

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

## 2014 ANNUAL REPORT



### 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

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The South Dakota Unit of the U.S. Geological Survey's Cooperative Research Unit program has served an important role in graduate education and technical assistance in fish and wildlife management at South Dakota State University since 1963. Research at the South Dakota Unit, guided by our Coordinating Committee, is conducted primarily by graduate students (M.S. and Ph.D.) studying a wide range of natural resource problems. 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 on/off-campus laboratory facilities. The USGS EROS Data Center and the GIS Center of Excellence (GISCE) at SDSU provide unique resources and collaborative opportunities for the South Dakota Coop Unit.

Since 1963, about 243 theses and dissertations have been completed by students working through the South Dakota Coop Unit. Unit students have conducted research on a range of topics that include endangered species, wetland ecology, fisheries management, upland game, big game management, and non-game species. A list of theses and dissertations is available at <http://www.sdstate.edu/wfs/publications/index.cfm>. In 2010, Professor Emeritus and Assistant Unit Leader (retired) Dr. Kenneth F. Higgins established an endowment to support graduate student research at SDSU. The *Kenneth F. Higgins Waterfowl Legacy Research Endowment* is directed toward supporting graduate student research activities that benefit wetland-dependent avian species. Contributions to the endowment can be made by contacting the SDSU Alumni Association (888.735.2257; [alumni@statealum.com](mailto:alumni@statealum.com)).

In keeping with over 50 years of tradition, the Unit continues to address applied research needs of our state and federal cooperators to help manage fish and wildlife resources in the Northern Great Plains. Please feel free to contact us for more information.

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[http://www.coopunits.org/South\\_Dakota/](http://www.coopunits.org/South_Dakota/)

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## UNIT STAFF AND COOPERATORS

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Larry Gigliotti, Kate Tvedt, Steve Chipps, Josh Stafford

## 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).



## **COORDINATING COMMITTEE**

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## **RESEARCH PERSONNEL**

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### **Post-Doctoral Associates**

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### **Ph.D. Candidates**

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Tobias Rapp  
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### **M.S. Candidates**

Laura Heironimus  
Natalie Scheibel  
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Fred Oslund  
Jeremy Kientz  
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Zach Jessee  
Denielle Meyerink  
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Aaron Sundmark  
Riley Schubert  
Josh Zylstra

## COOPERATING FACULTY – SOUTH DAKOTA STATE UNIVERSITY

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<u>Name</u>	<u>Department</u>	<u>Cooperative Activity</u>
Dr. Katie Bertrand	Natural Resource Management	Fish ecology
Dr. Brian Blackwell	Natural Resource Management	Fish ecology
Dr. Michael Brown	Natural Resource Management	Limnology studies
Dr. Delvin DeBoer	Civil and Environmental Engineering	Water quality
Dr. Chuck Dieter	Natural Resource Management	Wildlife research
Dr. Barry Dunn	Dean, College of AgBio Sciences	Administration
Dr. Leigh Fredrickson	Natural Resource Management	Wetlands research
Dr. Brian Graeb	Natural Resource Management	Fish ecology studies
Dr. Troy Grovenburg	Natural Resource Management	Wildlife research
Dr. Jon Jenks	Natural Resource Management	Wildlife ecology
Dr. Kent Jensen	Natural Resource Management	Bird studies
Dr. Carter Johnson	Natural Resource Management	Wetland ecology
Dr. Carol Johnston	Natural Resource Management	Wetland ecology
Mr. Michael Kjellsen	Natural Resource Management	National Wetland Inventory
Dr. Gary Larson	Natural Resource Management	Plant science
Dr. Thomas Loveland	EROS-GIS Center of Excellence	Breeding bird study
Dr. Micheal Miller	Economics	Economic Impact of Fishing
Dr. Darrell Napton	Geography	Wetland study
Dr. Regg Neiger	Veterinary Sciences	Waterfowl studies
Dr. Nels Troelstrup	Natural Resource Management	Oak Lake Field station
Dr. David Willis	Natural Resource Management	Administration
Dr. Michael Wimberly	GIS Center of Excellence	Pallid sturgeon
Dr. Melissa Wuellner	Natural Resource Management	Fish ecology studies

## REGIONAL COOPERATING SCIENTISTS

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<u>Name (South Dakota Unit Person)</u>	<u>Agency/University</u>	<u>Subject</u>
Mr. Geno Adams (Gigliotti)	SD GFP	Internet Angler Surveys
Dr. Michael Anteau (Stafford)	USGS – NPWRC	Wetland and waterbird health
Dr. Jane Austin (Stafford)	USGS – NPWRC	Waterbird and wetland ecology
Mr. Michael Barnes (Chipps)	SD GFP	Salmonid 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
Mr. Kris Edwards (Chipps)	SD GFP	Hydroacoustics
Dr. Michael Eichholz (Stafford)	Southern Illinois University	Migration ecology
Dr. Mark Fincel (Chipps)	SD GFP	Hydroacoustics
Mr. Craig Flemming (Chipps)	US Army Corps Engineers	Pallid sturgeon
Mr. Gene Galinat (Chipps)	SD GFP	Black Hills trout
Dr. Robert Gates (Stafford)	The Ohio State University	Spring-migration ecology
Dr. James Garvey (Chipps)	Southern Illinois University	Diet Quantification
Dr. Heath Hagy (Stafford)	Illinois Natural History Survey	Waterbird foraging ecology
Dr. Daniel James (Chipps)	FWS-Pierre, SD	Rapid Creek ecology
Dr. Rex Johnson (Stafford)	FWS HAPET – Fergus Falls	Conservation planning
Dr. Dylan Kesler (Stafford)	University of Missouri	Avian ecology, modeling
Dr. Robert Klumb (Chipps)	FWS-Pierre, SD	Pallid Sturgeon
Mr. Dave Luchessi (Chipps)	SD GFP	Small impoundments

