



Shoreline Restoration Plan for Shorelines in Benton County: *Yakima and Columbia Rivers*



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SHORELINE RESTORATION PLAN
**FOR SHORELINES IN BENTON COUNTY: YAKIMA AND
COLUMBIA RIVERS**

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SHORELINE RESTORATION PLAN

FOR SHORELINES IN BENTON COUNTY: YAKIMA AND COLUMBIA RIVERS

1.0 INTRODUCTION

The Benton County Shoreline Restoration Plan builds on the goals and policies proposed in the Shoreline Master Program (SMP). The Shoreline Restoration Plan provides an important **non-regulatory** component of the SMP to ensure that shoreline functions are maintained or improved despite potential incremental losses that may occur in spite of SMP regulations and mitigation actions.

The Shoreline Restoration Plan draws on multiple past planning efforts to identify possible restoration projects and reach-based priorities, key partners in implementing shoreline restoration, and existing funding opportunities. Many of the projects and strategies identified are focused on restoring hydrologic processes where possible and protecting high-functioning areas. The Shoreline Restoration Plan represents a long-term vision for **voluntary** restoration that will be implemented over time, resulting in ongoing improvement to the functions and processes in the County's shorelines.

Many of the restoration opportunities noted in this plan affect private property. It is not the intent of the County to require restoration on private property or to commit privately owned land for restoration purposes without the willing and voluntary cooperation and participation of the affected landowner.

1.1 Purpose

The primary purpose of the Shoreline Restoration Plan is to plan for "overall improvements in shoreline ecological function over time, when compared to the status upon adoption of the master program" (WAC 173-26-201(2)(f)). Secondly, the Shoreline Restoration Plan may enable Benton County to ensure that the minimum requirement of no net loss in shoreline ecological function is achieved on a county-wide basis, notwithstanding any shortcomings of individual projects or activities.

Activities that will have adverse effects on the ecological functions and values of the shoreline must be mitigated (WAC 173-26-201(2)(e)). Proponents of such activities are individually required to mitigate for impacts to the shoreline areas, or agreed-to off-site

mitigation, which as conditioned, is equal in ecological function to the baseline levels at the time each activity takes place. However, some uses and developments cannot be fully mitigated. This could occur when project impacts may not be mitigated in-kind on an individual project basis, such as a new bulkhead to protect a single-family home that can be offset, but not truly mitigated in-kind unless an equivalent area of bulkhead is removed somewhere else. Another possible loss in function could occur when impacts are sufficiently minor on an individual level, such that mitigation is not required, but are cumulatively significant. Additionally, unregulated activities (such as operation and maintenance of existing legal developments) may also degrade baseline conditions. Finally, Benton County's SMP applies only to activities in shoreline jurisdiction, yet activities upland of shoreline jurisdiction or upstream in the watershed may have offsite impacts on shoreline functions.

Together, these different project impacts may result in cumulative, incremental, and unavoidable degradation of the overall baseline condition unless additional restoration of ecological function is undertaken. Accordingly, the Restoration Plan is intended to be a source of ecological improvements implemented voluntarily by the County and other government agencies, developers, non-profit groups, and property owners within shoreline jurisdiction to ensure no net loss of ecological function, and where possible improvement of ecological function (see Figure 1). No net loss of ecological function is defined by the Washington Department of Ecology's (Ecology) SMP Handbook (2010) as follows: "Over time, the existing condition of shoreline ecological functions should remain the same as the SMP is implemented. Simply stated, the no net loss standard is designed to halt the introduction of new impacts to shoreline ecological functions resulting from new development. Both protection and restoration are needed to achieve no net loss. Restoration activities also may result in improvements to shoreline ecological functions over time."

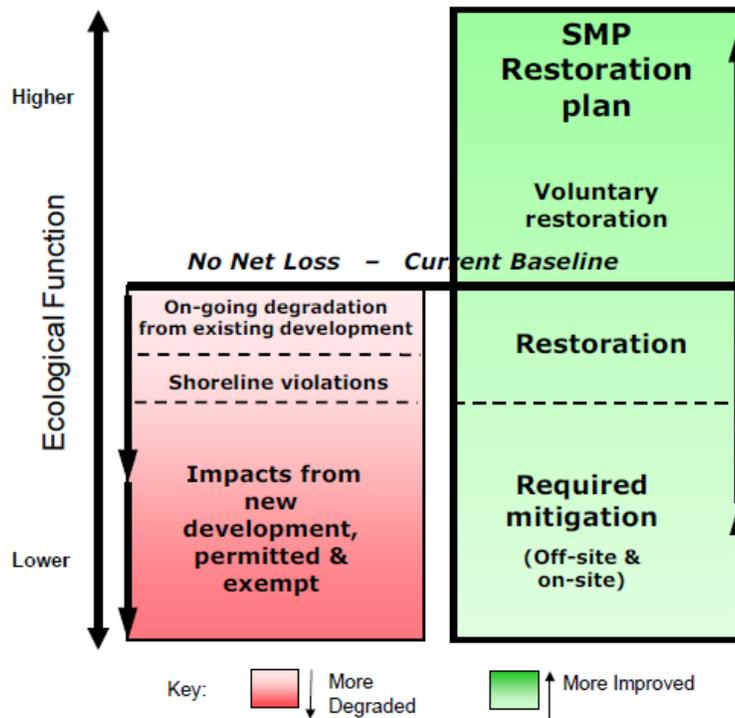


Figure 1. Diagram of the role of restoration relative to achieving the SMP standard of “No net loss” of ecological functions. (Ecology 2010)

1.2 Restoration Plan Requirements

This Restoration Plan has been prepared to meet the purposes outlined above, as well as specific requirements of the SMP Guidelines (Guidelines). Specifically, WAC Section 173-26-201(2)(f) of the Guidelines¹ says:

- (i) Identify degraded areas, impaired ecological functions, and sites with potential for ecological restoration;
- (ii) Establish overall goals and priorities for restoration of degraded areas and impaired ecological functions;
- (iii) Identify existing and ongoing projects and programs that are currently being implemented, or are reasonably assured of being implemented (based on an evaluation of funding likely in the foreseeable future), which are designed to contribute to local restoration goals;

¹ The Shoreline Master Program Guidelines were prepared by the Washington Department of Ecology and codified as WAC 173-26. The Guidelines translate the broad policies of the Shoreline Management Act (RCW 90.58.020) into standards for regulation of shoreline uses. See <http://www.ecy.wa.gov/programs/sea/sma/guidelines/index.html> for more background.

- (iv) Identify additional projects and programs needed to achieve local restoration goals, and implementation strategies including identifying prospective funding sources for those projects and programs;
- (v) Identify timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals;
- (vi) Provide for mechanisms or strategies to ensure that restoration projects and programs will be implemented according to plans and to appropriately review the effectiveness of the projects and programs in meeting the overall restoration goals.

In addition to meeting the requirements of the Guidelines, this Restoration Plan is intended to identify and prioritize areas for future restoration and mitigation, support the County's and other organizations' applications for grant funding, and to identify the various entities and their roles working within the County to enhance its shoreline environment.

