

**North Pacific Landscape Conservation Cooperative
FY2014 Project Full Proposal**

Project Title

An applied case study to integrate climate change into design and permitting of water crossing structures.

Lead Agency: WDFW

Principle Investigator: Timothy Quinn PhD, Chief Scientist, Habitat Program, Washington Department of Fish and Wildlife

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Cooperators:

Investigators		
NAME	TITLE/AFFILIATION	PROJECT ROLE
Timothy Quinn PhD	Chief Scientist, Habitat Program, WDFW	Principle Investigator – Tim will participate in project team meetings, provide overarching guidance throughout the project, and ensure that products are applicable to Department practices.
Lynn Helbrecht	Climate Change Coordinator, WDFW	Lynn will serve as project manager. She will provide coordination and communication between team members, and ensure that tasks and deliverables stay on schedule and within budget.
Donald Ponder	Engineering Section Manager, WDFW	Don will provide input into current practices and assist with the decision mapping, translation tools and developing recommendations. Don serves as a direct link to the engineers who develop and apply design guidance, and will ensure that products are relevant.
Jennie Hoffman PhD	Consultant, Climate Adaptation Research	Jennie will serve as the lead for decision mapping, developing translation tools and report writing. She will assist with workshop presentations and organization.
Ingrid Tohver	Research Scientist, Climate Impacts Group	Ingrid will provide the climate science data used in the project, and assist with developing translation tools, workshop presentations and report writing.
Collaborative Partnerships		
Dan Siemann	Climate Change Advisor, Washington Department of Natural Resources (WDNR)	WDNR will participate in decision mapping workshop and provide input to the project from the perspective of a practitioner. WDNR representatives will be invited to the final project workshops.
Carol Lee Roalkvam	Environmental Policy Branch Manager, WSDOT	Carol Lee Roalkvam will coordinate WSDOT's input at key milestones and share relevant information from WSDOT research and climate change pilot project in the Skagit Basin.
Jason Dunham PhD	Researcher, USGS	Jason will serve as a resource to ensure the research and products from this project build on the USGS stream prioritization work.

Bill Shelmerdine	Olympic National Forest, USFS	Bill will provide consultation related to a USFS project which considered culvert sizing and climate change in the Olympic National Forest.
Dave Peterson	North Cascadia Adaptation Partnership, USFS	Dave will assist in getting the word out about project findings and workshops to the NCAP network.

General Public Summary:

We will translate existing modeled hydroclimatic data into metrics used for water crossing design and replacement. WDFW permits (Hydraulic Code Rules, Chapter 220-110 WAC) and provides technical guidance for construction of hundreds of fish passable culverts, a number which is expected to rise dramatically in response to a 2013 federal court injunction directing the state to repair thousands of culverts that inhibit salmon migration. Current WDFW design guidance does not account for changes in hydrology resulting from climate change. This project will support the development of designs that maintain desired performance (e.g. connectivity benefits to aquatic organisms) throughout water crossings' expected life.

Project Objective

This project will incorporate climate change data into WDFW water crossing design guidance and permitting process by 1) translating available hydrologic projections derived from downscaled climate projections into metrics (e.g., bankfull width, toe width) used by WDFW and many others in the design of fish passage structures, and 2) mapping decision pathways to indicate where and how to incorporate climate information.

Management Objective:

This project will integrate climate data into existing procedures for WDFW, the regulatory authority over most culvert and bridge projects in Washington State, and thus advance a NPLCC priority to work with decision makers to incorporate the implications of climate change into management activities. The products will ensure that aquatic connectivity investments will be robust in light of a changing climate.

Project Description:

Need:

WDFW not only designs fish passable structures, but also permits and provides technical guidance to hundreds of others entities annually, specifying how to build and install fish passable water crossing structures. Despite WDFW's understanding of potential climate change implications for water crossing design, WDFW has been unable to convert projected climate-induced hydrological changes into water crossing design guidance and permitting decisions. This project addresses two important problems: 1) current design standards used by WDFW do not consider future changes in hydrology, despite water crossing project lifespans of 30 – 100 years, and 2) climate projection metrics (e.g., changes in flood frequency and basin hydrology) do not directly translate into the metrics (e.g., bankfull width and sediment gradations) used by WDFW and other engineers for water crossing design.

This project will map WDFW's culvert design and permitting decision process and identify decision elements potentially sensitive to climatic changes and impacts. We will then translate existing projections of hydroclimatic data into metrics used by engineers for these decisions and work to incorporate these data into water crossing design guidance and permitting decisions.

