WATERSHED INTEGRITY REVIEW & EVALUATION (WIRE)
PROJECT COVER SHEET

Submission Date: March 27, 2014

Project Title: Long-term monitoring of biochemical and physical processes in the Henry's Fork and tributaries

Sponsoring Agency/Entity: Henrys' Fork Foundation

Responsible Individual: Rob Van Kirk

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Subwatershed: Upper and Lower Henrys Fork hydrologic units

Project Location: Henrys Fork from Mack's Inn to N.F. Teton, Buffalo River, Fall River, Warm River

Other Agencies & Individuals Involved:

Agencies, NGOs and/or private landowners who have river access at desired monitoring locations

Collaboration with any interested agencies, NGOs and private entities will be welcomed.

Estimate of Project Duration: Three years for full installation of monitoring network. Long-term (10+ years) operation, maintenance, and data analysis after installation.

Requested Assistance from the Council: (Check All That Apply)

We are requesting WIRE endorsement for this project to: 1) share our plans and project goals with stakeholders and agencies before we implement the project, 2) provide Council participants with an opportunity to provide technical input, 3) advertise the availability of the data and our interest in sharing it, and 4) illustrate to potential funders that the project has been reviewed by watershed stakeholders.

__X__ WIRE Endorsement/Letter of Support
_____ Financial Assistance (budget attached)
_____ Legislative/Political Assistance (specify)
_____ Basic Project Design (in response to a new problem)
_____ Technical Review Only (for ongoing projects)
__X__ Other: We welcome any assistance with logistics, access, and laboratory analysis that parties are willing and able to provide.

Brief Project Summary (Cover the following: Goals or objectives, benefits, urgency, potential impacts, post-project monitoring and implications if no action taken. Use up to 2 additional sheets if necessary. Use the watershed integrity criteria for guidance in preparing the background discussion).

Background and Need
Recreational fishing for trout in the Henry's Fork and its tributaries is a major contributor to local and regional economies. In collaboration with numerous agency, non-governmental, and private partners, the Henry's Fork Foundation (HFF) works to maintain high-quality wild trout fisheries in the Henry's Fork and its tributaries, while also ensuring the

sustainability of other economically important activities such as irrigated agriculture and hydroelectric power generation. The abundance and size of wild trout, as well as the abundance of organisms on which trout feed, are determined in large part by river flow and the physical and biochemical properties of the water. Fourteen U.S. Geological Survey stream gage stations (see map) and dozens of other gages on canals and reservoirs provide a continuous record of water quantity throughout the watershed. These data are used on a daily basis to manage water optimally to meet irrigation water rights while also providing benefits to hydroelectric power and fisheries. However, our collective understanding of physical and biochemical processes such as sediment- and nutrient-cycling in the Henry's Fork—much less our ability to apply this understanding to management of watershed resources—lags far behind that of hydrology.

Physical, chemical, and biological properties of water are usually referred to as "water quality," but this term also has regulatory meaning and connotations, and the goals of this project do not include regulatory activities. However, these "water-quality" properties, as well as biochemical processes such as nutrient uptake and stream metabolism that can be calculated from them, influence reproductive success, survival, and growth of wild trout and other aquatic and riparian organisms. Because collection and analysis of continuous water-quality data is expensive, physical and biochemical properties of water in the Henry's Fork have been assessed primarily with an indirect approach that is based on habitat conditions and the abundance and diversity of aquatic insects. Direct measurements of water quality have often accompanied these indirect assessments, but to date, such assessments have been conducted only at discrete points in time, often with many years between visits to any given site. Although in some cases the resulting data have been sufficient to detect coarse-scale patterns in water quality, these data are not sufficient to detect more subtle or incremental changes over time, to quantify daily and seasonal cycles, or to contribute to our understanding of the underlying physical, chemical and biological processes that affect trout and other organisms. Furthermore, without continuous monitoring of background conditions, it is impossible to assess the effects—potentially positive or negative—of restoration projects, new infrastructure, or changes in management actions. For example, the Henry's Fork Basin Study, which is nearing completion, presents numerous alternatives for changes in water management and construction of new irrigation facilities, most of which will require formal environmental review. Although we do not yet know which alternatives will eventually be implemented, we do know that the State has allocated funds to study enlargement of Island Park Reservoir. This study would benefit greatly from data that can be used to assess the role Island Park Reservoir currently plays in processes such as sediment and nutrient delivery to the Henry's Fork.

