IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Office of Sponsored
Programs Administration
1138 Pearson Hall
505 Morrill Road
Ames, Iowa 50011-2103
Phone: 515 294-5225
Fax: 515 294-8000

June 6, 2017

Louise Mauldin
Fisheries Biologist
US Fish and Wildlife Service
La Crosse Fish and Wildlife Conservation Office
Midwest Fisheries Center
555 Lester Ave, Onalaska, WI

Proposal Title: Inventory of coldwater streams and associated fish communities in the Iowa Driftless Region
Period of Performance: December 1, 2017 – June 30, 2019
Requested Amount: $55,000
Cost Sharing Amount: $0

Dear Ms. Mauldin:

On behalf of Iowa State University and Dr. Michael Weber, I am pleased to endorse the enclosed application for funding. It has been reviewed and approved by the appropriate programmatic and administrative personnel at Iowa State University. If the proposal is selected for funding, Iowa State University is committed to fulfilling all commitments made in the grant application.

Iowa State University certifies it is in compliance with 42 CFR Part 50 SubPart F. Iowa State University will comply with its policy relating to the disclosure of Significant Financial Interests and will report all identified Financial Conflicts of Interest to the awarding entity.

Sincerely,

Sandra K Clark
Pre-Award Administrator
grants@iastate.edu

ATTACHMENT TO PROPOSAL TRANSMITTAL LETTER

(The following general information is provided to assist potential Sponsors. It is recognized that some information may not be applicable to this specific proposal and, if inappropriate, should be disregarded.)

1. **All correspondence should be mailed to:**
   Iowa State University
   Office of Sponsored Programs Administration
   1138 Pearson Hall
   505 Morrill Road
   Ames, IA 50011-2103

   Phone: 515-294-5225
   Fax: 515-294-8000
   Email: grants@iastate.edu

2. **University Contacts: 515-294-5225**
   Director (grants@iastate.edu)
   Becky Musselman

   Proposal Team (ospa-proposals@iastate.edu) for all pre-award issues
   Andrea Rich, Kirsten Abel, Lynn Bagley, Sandy Clark, Michelle Vogt

   Awards Team (ospa-awards@iastate.edu): award issues for all non-industry or non-commodity sponsors
   Tammy Polaski, John Gilmour, Keith Kutz, Marva Ruther, Pamela Helfer, Kristy Stallmann, Aaron Lott

   Industry Team (Industry-contracts@iastate.edu) award issues for all industry or commodity sponsors
   Laura Carabillo, Peter Gudlewski, Lynne Mumm, May Wu, Mary Bonvillain

3. **Contract/Grant payments should be mailed to:**
   Sponsored Programs Accounting Office
   Iowa State University
   3609 Administrative Services Building
   Ames, IA 50011-3609

   Phone: 515-294-4569
   Fax: 515-294-6470
   Email: **spa@iastate.edu**

4. **DUNS:** 005309844 **FEIN**: 42-600-4224 **Cage Code**: 5J949

5. **Cognizant Federal Agency:**
   Division of Cost Allocation
   Dept. of Health and Human Services (DHHS)
   Arif Karim, Director
   1301 Young Street, Room 732
   Dallas, TX 75202
   Phone: 214-767-3261

   Rates:

	EFFECTIVE PERIOD				
TYPE	**FROM**	**TO**	**RATES(%)**	**LOCATION**	**APPLICABLE TO**
PRED.	07/01/2016	06/30/2018	52.00	On Campus	Organized Research
PRED.	07/01/2018	06/30/2020	53.00	On Campus	Organized Research
PRED.	07/01/2012	06/30/2016	53.00	On Campus	Instruction
PRED.	07/01/2012	06/30/2016	33.00	On Campus	Other Sponsored Activities
PRED.	07/01/2012	06/30/2016	26.00	Off Campus	All Programs
PROV.	07/01/2016	Until Amended		Use same rates and conditions as cited for FYE 6/30/18	

Additional institutional information can be found on our website at:
http://www.ospa.iastate.edu/proposal/institutional.html

Announcement Number: FY17AS00016

Study Title: Inventory of coldwater streams and associated fish communities in the Iowa Driftless Region

Primary investigator: Dr. Michael J. Weber

Project Narrative:

Coldwater streams occuring throughout the Paleozoic Plateau (Driftless Region) of Northeast Iowa (Figure 1) are unique resources. However, little effort has been directed towards locating and cataloging these resources. Typically, coldwater streams are located on private property in remote areas and are small in size, making them difficult to access. Additionally, these systems are often overlooked during Surface Water Classification as intermittent, headwater streams or are misclassified as warmwater streams. Consequently, little is known about coldwater streams in Iowa, making it difficult to manage these unique resources. Small coldwater streams often contain unique and diverse coldwater fish communities, possibly including the iconic, native Brook Trout, state listed as a species of greatest conservation need. As climate change threatens coldwater fisheries and introduces new challenges to fisheries management, it is increasingly important to understand the fish communities found in these unique coldwater systems and how they change temporally.