1.3 Types of Restoration Activities

Consistent with Ecology's definition, use of the word "restore" in this document is not intended to encompass actions that reestablish historic conditions. Instead, it encompasses a suite of strategies that can be approximately delineated into five categories:

- **Creation:** Establishment of new shoreline resource functions where none previously existed.
- **Re-establishment:** Restoration of a previously existing converted resource that no longer exhibits past functions.
- **Rehabilitation:** Restoration of functions that are significantly degraded.
- **Enhancement:** Improvement of functions that are somewhat degraded.
- **Preservation:** Protection of an existing high-functioning resource from potential degradation. Preservation is often achieved through conservation easements or the purchase of land.

Restoration can sometime be confused with mitigation. Mitigation is defined by WAC 197-11-768 as the sequential process of avoiding, minimizing, rectifying and reducing impacts, as well as compensating for unavoidable impacts and monitoring the impact. Two primary conditions differentiate the terms restoration and mitigation: the outcome

and whether the action is voluntary or required as a result of anticipated or realized impacts. Table 1 describes the differences between the two terms.

Table 1. Characteristics of restoration versus mitigation.

Restoration	Mitigation
Actions to reestablish or improve functions or processes above the existing baseline condition.	Actions to compensate for unavoidable negative impacts to functions or processes and return functions and processes to existing baseline condition (the condition prior to the proposed impact).
Voluntary	Required as a result of anticipated or realized impacts

Although some of the projects or programs included in this Restoration Plan may be implemented as mitigation, only those projects and programs that have reliable certainty of being implemented as restoration will be utilized in the County’s cumulative impacts analysis

1.4 Contents of this Restoration Plan

As directed by the SMP Guidelines, the following discussions provide a summary of baseline shoreline conditions, list restoration goals and objectives, and describe existing County and local plans and programs that facilitate restoration actions, identification of the County’s partners in restoration, and ongoing and potential projects that positively impact the shoreline environment. The Restoration Plan also identifies anticipated scheduling and funding of restoration elements.

In total, implementation of the SMP in combination with this Restoration Plan will result in no net loss of ecosystem function, and voluntary actions and partnerships identified in this Plan may result in a net improvement in Benton County’s shoreline environment. The restoration opportunities identified in this plan are focused primarily on publicly owned open spaces and natural areas. **Any restoration on private property would occur only through voluntary means or through re-development proposals.**

1.5 Utility of this Restoration Plan

In addition to meeting a grant requirement, this Restoration Plan can be used by property owners and other interest groups in a couple of ways.

1. Information Resource: This plan identifies a number of organizations in Chapter 5.0 that provide guidance, and in some cases funding, for a wide variety of

restoration projects. These organizations can be consulted by property owners or other parties wishing to undertake a restoration action. Some specific guidance materials are also listed in Chapter 9.0.

2. Grant Applications: Programs and projects (either specific or general) included in this Restoration Plan may find it easier to obtain grant funding if the project is included in a publicly vetted and adopted plan.
3. Mitigation: In those circumstances where off-site mitigation may be necessary, this document can provide a source of programmatic ideas or specific projects that maximize the effect of the mitigation regionally.

Depending on the scale and type of project, property owners and interest groups wishing to conduct a restoration action may need to obtain permits from the County, as well as Washington Department of Fish and Wildlife, Washington Department of Ecology, Washington Department of Natural Resources, and/or the U.S. Army Corps of Engineers. In shoreline jurisdiction, the project would need to comply with the County's Shoreline Master Program, including the incorporated critical areas regulations. Also depending on the scale and type of project, professionals, including biologists or engineers, may need to assist in project development.

2.0 SHORELINE INVENTORY AND ANALYSIS REPORT SUMMARY

The County recently completed a draft comprehensive inventory and analysis of its shorelines (November 2012) as an element of its SMP update. The purpose of the shoreline inventory and analysis was to gain a greater understanding of the existing condition of the County's shoreline environment to ensure the updated SMP policies and regulations will protect local ecological processes and functions. The inventory describes existing physical and biological conditions in shoreline jurisdiction in unincorporated Benton County. The *Shoreline Analysis Report for Shorelines in Benton County: Yakima and Columbia Rivers* (TWC and BERK 2012) is summarized below to provide context for this Restoration Plan.

2.1 Shoreline Boundary

As defined by the SMA of 1971, shorelines include certain waters of the state plus their associated "shorelands." At a minimum, the waterbodies designated as shorelines of the

state are streams whose mean annual flow is 20 cubic feet per second (cfs) or greater and lakes whose area is greater than 20 acres. Shorelands are defined as:

“those lands extending landward for 200 feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward 200 feet from such floodways; and all wetlands and river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of this chapter...Any county or city may determine that portion of a one-hundred-year-floodplain to be included in its master program as long as such portion includes, as a minimum, the floodway and the adjacent land extending landward two hundred feet therefrom... Any city or county may also include in its master program land necessary for buffers for critical areas (RCW 90.58.030(2)(d))”

The County’s shoreline management area includes the shorelines of the Yakima River and the Columbia River.

Benton County adopted its original Shoreline Management Master Plan in 1974. The County’s shoreline management area includes the shoreline within the jurisdiction boundaries of the Yakima River and the Columbia River. Shoreline uses, developments, and activities are also subject to the County’s Comprehensive Plan, County Code, and various other provisions of County, state and federal laws.

2.2 Shoreline Inventory and Analysis Report

The County’s shoreline inventory and analysis encompasses shoreline jurisdiction currently within unincorporated Benton County (see the *Shoreline Analysis Report*, Appendix A (TWC and BERK 2012)). The *Shoreline Analysis Report* includes a summary of the current regulatory framework and existing shoreline conditions, as well as an analysis of ecological functions and ecosystem-wide processes, land use, and public access. The total area subject to the County’s updated SMP, not including aquatic area, is approximately 14.93 square miles. The following inventory and analysis information is summarized from detailed information presented in the *Shoreline Analysis Report*.

2.2.1 Columbia River

Within Benton County, the Columbia River flows through the Alkali-Squilchuck WRIA and the Rock-Glade WRIA. The Alkali-Squilchuck WRIA extends from the mouth of Squilchuck Creek in Chelan County to the mouth of the Yakima River in Benton County. The Rock-Glade WRIA extends downstream from the Yakima River mouth to the John Day dam in Klickitat County.

The 21 dams built on the Columbia and Snake Rivers since 1933 have substantially altered the Columbia River hydrograph. Dam operations have reduced the frequency of spring floods, which historically helped maintain floodplain habitat connectivity and aided the migration of juvenile salmon. Today, over-bank flows and associated large woody debris (LWD) recruitment and sediment transport processes have been substantially reduced.

In WRIA 31, extensive flatlands which existed along the Columbia River prior to inundation have formed shallow wetlands and embayments along the shore of Lake Umatilla; these serve as holding or resting areas for migrating adults and juveniles (Lautz 2000). These backwater areas have been further altered by development, including the construction of railroad causeways that separate the shoreline habitats from the mainstem river, except where culverts allow water exchange and fish passage (P. La Riviere, WDFW, personal communication, 11 October 2012). Agricultural water return flows also affect the ecology of these backwaters. Irrigation drains from the Kennewick Irrigation District and the Columbia Irrigation District (Yakima River sources) intercept natural streams and springs that drain into the Columbia River, supplementing their natural flow. The source of these drains (Yakima River, springs, or groundwater) may trigger a stray response in spawning salmon, and for years, adult coho salmon have been observed in these backwater areas of the Columbia River (P. La Riviere, WDFW, personal communication, 11 October 2012).