Dr. Charlie Madenjian (Chipps)	USGS Great Lakes Sci Cntr	Fish bioenergetics
Dr. Brian McLaren (Chipps)	Lakehead University	Lake sturgeon ecology
Mr. Rocco Murano (Stafford)	SD GFP	Waterfowl ecology
Dr. Ben O’Neal (Stafford)	Franklin College	Radar ornithology
Dr. Craig Paukert (Chipps)	Missouri Coop Fish and Wildlife Unit	Paddlefish
Dr. Aaron Pearse (Stafford)	USGS – NPWRC	Biometrics
Dr. Robert Pilsbury (Chipps)	University of Wisconsin	Didymo in the Black Hills
Dr. Greg Sass (Stafford)	Illinois Natural History Survey	Integrated wetland management
Mr. Greg Simpson (Chipps)	SD GFP	Black Hills trout
Mr. Todd St. Sauver (Chipps)	SD GFP	Small impoundments
Mr. Kurt Schilling (Chipps)	FWS	Hatchery Studies
Dr. James Stone (Chipps)	South Dakota School of Mines & Tech.	Hg Studies
Mr. Sam Stukel (Chipps)	SD GFP	Pallid sturgeon
Dr. Corey Suski (Chipps)	University of Illinois	Fish Physiology
Dr. Chris Swanson (Stafford)	FWS – Kulm WMD	Grassland bird ecology
Dr. David Wahl (Chipps)	Illinois Natural History	Bioenergetics
Mr. Matt Ward (Chipps)	SD GFP	Walleye foraging
Dr. Pat Weatherhead (Stafford)	University of Illinois	Risk taking in ducks
Dr. Molly Webb (Chipps)	FWS, Bozeman, Montana	Lake sturgeon reproduction
Dr. Tim Welker (Chipps)	US Army Corps Engineers	Pallid sturgeon
Mr. George Williams (Chipps)	US Army Corps Engineers	Pallid sturgeon
Dr. Steve Windels (Chipps)	National Park Service	Lake sturgeon

## **ADMINISTRATIVE SUPPORT**

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### **SOUTH DAKOTA DEPARTMENT OF GAME, FISH & PARKS**

The South Dakota 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 assistance from SDSU and we wish to thank Kate Tvedt, Terri Symens, Di Drake, and Dawn Van Ballegooyen (NRM), as well as personnel from the Office of Grants and Sponsored Programs: Holly Beutler, Dr. James Doolittle, Kathleen Campbell, Brenda Hayne, Kay Scheibe, and Doug Ward for their assistance and advice.

### **US GEOLOGICAL SURVEY, COOPERATIVE RESEARCH UNIT PROGRAM**

The South Dakota Unit receives guidance and assistance from the CRU Headquarters staff in Reston, VA. We thank Suzanne Cartagirone, Shana Coulby, Brenda Croston, Don Dennerline, Terry Linton, Rita Raines, Mike Tome and Kevin Whalen 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.

## Tribute to Dr. David W. Willis 1955-2014

Dave Willis was an outstanding leader, scientist, friend and mentor -- who touched the lives of many people. A passionate, long-time supporter of the Coop Unit program, Dave served as Secretary of the National Cooperators Coalition (NCC) -- an alliance of state wildlife agencies, universities, and non-federal organizations. Always willing to lend a hand or share his knowledge, Dave contributed significantly to the SD Coop Unit and CRU Program over the years --- and for that we are very grateful. To borrow a phrase that Dave often used to describe others --- *"he was a real gem"*. Indeed, Dave was a diamond mine.

To continue Dave's legacy of excellence in education and research, an endowment has been set up in his name --- the Dave Willis Fisheries Science Endowment. Information on making a donation to the endowment can be found on SDSU's Natural Resource Management Department's web page <http://www.sdstate.edu/nrm/people/willis.cfm>



## PROGRAM DIRECTION STATEMENT

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The Unit's program direction is reviewed annually by our Coordinating Committee. The overall program direction will be to conduct applied 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 retention, livestock forage, flood reduction, ground water recharge, esthetics, and fishery potential – will be included in research efforts when appropriate. Applied aspects of wetland and upland research will address wetland conservation, 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.



## **ONGOING PROJECTS**

### **Influence of Reservoir Productivity on Food Web Structure and Walleye Stocking Success in Two South Dakota Impoundments**

Management of walleye fisheries in South Dakota impoundments can be hindered by factors that include poor habitat quality, eutrophication and limited natural recruitment. Richmond and Mina reservoirs, in northeastern South Dakota, are important regional fisheries managed for walleye. Natural reproduction of walleyes in both reservoirs is low, necessitating periodic stocking of fingerling fish. The extent to which factors such as prey availability and(or) environmental variation influences growth and survival of young walleyes is not known. To address these questions, we are using a combined field and experimental approach to evaluate diet, growth and survival of fingerling walleye in Mina and Richmond reservoirs.

#### **FUNDING**

South Dakota Department of Game, Fish & Parks (F-15-R-1521)

#### **INVESTIGATOR**

Megan Thul, M.S. candidate

#### **FACULTY**

Steve Chipps and Brian Blackwell

#### **EXPECTED COMPLETION**

October 2014



## **Development of a Spatially Explicit Growth Model for Larval Pallid Sturgeon: A New Tool for Habitat Assessment**

The pallid sturgeon (*Scaphirhynchus albus*) is a federally endangered species native to the Missouri and lower Mississippi River. Throughout much of the Missouri River system, natural reproduction by pallid sturgeon is believed to be negligible--attributed primarily to the loss of spawning habitat and(or) rearing areas. Long-term recovery and maintenance of this species will likely require significant habitat restoration efforts, with an emphasis on spawning and nursery habitat. In this study, we developed a growth model that will allow researchers to evaluate habitat quality and survival potential for age-0 pallid sturgeon. To do so, a series of studies were performed to quantify foraging dynamics and energetics of age-0 sturgeon that served as inputs in the model. Feeding response, respiration rate, swimming performance, evacuation rate and feeding satiation were quantified as functions of water temperature (12-24°C) and fish size (10-150 mm). In addition, the model was evaluated by quantifying growth in small scale mesocosms simulating natural conditions. Using empirical data, the model was applied to various sites in the Missouri River to evaluate spatially-explicit growth patterns for age-0 Pallid Sturgeon. The model should prove useful for identifying important rearing areas and habitat restoration efforts for Pallid Sturgeon, given the general lack of natural reproduction and hence, the age-0 life-stage in the Missouri River.