One of the many reasons that the Driftless Region of northeastern Iowa is unique is that it represents the southwestern edge of the Brook Trout's native range. While Brook Trout were once common in the Driftless Region, they nearly disappeared throughout much of the region by the 1970s (Thorn and Ebbers 1997). In Iowa, the South Pine population of Brook Trout is the only relict population known to currently exist. Yet, fish surveys in other locations where remnant Brook Trout populations may persist are rare and no information exists regarding the current status of Brook Trout in Iowa. Determining if and where Brook Trout populations have persisted or increased within the Driftless Region of Iowa will allow for improved management of this unique species.

Native Brook Trout face many threats, including climate change, land use change, and the introduction of nonnative fishes. Consequently, Brook Trout populations are challenging to manage. Brook Trout are a coldwater fish predicted to decline as a result of climate change, particularly at the southern edge of their range (Lyons et al. 2010). Yet, recent surveys in Minnesota indicate that Brook Trout occurrence in coldwater streams increased from 3% in the 1970 to nearly 70% by 2010 (Hoxmeier et al. 2015). Stream discharge was positively related to Brook Trout abundance, size at maturity, and body size in the Driftless Area of Minnesota, possibly due to its mitigating effects on climate change (Hoxmeier et al. 2015).

In addition to climate change, land use changes may also have substantial effects on Brook Trout and synergistically interact with the effects of climate change. Much of Iowa has experienced substantial land use modification, as land has been converted to row crop agriculture. Consequently, land use changes in Iowa have been associated with declines in native fishes (Hughes et al. 1990; Gallant et al. 2011). Restoring riparian corridors and instream habitat may mitigate the effects of land use and improve Brook Trout populations (Slevers et al. 2017). However, little is known about relationships between abiotic habitat characteristics and Brook Trout populations, particularly in the Driftless Region. In addition to abiotic factors, native Brook Trout populations can also be negatively affected by biotic factors, including the introductions of Brown Trout and Rainbow Trout (Larson and Moore 1985; Fausch 2008) that are commonly stocked throughout the Driftless Region as a result of competition for resources.

Due to the wide array of factors potential influencing Brook Trout and the limited amount of information available on them, an assessment of the current distribution of Brook Trout is needed. Further, understanding relationships among a suite of biotic and abiotic factors and Brook Trout populations would facilitate management actions promoting the persistence of these important remnant populations.

Goals and Objectives:

The objectives of this project are to examine Brook Trout populations in the Driftless Area of northeastern Iowa to 1) evaluate the current spatial distribution of their populations, 2) quantify population characteristics (e.g., abundance, body size, condition), and 3) evaluate effects of biotic and abiotic factors on their distribution and population characteristics.

Project Activities, Methods, and Timetable:

Coldwater stream fish communities in Winneshiek, Allamakee, and Clayton counties of Northeast Iowa (Figure 1) will be sampled using single or tandem backpack electrofishing units. Sites where Brook Trout were historically documented will be targeted and additional coldwater stream sites will be randomly selected. Three transects a minimum of 35 times the mean stream width will be sampled at each location (Hoxmeier et al. 2015). Individual fish will be identified to species, measured (mm), weighed (g), and if Brook Trout are present, an adipose fin clip will be taken for genetic analysis (to be completed at a later date as part of a separate project if funding becomes available). Aging structures (e.g. scales) will be removed from all trout. Brook Trout abundance will be calculated as the number of individuals captured per hour of electrofishing and per km of stream.

Water quality measurements for stream sites will consist of temperature (°C), dissolved oxygen (mg/L), conductivity (mS/cm; Yellow Springs Instruments, Professional Series model 2030), and pH (Thermo Fisher Scientific, model pHTestr 10). Turbidity (NTU) will be determined using a Hach 2100Q portable turbidimeter. These measurements will be taken before any fish or habitat data are collected to minimize water quality contamination due to stream disturbance.

