

WASHINGTON STATE  
DEPARTMENT OF  
E C O L O G Y

## Application for a 2015-2017 Floodplains by Design Project Grant

Submitted applications will be rated to create a ranked list in support of Ecology's FY 2015-2017 Floodplains by Design budget request.

Applications must be submitted electronically via email to Ecology by 5:00 pm, **September 8, 2014**. Send applications to:

**Adam Sant** at [Adam.Sant@ecy.wa.gov](mailto:Adam.Sant@ecy.wa.gov)

**With the Subject line: 2015-2017 Floodplains by Design Project Grant Application**

You will receive confirmation that your application has been received by close of business on September 15.

*Applicants must use this form as provided. No alterations will be accepted.*

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Project Title Anderson Property-Yakima River Floodplain Restoration

Organization/Jurisdiction Name Trout Unlimited  
Contact Name Justin Bezold  
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City, State, Zip Code Wenatchee, WA 98801

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Legislative District(s) #13  
County Kittitas  
WRIA(s) #39  
Congressional District(s) #8

Specific Project Location

Section S 10 Township 17 N Range 18 E River Mile 151.7 - 153.0  
Latitude N 46.973842 Longitude W (-)120.561507 GPS coordinates, if available  
Major Watershed Project is in Yakima River

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***Full project (or phase proposed herein) should be completed in 3-4 years.  
Project Narrative and Budget are limited to 20 pages.***

***Scope of Work, Schedule, Maps and Photos can be in addition to those 20 pages.***

**1. Short Description of Project (500 words or less)**

Please describe the overall goals for this floodplain area that is the focus of your proposal. Include in the description all major components of the project or activity such as breaching a levee, constructing a new levee, restoring a specific number of acres of floodplain, wetland creation or fill, restoration planting, project design planning, public process, or any other appropriate major component. Please indicate if funding is being requested for a phase of a larger multi-year project.

Trout Unlimited's Washington Water Project is partnering with Mark Anderson (property owner) to restore approximately 200 acres of Yakima River floodplain near Ellensburg, Washington. The Anderson Project area is in a river reach vital to the area for ecosystem services and flood hazard reduction. Historic land-use practices left the project site with aging levees, a degraded floodplain ecosystem, and a channelized river that increases flooding hazards for Interstate 90 and private property.

The location of the Anderson property makes it integral to floodplain restoration. The Thorp to Canyon reach of the Yakima River is vital to the area's agricultural economy, flood hazard avoidance, and the health of the river system. However, much of the area is scarred from past anthropogenic uses—like gravel mining, levee building, and cattle grazing—including the project site.

This is a multi-phase floodplain restoration project. We plan four phases: phase one—comprehensive restoration planning and alternatives assessment; phase two—alternatives selection, design, and permitting; phase three—implementation/construction; and phase four—monitoring and assessment. We request funds for phases one and two.

The goals of the Anderson Project are three-fold and designed to integrate with ongoing assessment and restoration efforts in the area. We plan to: (1) restore floodplain ecosystem functions to as much of the property as practicable; (2) protect the agricultural portion of the property from catastrophic flooding risks; (3) enhance and restore habitat in side channels and spring creeks to benefit steelhead listed under the Endangered Species Act (ESA); and (4) complete a project with significant public benefit (flood hazard reduction). To achieve these goals we will first convene a technical advisory group to provide options for realistic restoration actions throughout the property. These actions will include: (1) levee reconfigurations (set-backs, removals, and reshaping: all three expected); (2) corrective steps ( revegetation, grazing plan, earth moving) to remedy past land-use practices (gravel mining, grazing); (3) floodplain reconnection with the river system (remove remnant levees and gravel spoils to lower the base flood elevation); (4) grazing plan development to allow a working landscape that encourages responsible cattle grazing in the floodplain; (5) floodplain ecosystem services restoration throughout the property; (6) development and enhancement of off-channel fish habitat; and (7) irrigation ditch/side channel restoration/enhancement options.

We plan to consult concurrently with Anderson to determine the scope of restoration without injuring current agricultural operations. The landowner and the advisory group will set parameters for the options, which the group will rank. To complete this work, we plan to hire GeoEngineers to complete alternatives assessments and design plans. We plan to work with relevant stakeholders to ensure the Anderson Project incorporates the concerns and ideas of the community and to integrate it into the larger restoration and flood hazard reduction efforts in the area.

Once complete, Mark Anderson committed to construct and implement the restoration and flood risk reduction elements. This saves public money and gives the landowner a greater stake in the project. The planning and process ensures the highest quality project possible without sacrificing public benefit.

## 2. Flood hazard / risk reduction (60 points)

Describe your project and how it will reduce the magnitude or frequency of flood damages to people, structures or infrastructure. Projects will be evaluated on the significance of the flood hazard and the ability of the solution to address the hazard. Evidence of flood hazard reduction can be demonstrated via flood storage added (acre-feet), flood stage reduction [reduced BFE (base flood elevation)], conveyance increased (cubic ft/sec), sediment storage added or inputs reduced, number or value of structures and/or development rights removed from hazard area (# or areal extent), critical facilities removed from high hazard area, transportation and infrastructure facilities removed from high hazard areas, and other project-specific goals. Describe both upstream and downstream effects of your project.

### Answer question 2 here:

The Anderson Project sits in the 'Thorp to Canyon Reach' of the Yakima River. (See [Figure 1, Appendix 1](#)). Throughout the reach, the risk of flooding extends to residential homes, small businesses, agricultural lands, and community infrastructure. In the immediate vicinity of the Anderson Project, critical public infrastructure is at risk from flooding. However, the risk of flooding to the infrastructure within the reach varies based on the flooding magnitude. Much of the infrastructure is at risk from a 10-year flood event. ([Draft Technical Memorandum: Flood & Erosion Assessment—Yakima River, Hansen Pits to Yakima Canyon, June 2014 citing Proposed Rehabilitation for the Schaake Reach of the Yakima River, 2007](#)). But the actual amount of risk involved varies based on the infrastructure location relative to the river channel. Structures closest to the channel experience the greatest risk because current velocity is higher in the channel during flood events. ([Id.](#))

Fortunately, within the project reach the peak flood flows are 20 to 55 percent lower than normal due to discharge control by upstream reservoirs. ([Id.](#)) As such, there is a significant reduction in immediate flood risk and lateral channel migration within the project reach. However, the risk of floods is not absent. In fact, three large floods occurred within in the reach over the past 37 years; each with a return period of 20 to 30 years. ([Id.](#)) One flood not experienced is the 100-year flood, an event that will be approximately 40 percent larger than the largest most recent flood. As such, the 100-year flood will pose a serious risk to public safety, infrastructure, and facilities, including the Ellensburg Water Treatment Plant (downstream), Interstate 90 (I-90; across the river), River Bottom Road (down river), Umptanum Road bridge (upstream over the Yakima River), Irene Rhinehart Riverfront Park (upstream, public boat launch), and US Bureau of Reclamation property (US BOR; across the river). Moreover, hundreds of acres of private property are flooded on a semi-annual basis and experience property damage.

To address the flood risks, we plan to complete a multi-phase restoration and flood risk reduction project. For phase one, we plan to assess actions to: (1) reconfigure levees (set-backs, removals, and reshaping: all three expected: **\*\*Note, we will not evaluate any increase in size (height or length) of any levee as part of this project. We only seek funds to evaluate the reduction of levees\*\***); (2) take corrective steps (revegetation, grazing plan, earth moving) to remedy past land-use practices (gravel mining, grazing); (3) reconnect floodplains with the river system (remove remnant levees and gravel spoils to lower the base flood elevation); (4) develop a comprehensive grazing plan to allow a working landscape that encourages responsible cattle grazing in the floodplain; (5) restore floodplain ecosystem services throughout the property; (6) develop and enhance off-channel fish habitat; and (7) assess irrigation ditch/side channel restoration/enhancement options. We will then develop a list of feasible alternatives. From this list, we will coordinate and collaborate with area stakeholders (technical advisory group) to select a preferred alternative. For phase two, we will complete the design and engineering for the selected alternative and complete all necessary permits.

Our planned project will directly and indirectly reduce the risk of flooding and eliminate flood hazards. Individually, the Anderson Project will incrementally decrease the magnitude of flooding in the project reach by reducing the restrictions on the river from existing levees. This will allow flood waters to spread

out through the reach and dissipate energy on the floodplain rather than being confined to the channel and flowing through the reach at high speeds. Additionally, as we restore the floodplain ecosystem we will help provide roughness that will slow floodwaters and allow sediments and debris to deposit in a natural way.

