Project Title:

Helping managers develop and implement a consistent method to prioritize conservation and identify climate adaptation strategies for Yellowstone cutthroat trout

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Project Summary (3 sentence target): Despite extensive knowledge and data surrounding the status and threats to Yellowstone cutthroat trout there is currently no comprehensive framework for prioritizing conservation of populations and metapopulations (i.e., locations) and potential actions that could be taken in these locations to secure and expand populations, particularly in anticipation of climate change. Through our existing collaboration with state and federal management partners from Idaho, Wyoming, Utah, Nevada, and Montana, we propose to integrate existing information on Yellowstone cutthroat trout status and limiting factors in a spatially-explicit conservation priority framework adapted from a financial portfolio concept aimed at maximizing species persistence in the face of adversity (Schindler *et al.*, 2010; Haak & Williams, 2012) that can be applied to many different species throughout the GNLCC. Using this portfolio concept, we will help managers prioritize conservation actions and then evaluate potential climate adaptation strategies for Yellowstone cutthroat trout by linking high priority conservation populations and actions with existing GNLCC (e.g., NorWeST temperature

modeling, Isaak et al. *Near completion*), Western Native Trout Initiative, and regional information.

Need: As a native species, Yellowstone cutthroat trout has high societal value (Gresswell & Liss, 1995) and is a key food resource for over 40 species throughout its range (e.g., grizzly bear *Ursus horribilis* and bald eagles *Haliaeetus leucocephalus*) (Stapp & Hayward, 2002; Wengeler, Kelt, & Johnson, 2010). The historical range of Yellowstone cutthroat trout extends over approximately 4° of latitude and 7º of longitude comprising an area of 166,450 km^2. However, many local populations have been lost over a broad range of elevations (820 to 3,126 m) as a result of land use, fragmentation of stream habitat, and the ingress of non-native species (Kruse, Hubert, & Rahel, 2000; Gresswell, 2011). Today, genetically pure Yellowstone cutthroat trout occupy less than 28% of their historical range.

In addition to current threats, anticipated changes in global and regional climate are likely to considerably alter existing thermal and hydrologic regimes (Al-Chokhachy *et al., In review;* Isaak *et al.*, 2012). The growing concern for native salmonids such as Yellowstone cutthroat trout in a changing climate stems from their relatively narrow thermal tolerances (Bear, McMahon, & Zale, 2007; McMahon *et al.*, 2007; Gresswell, 2011) and influences of climate-related attributes such as temperatures and stream flows on life-history patterns. Furthermore, recent research suggests that changing climatic conditions are likely to favor non-native species over Yellowstone cutthroat trout (Al-Chokhachy *et al., In review*), thus increasing threats to extant populations.

An imperative step in ensuring long-term persistence of Yellowstone cutthroat trout across its historic range is the development of a comprehensive conservation strategy that encompasses existing data regarding species distribution and status, current limiting factors, and potential threats of climate. Within this framework it is becoming increasingly important to identify and prioritize population-specific restoration and management actions, particularly given the limited amount of resources available, and evaluate these actions for their value as potential climate adaptation strategies.

The Multi-State Interagency Yellowstone Cutthroat Trout Conservation Work Group (YCT Work Group) was formally chartered through a Memorandum of Understanding in 2000 to conserve Yellowstone cutthroat populations across their historical range. This YCT Work Group includes state management agency personnel from Montana, Wyoming, Idaho, Utah, and Nevada, and federal agency managers from the U.S. Forest Service, U.S. Fish and Wildlife Service, and National Park Service (Yellowstone and Grand Teton National Parks), as well as numerous non-governmental partners. The YCT Work Group has formed three geographic management unit (GMU) teams that annually convene biologists, managers, and researchers within GMU regions to share information, work together to conduct conservation actions, and update status and threat information for individual YCT populations. Individual GMU Team Leaders report annually to the full YCT Work Group on their conservation accomplishments, research results, and emerging issues.

Here, we propose a collaborative project between the USGS Northern Rockies Science Center, the Wildlife Conservation Society, the Western Native Trout Initiative, the YCT Work Group,

and Trout Unlimited to integrate existing Yellowstone cutthroat trout data with regional projects to develop a spatially-explicit conservation priority framework and identify on-the-ground climate adaptation strategies. Through this process we will adapt and further develop a conservation priority framework suggested by Haak and Williams (2012) that modifies a financial portfolio concept to spread the risk for conservation of species (Schindler *et al.*, 2010). The portfolio concept is built upon the premise of maintaining and enhancing a species' resilience to stressors (e.g., climate change) through the preservation of genetic, life-history, and spatial diversity across the landscape. Portfolio components for YCT are likely to include population or habitat patch size, degree of connectedness (i.e., metapopulation structure), genetic status, life-history diversity, spatial and landscape uniqueness, and existing threats. We will then integrate the manager-based portfolio for YCT with local and regional climate products including streamflow models from the Climate Impacts Group (VIC model, http://cses.washington.edu/cig/; Wenger *et al.*, 2010), temperature models from the GNLCC funded NorWeST stream temperature modeling effort (Isaak et al.) and Al-Chokhachy et al. (*In Review*), and climate simulations from Hostetler et al. (2011). Merging the YCT portfolio framework with climate vulnerability measures will help refine conservation priorities and identify and prioritize spatially-explicit climate adaptation opportunities.