Therefore, there is a need to collect "water-quality" data in the Henry's Fork watershed that is equal in temporal and spatial resolution to the existing "water-quantity" data. Given its history of success in conducting scientific research and monitoring and in collaborating with multiple parties to translate science into management, HFF is well positioned to establish, maintain, and apply a network of stations to measure physical, chemical, and biological properties of water in the Henry's Fork and its tributaries. HFF desires to collaborate with interested parties on this project and is committed to sharing data to promote improved management of the watershed's resources.

Goals

- Monitor long-term changes to important water-quality attributes in major river reaches and tributaries.
- Accumulate fine-scale data that provides the underlying chemical, physical, and biological context for interpreting results of site-specific research and monitoring.
- Establish the capability to rapidly collect pre- and post-project data for the purposes of evaluating effects of new facilities and management actions.

Description of Network

We propose to establish a network of 10 stations at strategic locations in the watershed (see table and map below). At each station, an automated data sonde will continuously record temperature, conductivity, dissolved oxygen, turbidity, water depth, and total algae production. The automated data will be supplemented with laboratory analysis of phosphorus and suspended sediment concentrations, two key parameters that cannot be measured by the sondes. The lab results will be used to develop a statistical relationship between turbidity and sediment concentration so that the continuous record of turbidity can be used to infer sediment concentrations. We will also explore other statistical relationships that may be useful in extending the information that can be inferred from the sonde records.

Proposed locations were selected based on proximity to existing USGS gage stations, locations of existing HFF projects and monitoring sites, accessibility, and ability to detect changes associated with major hydrologic features such as large

tributaries and reservoirs. The network will cover important reaches of the Henry's Fork its three largest tributaries upstream of St. Anthony (see map and summary table). Future expansion of the network to the Teton River could occur in collaboration with HFF's partners there. In addition, we propose to obtain an 11th sonde that can be used at specific locations and times as needed. For example, a study of Island Park Reservoir, which may last for two or three years, would require information from major tributaries the drain the Centennial Mountains, and the 11th sonde could be temporarily deployed there. The sondes will record data internally but will also have the capability to remotely transmit data via satellite so that we can add this feature to the network in the future if desired.

Implementation Schedule and Budget

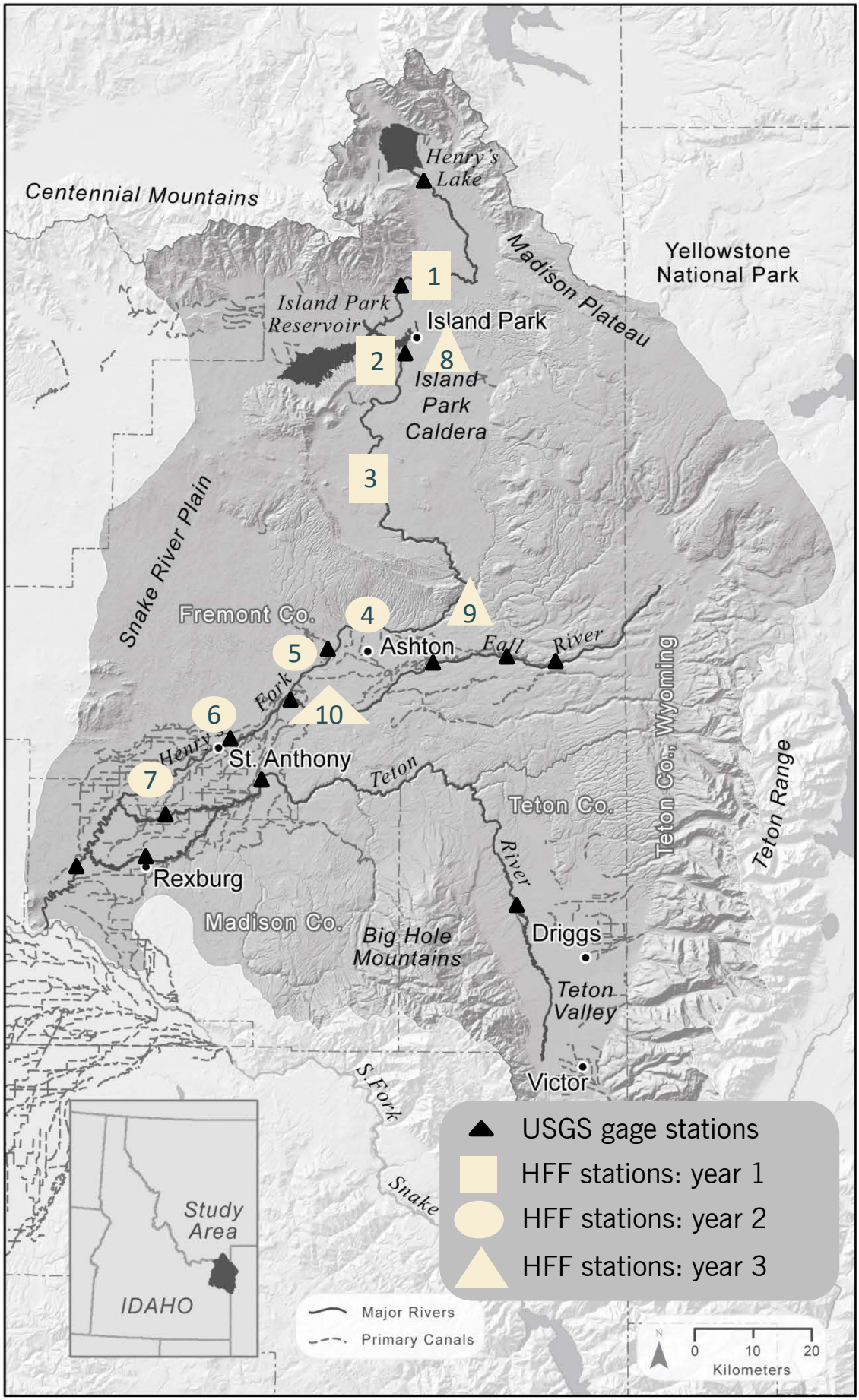
We propose to purchase and install the instruments over a three-year time period (see map and budget table). The instruments themselves cost around $15,000 apiece; installation costs an additional $2,000 apiece. Annual operation and maintenance, including data management and field samples, will cost $3,700 per station. Total purchase and installation cost is $187,000. Annual operation and maintenance is $40,700 per year once all 11 stations, including the "roving" unit are installed and operational.