When placed in the larger context of ongoing flood hazard assessment and reduction work by Kittitas County and the US BOR, the Anderson Project will help reduce the risk of flood damage to critical infrastructure including the Ellensburg Water Treatment Plant (downstream), Interstate 90 (I-90; across the river), River Bottom Road (down river), and Umptanum Road bridge (upstream over the Yakima River) as well as Irene Rhinehart Riverfront Park (upstream, public boat launch), U.S. Bureau of Reclamation property (across the river), and hundreds of acres of private property. As mentioned above, we expect to reduce the risk of flooding and subsequent damage by reconfiguring levees to reduce constrictions on the river and provide a less impeded floodway through the area. This will help reduce the floodwater energy and reduce the erosive potential. Additionally, our planned restoration of the floodplain ecosystem will allow flood waters to access the floodway/plain and encounter a natural, roughened pathway that further slows the floodwaters and provides high-water side channels.

To achieve these results, we must first properly assess how the Anderson Project site interacts with flooding risks and other ongoing projects in the area. The Anderson Project site lies in a mapped floodway/plain, and any action we take can have significant impacts on surrounding infrastructure and property. As such, we plan to consult with all relevant technical experts in the area to develop alternatives that provide floodway needs based on recognized risks and to identify any additional risks. We will incorporate these risks and alternatives into any ecosystem restoration alternatives.

GeoEngineers will coordinate with Kittitas County (administers the Kittitas County Flood Control Zone District) and the US BOR to assess the overall restoration options to determine the alternatives that maximize the flood hazard and risk reduction to the area. With this information, we will then have a set of options to offer the landowner to determine the best option that allows a working landscape while also reducing flood risks.

We derive our approach to the reduction of flood hazards and risks from the Anderson Project site's contributions to flooding in the area. A major contribution comes from the levee at the upstream end. (See [Figure 2, Appendix 1](#)). This levee, and a similar levee across the river on US BOR property, creates a pinch point in the river that causes floodwaters to flood upstream areas. ([Proposed Rehabilitation for the Schaake Reach of the Yakima River, US BOR, 2007](#)). One such area near the Anderson Project site is the Umptanum Road bridge. The bridge is approximately 400 feet upstream of the Anderson Project site. Also at risk from these floodwaters are the Irene Rhinehart Riverfront Park and gravel pits. A major factor we will assess with each alternative is the reconfiguration of the upstream levee to reduce the restriction and reduce upstream flooding that can occur.

Another major piece of public infrastructure at risk from floodwaters is I-90. The upstream levee on the Anderson Project site confines the river channel and forces flows east, toward the interstate. Currently, a US BOR levee and 500 feet of land are all that protect I-90 from the river. During a 100-year flood event, these may not be enough to prevent the river from flooding I-90. ([Id.](#)) All of our alternatives will assess the potential to dissipate any river energy through various reconfigurations of the upstream levee on the Anderson Project site. We will strive to reduce the risk of a single catastrophic flood event that puts I-90 at risk. We hope to reduce the risk of flooding by better conveyance to prevent flooding and better access to the floodplain to provide quicker flood storage.

Downstream of the Anderson Project site are several more public structures and private properties at risk from flooding. These include the Riverbottom Road (Kittitas County public road), the US BOR property (Schaake Property), the Ellensburg Water Treatment Plant, and numerous private properties. These properties are at risk from flooding due to decreased flood plain connectivity, similar to that on the

Anderson Project site. To address this risk, we plan to assess methods to restore floodplain connectivity, such as removing gravel spoils and relocating them to an offsite location, regrading the spoils to lower the base flood elevation, and even a do nothing option. We expect to achieve the best option through careful analysis and hydraulic modeling of floodwaters. Through this analysis we will find a means to increase the flood storage abilities of the property (likely through a base flood elevation decrease).

Moreover, by increasing the amount of area the floodwaters can spread, we add more flood risk reduction to across river properties, which include a historic manure spray field (with unnaturally high levels of nitrogen) and I-90. This will also help reduce the risk of the river flooding and scouring the historic spray field, which could lead to a large discharge of nitrogen to the river system. The Yakima River already has TMDL issues, so this will help reduce the risk of spreading identified pollutants.

Although Anderson property levees do not completely cut-off floodwaters from the natural floodplain, they do prevent the river channel from actively moving and accessing the floodplain in a natural manner. As part of this project, we will work with the US BOR, WA-DOT, and Kittitas County to develop alternatives to the current Anderson levee configurations that will protect Anderson's agricultural field but will also reduce the flood hazard currently created by the levee.

To complete our planned work, we will need to properly assess floodplain conditions. We plan to begin by compiling all relevant elevation, flood, and land-use data. Currently, numerous hydraulic modeling studies and LiDAR surveys exist that we will utilize to determine exact alternatives to floodplain restoration. However, the overall objective is to restore normative floodplain functions by decreasing the base flood elevation through re-contouring of the highly impacted areas. This will allow seasonal flood events to access the floodplain and relieve flooding risks to downstream and across river properties.

We will design all elements of the Anderson Project to integrate with the current flood hazard reduction efforts in process by Kittitas County, the US BOR, and WA-DOT. By doing so, we can leverage the beneficial flood reduction effects of the Anderson Project to have a greater cumulative effect.

Finally, climate change can alter flooding risk in a number of ways. The projected shift in winter precipitation from snow to rain may increase the immediate flood risk as the water leaves the system more quickly. Additionally, climate change could have additional impacts on the Anderson Project as temperatures increase and weather patterns change to the point that vegetative communities may also change and current existing floodplain species in the ecosystems are no longer viable. As such, we are interested in collaborating with the National Oceanic Atmospheric Administration (NOAA), the University of Washington's Climate Impacts Group, and other partners to evaluate and quantify climate change impacts that could affect project design and implementation.

### **3. Floodplain ecosystem protection or restoration element (60 points)**

Describe the ecological benefit of the project, its significance, and the ability of the solution to address the overall need in the project area or watershed. Examples include, but are not limited to, reconnecting floodplains, salmon recovery actions, habitat restoration, Channel Migration Zone protections, etc. Evidence of ecosystem benefits include floodplain (including estuary) habitat type (e.g., wetland, side channel, forest) and area restored (# acres), floodplain area protected from bank armoring (# of acres), floodplain area protected from development or other land use change (# acres), hardened bank removal or levee/riprap removal (linear feet), levee setbacks constructed (linear feet, # acres), new side channels or reconnection of old side channels (linear feet or storage volume), salmon species benefitted (# of listed, non-listed species). Secondary evidence includes culvert replaced to restore fish passage or increase conveyance, logjam and or wood structures installed, riparian area planted, and other project-specific goals.

**Answer question 3 here:**

The Yakima River basin is located in south central Washington and drains approximately 6,155 square miles. The basin occupies most of Yakima and Kittitas counties, about half of Benton County, and a small portion of Klickitat County. The Yakima River basin is bounded on the west by the Cascade Range, on the north by the Wenatchee Mountains, on the east by the Rattlesnake Hills, and on the south by the Horse Heaven Hills.

The Yakima River basin is a rich agricultural area almost totally dependent on irrigation. It contains about 500,000 acres of irrigated land with the water for most of this acreage supplied by the US BOR's Yakima Project. The climate of the Yakima River basin ranges from alpine along the crest of the Cascade Range to arid in the lower valleys. Precipitation varies considerably depending on altitude with mean annual accumulations between about 128 inches in the mountains to about 8 inches in the eastern portion. Most of the precipitation occurs as snow at higher elevations, generally from November through March. While the valleys receive some snow, the majority of the precipitation falls as rain between October and March. If climate change predictions for the Northwest are realized, these patterns may shift over time.

The Yakima River flows southeasterly for about 214 miles from its modern-day origin at Keechelus Dam to its confluence with the Columbia River. The hydrographs of the basin's major rivers are severely altered by the storage, release, and diversion of irrigation water. There are five major storage reservoirs in the Yakima River basin: Keechelus, Kachess, and Cle Elum reservoirs are located high in the upper Yakima basin. The release of water from these dams heavily influences seasonal flooding patterns. Specifically, the 'flip-flop', a period when water is held during the spring and released during the summer, severely alters the hydrograph and results in an unnatural flow regime. The preceding was excerpted and edited from the Yakima Bull Trout Action Plan, p 156 – 163, 2012.