The timing of this work could not be more urgent. The number of fish passage barriers replaced annually is expected to increase dramatically in response to a 2013 federal court injunction directing Washington State to repair all culverts that block 200 meters or more of salmon habitat, and many of those replacements occurring by 2016. Effectively tackling this mandate requires that both prioritization of culverts for corrective action and design of the water crossing structures replacing those culverts be done in a climate-informed fashion. The previously funded USGS/NPLCC project in the Siuslaw National Forest addresses approaches to climate-informed fish passage restoration prioritization (preliminary results expected by June of 2014). This project will allow us to design and permit prioritized water crossings that are resilient to future projected hydrologic changes, ensuring continued habitat connectivity and other benefits for the expected life of the structure by incorporating projected changes in stream hydrology into design and risk assessment.

Methods and Timeline: (Assume start date of July 1st, 2014)

TASK	DATE
1. Project kick-off and regular project meetings. Clarify roles, assignments, deliverables and timelines among project investigators and partners.	July, 2014, and ongoing
2. Meet with WSDOT staff to review project tasks and workplan, and refine as needed and/or appropriate to ensure WSDOT support and engagement.	
3. Meet with NPS and US regarding the project to develop a decision support tool for assessing climate change impacts on flood risk in Northern Cascadia road networks. <ul style="list-style-type: none"> • Identify opportunities to use findings and/or products in the WDFW project. • Identify opportunities for any collaboration 	
4. Map decision process. Create preliminary visual map of the decision process for designing and permitting water crossings structures, illustrating when various types of input (e.g. data, expert opinion, risk models) are used. Create draft from existing models Meet with WDFW Habitat Engineers and partners to vet map	Aug-Sep 2014
5. Identify decision elements influenced by climate change and develop climate change screening questions. Will include analytic (e.g. design metrics such as bankfull width) and deliberative (e.g. risk tolerance) elements. Screening questions will prompt decision makers to address climate considerations explicitly (Morelli, et al 2012, Stein et al. in press.)	Aug-Sept, 2014
6. Translate hydrologic projections derived from downscaled climate projections to data critical for designing and permitting fish passage structures. Develop algorithm linking commonly available climate change projections with key metrics for three types of watersheds: rain-dominated, snow-dominated, and mixed rain and snow. See figure 1 for a simple prototype. This process will be modeled only, but based on basin specific data from downscaled climate change projections.	Sept-Dec, 2014
7. Assess sensitivity of design and permitting decisions to changes in climate-sensitive data input. Investigate relationship between change in input metrics (e.g. bankfull width) and the final design decision – as applied to individual crossings and entire watersheds.	Sept-Dec, 2014
8. Assess adequacy of current culvert design standards in light of project findings, by assessing risk (both in terms of overdesign and of failure) implicit in current stream crossing design standards by location and crossing type.	Jan-Feb, 2015

- 9. **Develop options for alternative procedures or protocols to improve adequacy.** This may include annotated process maps, decision trees, decision matrices, screening questions, or other relevant decision tools. Feb-Mar, 2015