### **FUNDING**

U.S. Army Corps of Engineers (RWO #104)

### **INVESTIGATOR**

David Deslauriers, Ph.D. candidate

### **FACULTY**

Steve Chipps, Brian Graeb, Brian McLaren  
(Lakehead University)

### **EXPECTED COMPLETION**

December 2015



## **Evaluating Relationships Between Wetland Quality, Land Use, and Waterbirds in the Prairie Pothole Region**

Wetland drainage and upland conversion for agriculture has significantly altered the landscape of the Prairie Pothole Region of North America. As a result, this region now contains a mosaic of disturbance regimes, from relatively intact pasturelands to nearly complete wetland and upland loss and conversion. Further, wetland drainage and upland conversion continue in the region and may be accelerating due to high commodity prices and mechanized drain tiling. Consequences of conversion may disturb bottom-up processes and reduce carrying capacity for waterbirds that rely on wetlands. Conservation and management efforts require reliable information on the responses of birds to habitat loss and for efficient allocation of resources. We will investigate wetland health and degradation by measuring plasma-metabolite dynamics of spring-migrating waterfowl and other waterbirds to variation in habitat quality in the Prairie Pothole Region.

### **FUNDING**

U.S. Geological Survey (RWO #103)

### **INVESTIGATOR**

Adam Janke, Ph.D. candidate

### **FACULTY**

Joshua Stafford, Michael Anteau (NPWRC)

### **EXPECTED COMPLETION**

December 2015



## Development and Evaluation of a Larval Pallid Sturgeon Energetics Model

Knowledge about feeding and growth dynamics of larval pallid sturgeon (*Scaphirhynchus albus*) is important for identifying rearing areas and monitoring habitat restoration efforts. Use of ecological models to estimate growth potential of larval pallid sturgeon represents a new approach for assessing habitat suitability for this critical life stage. In this study, we developed a bioenergetics model to determine optimal temperature for growth in young-of-year pallid sturgeon. To parameterize the model, we estimated metabolic demands and growth of pallid sturgeon subjected to a range of temperatures commonly found in the Missouri River (13–24°C). We used static respirometry to quantify routine respiration rate. Exogenously feeding larvae were fed chironomids over a range of ration levels (0-50% body weight) to determine maximum consumption and estimate growth. Larval pallid sturgeon exhibited a 77% increase in metabolic rates and a 52% increase in consumption rates from 13-24°C. Critical thermal maximum was evaluated by increasing temperatures 1°C every half hour from acclimation temperatures until lethal temperatures were achieved (34°C). Upper, lethal temperatures were significantly different between endogenous and exogenous larvae acclimated at water temperatures of 13-24°C. On the average, lethal temperatures for endogenous larvae were 2.6 to 3.5°C lower than those for exogenous fish. The quantification of these bioenergetic parameters will allow us to estimate energetic requirements of larval pallid sturgeon, to make growth predictions from field observations, and to determine availability of optimal temperature ranges within the Missouri River.

### FUNDING

U.S. Army Corps of Engineers (RWO #104)

### INVESTIGATOR

Laura Heironimus, M.S. candidate

### FACULTY

Steve Chipps

### EXPECTED COMPLETION

December 2015



## Quantifying Trophic Interactions and Effects of Harvest Regulations on Lake Trout and Northern Pike in Pactola Reservoir, South Dakota

Lake trout are a non-native fish in South Dakota and were first stocked in Pactola Reservoir in the late 1970s. Recent collections of small (<250 mm) lake trout suggests that natural reproduction is occurring in the reservoir. Unlike other stocked salmonids, lake trout exhibit relatively slow growth and long maturation time, resulting in a fishery that takes years to develop. The recent, illegal introduction of northern pike in Pactola Reservoir may further complicate management options for lake trout, and other salmonid species currently managed in the reservoir. Anecdotal information from anglers and fish surveys suggest a marked increase in the abundance of northern pike and concomitant declines in catch rate of stocked rainbow trout. In this study, we used bioenergetics modeling to evaluate trophic interactions and assess annual predatory demands by Lake Trout *Salvelinus namaycush* and Northern Pike *Esox lucius* in Pactola Reservoir, South Dakota. Diets and stable isotope analyses showed ontogenetic shifts for both species. Rainbow Smelt *Osmerus mordax* accounted for 52% of the annual consumption by sub-adult Lake Trout. However, adult Lake Trout annual consumption was comprised mainly (67%) of Bluegill *Lepomis macrochirus*. Younger Northern Pike fed on an array of prey items, with Rainbow Smelt being a frequent prey item during spring (27%). Larger Northern Pike (>600 mm) fed primarily (65% of diet) on stocked Rainbow Trout *Oncorhynchus mykiss*. Except for spring consumption of Rainbow Smelt, our findings show that diets of Lake Trout and Northern Pike exhibit little overlap. Information about the energetic demands of lake trout and Northern Pike should aid in management decisions concerning trout stockings and Centrarchid management in oligotrophic lakes.

### FUNDING

South Dakota Game, Fish and Parks

### INVESTIGATOR

Natalie Scheibel, M.S. candidate

### FACULTY

Steve Chipps, Jake Davis (GFP), Dan James (USFWS)

### EXPECTED COMPLETION

December 2015



## **Evaluating the Value of the Internet for the Collection of Scientific Data (use, harvest and attitudes) from Anglers**

Fishery managers have long recognized the need for and value of human dimensions information for managing the fisheries resources. Collecting good scientific data representative of the angling population is very expensive and takes months to collect and analyze. Recent advances in computer technology and widespread use of the Internet by the public have generated considerable interest in using Internet-based survey methodology. The main advantages of using the Internet are speed and cost savings. However, two major factors that reduce the validity of Internet-based survey methodology are non-response bias and sample validity resulting from incomplete coverage of the target population. It may be possible to develop correction formulas for certain data that would be applicable for longer periods without the need for expensive annual correction procedures. Such correction formulas could save SDGFP considerable amounts of effort and money and permit annual collection of reliable and valid angler data.

Two years of data have been analyzed from annual surveys of anglers for the 2011 and 2012 South Dakota fishing seasons. Internet survey data was compared with a mail survey of anglers without email addresses in SDGFP's license database and a mail survey of Internet non-responders to identify coverage and nonresponse bias of Internet surveys. This study concluded that Internet surveys, when corrected for sex, age, and percent fishing biases, can provide accurate and reliable data similar to mail surveys for the variables normally measured in the South Dakota statewide angler monitoring survey.

