. 80 pp.
<https://openprairie.sdstate.edu/etd/3254/>

SUNDMARK, A.P. 2019. The Economic and Social Values Associated with Small South Dakota Lakes. Ph.D. Dissertation. South Dakota State University. 153 pp.
<https://openprairie.sdstate.edu/etd/1692/>

PEER-REVIEWED PUBLICATIONS

1. Behney, A.C., R. O'Shaughnessy, M.W. Eichholz, and J.D. Stafford. 2019. Worth the reward? An experimental assessment of risk-taking behavior along a life history gradient. *Journal of Avian Biology* e02068. DOI: 0.1111/jav.02068
2. Gigliotti, L.M. 2018. Evaluation of a decoy-only public goose hunting opportunity in central South Dakota: The role of harvest success on hunter satisfaction. *Proceedings of the South Dakota Academy of Science* 97:33-43.
3. Gigliotti, L.M., and S.J. Fopma. 2018. Low survey response! Can I still use the data? *Human Dimensions of Wildlife* 24:71-79.
4. Gigliotti, L.M., and L.A. Sweikert. 2019. Wildlife value orientation of landowners from five states in the Upper Midwest, USA. *Human Dimensions of Wildlife* 24:433-445.
5. Henderson, K.R., and L.M. Gigliotti. 2018. Evaluation of internet surveys for conducting statewide angler surveys in South Dakota. *Proceedings of the South Dakota Academy of Science* 97:45-60.
6. Janke, A.K., M.J. Anteau, and J.D. Stafford. 2019. Prairie wetlands confer consistent migrant refueling conditions across a gradient of agricultural land use intensities. *Biological Conservation* 229:99–112.
7. Janke, A.K., M.J. Anteau, and J.D. Stafford. 2019. Extreme climatic variability during migration invokes physiological and dietary plasticity among spring migrating ducks. *Canadian Journal of Zoology* 97:340–351.
8. O'Neal, B. J., Stafford, J. D., Larkin, R. P., and E. S. Michel. 2018. The effect of weather on the timing of migratory departure in autumn-migrating ducks. *Movement Ecology* 6:23. DOI: 10.1186/s40462-018-0141-5
9. Selch, T.M., S.R. Chipps, B.G. Blackwell, and R.P. Hanten. 2019. Influence of season, sex, age and diet composition on mercury concentration in walleye (*Sander vitreus*). *Archives of Environmental Contamination and Toxicology* 77:336-343.
10. Smith, B.J., S.R. Chipps, T. Rapp, J.D. Grote, J. Mecham, and T.M. Stevens. 2019. Comparison of aquatic invertebrate communities in near-shore areas with high or low boating activity. *Journal of Freshwater Ecology* 34:189-198.
11. Sundmark, A.P., and L.M. Gigliotti. 2019. Economic activity generated by angling at small South Dakota lakes. *Fisheries* 44:321-330.
12. Sweikert, L. A., and L.M. Gigliotti. 2018. A values-based private landowner typology to improve grassland conservation initiatives. *Society and Natural Resources* 32:167-183.

13. Sweikert, L. A., and L.M. Gigliotti. 2018. Evaluating the role of Farm Bill conservation programs in conserving America's grasslands. *Land Use Policy* 81:392-399.
14. Sweikert, L. A., and L.M. Gigliotti. 2019. Understanding conservation decisions of agricultural producers. *Journal of Wildlife Management* 83:993-1004.
15. Voorhees, J.M., M.E. Barnes, S.R. Chipps, and M.L. Brown. 2019. Effects of exercise and bioprocessed soybean meal diets during rainbow trout (*Oncorhynchus mykiss*) rearing. *The Open Biology Journal* 7:1-13.
16. Voorhees, J.M., M.E. Barnes, S.R. Chipps, and M.L. Brown. 2019. Bioprocessed soybean meal replacement of fishmeal in rainbow trout (*Oncorhynchus mykiss*) diets. *Cogent Food and Agriculture* 5:1579482.
17. Voorhees, J.M., M.E. Barnes, S.R. Chipps, and M.L. Brown. 2018. Dietary bioprocessed soybean meal does not affect the growth of exercised juvenile rainbow trout (*Oncorhynchus mykiss*). *Journal of Animal Research and Nutrition* 3:2:6.