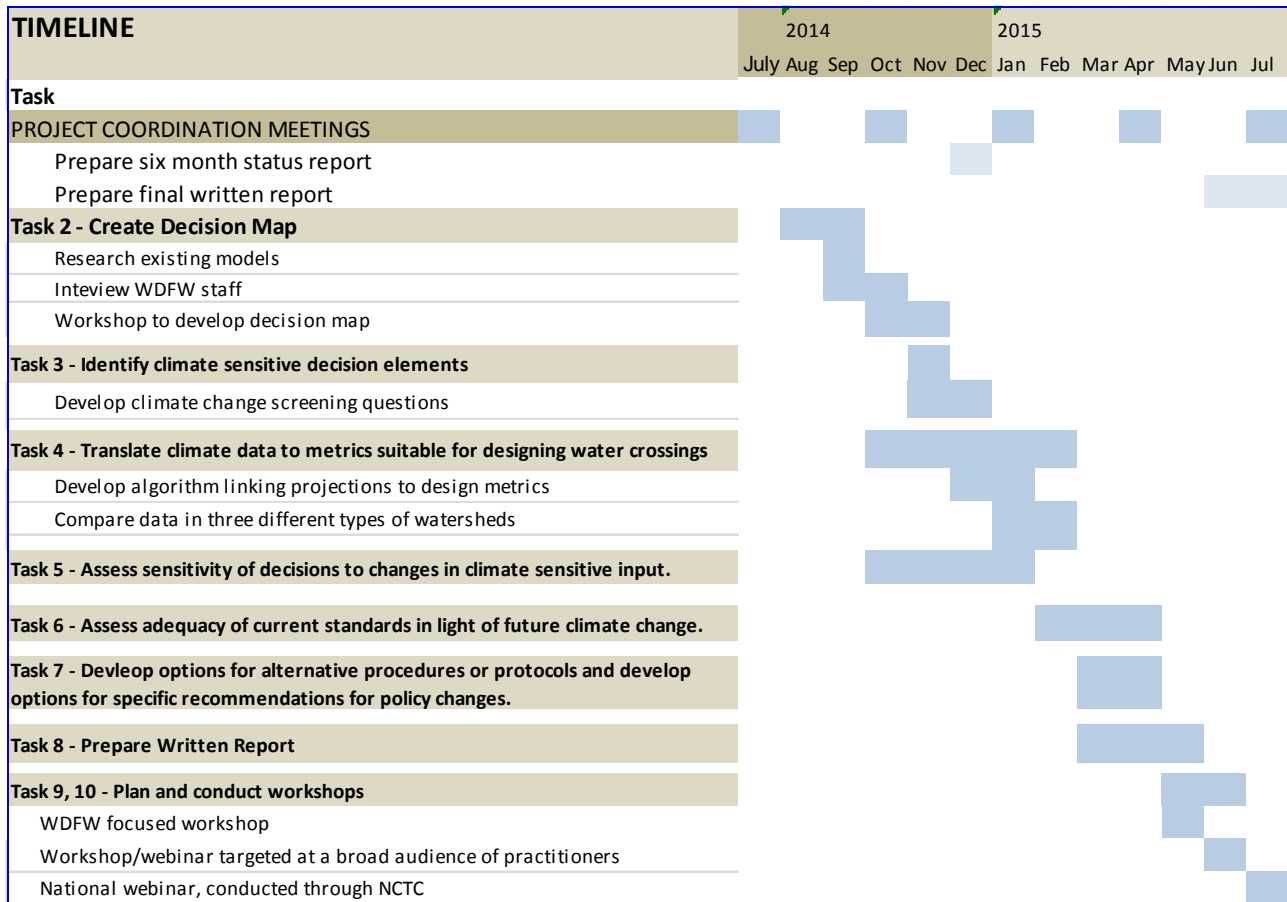
- 10. **Prepare a written report** summarizing methodology and findings, including discussion of applying the decision map and matrix/assessment. The report will include options for specific recommendations for policy changes or refinements to support climate-informed water crossing decisions. Mar-Apr, 2015

- 11. **Plan and conduct two workshops to disseminate findings.** Workshop #1 to specifically target WDFW engineers and managers, and the second to focus on a broader audience of organizations engaged in stream crossing replacement for fish passage. We anticipate this group will include representatives from NPLCC steering committee and partners, local government, selected federal and state agencies, tribes and others. May-June, 2015

- 12. **Disseminate findings more broadly** through a presentation as part of the USFWS National Conservation Training Center adaptation webinar series, and as a case study in climate-related NCTC trainings. May-June, 2015 and ongoing

Figure 1. An example of how to organize information useful in permitting and design of water crossing structures in response to climate driven changes in hydrology. This table is for illustrative purposes only and does not necessarily show all stream or basin metrics that would be considered in the project.

	Rain on Snow System								
	Cascade			Run			Pool		
	High Erosive	Mod Erosive	Non Erosive	High Erosive	Mod Erosive	Non Erosive	High Erosive	Mod Erosive	Non Erosive
High % impervious									
Mod % impervious									
Low % Impervious									
Cells filled with range in values (% increase in BFW) @ year2043, 2063, and 2093.									



Species Impacted: All seven species of salmonids and other aquatic organisms that benefit from improved stream connectivity.

Geographic extent: Will apply directly to the entire State of Washington, but the process and products should be relevant to stream-road crossing decisions throughout the United States and Canada.

Specific Outcomes: WDFW engineers will be able to provide climate smart guidance and technical assistance influencing hundreds of stream crossings for fish passage annually – an opportunity to leverage project results across a multitude of organizations engaged in fish barrier replacements.