### **FUNDING**

S.D. Game, Fish and Parks

### **INVESTIGATOR**

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### **FACULTY**

Larry Gigliotti

### **EXPECTED COMPLETION**

November 2014



## **Human Dimensions of Habitat Loss in the Plains & Prairie Pothole LCC**

The Plains & Prairie Potholes Landscape Conservation Cooperative (PPP-LCC) identified habitat loss (factors influencing land use and land conversion) as a key research need in 2012. This grassland-wetland ecosystem provides essential habitat for an array of wildlife, especially waterfowl. Temperate grasslands are one of the most threatened biomes worldwide, with the greatest threat being conversion to annual crop production. Recent studies have estimated a net loss of 1.3 million acres of grassland from 2006 to 2011 in five states (ND, SD, NE, MN, IA). Many factors contribute to loss of wildlife habitat, but ultimately it comes down to decisions made by the private landowner. Currently, economic pressures from high corn and soybean prices probably figure heavily in the decision; however, understanding how a private landowner responds to economic incentives/pressures may identify strategies to reduce habitat loss in the Plains and Prairie Pothole Region. Also, farmers and ranchers generally have more than an economic interest in their lands often with strong social and cultural ties to their lands. Moreover, half of all current farmers and ranchers are likely to retire in the next decade often resulting in the agricultural land being split among surviving relatives who do not plan to continue farming/ranching. The purpose of this study is to (1) measure attitudes and behaviors towards participating in conservation programs, (2) identify future changes in farming/ranching practices related to the aging trend of farmers/ranchers, and (3) measure the wildlife value orientations of landowners and the relationship with attitudes and intended behaviors towards participating in conservation programs.

### **FUNDING**

U.S. Fish and Wildlife Service (RWO # 112)

### **INVESTIGATOR**

Lily Sweikert, Ph.D. candidate

### **FACULTY**

Larry Gigliotti

### **EXPECTED COMPLETION**

December 2017



## **Dynamics of Wetland and Grassland Wetland Ecosystems in the Northern Great Plains**

The U.S. Geological Survey is engaged in an on-going research effort to better understand wetland and grassland ecosystems and their associated biotic communities in the Northern Great Plains (NGP). Of specific research interest are the influences of landscape modification to support agriculture, habitat fragmentation, climate change, invasive plant and animal species, and runoff of chemicals and sediments on native flora and fauna. This project will use and update a historical (1960s) dataset to quantify dynamics of wetlands and their plant communities in the NGP. We will use this long-term comparison to investigate drivers affecting the biota and ecosystem function of wetland and grassland ecosystems, including land use and climate change. This project will directly contribute to priority information needs and conservation programs of partners and partnership organizations in the NGP, such as the Prairie Pothole and Northern Great Plains Joint Ventures.

### **FUNDING**

U.S. Geological Survey-CRU, and Northern Prairie Wildlife Research Center - (RWO #108)

### **INVESTIGATOR**

Ryann Cressey, M.S. candidate

### **FACULTY**

Joshua Stafford, Jane Austin (NPWRC)

### **EXPECTED COMPLETION**

September 2015



## **Settling Dynamics of Breeding Ducks in the U.S. Prairie Pothole Region, 1987-2011**

In 1988, the U.S. Fish and Wildlife Service created two Habitat and Population Evaluation Teams to conduct an annual sample of wetlands and waterfowl (Cowardin et al 1995) in the U.S. Prairie Pothole Region. The goal of this survey is to estimate the impacts to lands in the National Wildlife Refuge System on waterfowl breeding populations and production. Approximately 583 4-mi<sup>2</sup> plots and 5,000 wetlands are surveyed each year for wetland condition and breeding pairs and aerial photography of each 4-mi<sup>2</sup> plot captures images of approximately 20,000 wetlands and surrounding uplands. Each year these aerial photos of plots are manually interpreted to estimate wetland ponded area and changes in upland land use. The resulting dataset spans 24 field seasons, making it a unique long-term habitat and population database. The objective of this study is to quantify the influence of local-scale factors on waterfowl pair density, using such variables as terrain relief and position, abundance and proximity of woody vegetation, emergent cover types and hydrologic conditions.

### **FUNDING**

U.S. Fish and Wildlife Service, Region 3 HAPET Office

### **INVESTIGATOR**

Fred Oslund, M.S. candidate

### **FACULTY**

Joshua Stafford, Rex Johnson (HAPET)

### **EXPECTED COMPLETION**

September 2015



## **Survival, Distribution and Relative Predation of Naturally-produced Rainbow Trout in the Deerfield Reservoir system**

Rainbow trout are an important sport fish species in the Black Hills of South Dakota. While primarily stocked into lakes and streams to provide put-and-take fisheries, reproduction and subsequent recruitment into the adult population has been observed in two locations in the Black Hills. In one of those locations, Deerfield Reservoir, naturally reproduced rainbow trout were estimated to make up around 25% of the total population. Although rainbow trout are recruiting into the Deerfield Reservoir population, there is still a lack of knowledge regarding the spawning habitats utilized by rainbow trout in the system, as well as the survival and potential consumption of naturally reproduced fish. Given the reproduction and recruitment observed in Deerfield Reservoir, it would be desirable to managers to remove stockings and manage the fishery for wild rainbow trout. In order to fill in the existing knowledge gaps and provide managers with a greater comprehension of this unique rainbow trout fishery, our study will focus on achieving a better understanding of the production, survival, and distribution of naturally produced rainbow trout, as well as the diet composition of piscivorous fishes and potential predation on rainbow trout in Deerfield Reservoir.

### **FUNDING**

South Dakota Game, Fish and Parks

### **INVESTIGATOR**

Jeremy Kientz, M.S. candidate

### **FACULTY**

Steve Chipps, Jake Davis (GFP), Dan James (USFWS)

### **EXPECTED COMPLETION**

September 2015



## **Effectiveness of Roundup® Ready Alfalfa for Nesting Habitat and Seedbed Preparation**

Ring-necked pheasant and waterfowl populations provide bountiful recreational opportunities for residents and visitors of South Dakota, providing a strong economic boost for local economies. This provides strong incentives for the maintenance and sustainability of their populations. With a rapidly changing landscape to agricultural production, primarily due to the loss of CRP, management of remaining grasslands is imperative to the success of upland nesting game birds. Traditional management practices to provide nesting/brood rearing cover involve the use of agricultural crops to prepare tracts of land for grassland restoration, providing negligible benefits for wildlife during this time. New techniques to reduce the use of agriculture in restorations are being explored, including using Roundup® ready (RR) alfalfa as a means to prepare seedbeds for grassland restoration. RR alfalfa could provide nesting cover as well as an economically feasible way of controlling invasive and noxious weeds during restoration. The effectiveness of using RR alfalfa in grassland restorations and how upland nesting game birds utilize these tracts is unexplored, however, creating a knowledge gap in our understanding of the best management practices for grasslands. This study aims to close the gap in knowledge and help us manage grasslands for the benefit and sustainability of upland nesting game bird populations.