In Lake Wallula and Lake Umatilla, high total dissolved gas levels that occur below McNary and the John Day Dam during high flows and high water temperatures in late summer are the primary water quality problems.

As the last free flowing reach on the Columbia River, the Hanford Reach is extremely valuable for aquatic and riparian resources. Today, riparian areas in the Hanford Reach include cobble shorelines, islands, floodplain lakes, and wetlands. Upland habitats adjacent to the Hanford Reach include large tracts of relatively undisturbed shrub-steppe vegetation. In June 2000, 257 square miles of the Hanford Site were declared a National Monument, including: Saddle Mountain National Wildlife Refuge, Wahluke Wildlife Recreation Area, and the Fitzner-Eberhardt Arid Lands Ecology (ALE) Reserve.

Despite its habitat value, groundwater at the 560-square-mile Hanford Nuclear Site has become contaminated from leaking storage tanks of nuclear wastes. As contaminated groundwater moves toward the Columbia River, it poses risks to water quality in downstream reaches. As a result, the Hanford Site is the focus of the nation's largest environmental cleanup. Recent water quality monitoring in the Columbia River within

the Hanford Site detected radioactive materials downriver from the Hanford Site, but in concentrations that are below federal and state limits (Patton 2009).

2.2.2 Yakima River

The Yakima River is divided into three WRIAs, the Upper Yakima (WRIA 39), the Naches (WRIA 38), and the Lower Yakima (WRIA 37). Benton County occupies the eastern half of WRIA 37. Precipitation is highly variable across the basin, ranging from approximately 7 inches per year in the eastern portion (Benton County) to over 140 inches per year near the crest of the Cascades (Yakima Subbasin Planning Board 2004). Virtually all of the streams originate at higher elevations where annual precipitation is 30 inches or more (Yakima Subbasin Planning Board 2004).

Primary land uses in the Yakima watershed include grazing, timber harvest, irrigated agriculture, and urbanization (50 square miles). Irrigated agriculture occupies approximately 1,000 square miles of the Yakima Subbasin. Six major diversion dams (Easton, Roza, Tieton, Wapato, Sunnyside, and Prosser) on the Yakima and its tributaries provide irrigation water to farms from Cle Elum to the Tri-Cities through 420 miles of canals, 1,697 miles of laterals, and 30 pumping plants (Yakima Steelhead Recovery Plan 2009).

The reduction in flood frequency and floodplain connectivity resulting from reservoir management and diversion of irrigation water has altered the timing and character of streamflow and groundwater recharge through the Yakima watershed. Streamflows are higher during summer months in the upper watershed as a result of dam releases. On the other hand, irrigation diversions at Sunnyside and Wapato typically divert one half of the entire river flow during the irrigation season, from May to October, while the Chandler Dam in Prosser diverts 1,413 cfs throughout most of the year for irrigation and power production (Yakima Subbasin Planning Board 2004). As a result of the diversion and use of irrigation water, the recharge of cold, spring-melt water into the aquifer systems has been replaced by recharge of warmer irrigation water later in the spring and summer. The Yakima River is impaired by high water temperatures. Recent studies have found groundwater seeps in backwater habitats and irrigation wastewater outflows still provide a source of cooler groundwater compared to elevated river temperatures (Appel et al. 2011).

In addition to changes relating to the altered watershed hydrograph, the United States Bureau of Reclamation's Interim Comprehensive Basin Operating Plan (IOP)(2002) identified floodplain isolation and channel simplification resulting from diking,

channelization, wetland draining, gravel mining, and highway and railroad building as significant watershed impacts. Although urbanized areas only cover approximately one percent of the watershed area, associated development "...has an impact on fish and wildlife habitats that is significant and disproportionate to its relative size" (Yakima Subbasin Planning Board 2004). In many areas, river channels have been leveed, armored, realigned, and shortened, restricting or eliminating natural river-floodplain interactions.

As upstream sources of LWD have decreased, LWD and the associated diversity of channel form in the lower Yakima channel has also dwindled. Islands capture LWD during high flows, and they are significant features for the formation of diverse habitats in the lower Yakima River (Appel et al. 2011).

Shrub-steppe is the predominant upland native habitat type from approximately Ellensburg to Pasco. However, conversion of shrub-steppe habitats to cropland and grazing has left only about 5 percent of the historical habitat in relatively undisturbed condition. A larger proportion of the native habitat is moderately disturbed by grazing, off-road vehicle use, and other land uses, but still provides cover, food, and nesting habitat for many species of wildlife, particularly during winter months when cultivated fields provide no vegetative cover.

3.0 RESTORATION GOALS

Benton County's proposed SMP update includes goals for restoration and conservation of the County's shoreline resources. Goals relevant to this Shoreline Restoration Plan are identified below.

- To upgrade shoreline ecological functions and aesthetics to a level commensurate with their importance to the community and to achievement of regional goals for species and habitat recovery such as through the projects, programs and plans established within the SMP Shoreline Restoration Plan.
- To provide voluntary incentives for restoration by property owners, facilitate the permitting for restoration projects, and coordinate with agencies, tribes, and non-profit groups to achieve effective restoration of shoreline ecological functions.
- To encourage sound management of renewable shoreline resources and protection of non-renewable shoreline resources. Non-renewable resources are those that are in danger of depletion faster than nature can create them, such as

aquifers, mineral resources, and others. Renewable resources can be replaced over time such as wind power, timber, and others. It is recognized that shorelines themselves are finite areas within which to balance shoreline uses, conservation, and public access.

- To achieve sustainability of resource functions and values and no-net-loss of ecological functions by allowing shoreline development and modifications when impacts are minimized through mitigation sequencing and by providing incentives for restoration of ecological functions where they have been impaired.

4.0 ONGOING COUNTY PLANS AND PROGRAMS

Benton County implements elements of the Growth Management Act (GMA) through the adoption of its Comprehensive Plan and the County Code, which includes critical areas regulations that apply outside of shoreline jurisdiction.

4.1 Comprehensive Plan

The County amended its Comprehensive Plan in 2006. The Plan includes goals to protect critical resource lands in Chapter Three, Plan Goals and Policies. Chapter Two, Natural Resources describes the physical and biological setting of the county as a whole and for specific areas, i.e., Barker Ranch, etc. It also identifies critical resources within the County, their functions and values, and the current trends associated with regulatory protections for those resources. In March of 1982, a study entitled *Ecologically Sensitive Areas of Benton County* was completed. The study was completed to provide an initial baseline inventory and descriptive database for the County planning department and area developers regarding sensitive habitat areas in the County. The study identifies ecologically sensitive areas within the County, including the locations, physical descriptions, critical fish and wildlife habitat, botanical characteristics, and hydrological and climate characteristics.