This project will provide substantial ecosystem benefits through floodplain restoration and fisheries habitat enhancement/restoration. In the project area, the ecosystem needs fall into ecosystem restoration. The project site has been impacted by levee construction, grazing, gravel mining, and other land use practices. Through our planned floodplain restoration, we hope to achieve a functional equivalent to allow fish and wildlife to utilize the floodplain while maintaining a working agricultural landscape.

The Anderson Project reach experienced significant past degradation that continues to influence the current ecosystem conditions. The degradation includes: log drives; removal of large woody debris from the channel and floodplain; channel straightening; disconnection of floodplain and off-channel habitat by roads and levees; hydrologic modifications resulting in reduced groundwater recharge and reduced migration corridor and rearing habitat conditions (velocity, runoff timing); and altered riparian vegetation conditions, followed by colonization by invasive vegetation (i.e. reed canary grass). For the Anderson Project site, the immediate needs are floodplain habitat quantity and quality through floodplain and off-channel habitat disconnection, hydrologic modifications, and riparian vegetation conditions. (Draft Technical Memorandum: Habitat Assessment, Yakima River – Hansen Pits to Yakima Canyon, June 2014).

The restoration of floodplain ecosystems is identified in several plans. First, the Yakima Basin Integrated Plan (YBIP) identifies habitat protection and enhancement as a major element in the successful implementation of the plan. (Yakima River Basin Study, p 49 – 56, 2011). Actions to implement this element would significantly improve prospects for recovering fish populations to levels that are resilient to catastrophic events and the potential impacts of climate change. Any such actions would accelerate ongoing efforts to protect existing high-value habitats, improve fish passage, enhance flows, improve habitat complexity and functions, and reconnect side channels and off-channel habitat to stream channels. The actions would also provide some flood risk reduction benefits through careful planning and coordination.

Second, the Mid-Columbia Steelhead Recovery Plan identifies protecting and enhancing floodplain conditions along the mainstem Yakima as a strategy to recovering steelhead in the Yakima basin. (Yakima Basin Steelhead Recovery Plan, p vii and 137, 2009). Steelhead are listed as threatened under the Endangered Species Act and use the project reach as migratory, spawning and rearing habitat, so any actions we take to improve the fisheries habitat will yield additional habitat (quality and quantity for ESA-listed steelhead). (Id.)

Third, the Yakima Bull Trout Recovery Plan also identifies Yakima River habitat as vital to the restoration of the species. At the time of listing the USFWS found no evidence that a subpopulation of bull trout remained in the mainstem Yakima River. The Washington Department of Fish and Wildlife, however, did recognize a mainstem Yakima stock. The assignment of stock status was based on old catch records, anecdotal accounts, and a relative few adult bull trout captures occurring in the 1990s. (Yakima Bull Trout Action Plan, p 156 – 163, 2012). Though the Anderson Project site likely functions as feeding, migratory, and overwintering habitat for bull trout, maintaining and enhancing its functional capacity is important to recovering bull trout in the Yakima River basin. Thus, any actions we take to improve or enhance fisheries habitat will benefit bull trout directly.

Fourth, the Anderson Project falls within the current Kittitas County critical areas ordinance, which requires that no net loss of habitat and floodplain storage occur. (Kittitas County Code §17A, 2014). The Anderson Project will not result in the net loss of any habitat or floodplain storage. Rather, this project will increase the amount of critical habitat while maintaining floodplain storage capacity.

Together, these plans demonstrate that the Anderson Project site falls within an area of significant ecosystem protection and restoration need. We will address the various actions identified in these plans thoroughly in our technical advisory group alternatives assessment phase, followed by completely incorporating the plans into our chosen design. We plan to follow the same process for reducing flood risks to increase ecosystem functions. That is, we will use the technical advisory group and landowner to establish the on-site goals for the restoration alternatives. Once established, we will determine what actions meet those restoration goals while maintaining the working agricultural landscape and reducing flood risks. We will then assess these actions to determine the most beneficial actions and complete engineering documents and plans.

Based on our planned outcomes, there are several ways that the Anderson Project will directly benefit the ecosystem needs of the area. First, we will increase the allowable channel migration area by removing or reshaping levees. This will allow the channel to safely migrate away from any major roads while also allowing floodwaters to access the floodplain. This also allows the channel to widen over time and reduces the river's velocity and erosive potential in the area, helping protect state, county, federal, and private properties. The benefits to the ecosystem are increased channel complexity and floodplain connections, both of which can increase ESA-listed fish habitat and improve riparian forest health and floodplain condition. Removing or reshaping the levees also lowers the risk of levee failure, thereby reducing the risk of unnatural sediment inputs, which helps maintain the water quality throughout the reach. Any design work that incorporates the channel migration zone will follow the recent Kittitas County Shoreline Master Program.

Second, we will restore floodplain connections by assessing the floodplain elevations to determine if unnatural processes resulted in higher elevations. We will then determine how to restore a base flood elevation that matches neighboring properties (or lower if possible). This should provide a base flood elevation that allows floodwaters to access the floodplain easier and reduce the stresses on neighboring lands. Restoring natural contours will also reduce flood hazards to nearby structures (county and state roads and water treatment plant), and help restore nature side-channels. By providing easier access to the floodplain, the floodwaters can enter the area and deposit sediments vital to cottonwood restoration. In turn, young cottonwoods will increase the understory complexity and roughness and slow future floodwaters. In turn, this can increase the fish and wildlife habitat availability, particularly by reconnecting

natural side-channels that provide seasonal refuges for endangered species. Water quality will benefit from the increased shade created as new cottonwoods mature and provide shade to surface waters.

Third, we will reconnect side channels that were disconnected through past land use practices and investigate development of an additional side channel. Side-channels provide mitigate flooding hazards by allowing the water to spread out and dissipate energy. More importantly, these channels will provide high water refuge for endangered steelhead and bull trout. These channels may also help protect Anderson’s agricultural operations by guiding floodwaters away from his fields while also reducing the risk of flooding to any other areas.

Fourth, this project will also protect Anderson’s agricultural operations by reconfiguring a failed levee. This is a primary concern for Anderson that is of ecological importance. A major levee failure would result in unnatural sediment inputs to the Yakima River and create the potential for avulsion through the property. Eliminating the risk of levee failure allows the property to maintain its agricultural character and provide floodplain ecosystem benefits – something important to Mr. Anderson, the agricultural community, and the environmental community.

Fifth, we will investigate alternatives to enhance and maintain a nearby irrigation ditch (Fogarty Ditch) as a side channel. Currently, the ditch functions as both a side channel and irrigation ditch. This is not ideal for fish or irrigation purposes. As part of our alternatives assessment, we will engage ditch users to determine the feasibility of alternatives for the ditch while facilitating continued agricultural use.

Sixth, climate change will impact ecosystem functions by altering water temperatures, seasonal water availability, and flow regimes. This will threaten the persistence of ESA-listed steelhead and bull trout. We are interested in collaborating with NOAA, the UW Climate Impacts Group, and other relevant partners to properly evaluate and quantify climate change impacts that could affect the Anderson Project’s design and implementation.

Finally, we will collaborate with all other project sponsors in this reach. This allows us to design a project that maximizes the ecological and flood hazard benefits to all stakeholders. Together, the suite of projects in this reach constitutes a comprehensive river restoration strategy that is self-sustaining over the long-term.

**4. Is your project in a Puget Sound Partnership Priority Floodplain? (5 points)**  
*(Deschutes, Dungeness, Duwamish/Green, Elwha, Hood Canal, Lake Washington, Lower Skagit, Nisqually, Nooksack, Puyallup, Sauk, Skokomish, Skykomish, Snohomish, Snoqualmie, Stillaguamish, Upper Skagit)*

Answer question 4 here: Yes                      No      X

**5. Other benefits (40 points)**

Describe how your project maintains or improves agricultural viability, water quality, public open space/recreation access, economic development, or other important local benefits or values, and does not conflict with other objectives of this program. Projects receive points based on the importance of the result produced, the ability of the solution to address the overall stakeholder need and the long-term improvement.

- a. Agricultural viability (evidence of agricultural benefits include reductions in flooding (acres), protection from development (acres), improvement of drainage infrastructure (acres), or other capital or non-capital benefits to agricultural productivity).
- b. Water quality improvement [e.g., through stormwater infrastructure upgrades, treatment of a TMDL or 303(d) issue, reduction in sediment, restoration of wetlands or riparian areas, implementation of related best management practices, etc.].
- c. Public access and recreation (e.g., through land acquisition, the development of trails or other

recreational infrastructure, etc.)