Expected Project Length: 12 Months

Communication:

We will actively engage WDFW, WSDOT and WDNR staff to develop water crossing decision maps and inputs and to test for relevance and usability as tools evolve. We will share results regionally via a final report and two project-end workshops and nationally via the USFWS National Conservation Training Center adaptation webinar series and as a case study in climate-related trainings.

Project Products

A. Six Month Products:

1. Visual map of stream-road crossing design and permitting decision process as practiced by Washington Department of Fish and Wildlife, annotated to indicate key decision points sensitive to climatic change and uncertainty, and where decisions about risk are made
2. Algorithm/tool linking values for commonly projected climate change variables with key metrics for stream-road crossing design decisions (e.g. bankfull width). See Figure 1 for a simple prototype.
3. Analysis of the adequacy of current culvert design standards given projected climate change impacts in a range of basin types and stream morphology.
4. Interim Status Report

B. Twelve Month Products:

5. Recommended modifications to design guidance and protocols, based on project findings.
6. Written report summarizing methodology and findings, including discussion of applying the decision map and matrix/assessment and draft recommendations for modifications.
7. Two regional workshops (one targeting WDFW and one a broader audience) to convey findings and demonstrate tool application.
8. A national webinar, delivered as part of the USFWS National Conservation Training Center adaptation webinar series

Budget

Requested Funds:	Year 1
A. Salaries	4,000
B. Supplies	500
C. Equipment	0
D. Travel	1,000
E. Contracts	29,500
F. Overhead	9,821
Sub-total	44,821
Matching Funds:	
Source 1 - WDFW salaries \$28,500 - Climate Change Coordinator (project coordinator), \$12,500 - Habitat Engineering Manager and Hydrologist, and \$4,500 - Habitat Program Chief Scientist (project PI).	45,500
Grand Total	90,321

Disclaimer regarding data sharing

There are no known restrictions on the sharing of data generated from this project.

Budget Justification Narrative

A. Salaries and Benefits

Proposal includes \$4,000 in Salaries and Benefits for Engineering Section staff to enable staff to participate in workshops and assist as needed with developing translation tools. This represents approximately 70 hours.

B. Supplies

We anticipate \$500 in supplies to cover materials and refreshments provided for workshops, and printing costs for a small number of hard copy final reports.

C. Equipment

No equipment costs are expected. Computers, copiers and other equipment used as part of this project will be considered in-kind support from WDFW.

D. Travel

\$1,000 is requested in travel funds to support WDFW travel to project management meetings and workshops, and to fund project partner travel to workshops if needed.

E. Contracts

The bulk of this project funding is requested for contractor assistance for climate science and adaptation expertise.

- We are requested 11,000 for Ingrid Tohver, a research scientist with the Climate Impacts Group, who will be the lead on delivering climate change data for selected watersheds and assisting with translation of those projections to other metrics. She will also assist with drafting sections of the final report and participate in workshops. This allocation represents 30 days of Ingrid’s time plus travel costs for up to 5 project meetings and 3 workshops.
- We are requesting \$18,500 for Jennie Hoffman, PhD, of Adaptation Insight, who will lead the decision mapping process, developing the translation tool and drafting recommendations and the final report. This funding represents 30 days of Jennie’s time and travel costs for up to 5 project meetings and 3 workshops.

F. Overhead

The official indirect rate for WDFW is 28.6. WDFW indirect costs will be billed at the federally approved indirect rate that was in effect when costs were incurred. WDFW will provide a copy of its current federal indirect cost negotiation agreement upon request.

MATCH

Salaries and Benefits for time spent by Chief Scientist, Climate Change Coordinator, and the Engineering Section Lead and Hydrologist on this project will be used as match.

We anticipate the following breakdown for match:

• Climate Change Coordinator (400 hours)	\$28,500
• Chief Scientist (40 hours)	4,500
• Engineering Section Manager and Hydrologist (140 hours)	<u>12,500</u>
Total	\$ 45,500

LITERATURE CITED

Morelli, Toni Lyn; Yeh, Sharon; Smith, Nikola M.; Hennessy, Mary Beth; Millar, Constance I. 2012. Climate project screening tool: an aid for climate change adaptation. Res. Pap. PSW-RP-263. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 29 p.

Stein, BA, P. Glick, N.Edelson,and A. Staudt (in press). Climate-Smart Conservation: Putting Adaptation Principles Into Practice. National Wildlife Federation, Washington, D.C.