4.2 Lower Yakima Total Maximum Daily Load (TMDL)

A Total Maximum Daily Load (TMDL) is a water-body-specific management plan designed to limit further water quality impairments and to bring the affected waters into compliance with applicable water quality criteria. The lower Yakima River is impaired by several pesticides, as well as temperature, pH, and dissolved oxygen. In 1997, Ecology published a total TMDL for the lower Yakima River - *Lower Yakima River Suspended Sediment TMDL*. Since the completion of the TMDL, entities and

organizations throughout the watershed have worked to improve irrigation practices and limit the transport of fine sediment into streams and irrigation return drains. These efforts have been successful in reducing pesticide concentrations and turbidity in the Yakima River. A study in 2006 found reduced contaminant levels in the tissues of Yakima River fish. Despite improvements, however, the TMDL was developed and approved to address chronic aquatic life criteria for legacy impacts from past DDT use (DDT usage was banned beginning in 1972), and not the more stringent standards for human health. Therefore, despite the existence of a TMDL to reduce the concentration of DDT in the watershed, DDT remains on the 303(d) list (Category 5) for threats to human health.

5.0 PARTNERSHIPS

State, regional, and local agencies and organizations are actively involved in shoreline restoration, conservation, and protection in and around Benton County. These partners and their local roles in shoreline protection and/or restoration are identified below and generally organized in order by the scope of the organization, from the larger state and watershed scale to the local scale.

5.1 U.S. Fish and Wildlife Service

In addition to its role in watershed planning groups, the U.S. Fish and Wildlife Service (USFWS) manages two national wildlife refuges in Benton County, and co-manages the Hanford Reach National Monument, as described below. The USFWS also provides funding for restoration activities through the Partners for Fish and Wildlife, which provides direct financial and technical assistance for private landowners to conduct projects that improve fish and wildlife habitat. The USFWS also funds the Fisheries Restoration Irrigation Mitigation Program, which funds fish screening and fish passage improvements related to water diversions.

5.1.1 Umatilla National Wildlife Refuge

The Umatilla National Wildlife Refuge (NWR) is intensively managed to provide habitat for migratory birds and resident wildlife. Management practices include restoration of wetlands, manipulation of seasonal wetlands to encourage native food supplies, farming, prescribed burning, native planting in riparian areas, removal of exotic weed species, and planting native grasses in upland areas. Approximately 1,400 acres of refuge lands are irrigated croplands which provide food and cover for wildlife. Local

farmers grow corn, wheat, alfalfa, and other crops under a cooperative agreement whereby the refuge's share of the crop is left in the field for wildlife.

5.1.2 McNary National Wildlife Refuge

Established in 1956, the McNary NWR was created to replace wildlife habitat lost to construction of the McNary Dam downstream. The 15,000 acres of sloughs, ponds, streams and islands includes islands north of the City of Richland in Benton County.

The McNary NWR is primarily focused on conservation of functioning shorelines, and active shoreline management is underway to maximize natural shoreline functions. Seasonal wetlands are managed to promote diverse wetland plant growth. Upland areas are managed with prescribed burning, removal of exotic weed species, and planting of native grasses. Native willows and cottonwoods are planted in riparian areas. Approximately 700 acres of refuge lands are managed in agriculture specifically to provide waterfowl with winter forage opportunities.

5.1.3 Hanford National Monument

The Hanford National Monument, established in 2000, is co-managed by USFWS and the U.S. Department of Energy. Conservation goals for the Monument identified in the Hanford Reach Comprehensive Conservation Plan (2008) include the following:

- Conserve and restore the plants, animals and shrub-steppe and other upland habitats native to the Columbia Basin.
- Conserve and restore the communities of fish and other aquatic and riparian-dependent plant and animal species native to the Monument.
- Enhance Monument resources by establishing and maintaining connectivity with neighboring habitats.
- Protect the distinctive geological and paleontological resources of the Monument.
- Protect and acknowledge the Native American, settler, atomic and Cold War histories of the Monument, incorporating a balance of views, to ensure present and future generations recognize the significance of the area's past.
- Compatible with resource protection, provide a rich variety of educational and interpretive opportunities for visitors to gain an appreciation, knowledge and understanding of the Monument.
- Compatible with resource protection, provide access and opportunities for high-quality recreation.
- Protect the natural visual character and promote the opportunity to experience solitude in the Monument.

- Facilitate research compatible with resource protection, emphasizing research that contributes to management goals of the Monument.
- Establish and maintain a cooperative fire management program that protects facilities, resources and neighbors and fulfills natural resource management objectives.

Through the Comprehensive Conservation Plan, the USFWS established objectives and strategies to address each of the above listed goals.

5.2 Northwest Power and Conservation Council Fish & Wildlife Program

Current hydropower programs and operations are engaged in activities to minimize the ongoing impacts of flow regulation on the ecological processes of the Columbia River. These actions are generally the result of obligations under the Endangered Species Act (Section 7 consultations, Section 10 Habitat Conservation Plans (HCPs)) or Federal Energy Regulatory Commission (FERC) relicensing, and therefore, these actions are technically mitigation for ongoing impacts rather than voluntary restoration. Similarly, the Bonneville Power Administration has dedicated funds to support restoration to mitigate for fish and wildlife impacts from the development and operation of its hydropower system. Projects that are conducted using these funds, no matter how indirectly related to hydropower impacts, are also a part of mitigation for ongoing dam impacts. Nevertheless, it is expected that despite the funding source, such projects will improve ecosystem functions above the existing functional baseline, and as such, these projects would be considered as restoration within the framework of the County's SMP.

In 2009, the Northwest Power and Conservation Council updated its Columbia River Basin Fish and Wildlife Program. The program identifies impacts to fish and wildlife resulting from hydropower operations in the Columbia Basin, and it identifies strategies to study, monitor, and mitigate those impacts. Project funding priorities identified for the program include the following:

1. Anadromous Fish, Resident Fish, and Wildlife
 - Bonneville will fulfill its commitment to "meet all of its fish and wildlife obligations."
 - Funding levels should take into account the level of impact caused by the federally operated hydropower system and focus efforts in areas most affected by operations.

2. Land and Water Acquisition Funds

- Water transaction program: Bonneville established a water transactions program in response to the 2000 Columbia River Basin Fish and Wildlife Program and the 2000 FCRPS Biological Opinion. Bonneville shall fund the continuation of the water transaction program to pursue water right acquisitions in subbasins where water quantity has been identified in a subbasin plan as a primary limiting factor. The water transaction program will continue to use both temporary and permanent transactions for instream flow restoration.
- Land acquisition fund: Bonneville shall fund a basinwide land acquisition program, which will include, but not be limited to, riparian easements and fee-simple acquisitions of land that protects watershed functions.

The Northwest Power and Conservation Council also supported development of subbasin plans, including the draft Mainstem Columbia River Subbasin Plan (Ward et al. 2004) and the Yakima Subbasin Plan (Yakima Subbasin Planning Board 2004), which formed the foundation of the Yakima Steelhead Recovery Plan (Yakima Fish and Wildlife Board 2009, see Section 5.4).

Contact Information: <http://www.nwcouncil.org/fw/>

5.3 Yakima River Basin Study (U.S. Bureau of Reclamation and Washington Department of Ecology)

The implementation framework for the Yakima River Basin Integrated Water Resource Management Plan (IWRMP) was completed in October of 2012 (HDR et al. 2012). This document sets the stage to move forward to improve the management of the Yakima River flow regime to benefit natural hydrologic processes and salmonid habitat functions. Since many of the limiting factors in the Lower Yakima watershed are influenced by the watershed's altered hydrologic regime, actions that restore or improve hydrologic processes in the upper Yakima watershed will significantly improve shoreline ecological functions in Benton County. A graphic summarizing proposed actions from the IWRMP is reproduced below in Figure 2.