- d. Other floodplain values or services of local importance.

**Answer question 5 here:**

The Anderson Project also provides private property and agricultural benefits. The private property benefits are reduced risk of flood damage as mentioned above. The benefits to agricultural viability in occur in two different ways. First, we will work with relevant agencies to develop a grazing and land management plan to protect the agricultural infrastructure investments of Anderson (fencing, irrigation equipment, farm roads). The plan will address the manner in which the land is grazed and managed to allow Anderson to achieve his agricultural goals while also minimizing his risks from floodwaters. The plan will not include building new levees or reconfiguring existing levees in any way that increases their footprint. Any levee reconfiguration that occurs will still allow the field to flood but will maintain the low current velocities through the field and minimize the likelihood of an avulsion from a large flood event. Such a plan allows Anderson to maintain and protect his agricultural investment and continue to utilize this property for agricultural purposes (historic photos demonstrate over 50 years of such use).

Second, we will develop a land use plan (with a grazing management plan) for the downstream portion of the property that allows Anderson to graze cattle. We will design the plan to allow rotational grazing in areas that are biologically robust at different times of the year. The plan will integrate sound, well-reasoned and scientifically-based restoration practices (like controlled burns and cattle grazing) to restore the functions of a naturally occurring flood cycle that are absent due to river regulation. We will utilize the local Natural Resource Conservation Service to develop the grazing plan in conjunction with Anderson's agricultural goals and the restoration goals for the property.

The Anderson Project offers numerous water quality benefits. For example, flood hazard mitigation will reduce the likelihood that contaminated sediments from a historic manure spray field will enter the Yakima River. Riparian areas along the side channels and floodplain will provide shade and maintain lower water temperatures. Increasing channel roughness will reduce turbidity by allowing sediments to settle. Restored riparian areas also buffer the addition of agricultural nutrients and pesticides to the river system.

This project does not change the amount of public accessing the region. However, by improving fish habitat, this project will incrementally help restore fish populations in the area which will benefit anglers and guide services based in Ellensburg and Cle Elum that utilize this reach for client fishing.

Both elk and mule deer utilize the property for overwintering and our restoration plans will account for deer and elk habitat requirements. This can help provide relief on other properties from depredation (the landowner currently accepts the deer and elk). Also, this property may serve as a refuge of sorts that keeps the animals away from major roads and limits vehicle-animal collisions—are a non-trivial factor.

**6. Cost-effectiveness (20 points)**

- a. Project will be judged on whether the budget is appropriate to the project scope, and designed for project success.
- b. Describe how the project will be continued or maintained after the grant has been completed.
- c. If project cannot be fully funded, explain how the project could be scaled downward.

**Answer question 6 here:**

As mentioned, this proposal seeks funds to assess current conditions, develop and model alternatives and options for floodplain restoration and flood risk reduction, and take a chosen option/alternative to final design. We want to design the Anderson Project to provide protection for the agricultural investment of Anderson while restoring the functionality of the floodplain and its ecosystem. Through careful design and

planning, we anticipate a self-sustaining floodplain that allows for agricultural operations.

We recognize that naturally flooding cycles are not present in this area due to regulation of the river for downstream irrigation. As such, we plan to develop a land use plan that will allow the landowner to utilize the property in a manner that simulates an annual flood disturbance as much as possible. The plan will include a revegetation strategy that will allow us to restore the vegetation after organized disturbance of the ecosystem (i.e. burning, cattle grazing, mowing, etc.). We will carefully coordinate the revegetation and grazing management to minimize the negative interactions between the two. This will give newly planted vegetation an opportunity to establish and restore the floodplain ecosystem.

This strategy will allow us to maximize the funds awarded by meeting the goals of the project from the standpoint of multi-disciplinary floodplain benefits.

In the event we receive only partial funding, we will develop the alternatives through the technical advisory group. We will incorporate the landowner's goals and objectives for his property into the alternatives. These alternatives will then be scored for ecosystem and floodplain benefits. We will select a final alternative/option from the scored list. We will design the scoring to take into account the multi-benefit goals of the Floodplains by Design program. The landowner will help score the projects before we choose a final option. When the final option is chosen we will fully model it for flooding and ecosystem benefits. Additionally, the project manager will assume a greater role in document development and permitting to reduce the amount of work that is contracted to an outside firm.

Please refer to the budget and project scope for specific numbers and a timeline.

**7. Long-term cost avoidance: (30 points)**

- a. Describe how your project minimizes or eliminates future costs for maintenance, operation, or emergency response. **(15 points)**

**Answer 7.a. here:**

This project avoids long-term costs in several ways. First, our design will utilize proprietary fish habitat software that will allow us to design fish habitat that maximizes the amount of habitat created at different river flows. This will reduce the need to return to the site to alter fish habitat at a later date to account for different flows.

Second, we will integrate this project with other ongoing flood hazard reductions and fish habitat projects in the area. By doing so, the Anderson Project will account for major design features from other projects that may change river conditions and impact how restoration actions function. Incorporating the other projects and their effects into our project will allow us to eliminate the need to take corrective actions for poorly designed features in our floodplain. Furthermore, this will also allow other projects to incorporate our features into their designs to minimize the need for later corrective actions on those projects.

Third, we will help Kittitas County and the Washington Department of Transportation avoid emergency response costs by reducing the potential negative effects of the Yakima River on their infrastructure. The Anderson Project will reduce the pinch points on the Yakima River and reduce the floodwater velocity as it approaches I-90 and county roads.

Fourth, we will develop a land management plan that will allow the floodplain to function as naturally as possible while maintaining agricultural practices. If properly designed, the plan will preclude the need for the landowner or any other agency to take further action on the property beyond monitoring and annual use. Moreover, the management plan will reduce the need to return to the project site and take further restorative actions.

- b. Describe how your project accounts for expected future changes to hydrology, sediment regimes, or water supply resulting from other floodplain management efforts, land use changes, extreme weather events, or other causes. **(15 points)**

**Answer 7.b. here:**

At present, the project reach is heavily armored from years of an altered hydrograph that starved the reach of fine sediments. The resulting ongoing shear stresses in the channel continue to prevent sediment recruitment and channel forming processes, which prevents regular channel forming actions from occurring. The US BOR documented these current conditions in their analysis and reports generated for the Schaake Property (immediately across the river).

We expect the Anderson Project to help reduce the current velocities and shear stresses by allowing more natural flooding and channel forming processes. Ideally, the Anderson Project (paired with additional projects in the area) will help recruit fine sediments to the channel and increase the natural channel formation processes in the project reach.

Moreover, we plan to account for future changes to hydrology, sediment regimes, and water supply by designing working in close coordination with neighboring properties and projects. Careful planning and coordination will allow us to incorporate design elements into the Anderson Project that maximize natural river functions while still protecting the agricultural and infrastructure needs in the area.

At this time the Anderson Project does not account for future changes because we are in the initial design phases. However, we can assure funders that the Anderson Project will account for future changes in the system by designing minimally invasive features that allow for natural functions to the extent practicable. Moreover, we will work with the landowner to develop a land use plan that will allow for land use in conjunction with changing system conditions.

**8. Demonstration of need and support (30 points)**

- a. Describe how your project is consistent with the intent of existing floodplain management or habitat recovery plans or is specifically identified through existing plans or work programs. (Elements of the project may have been developed through more than one planning process. Please identify the planning process used for each major element if they are not from a common plan.) **(15 points)**

**Answer question 8.a. here:**

Mentioned above, the Anderson Project addresses the assessment, modeling, and design phases necessary for a full project. At present, the Anderson Project is in the planning and assessment phase. As such, we retain flexibility for the options chosen and are able to work with the ongoing efforts of Kittitas County and any other flood hazard reduction efforts in the area. Thus, we have the ability to meet the intent of existing and developing floodplain management plans in the Ellensburg area.

We are able to meet the goals and objectives of additional plans in several ways. First, levee removal and/or significant setbacks are identified as options for this property and discussed in the US BOR Schaake Property Habitat Improvement Study as a key element to improving the overall flooding and fish habitat health of the river. Additionally, Kittitas County is in the process of assessing the flood hazards and risks in the floodplain immediately downstream from the Anderson Project site. The project complements Kittitas County assessment and may act as a functional extension of their efforts. The need for habitat restoration and flood risk reduction was identified by both the US BOR and Kittitas County and the project helps address these needs.

Second, we anticipate developing ESA-listed salmonid habitat, such as side channels for rearing and spawning. These elements are identified in the Steelhead Recovery Plan and in the Bull Trout Recovery

Plan.