### **FUNDING**

South Game, Fish & Parks  
U.S. Fish and Wildlife Service  
South Dakota State University  
USGS, South Dakota Coop Unit

### **INVESTIGATOR**

Neal Martorelli, M.S. candidate

### **FACULTY**

J. Stafford, R. Haffele, J. Freidel, T. Runia, and R. Murano (GFP)

### **EXPECTED COMPLETION**

December 2016



## Evaluation of the James River Conservation Reserve Enhancement Program in South Dakota

Although much of the original wetland area in the lower 48 states of the United States has been lost, progress has been made in recent decades to reduce additional loss and restore wetlands in watersheds throughout the Midwest. The Conservation Reserve Enhancement Program (CREP) is a valuable tool for wetland conservation, focusing the enrollment of wetland acreage in regions of priority determined by each state. The United States Department of Agriculture introduced CREP in 1998, forming partnerships with state and nongovernmental organizations in an effort to address specific regional conservation priorities. In South Dakota, a CREP project was proposed and approved for the James River watershed. The program was intended to provide a variety of environmental benefits and improvements, such as reducing peak flooding, sediment, phosphorus, and nitrogen pollution, and channel stabilization. The program aims to provide habitat for breeding non-game wildlife, specifically bobolink, upland sandpiper, chestnut-collared longspur, western meadowlark, grasshopper sparrow, savannah sparrow, dickcissel, and sedge wren. Projections also indicate production of 285,000 pheasants and 60,000 ducks annually from the project. Further, this CREP project was unique in that all lands under contract would also be required to allow public use through South Dakota's Walk-in Area program. This project aims to assess effects of CREP on water quality in the James River, its tributaries, and watershed wetlands and evaluate functional and numerical responses of avifauna to the James River CREP program.

### FUNDING

South Game, Fish & Parks  
U.S. Fish and Wildlife Service  
South Dakota State University  
USGS, South Dakota Coop Unit

### INVESTIGATOR

Jarrett Pfrimmer, Ph.D. candidate

### FACULTY

J. Stafford, K. Bertrand, E. D. Stukel (GFP), M. Norton, and R. Murano (GFP)

### EXPECTED COMPLETION

December 2017



## **Modeling the Effects of Pattern Field Tiling on the Hydrology and Ecological Functioning of Prairie Pothole Wetlands**

Wetland managers throughout the Dakotas are witnessing an unprecedented increase in requests for drainage tile installation on USFWS wetland easement tracts, comprising some 1.4 million acres. For example, the USFWS Madison Wetland Management District currently has over 90 requests pending for potential tile placement on wetland easement tracts. Likewise, the number of wetland manipulation requests forwarded by landowners to the USDA Natural Resources Conservation Service in South Dakota has increased by over 400 percent since 2007. The westward expansion of drainage tile is a rapidly emerging issue that is posing immediate challenges to wetland conservation throughout the PPR. This project will modify an existing mathematical simulation model needed to assess the impacts of pattern tile drainage on wetland resources of the Prairie Pothole Region (PPR). Special emphasis will be placed on providing information critical to the USFWS wetland easement program throughout the U. S. portion of the PPR.

### **FUNDING**

U.S. Fish & Wildlife Service  
U.S. Geological Survey (RWO # 105)

### **FACULTY**

Carter Johnson

### **EXPECTED COMPLETION**

December 2013



## River Channel Restoration and Pecos Bluntnose Shiner Recruitment

The federally (USA) and state (NM, TX) threatened Pecos bluntnose shiner (*Notropis simus pecosensis*) persists in only one segment of the Pecos River, New Mexico. The biology of this species has been extensively studied and previous studies have suggested that the population is limited in part by downstream displacement of eggs and larvae during extended, high-discharge reservoir releases and by dewatering that occurs during drought periods when little or no water is released from upstream reservoirs, which limits suitable fluvial habitats occupied by larger juveniles and adults. Larger juvenile and adult Pecos bluntnose shiner are also restricted to unchannelized portions of the Pecos River, but factors causing this limitation are poorly understood. The purpose of this study is to assess factors associated with annual recruitment growth, and survival of young of year Pecos bluntnose shiners in unchannelized, channelized, and restored river reaches with emphasis on recruitment from nursery habitats to those typically occupied by adults.

### FUNDING

U.S. Bureau of Reclamation (RWO # 106)

### INVESTIGATOR

Darrel Mecham, M.S. candidate

### FACULTY

Brian Graeb and Chris Hoagstrom (Weber State)

### EXPECTED COMPLETION

December 2014



## **Integrated Regional Modeling of Land Use Change and Natural Vegetation Dynamics**

There is a current need for spatially explicit models that can simulate multiple drivers of land cover change, including land use transitions, land management practices, natural disturbances, and natural vegetation dynamics, at regional to continental scales. The land cover change models that are currently available typically incorporate only a subset of these processes and have been implemented across much smaller spatial extents. This research project will develop and test new methodologies for conducting integrated land cover change modeling for large-scale ecological assessments. The specific focus will be on extending the existing capabilities of an existing model (FORE-SCE) to incorporate natural disturbances (e.g., fire, insect outbreaks) and natural vegetation dynamics (e.g., responses to disturbance and succession). This work will provide new tools that can be used for scenario-based projections of land cover change at regional to continental levels, and will also lead to new scientific insights about how the interactions between human activities and natural processes will influence future pathways of land cover and land use change.

### **FUNDING**

U.S. Geological Survey (RWO # 109)

### **INVESTIGATOR**

Zhihua Liu, Postdoctoral Fellow

### **FACULTY**

Mike Wimberly

### **EXPECTED COMPLETION**

March 2015



## **An Assessment of Direct Mortality to Avifauna from Wind Energy Facilities in North Dakota and South Dakota**

Potential impacts of large wind energy developments to migratory and resident bird populations in the Prairie Pothole Region (PPR) within North Dakota and South Dakota remain poorly understudied even though 2,230 turbines are actively generating power in these states and numerous wind energy projects have been proposed for future development. Conservation agencies (both state and federal) entrusted with the protection of migratory birds and resident wildlife require empirical information to make informed decisions that minimize potential negative impacts to waterfowl, shorebirds, waterbirds, songbirds, galliformes, and raptor species that rely on large intact blocks of mixed-grass prairie and abundant wetlands to meet their life-history requirements. However, no information on potential direct mortality from wind turbines is available for the Missouri Coteau portion of the PPR across these avian guilds. Additionally, the Missouri Coteau is considered the most productive landscape for nesting waterfowl in North America. Because of the unique topographical characteristics of the Missouri Coteau and its importance to avian communities, site-specific information is in need to inform managers and wind energy developers regarding the siting of wind farms in areas whereby adverse impacts from direct mortality to birds are minimized.