In addition to proposed actions to restore hydrologic processes, the Yakima River Basin Study Mainstem Floodplain Restoration Technical Memorandum (Anchor QEA and HDR 2011) identified and prioritized floodplain restoration opportunities in the Yakima River watershed. In this report, the lower Yakima reach (which encompasses nearly all of Benton County's shorelines on the Yakima River) was identified as Tier III for

floodplain restoration, meaning that the likely timing of projects will occur later in time compared to upper watershed projects, which are ready to proceed. Projects identified in the lower Yakima reach were estimated to cost \$9.4 million. Restoration actions identified for the lower Yakima from the Floodplain Restoration Technical Memorandum (Anchor QEA and HDR 2011) included the following:

- Modify infrastructure around mouth of river to improve sediment transport function and floodplain processes.
- Connect wetlands to the River.
- Restore 1 mile of riparian habitat.
- Install 20 engineered logjams in 3 miles of instream habitat to improve in-channel habitat functionality.
- Protect 400 acres of floodplain through conservation easements and acquisition.

5.4 Yakima Basin Fish and Wildlife Recovery Board

As a member of the Yakima Basin Fish and Wildlife Recovery Board, Benton County participated in the development of the Yakima Steelhead Recovery Plan (2009). The Yakima Steelhead Recovery Plan was incorporated into the Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan, assembled by the National Marine Fisheries Service (2009).

The majority of the recommended restoration opportunities in the Steelhead Recovery Plan focus on restoration of habitat and hydrology in the upper watershed. A complete list of proposed projects can be found in Chapter 5.5 of the Yakima Steelhead Recovery Plan, and projects specific to the lower Yakima River are included in Table 5, below. Although actions in the upper watershed may not directly involve Benton County, the effects of the habitat, fish passage, and flow improvements in the upper watershed are expected to benefit habitat, water quality, and fish populations within Benton County shorelines.

The County is taking important steps towards furthering the goals and objectives of the Yakima Steelhead Recovery Plan through preparation of the Shoreline Analysis Report that includes an inventory and characterization of County's shorelines, and by developing this Shoreline Restoration Plan.

Contact Information: <http://www.ybfwr.org/> .

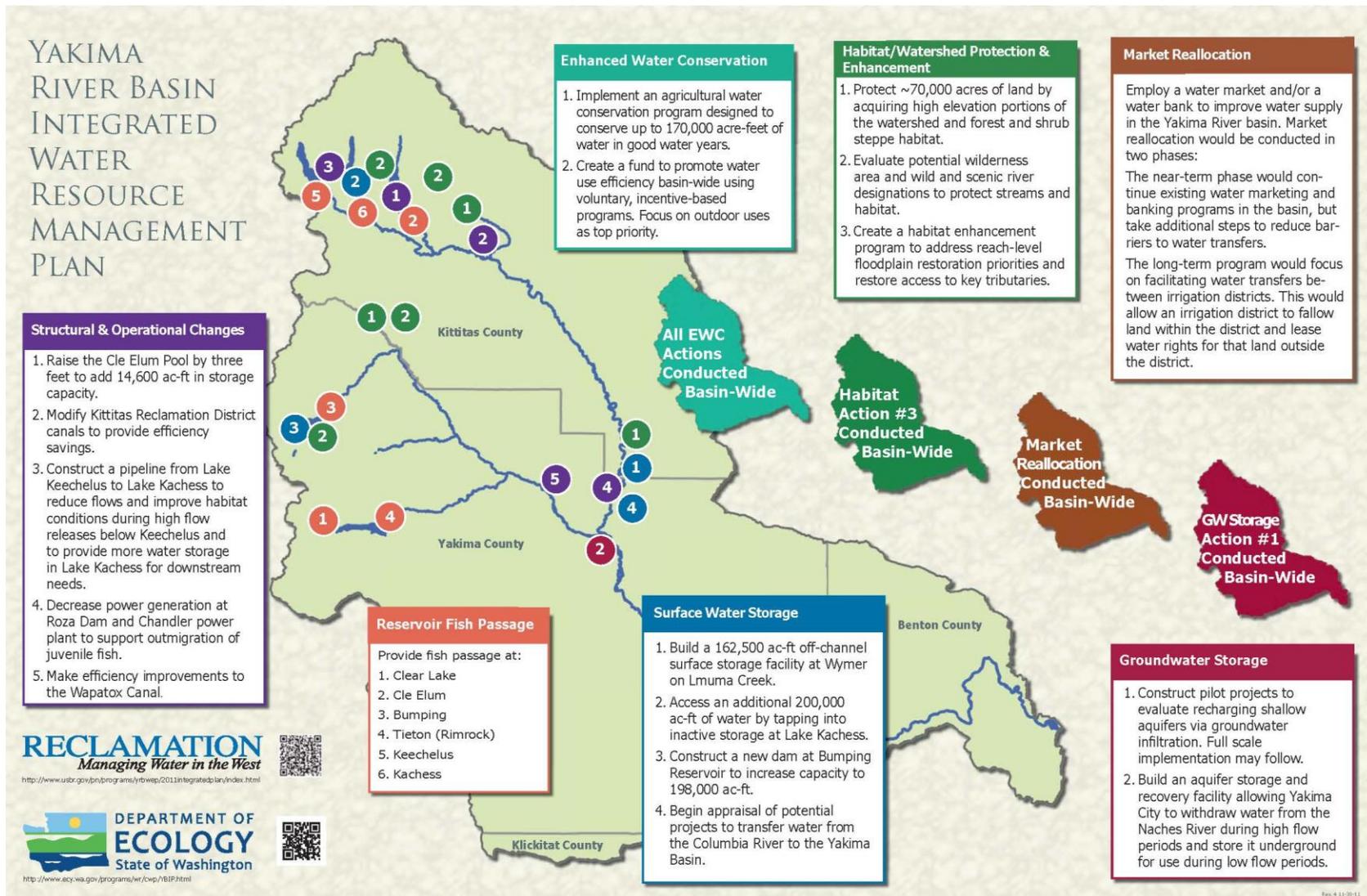


Figure 2. Summary of key actions proposed in the Yakima River Basin Integrated Water Resource Management Plan (Reproduced from HDR 2012)

5.5 Yakama Nation

Yakama Nation projects throughout the mid- and upper-Columbia's ceded lands follow the tribes mission, "to preserve, protect, enhance, and restore culturally important fish populations and their habitats throughout the Zone of Influence of the Yakama Nation and to protect the rights of Yakama Nation members to utilize these resources as reserved for them in the Treaty of 1855." The Yakama Nation hopes to "demonstrate the fishery benefits of integrated land and water management practices" (Yakama Nation website). The Yakama Nation also participates in numerous salmon recovery and watershed planning efforts, in addition to the research and monitoring programs for fish species of the watershed.