Third, floodplain health and restoration are identified in the Yakima Basin Integrated Plan as primary elements to successfully restoring the functions of the Yakima River ecosystem. Actions to restore and protect the Yakima River floodplain health are identified as critical to the future of the basin in the Yakima Basin Fish and Wildlife Recovery Board's Subbasin Plan.

A fourth, and final component, is the preservation of agriculture. The Yakima Basin Integrated Plan also identifies maintaining the viability of agriculture as an end goal. This project will help to meet that goal by protecting agriculture and integrating it into the design alternatives rather than attempting to remove agricultural land use from the restoration.

- b. Describe which flood control authorities, Tribal Nations, local governments, lead entities, key stakeholders or decision-makers representing floodplain interests located within the river reach or affected by the project have provided letters of support explicitly endorsing the project and its outcomes for their interests. **(15 points)**

**Answer question 8.b. here:**

We will direct or submit all letters of support for this proposal to the Department of Ecology by September 22, 2014. We anticipate support on this project from the Kittitas County (Flood Control Zone District), Yakama Nation, Yakima Basin Fish and Wildlife Recovery Board, Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, and National Marine Fisheries Service.

**9. Readiness to proceed and complete the proposed phase of the project (25 points)**

Describe how your project is ready to proceed with the scope of work, and your capacity to complete the project successfully and maintain it over time, including your project schedule and deliverables. Describe your experience with similar projects. If your project is acquisition only, describe how you will complete floodplain restoration subsequent to the acquisition.

**Answer question 9 here:**

Justin Bezold of TU-WWP is the project manager. Justin earned B.S. and M.S. degrees in fisheries biology and a law degree. Professionally, Justin was a project manager/regional fishery biologist for the Idaho Department of Fish and Game for 2.5 years. In that role, Justin restored ESA-listed salmon and steelhead habitat in the Salmon River basin in Idaho. His projects were fishery-centric but ultimately included all relevant natural resources associated with fish habitat restoration. Combined, his education and experience give him the tools to make this project a success.

We designed this project to maximize coordination with other entities and likelihood of success. At this time, we are prepared to proceed with phase one upon receipt of notification that the Anderson Project will receive funding. Justin is working with the landowner and technical experts in the area to develop a vision for the property. He is also building community support for the project to ensure all stakeholders are represented and considered when we begin phase one.

The main components of phase one include accumulating data from relevant agencies and conducting a thorough literature review to determine what information is known. This will provide us with the necessary information to plan our assessments and begin designing project alternatives. Finally, Justin will also maintain communication with stakeholders to notify them of project progress.

As we near completion of phase one, we will begin work on phase two—the selection of design alternatives and completion of all necessary engineering plans. As with Phase One, Justin Bezold will

manage this work. Moreover, Justin will work with relevant agencies to communicate the design and enter the permitting and compliance process (biological, cultural, and flood zone).

To help with Phase One and Two, we identified GeoEngineers as the design firm. In addition to unique experience and qualifications with floodplain work and fish habitat restoration in the Yakima River basin, this firm offers proprietary modeling software that will allow us to tailor habitat restoration design for maximum benefit and ecological function. Typically, restoration efforts are quantified in terms of linear feet of fish habitat created. However, the new modeling technique will allow us to maximize the volume of habitat enhanced/created and provide a more accurate representation of fisheries restoration. This permits design variability of any fish habitat structures to maximize the habitat created/restored at a variety of Yakima River flows.

GeoEngineers will also help with the development of a construction timetable based on the relevant instream work windows (when necessary to work in the water). Since development of the pre-proposal, the landowner offered construction services as a cost-share element. As such, GeoEngineers will still develop a cost-estimate of construction activities but we will only use that estimate for budgeting purposes. Moreover, we will coordinate our construction schedule with the availability of the offered construction services to maximize the cost-share amount.

Phase Three and Four: At this time, we are not prepared to proceed beyond phase two because we require the designs and permits to be acquired during phase two. Please note, however, that the construction services are secured at this point and we anticipate not requiring additional funds from any source for the construction of this project. If we do require additional funds, we will pursue those from another source.

#### **10. Pilot project and leverage opportunities (25 points)**

- a. If applicable, describe how your project could serve as a pilot effort or result in changes or results with broader impacts to the state. **(10 points)**

**Answer question 10.a. here:**

This project can act as a floodplain restoration and flood risk reduction pilot within the Ellensburg area of the Yakima River basin. We anticipate the Anderson Project being the first project completed in the reach. This allows the Anderson Project to act as an anchor point in the reach and remove uncertainty as other projects are planned in the reach. Until now, this property was an unknown in the greater reach and other agencies had to work around it. We look forward to the opportunity to integrate other entities into the design and alternatives process to demonstrate the importance a small property can have in the greater context. Additionally, this project will build on past successes of the Yakima Basin Integrated Plan and continue to demonstrate the importance of a truly integrated process when designing and completing projects in Washington. The Yakima Basin has a proven record of inter-agency and stakeholder coordination and this project will further that ethos. This project can also demonstrate that entities other than traditional agencies are capable of completing floodplain restoration and flood hazard reduction projects because of the integration process. By doing so, we hope to provide landowners another option to complete restoration and flood hazard projects on their land.

- b. If applicable, describe how your project leverages existing investments, such as SRFB, FCZDs, Dike Districts, TMDLs, WWRP, ESRP, NEP, and other funding sources. Evidence of this will be based on the amount and diversity of the leveraged funding sources. **(10 points)**

**Answer question 10.b. here:**

Numerous agencies invested various resources in the project reach over the past 15 years. We plan to leverage investments from the US BOR, Kittitas County, the Yakima Basin Integrated Plan, and the Natural

Resource Conservation Service. For example, much of the hydraulic modeling is complete and available from the US BOR. Additional modeling was completed for Kittitas County and we plan to work with the county to incorporate their model results and parameters to ensure the Anderson Project closely coordinate. Several LiDAR datasets were collected during the past decade permit fine-scale topographic analysis of the floodplain. We will leverage project manager time and avoid hiring an external project manager (NRCS funding). We will leverage private funds from the landowner in the form of construction costs and grazing management plan implementation. Finally, the Anderson Project fits into the goals of the Yakima Basin Integrated Plan and will provide more benefit to projects completed under the plan and results in a leveraged funding for the plan and floodplains by design. Combined, by coordinating with the funding sources we are able to keep design and construction costs low and avoid duplicating work while providing good value and return on public money.

- c. If applicable, describe how your project addresses inequity or social justice issue by benefitting underserved communities. **(5 points)**

**Answer question 10.c. here:**

At the present time, the Anderson Project does not address social justice issues or directly benefit an underserved community. However, Kittitas County is developing plans for flood zone control district work. As such, the Anderson Project will benefit the Kittitas County FZCD by addressing a portion of the floodplain that is of concern to the district. This will allow the District to utilize its funds in another place while still benefitting from the project.

**11. Budget** (add more tasks as needed).

<b>Task</b>	<b>Amount Requested from Ecology*</b>	<b>Other Funding for Project** (20% of Total Cost Minimum)</b>	<b>Total Cost</b>
<b>Task 1—Administration</b>	<b>\$23,364</b>	<b>\$0</b>	<b>\$23,364</b>
<b>Task 2—Initial planning and geomorphic assessment of project site</b>	<b>\$22,500</b>	<b>\$5,500</b>	<b>\$28,000</b>
<b>Task 3—Alternatives Modeling and analysis (conceptual alternatives package)</b>	<b>\$60,500</b>	<b>\$10,000</b>	<b>\$70,500</b>
<b>Task 4—Preliminary Alternative Design (chosen)</b>	<b>\$26,600</b>	<b>\$7,500</b>	<b>\$34,100</b>
<b>Task 5—Final design package, permitting, and compliance</b>	<b>\$12,200</b>	<b>\$10,000</b>	<b>\$22,200</b>
<b>Task 6—Operations (travel, supplies, communication)</b>	<b>\$6,000</b>	<b>\$10,000</b>	<b>\$16,000</b>
<b>Total</b>	<b>\$151,164</b>	<b>\$43,000</b>	<b>\$194,164</b>

\*Amount requested from Ecology under this grant program

\*\*Other sources of funding dedicated to this project. Insert narrative below that details what the

source of funding is and whether or not it has been received or applied for but not yet received.  
Match must be at least 20% of Total Project cost.