Habitat characteristics will be measured following a slightly modified version of the Iowa Department of Natural Resources wadeable streams procedure. At stream sites, each sampling reach will consist of ten equally spaced transects where measurements will be taken. At each transect, a tape measure will be stretched across to obtain a wetted width. Next, depth (m), velocity (m/sec), and substrate type will be determined at 10, 30, 50, 70, and 90% of the width (Figure 2). Stream velocity will be measured using a Marsh McBirney Flow-mate 2000 flow meter at 60% of the depth if <0.75m or 20% and 80% of the depth and averaged if ≥0.75m. Density of in-stream cover (i.e., macrophytes, filamentous algae, woody debris, tree roots, boulders, over-hanging banks, under-cut banks, and artificial structure) will be measured by visual estimate within an area 5m upstream and 5m downstream of each transect line. Estimates will be recorded as either absent (0%), sparse (<10%), moderate (10-40%), heavy (40-75%), or very heavy (>75%). Measurements taken at each bank of each transect will include bank angle by clinometer, percent bare stream bank by visual estimate, and canopy cover by spherical densitometer facing upstream.

Two mini-transects will be located at 33% and 67% of the distance between two transects (Figure 2). At mini-transects, thalweg depth will be measured and presence of soft or small sediment (e.g., fine gavel, sand, silt, clay, and muck) will be determined. Macrohabitat will be characterized at each transect and mini-transect as pool, riffle, or run. For the purposes of this study we will use the following definitions for each macrohabitat as described by Sponholtz and Rinne (1997). Pools are described as typically being the deepest sections of a stream and having little or no surface velocity. Pools tend to have fine gravel, sand, and silt substrates. Riffles are defined as shallow, swift areas with a large amount of surface turbulence. Riffles tend to have larger gravel and cobble substrates with boulders commonly present. Runs are typically described as being deeper and slower than riffles and shallower and swifter than pools. Gravel, cobble, and sand are common substrates of run macrohabitats.

Riparian vegetation will be visually estimated at transects 1, 5, and 10 in an area 5m upstream and downstream and 10m out into the riparian area from each transect (Figure 2). Type (i.e., deciduous, coniferous, broadleaf evergreen, mixed, or none) and density of vegetation will be estimated for the canopy (>5m), understory (0.5-1.5m), and ground cover (<0.5m) on each bank and recorded as either absent (0%), sparse (<10%), moderate (10-40%), heavy (40-75%), or very heavy (>75%). Last, we will assess any human influence to the area and its proximity to the stream at transects 1, 5, and 10. Human influences to be examined are walls/dams, buildings, confinement operations, open feedlots, pavement, roads/railroads, pipes, landfills, parks/lawns, row crops, range/pastures, logging activity, and mining activity. Each human influence category will be recorded as not present (0), on the bank (B), within 10m of the stream (C), between 10-30m from the stream (D), or greater than 30m from the stream (P).

Schedule of Work:

The graduate student will be hired to start in January 2018. Field work for the first season will occur May-August 2018. Preliminary data analysis will occur August-December 2018, cumulating in an annual report. Additional field sampling will occur May-August 2019 if additional funding becomes available.

Anticipated Benefits:

Student educational opportunities

The research project will allow a graduate student to gain extensive field, analytical, and technical writing experience, resulting in a MS degree. The project will also result in training of several undergraduate students in appropriate field sampling methods and data collection and management. The graduate student will have opportunities to present their results at regional and national scientific meetings and publish their work in peer-reviewed scientific journals.

Stream/Watershed-Level Ecological Benefits

Understanding the distribution of coldwater habitats and relict Brook Trout populations throughout Northeast Iowa will better inform management decisions by several conservation organizations. By understanding where important habitats and species remain, we can direct watershed and stream restoration emphasis towards these areas. Future trout stocking can be limited or eliminated in areas where relict populations of Brook Trout exist. If a coldwater resource is successfully located, it will be submitted for designation through the State of Iowa's Cold Water Use Designation Assessment Protocol.

If applicable, how does the project address climate change adaptation.

By encouraging conservation practices on the ground in areas with relict Brook Trout populations, we can buffer the effects of climate change to preserve these unique populations. Collaborative work by conservation partners can prioritize these areas for conservation practices that will dampen the effects of increased air temperatures and higher intensity precipitation events. For example, if three previously unknown relict populations of Brook Trout are discovered in a watershed then additional conservation practices (e.g., terracing, grassed waterways, sediment retention basins) can be offered to local landowners in an effort to protect those coldwater aquatic habitats.