Contact Information: <http://yakamafish-nsn.gov/restore>

5.6 Benton Conservation District

The Benton Conservation District (BCD) provides programs and services to landowners and residents, including natural resource education and technical assistance. BCD offers local land owners technical and financial assistance with the following activities:

- Fish screening of irrigation withdrawals,
- Water conservation,
- Riparian planting,
- Livestock fencing and off-channel watering, and
- Xeriscaping.

The BCD also participates in the Conservation Reserves Enhancement Program (CREP), which offers landowners reimbursement for riparian planting and maintenance costs, as well as reimbursement for the dedicated riparian land for a set period of time. The program is delivered through the Farm Service Agency, but technical support and maintenance fees are given through the Benton Conservation District.

In 2005, the BCD used grant funding from the Salmon Recovery Funding Board to perform an assessment of the lower Yakima River and investigate the aquatic habitat needs, riparian restoration, fish screening needs, and beneficial uses of the lower Yakima River basin. This project helped identify several areas along the Yakima River that

would benefit from restoration actions. Proposed restoration actions identified through this project are included in Table 5, below.

The BCD is also leading a community effort to deal with the dense mats of water stargrass that have become an increasing concern for dissolved oxygen and spawning habitat in the Lower Yakima River. The Benton Conservation District recruited and organized volunteer work parties to remove water stargrass from 1.5 acres of the potential spawning habitat on the Yakima River.

Contact Information: <http://www.bentoncd.org/>

5.7 Klickitat Lead Entity

The Klickitat Lead Entity organization coordinates salmon recovery actions in Klickitat County, as well as portions of the Rock/Glade Creek watershed that extend into Benton County. The Klickitat Lead Entity Region Salmon Recovery Strategy, written in 2012, identifies recovery goals, current conditions, limiting factors, recommended actions and reach priorities. The Strategy identifies Columbia River tributaries, including Glade Creek in Benton County, as a lower priority for restoration (Tier C) compared to other reaches within the Lead Entity's area. Within these Columbia River tributaries, the Strategy document identifies a probable lack of properly functioning conditions resulting from multiple factors that require further assessment. It recommends assessment of potential habitat use and productivity to inform further recovery actions (Klickitat Lead Entity 2012). An assessment temperature, flow and sedimentation dynamics at the mouth of the Yakima River was funded by the Salmon Recovery Funding Board, and is underway. This project, led by the Mid-Columbia Fisheries Enhancement Group will assess the impacts of these conditions on salmonid migration and survival.

Contact Information: http://hws.ekosystem.us/prun.aspx?p=Page_89901fef-078a-47c8-9c7b-f3c0c259700a&sid=310

5.8 Mid-Columbia Fisheries Enhancement Group

Mid-Columbia Fisheries Enhancement Group is a non-profit, community based group working to restore salmon and steelhead populations in the Yakima Basin, the Klickitat, White Salmon, and Wind Rivers, and numerous smaller tributaries in Skamania, Klickitat, Benton, Yakima, Kittitas and Franklin Counties. Mid-Columbia Fisheries is developing a restoration plan for the mainstem Columbia River between the White Salmon River and the Yakima River, and it is also presently engaged in a study of

temperature, flow and sedimentation dynamics in the Yakima River delta to assess the impacts on salmonid migration and survival.

Contact Information: <http://midcolumbiarfeg.com/>

5.9 Natural Resources Conservation Service

The USDA Natural Resources Conservation Service (NRCS) has a voluntary Wetlands Reserve Program that “offer[s] landowners the opportunity to protect, restore, and enhance wetlands on their property.” Under the program, NRCS will fund restoration of wetlands and riparian areas in exchange for permanent or 30-year protection of the subject area in the form of easements, contracts or agreements. If the property owner enters into a permanent or 30-year easement, NRCS will pay all or up to 75% of the easements value, respectively. According to the Program’s website, “More than 11,000 of America’s private landowners have voluntarily enrolled over 2.3 million acres into the Wetlands Reserve Program. The cumulative benefits of these wetlands reach well beyond their boundaries to improve watershed health, the vitality of agricultural lands, and the aesthetics and economies of local communities.”

Contact Information:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands/>

5.10 Other Volunteer Organizations

Many recreational groups and private organizations are active in Benton County. While some of these groups may not have historically worked in the shoreline jurisdiction of Benton County, this does not preclude involvement in voluntary restoration activities in the future. Probably the most important volunteer is the landowner that acts as a steward of the land following the completion of the project. Potentially active groups include:

- Lower Columbia Basin Audubon Society
<http://www.lowercolumbiabasinaudubon.org/>
- Open Space Coalition of Benton and Franklin Counties <http://oscbf.org/>
- Ridges to Rivers Open Space Network <http://www.rrosn.org/>
- Tapteal Greenway Association <http://tapteal.org/>

- Trout Unlimited <http://troutunlimitedwashington.org/index.html>
- Ducks Unlimited <http://www.ducks.org/Washington>

6.0 IDENTIFICATION OF RESTORATION OPPORTUNITIES

Restoration recommendations have been proposed by the County’s restoration partners, described in Section 5, based on watershed and regional restoration planning efforts. Recommendations identified in these planning efforts that are applicable to Benton County’s shorelines are identified below. The expected time to implement these projects was either derived directly from the planning documents or estimated based on the complexity of project implementation (i.e. riparian planting projects can be implemented quickly, with little time required for permitting, design, and analysis compared to artificial storage projects). A very brief summary of the expected benefit of project implementation is also described. Project opportunities in Table 2 are organized approximately by geographic location within the County, and the order does not represent any prioritization.

Table 2. Habitat restoration recommendations for Benton County shorelines identified through past planning efforts.

Shoreline Reach(es) ¹	Restoration Action	Expected Time to Implement	Benefit	Source
All reaches on Columbia River	Dam management to minimize potential impacts to fish and wildlife (technically mitigation)	Ongoing	Improve habitat and survival of anadromous and resident fish	NPCC 2009
C1- Crow Butte	<ul style="list-style-type: none"> • Enhance hydrologic and fish passage connectivity through causeway; particularly on north side at Dead Canyon delta. • Restore shoreline complexity at campground area and treaty fishing site via planting native riparian vegetation and controlling/eradicating invasives. Enhance complexity along shorelines using large wood 	To be determined	<ul style="list-style-type: none"> • Restore off-channel habitats • Improve shoreline habitat complexity 	Inter-Fluve 2013
C3- Whitcomb Island	<ul style="list-style-type: none"> • Enhance hydrologic and fish passage connectivity through disconnected side-channel around island, including 	To be determined	<ul style="list-style-type: none"> • Restore off-channel habitats • Improve shoreline habitat 	Inter-Fluve 2013