**Narrative and/or Table of other funding sources for project, here:**

Phase One and Two Request:

All the funds requested in the above budget table are to cover the costs of Phase One and Two of the Anderson Project. The estimates come from a prepared cost-sheet from GeoEngineers (see the scope of work). The cost-share (non-Floodplains by Design) funds come from two sources. First, the landowner and his ranch manager will take part in planning exercises. The time and energy commitment is measurable and we include that at a modest \$ 2,000 amount under Task 2 (initial planning). Second, Trout Unlimited has secured and received funding for a Natural Resources Conservation Service grant that funds Justin Bezold to act as a project manager. We include \$ 41,000 for this amount, which includes his time and benefits for 6 months of work (expected time required to complete this project).

We expect these funds to fully cover the costs associated with the necessary and important assessment and analysis process.

For actual project implementation and monitoring (Phase Three and Four), we expect to pursue and receive two different sources of funds. First, to complete project implementation Mark Anderson offered cost-share in the form of construction equipment, time, and operators to complete the restoration objectives. At this time, the total estimated amount is uncertain, as the final value is highly contingent on the restoration and flood risk reduction chosen alternatives. However, the amount will cover the cost of major construction (earth moving) activities associated with the final design of this project.

Second, we will pursue any additional funds necessary to cover the cost of revegetation or maintenance/monitoring from Salmon Recovery Funds. This project meets many of the same goals as that program. At this time, the amount we will pursue is unknown as it relies on the chosen alternatives.

If it's not possible to fully fund this proposal, please describe a *phased* approach that would still significantly advance the effort:

If this project is not fully funded, we will reduce the amount of alternatives assessment the consultants conduct. We will then allow the technical advisory group and project manager to assume more of the preliminary alternatives development and assessment. The resulting alternatives will be scored by the advisory group (including the landowner). GeoEngineers will model the top alternatives to determine the fisheries and flood risk benefits. Additionally, Justin Bezold (project manager) has experience with these types of projects and will work to minimize costs by performing work himself when possible.

- 12. SCOPE OF WORK:** Please attach a Scope of Work and schedule. If your proposal is a phase of a larger multi-year project, please place this proposal in the context of the overall project and provide preliminary cost projects to complete the project.

See Appendix 2 for Scope of work with a timeline.

- 13. Maps:** Please attach at least two (2) maps to your application. The first map should be a vicinity map and the second should be a map of your project.

Attached in Appendix 1 are two maps. Figure 1 is a vicinity map. Figure 2 is a project site map.

- 14. Planting Maintenance/Survival:** If your project includes plantings, please provide a description

of how you will ensure plant survival and maintenance.

At the present time, we are evaluating the various options for riparian/floodplain restoration through plantings and land management plans. We will ensure survival and minimal maintenance of any vegetation work by acquiring our plants/trees from appropriate sources that account for project site elevation, climate, and land use plans. We will design the revegetation plan with the grazing management plan to maximize plant survival (i.e. only in required areas, timed with weather, and coordinated with grazing/land disturbances). We will work with Mark Anderson and the Kittitas Conservation District Office to develop a land management plan that effectively maintains floodplain ecosystem health.

- 15. Photos:** Photos are not required, but if you think they enhance our understanding of your application, please include them. We are particularly interested in “before” photos that can be matched with “after” photos.

At this time, photos are not pertinent to the application. However, we plan to document the before and after conditions for the Anderson Project to demonstrate the success of the process.

- 16. Executive order 05-05, Archaeological and Cultural Resources** (online at [http://www.governor.wa.gov/office/execorders/eoarchive/eo\\_05-05.pdf](http://www.governor.wa.gov/office/execorders/eoarchive/eo_05-05.pdf)) directs state agencies to review all capital construction projects for potential impacts to cultural resources to make sure that reasonable action is taken to avoid adverse impacts to these resources. If this grant program is funded by the 2015 Legislature, successful grant applicants will be required to submit additional information to Ecology to comply with this Executive Order.

**Additional factors in ranking and award:** This is a very new funding source. To ensure that projects meet the objectives of the program, these additional factors will be considered in creating the proposed funding list:

- **Balance of project types:** Balance funding ready-to-proceed construction projects with funding pre-construction activities. This balance in project types is vital to ensuring success over time.
- **Geography:** There is strong interest in ensuring that projects in all areas of the state receive funding.
- **Advancing multi-benefit floodplain management:** It is important that the project list advance the principles and practical application of multi-benefit floodplain management.

## Certification

I certify to the best of my knowledge that the information provided above is true and correct and that I am legally authorized to sign and submit this information on behalf of the organization applying for this grant.

  
\_\_\_\_\_  
Signature

September 8, 2014  
\_\_\_\_\_  
Date

Justin Bezold, Project Manager

\_\_\_\_\_  
Printed name and Title

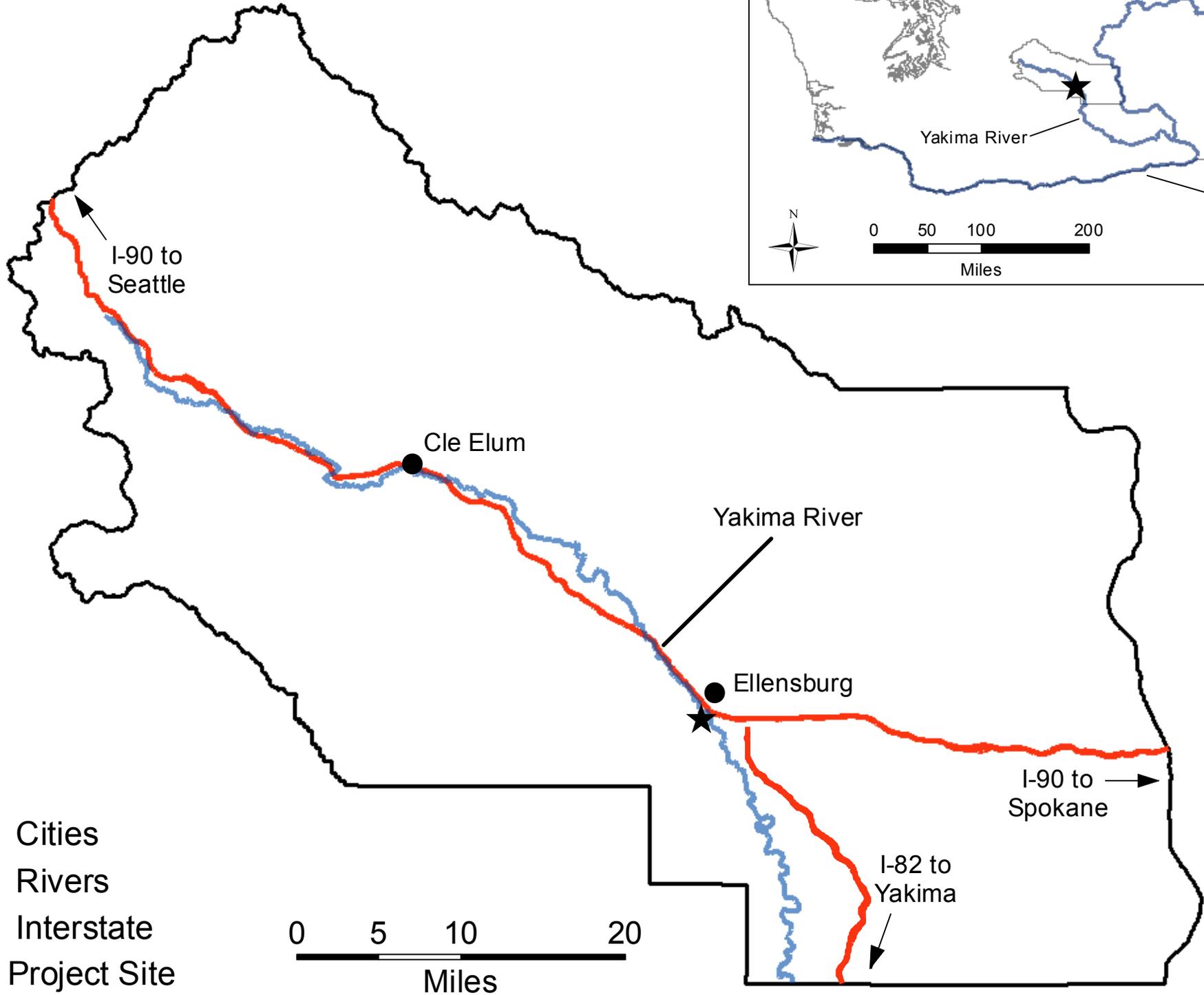
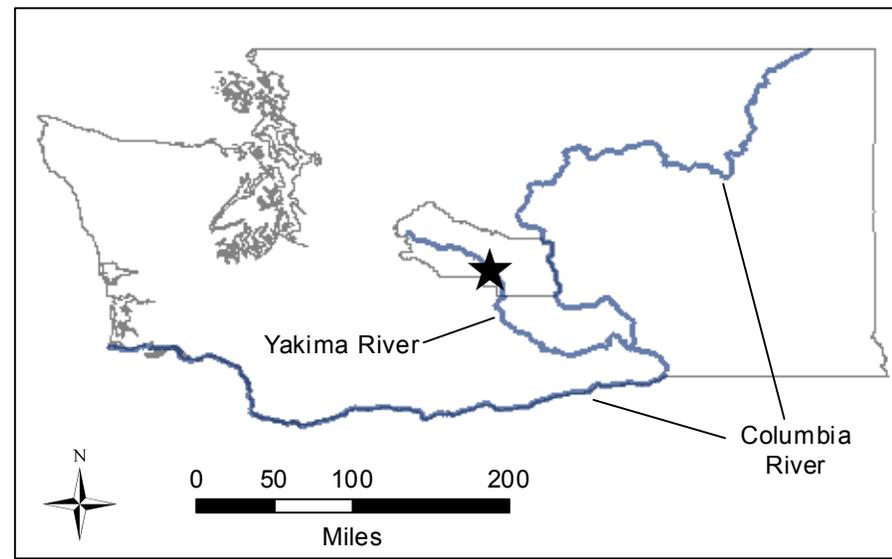
Trout Unlimited