### **FUNDING**

U.S. Geological Survey (RWO # 110)

### **INVESTIGATOR**

Bri Graff, M.S. candidate

### **FACULTY**

Troy Grovenburg, J. Stafford, J. Jenks, C. Swanson (USFWS), K. Jensen, R. Klaver (USGS), S. Kempema (GFP)

### **EXPECTED COMPLETION**

October 2015



## Assess the Current Status of Reintroduced Swift Fox in Southwestern South Dakota

Since establishing that restored swift fox (*Vulpes velox*) populations in western South Dakota were in jeopardy of extinction due to high potential mortality, an additional factor that could further affect population viability of swift foxes has colonized rangeland within the distribution of the species. Plague (*Yersinia pestis*) is now evident within black-tailed prairie dog (*Cynomys ludovicianus*) towns throughout western South Dakota. Although the relationship between swift foxes and prairie dogs is controversial, swift foxes have been documented consuming prairie dogs during the pup-rearing period. Swift fox prefer shorter vegetation structure and become displaced as a result of the lack of vegetative clipping provided by prairie dogs. Vegetation height likely impacts the ability of fox to detect predators, which will greatly affect survival. Since the highly successful reintroduction in this area, there has been an apparent decline in the local swift fox population that seems directly related to plague, recent weather patterns, and possibly increased coyote numbers. Nevertheless, no information on the status of swift foxes in western South Dakota has been collected since a viability analysis completed in 2011, which was based on data collected pre-colonization of plague. Consequently, the status of swift fox in areas where prairie dog towns have been decimated by plague, including the Badlands Region, is unknown. Therefore, the purpose of this study is to determine the current status of swift fox as it relates to the Badlands National Park area and the historic population in Fall River County in southwestern South Dakota. This region of the state is within the historic distribution of the species and is representative of the area of effect of previous successful restoration efforts for the species conducted during the past decade.

### FUNDING

U.S. Geological Survey (RWO # 111)

### INVESTIGATOR

Sarah Nevison, M.S. candidate

### FACULTY

J. Jenks, J. Stafford, E. Childers (NPS), J. Delger (NPS)

### EXPECTED COMPLETION

October 2016



## 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 understanding of the transmission dynamics of respiratory pathogens, believed to play a role in the etiology of this disease, is limited. The purpose of this study is to investigate aspects of these transmission processes, and specifically to determine if variability exists in the shedding rates of pathogens within individual bighorn sheep and the importance of this variability in sustaining the disease. Our hypothesis is that respiratory disease persists in bighorn sheep populations through infection of a small number of chronically infected or “super-shedder” animals that drive disease transmission in bighorn sheep herds. To test this hypothesis, we will capture free-ranging bighorn sheep with a known history of pathogen shedding and house them in a captive facility. We will then monitor their pathogen shedding patterns through time and classify individuals as either chronic, intermittent or non-shedders. Once we have established their shedding status we will perform commingling experiments of individuals from the various groups, and monitor shedding rates to determine if an individual’s shedding status changes based on its association with individuals exhibiting different shedding patterns. We will also monitor the effect of commingling on individual lamb survival. Through this experiment we hope to elucidate the importance of pathogen shedding patterns in bighorn sheep respiratory disease which will lead to the development of effective management strategies to recover bighorn sheep populations.

### FUNDING

U.S. Geological Survey (RWO # 113)

### INVESTIGATOR

Brandi Crider, M.S. candidate

### FACULTY

J. Jenks, D. Walsh (USGS), F. Cassirer (IDFG), T. Besser (WSU)

### EXPECTED COMPLETION

December 2016



Frances Cassirer

## TEACHING

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### STEVE CHIPPS

#### Spring 2014: *Trophic Ecology*

This course covered theoretical and applied aspects of aquatic food web management with an emphasis on lake ecosystems. Quantitative methods for food web analysis and applied approaches to food web management were major themes of the course. The course is intended for advanced students in fisheries and wildlife sciences, biology, or zoology.

#### Fall 2014: *Ecology of Aquatic Invertebrates*

This course covered the phylogeny, life-history, habitats and ecology of major freshwater invertebrates. Students developed an appreciation for biomonitoring theory and studied the impacts of exotic and invasive species.

### JOSHUA STAFFORD

#### Spring 2014: *Behavioral Ecology*

The course covered various aspects of animal behavior, exposing students to foundational basic and applied research to help students answer “why” questions in ecology. Students developed an appreciation for the intricacies of behavioral research, and how to apply behavioral studies to their own projects.

## AWARDS AND HONORS

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### ADAM JANKE, PH.D. STUDENT

Lloyd Fredrickson Memorial Scholarship (2014), Department of Natural Resource Management, South Dakota State University

### DAVID DESLAURIERS, PH.D. STUDENT

Outstanding Fisheries Graduate Student-Ph.D. (2014), Department of Natural Resource Management, South Dakota State University

*John E. Skinner Memorial Award – Honorable Mention*, 144<sup>th</sup> Annual Meeting of the American Fisheries Society, Quebec City, Canada

2014 Robert A. Klumb Travel Award, Missouri River Natural Resources Conference, Nebraska City, Nebraska

**LAURA HEIRONIMUS, M.S. STUDENT**

*John F. Skinner Memorial Award, 144<sup>th</sup> Annual Meeting of the American Fisheries Society, Quebec City, Quebec.*

*Robert A. Klumb Memorial Award, 2014 Meeting of the Dakota Chapter American Fisheries Society, Chamberlain, SD.*

2014 Robert A. Klumb Travel Award, Missouri River Natural Resources Conference, Nebraska City, Nebraska

**TOBIAS RAPP, PH.D. STUDENT**

*2014 Robert A. Klumb Award for Habitat, Aquatics, and Management of the Missouri River System (HAMMS), Department of Natural Resource Management, South Dakota State University.*

**NATALIE SCHEIBEL, M.S. STUDENT**

*John F. Skinner Memorial Award, 144<sup>th</sup> Annual Meeting of the American Fisheries Society, Quebec City, Quebec.*

**SCIENTIFIC PRESENTATIONS**

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Cressey, R.L., J.E. Austin, and J.D. Stafford. 2014. Changes in wetland plant communities and wetland conditions in the Prairie Pothole Region after 50 years. Joint Aquatic Sciences Meeting, Portland, Oregon.