Shoreline Reach(es) ¹	Restoration Action	Expected Time to Implement	Benefit	Source
	<p>through causeway and through other fill</p> <ul style="list-style-type: none"> • Alternatively, only reconnect downstream portion of side-channel as a connected backwater area • In select locations, recontour bed topography to achieve a complex range of depths and plant communities • Restore shoreline complexity where warranted via planting native riparian vegetation and controlling/eradicating invasives. Enhance complexity along shorelines using large wood 		<p>complexity</p>	
<p>C2- Glade Creek</p>	<ul style="list-style-type: none"> • Lengthen bridges at railway and highway to restore floodplain and deltaic processes • In lieu of bridge expansion, increase availability of off-channel wetland habitat between railway and highway via excavation of floodplain material. Might also be potential for creation of connected off-channel habitat upstream of highway bridge • On Columbia side of railway, recontour delta area to create vegetated islands and distributary channel network (with or without bridging of railway). Add large wood structures to help retain placed sediments • On Columbia side of railway, remove levee structure or incorporate into recontoured delta • Wetland area between railway and highway can serve as partial analog for wetland creation at other tributary confluences, especially at the high water condition 	<p>To be determined</p>	<ul style="list-style-type: none"> • Restore off-channel habitats. • Improve shoreline habitat complexity 	<p>Inter-Fluve 2013</p>
<p>C3- Blalock area</p>	<ul style="list-style-type: none"> • Enhance hydrologic and fish passage connectivity where needed. • Recontour bed topography to 	<p>To be determined</p>	<ul style="list-style-type: none"> • Restore shoreline habitat complexity • Preserve high 	<p>Inter-Fluve 2013</p>

Shoreline Reach(es) ¹	Restoration Action	Expected Time to Implement	Benefit	Source
	<p>achieve a complex range of depths and plant communities. Use submerged road fill for recontouring</p> <ul style="list-style-type: none"> • Restore shoreline complexity where warranted via planting native riparian vegetation and controlling/eradicating invasives. Enhance complexity along shorelines using large wood • Potential to create shallow nearshore habitat on river side of submerged road bed and complex backwaters on the interior • Islands: analog for restoration of shallow nearshore habitats and island creation. Preservation 		functioning shorelines	
C3- Paterson Slough	<ul style="list-style-type: none"> • Preservation focus. Use as analog for other backwater restoration efforts • Reconnect hydrology and fish passage at north and east backwaters • Consider creation/ reconnection of flow-through side-channel habitat via removal of fill at two locations at southern portion of complex 	To be determined	<ul style="list-style-type: none"> • Protect high-functioning shorelines • Enhance off-channel habitats 	Inter-Fluve 2013
C4- Christy Road	<ul style="list-style-type: none"> • Where warranted, restore native riparian vegetation and control/eradicate invasives. • Enhance shoreline complexity using large wood 	To be determined	Enhance shoreline complexity	Inter-Fluve 2013
C5- Plymouth Park	<ul style="list-style-type: none"> • Enhance hydrologic and fish passage connectivity through causeways • If free-flowing side-channel is not restored, recontour side-channel as connected backwater areas with a complex range of depths and plant communities • Restore shoreline complexity where warranted via planting native riparian vegetation and controlling/eradicating invasives. Enhance complexity along shorelines 	To be determined	<ul style="list-style-type: none"> • Restore shoreline complexity • Enhance off-channel habitats 	Inter-Fluve 2013

Shoreline Reach(es) ¹	Restoration Action	Expected Time to Implement	Benefit	Source
	using large wood			
C6- Umatilla Bridge	<ul style="list-style-type: none"> Restore shoreline complexity via planting native riparian vegetation and controlling/eradicating invasives. Enhance complexity along shorelines using large wood 	To be determined	Restore shoreline complexity	Inter-Fluve 2013
C6- McNary	<ul style="list-style-type: none"> At tributary outlets, there may be the potential for restoration of fish passage and deltaic processes and habitat At backwaters, there may be the potential for restoring connectivity and for recontouring bed topography to enhance depth and vegetation complexity 	To be determined	<ul style="list-style-type: none"> Restore off-channel habitats Improve fish passage 	Inter-Fluve 2013
C8- Hover Park	<ul style="list-style-type: none"> Good restoration opportunity due to large, publicly owned land. At the partially and fully disconnected backwater complexes: restore hydrologic and fish passage connectivity. Recontour bed topography to achieve a complex range of depths and plant communities Middle shoreline area: remove fill and bank armoring at upstream end Middle shoreline area: restore shoreline complexity by planting native riparian vegetation and controlling invasives. Enhance complexity along shorelines using large wood Middle shoreline area: consider recontouring a portion of this area to create complex backwater habitat 	To be determined	<ul style="list-style-type: none"> Restore off-channel habitats Improve fish passage Enhance shoreline complexity 	Inter-Fluve 2013
C8- Lechelt	<ul style="list-style-type: none"> Restore shoreline complexity via planting native riparian vegetation and controlling/eradicating invasives. Enhance complexity along shorelines using large wood 	To be determined	Enhance shoreline complexity	Inter-Fluve 2013

Shoreline Reach(es) ¹	Restoration Action	Expected Time to Implement	Benefit	Source
C8- Hedges and Twin Tracks Lagoons	<ul style="list-style-type: none"> Recontour bed topography to achieve a complex range of depths and plant communities Restore shoreline complexity via planting native riparian vegetation and controlling/eradicating invasives. Enhance complexity along shorelines using large wood 	To be determined	Restore shoreline complexity	Inter-Fluve 2013
C10- Two Rivers Park	<ul style="list-style-type: none"> Preserve existing conditions at downstream portion. Downstream portion is a good analog for backwater restoration elsewhere At upstream portion, recontour bed topography to achieve a complex range of depths and plant communities. Use downstream portion as analog Restore shoreline complexity via planting native riparian vegetation and controlling/eradicating invasives. Enhance complexity along shorelines using large wood 	To be determined	<ul style="list-style-type: none"> Protect high functioning shorelines Restore shoreline complexity 	Inter-Fluve 2013
C3- UNWR and C14- Hanford	Ongoing management of National Wildlife Refuge area wetlands, riparian areas, and wildlife habitat	Ongoing	Fish and wildlife habitat	USFWS management and conservation plans
All reaches on Yakima River	Protect, enhance, and analyze thermal refugia	0-3 years	Identify and prioritize restoration and protection of cool water sources	Appel et al. 2011
	Water stargrass management	0-3 years	Maintain instream habitat for salmon	Appel et al. 2011
	Improve hydrograph through artificial storage and/or Columbia River water transfer	>10 years	Maintain more natural flow regime in the Lower Yakima River	Yakima Basin Recovery Board 2009, HDR et al. 2012
Privately owned lands in all reaches	Work with private landowners to restore riparian vegetation and manage streamside grazing	0-3 years	Limit sedimentation and promote riparian vegetation	Appel et al. 2011
Y1-Y7	Restore access to off-channel habitats from Benton City to Richland through alterations to dam operations (preferred) or local alterations to off-channel areas	5-10 years	Improve off-channel habitat opportunities	Appel et al. 2011