Proposed Three-Year Budget

		Year 1		Year 2		Year 3		
Item	Unit Cost	Qty.	Total	Qty.	Total	Qty.	Total	TOTAL
Instruments	$15,000	4	$60,000	4	$60,000	3	$45,000	$165,000
Installation	$2,000	4	$8,000	4	$8,000	3	$6,000	$22,000
O&M	$3,700	4	$14,800	8	$29,600	11	$40,700	$85,100
TOTAL			$82,800		$97,600		$91,700	$272,100

Proposed Monitoring Sites

Map ID	Location	Comments
1	Henry's Fork near Coffee Pot	Existing USGS gage, upstream of Island Park Reservoir
2	Henry's Fork below Island Park Dam	Existing USGS gage, downstream of Island Park Reservoir
3	Henry's Fork at Pinehaven/Riverside	Downstream of most popular fishery; at transition to canyon reach
4	Henry's Fork above Ashton Reservoir	Upstream of Ashton Reservoir
5	Henry's Fork at Ashton	Existing USGS gage, downstream of Ashton Reservoir
6	Henry's Fork near St. Anthony	Existing USGS gage, downstream of Fall River, at top reach that gains a large amount of irrigation return through groundwater
7	Henry's Fork at Parker-Salem Road	Upstream of N.F. Teton confluence, at bottom of gaining reach
8	Buffalo River at Highway 20	Major tributary; fish passage is monitored at Buffalo hydroelectric plant
9	Warm River between Robinson Creek confluence and Henry's Fork	Largest stream in watershed with unregulated flow; largest tributary between Island Park Reservoir and Fall River
10	Fall River near Chester	Existing USGS gage, largest tributary to the Henry's Fork


Centennial Mountains
Henry's Lake
Yellowstone National Park
Madison Plateau
Island Park Reservoir
Island Park
Island Park Caldera
Snake River Plain
Fremont Co.
Ashton
Fall River
Henry's Fork
St. Anthony
Teton
Teton Co., Wyoming
Teton Range
Teton Co.
Rexburg
Madison Co.
Big Hole Mountains
Driggs
Teton Valley
Victor
S. Fork
Snake
1
2
3
4
5
6
7
8
9
10
USGS gage stations
HFF stations: year 1
HFF stations: year 2
HFF stations: year 3
Study Area
IDAHO
Major Rivers
Primary Canals
N
0
10
20
Kilometers