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Name of Organization Applying for Grant

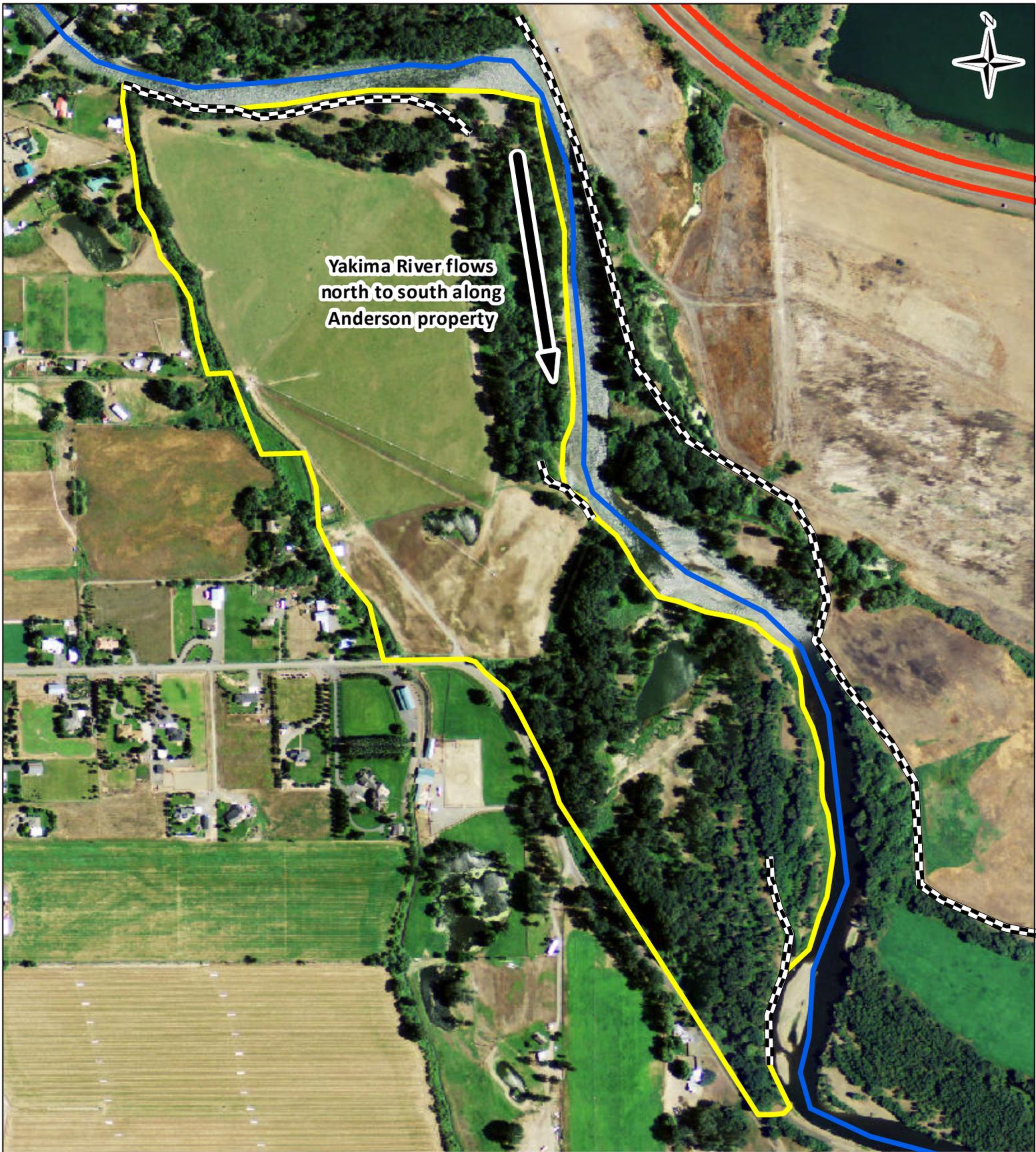
**Appendix 1. Maps.**

# Kittitas County, WA

Figure 1. Overview map of Anderson property in Kittitas County, WA.



- Cities
- Rivers
- Interstate
- ★ Project Site

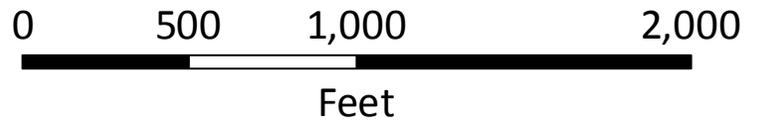


 Anderson Property

 Yakima River

 Interstate 90

 Levees



Basemap is NAIP 2013 compressed county mosaic.  
This map provided "as is" and without warranty of any kind.

## **Appendix 2. Scope of Work and Timeline**

## SCOPE OF WORK and TIMELINE

### Trout Unlimited's Anderson Property-Yakima River Floodplain Restoration

The goals of our project are four-fold and designed to integrate with ongoing assessment and restoration efforts in the area. We plan to: (1) restore floodplain ecosystem functions to as much of the property as practicable; (2) protect the agricultural portion of the property from catastrophic flooding risks; (3) enhance and restore endangered species listed steelhead habitat in side channels and spring creeks; and (4) complete a project with significant public benefit (flood hazard reduction). To achieve these goals we will first convene a technical advisory group to provide options for realistic restoration actions throughout the property.

These actions will include: (1) levee reconfigurations (set-backs, removals, and reshaping: all three expected); (2) corrective steps (revegetation, grazing plan, earth moving) to remedy past land-use practices (gravel mining, grazing); (3) floodplain reconnection with the river system (remove remnant levees and gravel spoils to lower the base flood elevation); (4) grazing plan development to allow a working landscape that encourages responsible cattle grazing in the floodplain; (5) floodplain ecosystem services restoration throughout the property; (6) development and enhancement of off-channel fish habitat; and (7) irrigation ditch/side channel restoration/enhancement options.

To complete these actions and meet the goals, our scope of work includes:

**Task 1: Administration:** We expect the administration of the funds to last until the funds are fully expended and we meet all reporting requirements. Our cost to administer the funds is \$23,364. Trout Unlimited staff in Yakima and Wenatchee, Washington will primarily administer the funds. Some assistance from Washington D.C. staff will occur at times.

**Estimated Completion:** upon grant completion

**Deliverable:** grant reporting requirements (budget expenditures, etc.)

**Task 2: Initial planning and geomorphic assessment of project site:** From a technical advisory group (including the landowner) to develop set of alternatives and goals with specific objectives and a unified project vision among different resource management agencies and the landowner. Compile all necessary background data and models for the project area, including but not limited to US BOR models, Kittitas County Flood Control Zone District data, Washington Department of Fish and Wildlife data, etc. GeoEngineers will evaluate all relevant information to include an analysis of the longitudinal profile, planform pattern, cross-section dimensions, cross-section hydraulics, riverbed and riverbank materials, sediment transport conditions, and large roughness elements such as boulders and large woody debris. We will also evaluate fluvial dynamics in the mainstem using BOR model data and results.