Cressey, R.L., J.E. Austin, and J.D. Stafford. 2014. Changes in wetland plant communities and wetland conditions in the Prairie Pothole Region after 50 years. Midwest Fish and Wildlife Conference, Kansas City, Missouri.

Davis, J., J.W. Wilhite, and S.R. Chipps. 2014. Mink predation of brown trout in a Black Hills stream during a radio telemetry study. 50<sup>th</sup> Annual Meeting Dakota Chapter of the American Fisheries Society, Chamberlain, South Dakota.

- Deslauriers, D., L. Heironimus, T. Rapp, B.D. Graeb, R.A. Klumb, and S.R. Chipps. 2014. Development and application of a spatially explicit growth model for *Scaphirhynchus* spp. larvae. 50<sup>th</sup> Annual Meeting Dakota Chapter American Fisheries Society, Chamberlain, South Dakota.
- Deslauriers, D., L. Heironimus, T. Rapp, B.D. Graeb, R.A. Klumb, and S.R. Chipps. 2014. Development and application of a spatially-explicit growth model for age-0 pallid sturgeon. 144<sup>th</sup> Annual Meeting of the American Fisheries Society, Quebec City, Quebec, Canada.
- Deslauriers, D., L. Heironimus, B. Graeb, R. Klumb, and S. Chipps. 2014. Development and application of a spatially explicit growth model for age-0 *Scaphirhynchus* species. Missouri River Natural Resources Conference, Nebraska City, Nebraska.
- Galinat, A., J. Kientz, S.R. Chipps, and J. Davis. 2014. Growth Potential and Population Dynamics of Yellow Perch (*Perca flavescens*) in Deerfield Reservoir. 50<sup>th</sup> Annual Meeting Dakota Chapter American Fisheries Society, Chamberlain, South Dakota.
- Gigliotti, L. M. 2013. Wildlife Value Orientations of South Dakota Citizens. Presented at Walleyes Unlimited monthly meeting. Sioux Falls, South Dakota.
- Gigliotti, L. M. 2014. Human dimensions of habitat loss in the Plains and Prairie Pothole LCC. The Prairie Pothole Joint Venture 2014 Summer Management Board Meeting. Ft. Pierre, South Dakota.
- Gigliotti, L. M. 2014. 2013 Fishing Season: Selected Summary Results. GFP Summer Fisheries Meeting. Brookings, South Dakota.
- Gigliotti, L. M. 2014. Wildlife Value Orientations: South Dakota Farmers/Ranchers 2012. PPP-LCC "Connections II" Workshop. Billings, Montana.
- Gigliotti, L. M. 2014. Human dimensions of habitat loss in the Plains and Prairie Pothole Region: Proposed research. 50<sup>th</sup> Annual Meeting Dakota Chapter of the American Fisheries Society, Chamberlain, South Dakota.
- Gigliotti, L. M. 2014. Public perceptions of mountain lions and their management in South Dakota (2002 - 2012). The Wildlife Society, South Dakota Chapter Annual Meeting, Chamberlain, South Dakota.
- Heironimus, L.B., D. Deslauriers, D.L. Galat, T. Rapp, B.D. Graeb, R.A. Klumb, S.R. Chipps. 2014. Development of a larval pallid sturgeon bioenergetics model. 144<sup>th</sup> Annual Meeting of the American Fisheries Society, Quebec City, Quebec, Canada.

- Heironimus, L., D. Deslauriers, B. Graeb, R. Klumb, and S. Chipps. 2014. Development of a larval pallid sturgeon bioenergetics model. Missouri River Natural Resources Conference, Nebraska City, Nebraska.
- Heironimus, L., D. Deslauriers, and S.R. Chipps. 2014. The development of a larval Pallid Sturgeon bioenergetics model. 50<sup>th</sup> Annual Meeting Dakota Chapter American Fisheries Society, Chamberlain, South Dakota.
- Hennig, J.D., T.J. Benson, J.D. Stafford, A.P. Yetter. 2014. Estimating Non-breeding Waterfowl Abundance in the Lower Wabash River Region Using a Grid-based Aerial-Sampling Approach. The Wildlife Society's 20<sup>th</sup> Annual Conference, Milwaukee, Wisconsin.
- Henderson, K., and Gigliotti, L. M. 2014. Statewide angler surveys: Is an Internet sample more representative than we thought? 50<sup>th</sup> Annual Meeting Dakota Chapter of the American Fisheries Society, Chamberlain, South Dakota.
- Janke, A. K., M. J. Anteau, and J. D. Stafford. 2014. Nutrient dynamics of pre-breeding blue-winged teal in eastern South Dakota. Annual Meeting of the South Dakota Chapter of The Wildlife Society, Oacoma, South Dakota.
- Janke, A. K., M. J. Anteau, and J. D. Stafford. 2014. Nutrient accumulation during early-onset of rapid follicle growth in an income-breeding duck. Midwest Fish and Wildlife Conference, Kansas City, Missouri.
- Janke, A. K., M. J. Anteau, and J. D. Stafford. 2013. Nutrient accumulation during early-onset of rapid follicle growth in an income-breeding duck. South Dakota Ornithological Union Annual Meeting, Pierre, South Dakota.
- Janke, A. K., J. D. Stafford, M. J. Anteau, and R. Murano. 2013. Evaluating wetland-ecosystem health in the Prairie Pothole Region using real-time nutrient dynamics of waterfowl – Project Update. South Dakota Department of Game, Fish & Parks Fall Wildlife Staff Meeting, Madison, South Dakota.
- Jessee, Z., N. Scheibel, and S.R. Chipps. 2014. Seasonal largemouth bass diets in Pactola Reservoir. 50<sup>th</sup> Annual Meeting Dakota Chapter American Fisheries Society, Chamberlain, South Dakota.
- Kientz, J., J. Davis, J.W. Wilhite, S.R. Chipps, and G. Simpson. 2014. The Effect of Environmental Factors on the Movement of Rainbow Trout in the Deerfield Reservoir System. 50<sup>th</sup> Annual Meeting Dakota Chapter of the American Fisheries Society, Chamberlain, South Dakota.