Deliverables:

This project will provide a number of deliverables to the Iowa DNR and US Fish and Wildlife Service in the students MS thesis which will serve as the final project report, including 1) the current distribution of remnant Brook Trout in Winneshiek, Allamakee, and Clayton counties of Northeast Iowa, 2) population characteristics of Brook Trout, 3) relationships among biotic and abiotic factors and Brook Trout populations, and 4) summary of general fish communities at sampling locations. It is anticipated that this project will generate annual reports, informal and professional presentations to the public in NE Iowa and scientific societies, one MS thesis, and peer reviewed publications.

Stakeholder Coordination/Involvement

We will work closely with the Iowa Department of Natural Resources (DNR) and US Fish and Wildlife Service to coordinate sampling efforts, share results, and discuss research opportunities and management implications. We will also disseminate results to stakeholders at local, state, regional, and national professional conferences.

Description of Entities Undertaking the Project

Project will take place at Iowa State University, a land grant institution established in 1858. The University has a long history of a strong fisheries research program. Dr. Michael Weber (339 Science Hall II, Iowa State University, Ames, IA 50011, mjw@iastate.edu, 515-294-7344) will oversee the day-to-day activities associated with the project.

Budget Justification

Personnel ($32,086) – One MS student will be hired to be conduct field work, analyze data, and write reports at a rate of $2,000 a month with a 3% annual raise. Fringe rates are 9.8% for graduate students. One summer field technician will be hired to help conduct field work at a rate of $1,900/month for 3 months with a fringe rate of 0.6%.

Travel ($5,500) – A 4-wheel drive truck will be rented at a rate of $0.49/ mile for the summer for travel to field sampling sites. Summer housing will be rented for the graduate student in NE Iowa near sampling sites at a rate of $750/month.

Other direct costs ($7,533) – Other direct costs include a computer to enter, store, and analyze data and write reports, and graduate student tuition.

Indirect costs ($6,768) – The allowable adjusted indirect cost rate of 15% for USFWS through the USGS Coop Unit was used to calculate indirect costs.

Total to ISU - $51,887

IDC to USGS Cooperative Unit ($3,113) – The USGS Coop Unit charges 6% assessment rate for reimbursable agreements with the USFWS.

Total Project Budget - $55,000

Literature cited

Fausch, K. D. 2008. A paradox of trout invasions in North America. Biological Invasions 10: 685–701.

Gallant, A.L., W. Sadinski, M.F. Roth, and C.A. Rewa. 2011. Changes in historical Iowa land cover as context for assessing the environmental benefits of current and future conservation efforts on agricultural lands. Journal of Soil and Water Conservation 66: 67A-77A.

Hoxmeier, J. H., D. J. Dieterman, and L. M. Miller. 2015. Brook Trout distribution, genetics, and population characteristics in the Driftless Area of Minnesota. North American Journal of Fisheries Management 35: 632-648,

Hughes, R. M., T. R. Whittier, C. M. Rohm, and D. P. Larsen. 1990. A regional framework for establishing recovery criteria. Environmental Management 14: 673-683.

Iowa Department of Natural Resources. 2015a. Biological sampling and physical habitat assessment standard operating procedure for Iowa wadeable streams and rivers. Revision 2.0.

Larson, G. L., and S. E. Moore. 1985. Encroachment of exotic Rainbow Trout into stream populations of native Brook Trout in the southern Appalachian mountains. Transactions of the American Fisheries Society 114: 195–203.

Lyons, J., J. S. Stewart, and M. Mitro. 2010. Predicted effects of climate warming on the distribution of 50 stream fishes in Wisconsin, U.S.A. Journal of Fish Biology 77: 1867–1898.

Sponholtz, P. J. and J. N. Rinne. 1997. Refinement of aquatic macrohabitat definition in the Upper Verde River, Arizona. Hydrology and Water Resources in Arizona and the Southwest.

Thorn, W. C., and M. Ebbers. 1997. Brook Trout restoration in southern Minnesota. Pages 188–192 in R. E. Gresswell, P. Dwyer, and R. H. Hamre, editors. Wild trout VI: putting the native back in wild trout. Wild Trout Symposium, Bozeman, Montana.

Figure 1. Driftless Area (left, green) located in Minnesota, Wisconsin, Iowa, and Illinois and Allamakee, Clayton, and Winneshiek counties located in northeastern Iowa (right, orange) where proposed work would occur.