**Estimated completion:** June 2015

**Deliverables:**

- A description of the Yakima valley physiography, including the geologic setting, landforms, and climate

## Trout Unlimited's Anderson Property—Yakima River Floodplain Restoration

- A hydrologic analysis of flood frequency discharges and general discharge statistics applicable to the project reach
- Longitudinal slope of the valley and active channel
- Analysis of active channel planform pattern from historic aerial photographs, including sinuosity, radius of curvature, meander wavelength, location of main channel and side channels, relationship between channel dimensions and valley/floodplain dimensions, style and rate of channel migration
- Analysis of riparian vegetation extent and plant community type from historic aerial photographs
- Analysis of LiDAR elevation data to assess main channel and side channel locations, potential avulsion risk, the extent of the channel migration zone, and riverbank elevations relative to main channel and side channel elevations
- Riverbed surface grain size distributions for each geomorphic unit sampled
- Analysis of cross-section hydraulics such as bankfull discharge, hydraulic radius, mean velocity, applied shear stress, incipient motion, and relative bed stability
- Analysis of longitudinal variation in stream power, sediment transport competency and capacity
- Length, height, slope and composition of actively eroding riverbanks
- Analysis of large wood material for location, type, orientation to flow, and functional interaction with the active channel and floodplain

**Task 3: Alternatives Modeling and analysis:** Assess alternatives for feasibility including preliminary hydraulic and fisheries habitat modeling; complete draft alternatives assessment. Preparation of the alternative concepts will be an iterative and collaborative process between the landowner, Trout Unlimited, BOR and other regulatory agencies as appropriate.

The conceptual alternative deliverable will include plan view drawings, cross sections, typical structure details, and cost estimates for each alternative. The conceptual plan sets will also include estimates of habitat uplift for each alternative. In addition, this deliverable will include a ranking matrix and benefit/cost analysis based on ecological objectives, which provides a quantitative and objective way of selecting a preferred alternative.

**Estimated completion:** August 2015

**Deliverables:**

## Trout Unlimited's Anderson Property—Yakima River Floodplain Restoration

- A topographic/bathymetric base map and a Digital Elevation Model (DEM) of the project site. This task will be the project design foundation.
- Habitat modeling assessment: GeoEngineers has developed a proprietary method for evaluating habitat uplift by combining hydraulic and habitat models. We will use this tool for evaluating anticipated habitat uplift that can be achieved through proposed designs. We will be able to show and quantify habitat conditions before they are constructed and compare them with existing conditions to determine uplift. Results of this assessment will be quantified and presented in two ways. First, habitat for each species and life history stage will be quantified in terms of Weighted Usable Area (WUA) throughout the treatment areas, at three specific flow recurrence intervals. Second, using the BOR hydraulic model output in our GIS-based habitat analyses, we will map the habitat to illustrate a spectrum of where suitable habitats will exist.
- Hydraulic Modeling: The hydraulic modeling will be the foundation for developing our design and also developed in concert with the habitat modeling. For the purposes of this project, we believe a combination of one-dimensional and two-dimensional steady-state models will be necessary to evaluate side channel conditions. All hydraulic modeling results will be used to develop design plans in a Civil 3D platform.
- Riparian Inventory: Results from the riparian inventory will be summarized in a memorandum with accompanying maps and figures. The riparian inventory will be useful in establishing flow paths throughout the floodplain to minimize riparian impacts during construction.

**Task 4: Preliminary Alternative Design (chosen):** Finalize alternatives assessment and modeling; coordinate this task closely with stakeholders in the area. Provide finalized report to all stakeholders and the technical advisory group and select a preferred alternative. After selection of the preferred conceptual alternative, GeoEngineers will develop a preliminary design package. The restoration design plans will include the physical character of the restoration, construction techniques, sequencing, staging, and cost estimating. The Preliminary plan set will have the necessary detail for permit preparation and submission.

**Estimated completion:** December 2015

### **Deliverables:**

- Cover Sheet – Illustrates the project location and serves as the Table of Contents for the design plan set.
- General/Construction Notes – This is a brief summary that describes design assumptions, rationale for the design, and contractor responsibilities.
- Vision, Goals, and Objectives – This is a graphic illustration of the values the design is intended to capture.

## Trout Unlimited's Anderson Property—Yakima River Floodplain Restoration

- General legend and treatments – This sheet illustrates treatment options that will occur through the rest of the design set, briefly describes each treatment type, and indicates how each treatment achieves the specific goals listed on the previous sheet. This sheet also doubles as a graphic legend for subsequent sheets.
- Existing conditions – Existing conditions will be expressed on this and the following four sheets. This first sheet will be an existing conditions aerial photo.
- Existing DEM – The second sheet will show the Digital Elevation Model of the project site.
- Existing soils – We include this sheet to provide geomorphic context to the site and is often valuable in the absence of specific borings and/or site test pits that will better describe subsurface conditions.
- Existing topography/bathymetry – Topographic and bathymetric contours will be overlain on an existing condition aerial photo for increased resolution of the site.
- Proposed Enhancements – This sheet illustrates an overview of the proposed enhancements. We often develop this sheet so it can be used as a display poster for wider audiences.
- Sheet index – The sheet index captures the entire site and illustrates specific sheets that provide increased detail at given locations throughout the site.
- Proposed channel plan and profile – This will be a series of sheets that provide a very specific level of detail for specific portions of the project site. Collectively, this series of sheets will be captured on the Sheet Index Sheet, noted above.
- Detailed cross sections – This will also be a series of sheets. Sections will be called out in the channel plan and profile sheets, noted above.
- Typical cross sections – The typical sections will provide information on typical channel and floodplain improvements, where applicable.
- Specific Details – Details of specific structures will also be provided. These will provide increased resolution on the structures and how they should be constructed. In addition to the permanent structures, these details will address temporary structures such as isolation structures and fish exclusion. Specific coordinates will be provided at key locations on the structures so the contractor's surveyor can locate the structures accurately in the field.
- Typical details – Details of typical structures and project elements will be included on this series of sheets. Details will range from habitat structures, diversion structures and Best Management Practices.
- Habitat uplift – This sheet will be a series of sheets that contrast and quantify existing habitat conditions with proposed habitat suitability and availability.

## Trout Unlimited's Anderson Property—Yakima River Floodplain Restoration

- Planting specifications – Will illustrate vegetation zones, plant community locations, and total planting area.
- Planting quantities – Will list the type, sizes, quantities, application rates and species of plants proposed.
- Survey Layout Plan – This plan will provide the coordinates of proposed channel alignments; controlling channel and floodplain features; toes and tops of banks; temporary staging areas; stockpiles; construction roads and the like. The survey data on this sheet will augment and complement the survey coordinates included on the specific structure detail sheets.
- Construction quantities – This will itemize construction materials and volumes
- Construction sequencing – These sheets will illustrate and describe the order in which construction occurs.

**Task 5: Final design package, permitting, and compliance:** Finalize design package to bid quality; begin permitting and compliance documentation.

Estimated completion: January 2016

### Deliverables:

- Basis of Design Report
- Contractor's Bid Package
- Construction Specifications

**Task 6: Implementation of design:** Gather materials, conduct engineering survey and mark elevations for construction, and begin/complete construction (including revegetation and grazing plans).

**Estimated Completion:** January 2017

### Deliverables:

- Completed grazing/land management/revegetation plans
- Fully implemented project

**Appendix 3: References.**

## Trout Unlimited's Anderson Property—Yakima River Floodplain Restoration

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Yakima River Basin Study, Vol. 1, April 2011, *Proposed Integrated Water Resource Management Plan*, U.S. Bureau of Reclamation, prepared by HDR Engineering, Anchor QEA, ECONorthwest, ESA Adolfson, and Golder Associates.  
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*Draft Technical Memorandum: Habitat Assessment, Yakima River – Hansen Pits to Yakima Canyon*, June 2014, prepared by Herrera Environmental Consultants, Inc. for Kittitas County Flood Control Zone District. Available upon request from Kittitas County.

*Draft Technical Memorandum: Flood & Erosion Assessment—Yakima River, Hansen Pits to Yakima Canyon*, June 2014, prepared by Watershed Science & Engineering for Kittitas County Flood Control Zone District. Available upon request from Kittitas County.

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*Yakima Subbasin Plan*, Final Draft, May 2004, Yakima Subbasin Planning Board, prepared for Northwest Power and Planning Council.  
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