Rapp, T., S.R. Chipps, B.D.S. Graeb, and R.A. Klumb. 2014. Growth and survival of pallid sturgeon larvae in response to different prey types. Missouri River Natural Resources Conference, Nebraska City, Nebraska.

Rapp, T., S.R. Chipps, B.D.S. Graeb, and R.A. Klumb. 2014. Growth and survival of age-0 pallid sturgeon in the Lewis and Clark Delta. Missouri River Natural Resources Conference, Nebraska City, Nebraska.

Scheibel, N.C. and S.R. Chipps. 2014. Bioenergetics Modeling of Trophic Interactions and Predatory Demands in Pactola Reservoir, South Dakota. 144<sup>th</sup> Annual Meeting of the American Fisheries Society, Quebec City, Quebec, Canada.

Scheibel, N.C. and S.R. Chipps. 2014. Pactola Reservoir: Current Status and Future Outlook. South Dakota Department of Game, Fish and Parks Summer Fish. Dakota Nature Center, Brookings, South Dakota.

Scheibel, N.C. and S.R. Chipps. 2014. Lake Trout and Northern Pike in Pactola Reservoir. Public Seminar. South Dakota Department of Game, Fish and Parks Outdoor Campus, Rapid City, South Dakota.

Scheibel, N.C., and S.R. Chipps. 2014. Foraging Patterns of Lake Trout and Northern Pike in Pactola Reservoir, SD. 50<sup>th</sup> Annual Meeting Dakota Chapter American Fisheries Society, Chamberlain, South Dakota.

## **WORKSHOPS & TRAINING**

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### **S. Chipps:**

*Instructor*, Enhancing Scientific Communication Workshop, Annual Meeting of the Dakota Chapter American Fisheries Society, Chamberlain, SD. February, 2014.

*Instructor*, Motorboat Operator Certification Course (MOCC), Brookings, SD. April, 2014.

*Instructor*, Motorboat Operator's Certification Course (MOCC), Brookings, SD. May, 2014.

### **J. Stafford:**

*Instructor*, ATV Safety: USGS Off-Road Utility Vehicle Safety Training (ORUV) ATV/UTV, Brookings, SD. May 2014.

## TECHNICAL AND POPULAR PUBLICATIONS

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Scheibel, N., and S.R. Chipps. 2014. Lake trout in South Dakota. *South Dakota Conservation Digest* 81:10-12.

## SCIENTIFIC PUBLICATIONS

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Behney, A. C., R. O'Shaughnessy, M. W. Eichholz, and J. D. Stafford. 2014. Influence of item distribution pattern and abundance on efficiency of benthic core sampling. *Wetlands*. DOI 10.1007/s13157-014-0570-x.

Davis, J.L., M.E. Barnes, J.L. Kientz, and A.G. Galinat. 2014. Effects of fish length and anatomical placement on retention of visible implant tags in hatchery-reared rainbow trout. *North American Journal of Fisheries Management* 34:932-937.

Dembkowski, D.J., S.R. Chipps, and B.G. Blackwell. 2014. Response of walleye and yellow perch to water-level fluctuations in glacial lakes. *Fisheries Management and Ecology* 21:89-95.

Fincel, M.J., D.J. Dembkowski, and S.R. Chipps. 2014. Influence of variable rainbow smelt and gizzard shad abundance on walleye diets and growth. *Lake and Reservoir Management* 30:258-267.

Fincel, M.J., D.A. James, S.R. Chipps and B.A. Davis. 2014. Using cumulative diet data and stable isotope analysis to determine trophic position of walleye *Sander vitreus* in a large, complex system. *Journal of Freshwater Ecology* 29:441-447.

French, W.E., B.D.S. Graeb, S.R. Chipps, and R.A. Klumb. 2014. Vulnerability of age-0 pallid sturgeon *Scaphirhynchus albus* to predation: effects of predator type, turbidity, body size, and prey density. *Environmental Biology of Fishes* 97:635-646.

Gigliotti, L. M., and A. Dietsch. 2014. Does age matter? The influence of age on response rates in a mixed-mode survey. *Human Dimensions of Wildlife* 19: 280-287.

Gigliotti, L.M., and C. Huxoll. 2014. Human dimensions and economic values of waterfowl hunting in South Dakota. Pages 335-350 in K.C. Jensen, K. F. Higgins, and S. J. Vaa., compilers. A history of waterfowl management, research, and hunting in South Dakota. South Dakota Department of Game, Fish and Parks, Pierre.

Gray, M. J., H. M. Hagy, J. A. Nyman, and J. D. Stafford. 2013. Management of wetlands for wildlife. Pages 121-180 in J. T. Anderson and C. A. Davis, editors. *Wetland Techniques: Volume 3: Applications and Management*. Springer Science. DOI 10.1007/978-94-007-6907-6\_4.

- Hagy, H. M., A. P. Yetter, K. W. Stodola, M. M. Horath, C. S. Hine, M. P. Ward, T. J. Benson, R. V. Smith, and J. D. Stafford. 2014. Stopover duration of mallards during autumn in the Illinois River valley. *Journal of Wildlife Management* 78:747–752.
- Hayer, C.A., B.M. Holcomb, and S.R. Chipps. 2013. Association between iron concentration and productivity in Montane streams of the Black Hills, South Dakota. *The Prairie Naturalist* 45:68-76.
- James, D.A., K. Mosel, and S.R. Chipps. 2014. The influence of light, stream gradient and iron on *Didymosphenia geminata* bloom development in the Black Hills, South Dakota. *Hydrobiologia* 721:117-127.
- Levengood, J. M., R. V. Smith, D. A. Gay, M. A. Davis, and J. D. Stafford. 2014. Mercury in migrating shorebirds in the Illinois River valley. *Waterbirds* 37:225–229.
- Mammenga, P. D., J. D. Stafford, and M. Grovijahn. 2014. Waterfowl Nesting Structures. Pages 277-308 in K. C. Jensen, K. F. Higgins and S. J. Vaa, editors. A History of Waterfowl Management, Research, and Hunting in South Dakota.
- O’Neal, B. J., J. D. Stafford, and R. P. Larkin. 2014. Migrating ducks in inland North America ignore major rivers as leading lines? *Ibis*. DOI 10.1111/ibi.12193.
- Pearse, A. T. and J. D. Stafford. 2014. Error propagation in energetic carrying capacity models. *Journal of Conservation Planning* 10:17–24.