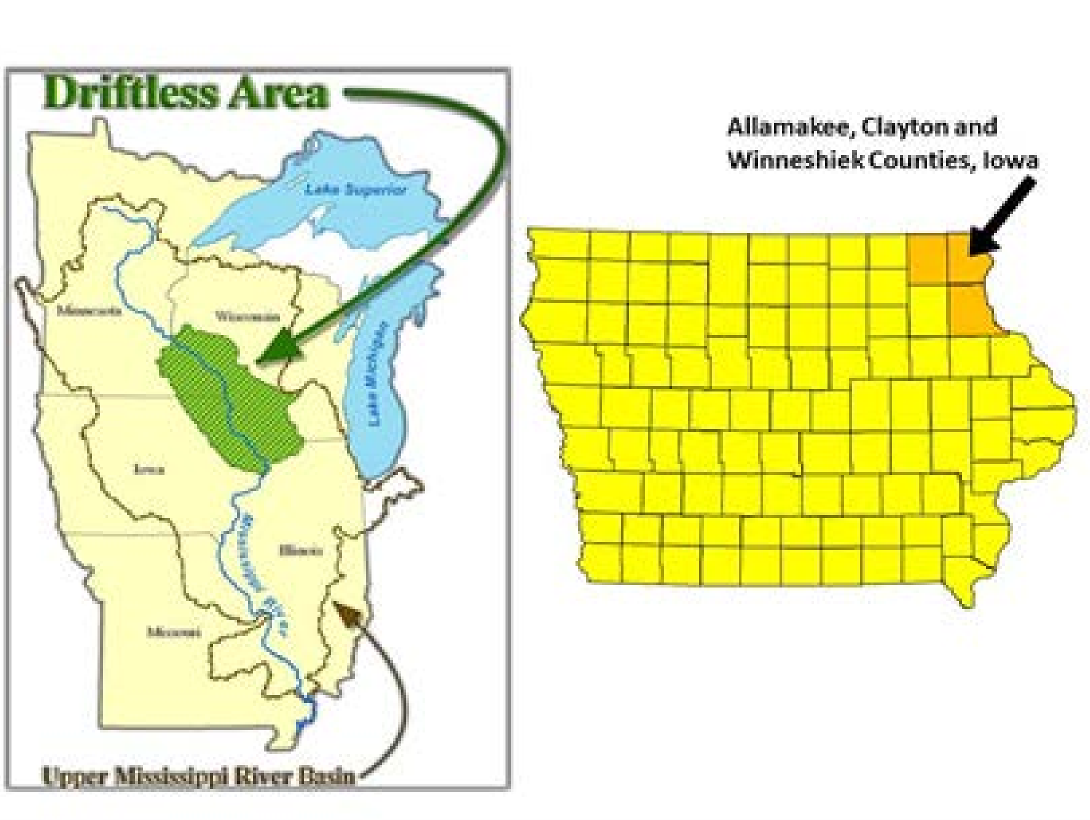
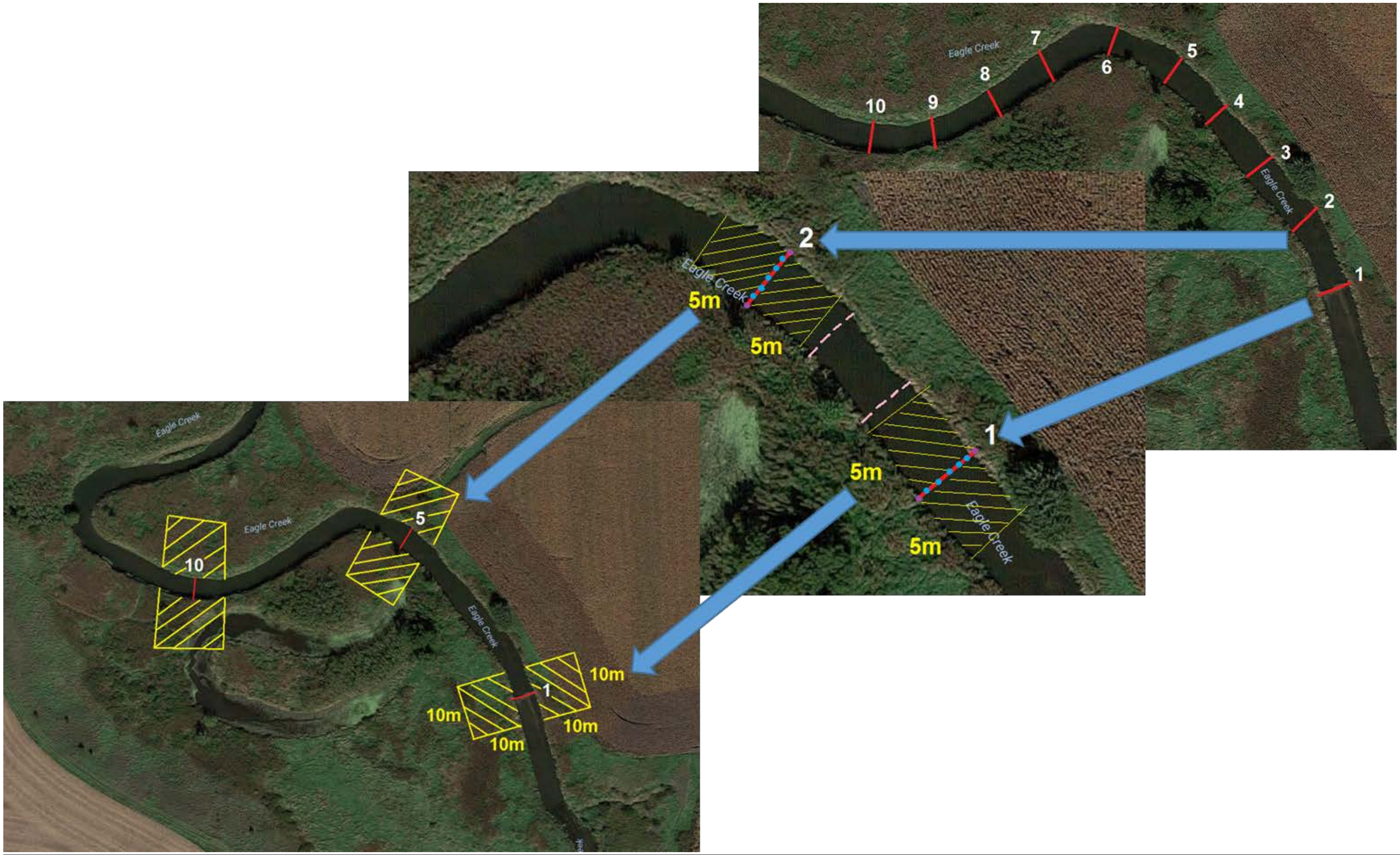