Objectives: Utilize existing Yellowstone cutthroat trout status and distribution data and collaborate with state and local managers to:

1) Develop a portfolio conservation framework for Yellowstone cutthroat trout that prioritizes conservation populations.
2) Assess existing threats to populations including habitat fragmentation, habitat degradation and loss, and non-native species.
3) Identify and prioritize conservation actions that will reduce existing threats.
4) Integrate information regarding population conservation priorities and existing limiting factors with recently developed climate products (e.g., NorWeST) to identify population-specific climate adaptation strategies.
5) Identify existing data gaps in knowledge needed to manage and conserve native trout.

Methods: Prioritization framework will be developed with GMU Teams and then GMU Teams will set prioritization criteria and determine the appropriate geographic scale for prioritizing individual conservation populations.

- Each GMU Team will develop a set of prioritization criteria.
- The prioritization criteria developed by each GMU Team will be compared for consistency or differences and these will be presented to the full YCT Work Group to reconcile differences and adopt a consistent set of prioritization criteria.
- GMU Teams will then prioritize geographic areas for conservation. We anticipate that these geographic areas will be approximately the size of 8-digit hydrologic unit codes (HUCs).
- Local biologists, managers, and researchers will then prioritize individual conservation populations (identified by the latest status assessment) within each identified geographic area, starting with the high priority geographic areas.
- The status assessment database will be queried to identify risks (threats) to these individual populations. Based on these threats, conservation actions will be identified to reduce

these threats and these actions will be prioritized using prioritization criteria established by GMU Teams. The goal will be to secure or expand existing high priority conservation populations.

- Consideration will then be given to areas where additional conservation populations could be established that would help secure the future of this subspecies and prioritize these "new" conservation populations.
- This process will be done iteratively until all geographic areas within the range and each conservation population has received some level of prioritization. Those areas or populations not rated during this process will be assumed to be of lesser priority.

Deliverables: We will provide a final report, a draft manuscript for publication, and make several presentations to scientific and public meetings that presents the prioritization framework and criteria, summarizes how these were used to prioritize conservation of Yellowstone cutthroat trout, displays priority areas for conserving Yellowstone cutthroat trout throughout their range, and identifies priority conservation actions, by conservation population, that should be undertaken to secure or expand existing populations and establish additional conservation populations. We will also identify research needs to better conserve native salmonids in the Great Northern region.

Statement of compliance: We have read the "Great Northern Landscape Conservation Cooperative Information Management, Delivery, and Sharing Standards" and agree to comply with these standards if our proposal is funded by the Great Northern LCC.

Schedule:

Fall 2013

- Meet with GMU Teams to set up prioritization criteria and determine geographic scale to apply prioritization criteria for conservation locations.
- Develop research priorities with GMU Teams to identify their research needs.

Winter 2013-2014

- Compare prioritization criteria among GMU Teams and highlight similarities and differences in these criteria. Send these out to the full YCT Work Group.
- Compile research priorities identified by each GMU Team for the full YCT Work Group.
- Meet with full YCT Work Group and reconcile prioritization criteria differences to develop a consistent set of prioritization criteria
- Ask the full YCT Work Group to rank research needs identified by GMU Teams.

Spring 2014

- Meet with individual GMU Teams to apply the agreed upon consistent prioritization criteria to prioritize geographic areas for conservation within each GMU
- Have local groups meet to prioritize individual conservation populations within each high priority geographic conservation area.
- Summarize and write a draft report on the research needs identified by the YCT Work Group.
- Develop tables within the YCT assessment database for documenting prioritization criteria for conservation populations

Summer 2014

- Iteratively work with GMU Teams to finalize prioritization of geographic areas and for individual conservation populations within high priority geographic areas.

Fall 2014

- Finalize prioritization of individual conservation populations within high priority geographic areas and identify and prioritize conservation actions to reduce threats to secure or expand existing populations.
- Identify high priority areas where "new" conservation populations should be established.
- Enter prioritization data into the assessment database, summarize these data, and create maps that display high priority areas and conservation populations.
- Make oral and poster presentations on results to scientific and public groups.

Winter 2014-2015

- Prepare a final report and draft manuscript for publication.
- Make additional oral and poster presentations on results to scientific and public groups.
- Collaborate with GNLCC and Multi-state Interagency Yellowstone Cutthroat Trout Conservation Work Group to prepare a press release on these results.

Budget: (See attached PDF)

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