Figure 2. Example of transects for water chemistry (upper right), aquatic habitat (middle), and riparian habitat (lower left) at each stream site.



BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 01/31/2019

SECTION A - BUDGET SUMMARY

	Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
			Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1.	USFWS NFHP DARE FY17	FY17AS00016	$	$	$ 55,000.00	$	$ 55,000.00
2.							
3.							
4.							
5.	Totals		$	$	$ 55,000.00	$	$ 55,000.00

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total
	(1)	(2)	(3)	(4)	(5)
	USFWS NFHP DARE FY17				
a. Personnel	$ 29,700.00	$	$	$	$ 29,700.00
b. Fringe Benefits	8,351.00				8,351.00
c. Travel	5,500.00				5,500.00
d. Equipment	0.00				
e. Supplies	1,568.00				1,568.00
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges (sum of 6a-6h)	45,119.00				$ 45,119.00
j. Indirect Charges	9,881.00				$ 9,881.00
k. TOTALS (sum of 6i and 6j)	$ 55,000.00	$	$	$	$ 55,000.00
7. Program Income	$	$	$	$	$

Authorized for Local Reproduction

SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8. USFWS NFHP DARE FY17	$ 55,000.00	$	$	$ 55,000.00
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	$ 55,000.00	$	$	$ 55,000.00

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 55,000.00	$ 13,750.00	$ 13,750.00	$ 13,750.00	$ 13,750.00
14. Non-Federal	$				
15. TOTAL (sum of lines 13 and 14)	$ 55,000.00	$ 13,750.00	$ 13,750.00	$ 13,750.00	$ 13,750.00

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS)			
	(b)First	(c) Second	(d) Third	(e) Fourth
16. USFWS NFHP DARE FY17	$	$	$	$
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$	$	$	$

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges: $45,119

22. Indirect Charges: $9,881

23. Remarks: IDC are split between Iowa State University (15%) and USGS (6%).