Shoreline Reach(es) ¹	Restoration Action	Expected Time to Implement	Benefit	Source
Y2- Riverside, Y3- Barker	Protect and restore mainstem floodplain habitats below Sunnyside dam. Work may include protecting habitat through acquisition, easements or cooperative agreements (including the CREP program), and activities like riparian plantings, reactivation of side channels, and winter irrigation to saturate floodplains.	0-3 years	Habitat enhancements	Yakima Basin Recovery Board 2009
Levees in Y2- Riverside, floodplain in all reaches	Modify levees and manage floodplain areas to minimize nutrient enrichment of the river during floods	5-10 years	Enhance habitat and water quality conditions	Appel et al. 2011
Y2-Y10	Protect islands and floodplains through lease or land purchases	>10 years	Maintain off-channel habitat opportunities	Appel et al. 2011
Agricultural reaches (Y3, Y5, Y6)	Fish screening and irrigation water conservation	0-3 years	Limit injury to fish from irrigation withdrawals; maximize irrigation efficiencies	Appel et al. 2011
Y5- Horn Rapids and Y11- Prosser UGA West	Reconfigure infrastructure to improve smolt survival rates at dam bypass structures	0-3 years	Limit physiological stress and predation on outmigrating smolts	Yakima Basin Recovery Board 2009
Y6- River Road, Y7- Benton City UGA, and other side channels	Restore and protect side channels from Prosser to Richland through removal of water stargrass or scouring with large woody debris (e.g., Benton City oxbow, Floodplain adjacent to Songbird Island)	5-10 years	Improve side channel habitat, particularly in areas of thermal refugia or historic spawning grounds	Appel et al. 2011
Y8- OIE, as well as other reaches	Improve quality of irrigation return flows	0-3 years	Improve water quality; improve understanding of ecological interactions with water stargrass	Yakima Basin Recovery Board 2009
Y11- Prosser UGA West	Increase flows in Chandler bypass reach to improve juvenile out-migration conditions	0-3 years	Outmigration survival of juvenile salmon	Yakima Basin Recovery Board 2009
	Manage capture and distribution of large woody debris at Prosser Dam	5-10 years	Enhance diversity of instream habitats	Appel et al. 2011

¹ Reaches identified in the *Shoreline Analysis Report* (TWC and BERK 2012)

In addition to the opportunities identified above, the *Shoreline Analysis Report* (TWC and BERK 2012) provided an analysis of existing shoreline functions on a reach basis. The Analysis Report identified a few restoration priorities recurring through most of the shoreline reaches. Broadly, these priorities include the reestablishment of floodplain connectivity and function, reestablishment of channel processes, provision of vegetated buffers, and control and improvement of water quality and hydrology.

In addition to these general restoration priorities, the following tables (Tables 4 and 5) provide a summary of existing functions and key features and alterations for each reach, as identified in the *Shoreline Analysis Report*. Functional scores identified in the *Shoreline Analysis Report* for hydrologic, vegetative, habitat, and hyporheic (involving subsurface flow and/or storage of water and sediment) functions are summarized in Tables 4 and 5, below, as “high,” “moderate” or “low” based on the average finding in the *Shoreline Analysis Report* (the average was determined using a numeric scale where “high”=3, and “low”=1). Average scores 1-1.5 are identified as “Low;” average scores 1.5-2.5 are identified as “Moderate;” and average scores 2.5 and greater are identified as “High” in the summaries in Tables 4 and 5. Although not included in the summary below, the *Shoreline Analysis Report* also included an evaluation of whether existing functions are altered or roughly consistent with natural conditions. Based on these results, with input from the Shoreline Advisory Committee, potential restoration opportunities and restoration priorities were developed for each reach.

Reach recommendations were categorized as “Protect,” “Protect/Restore,” and “Restore,” depending on the action(s) recommended. Reach prioritization level (high – medium – low) was based on the following: (1) potential to restore and maintain shoreline processes, (2) significance of action for watershed functions, and (3) likely feasibility of proposed action, where lands in public ownership or with existing conservation easements are ranked as higher priority compared to privately owned lands because of the presumed feasibility of such work. Prioritization criteria are discussed further in Table 3. New information, as well as changes in ecosystem condition or land use, could affect the assessment of ecological benefits and/or feasibility of individual projects, resulting in changes to the prioritization identified here. Regardless of priority ranking, straightforward projects with available funding should be initiated for the worthwhile benefits they provide and to preserve a sense of momentum while permitting, design, site access authorization, and funding for the larger, more complicated and more expensive projects, are under way. Therefore, the actual order of implementation may not always correspond with the ranking level assigned to that project.

Table 3. Key considerations in prioritizing reach restoration in Benton County’s shorelines.

	Priority		
	High	Moderate	Low
Key Considerations	Restores/maintains shoreline processes at a watershed/basin scale.	Restores/maintains functions and/or processes at a reach scale.	Restores/maintains functions at a site-specific location.
	Addresses a key limiting factor in the basin.	Addresses a significant factor for ecological function on a reach scale.	Addresses a local shoreline issue.
	No major technical, political, social, or economic barriers to implementation OR technical, political, social, and economic considerations have already been addressed.	Minor technical, political, social, or economic hurdles.	Project implementation would be restricted by technical, political, social, or economic considerations.

Table 4. Reach-based restoration opportunities on the Columbia River in Benton County.

Reach Number/ Name		Average Functional Scores from Shoreline Analysis Report				Key alterations/ Existing functions	Restoration opportunities	Priority
		High						
		Moderate						
		Low						
		Hydrologic	Vegetative	Habitat	Hyporheic			
C1	Crow Butte Park	M	M	L	L	Shoreline armoring, boat launch, pier, and bridge alter hydrology and limit habitat.	Restore riparian vegetation in off-channel areas. Remove or soften shoreline armoring where feasible.	Restore-Moderate
C2	Lake Umatilla	M	L	H	H	Shoreline armoring and roads limit habitat connectivity. Creek mouth deltas provide habitat diversity and cool water seeps.	Protect riparian vegetation and wetlands at creek mouths. Create wildlife underpasses where feasible.	Protect/Restore-High
C3	UNWR	H	H	H	H	Extensive wetland habitats provide high hydrologic, habitat, and vegetative functions. Access to these off-channel areas is limited by the old railroad causeway.	Protect wetland and off-channel habitats (See Section 5.1.1). Remove derelict in-water structures to improve connectivity to off-channel habitats.	Protect/Restore-High
C4	Plymouth Ag	L	M	L	L	Road parallels shoreline and armoring limits shoreline functions.	Maintain existing vegetation and plant riparian vegetation where feasible.	Restore-Low
C5	Plymouth	H	M	H	M	Riparian vegetation is present in most of the reach, although limited to a narrow band in places.	Plant riparian vegetation where feasible. Protect shoreline functions on Plymouth Island.	Restore-Moderate
C6	McNary	L	L	L	L	Dam operations impact hydrology and habitat. Vegetative and hyporheic functions are naturally limited.	Dam mitigation.	Restore (mitigate)-High
C7	Columbia Ag	L	L	L	L	Railroad and associated armoring runs along the shoreline for most of the reach. Vegetation is located upland of the railroad prism, limiting its potential shoreline functions.	Improve fish passage and hydrologic connections under railroad causeway.	Restore-Moderate

Reach Number/ Name		Average Functional Scores from Shoreline Analysis Report				Key alterations/ Existing functions	Restoration opportunities	Priority
		High						
		Moderate						
		Low						
		Hydrologic	Vegetative	Habitat	Hyporheic			
C8	Hover	M	H	H	H	Despite high habitat functions in wetlands and off-channel habitats, connectivity is limited by the railroad causeway.	Protect high functioning wetlands. Improve passage under railway causeways to allow greater connectivity for fish, aquatic mammals, waterfowl, and other wildlife	Protect/Restore-High
C9	Finley Industrial	L	L	M	L	Hydrologic processes are altered by armoring and overwater structures.	Plant riparian vegetation along shoreline where feasible.	Restore-Low
C10	Two Rivers (Park)	H	M	H	H	Riverine wetlands provide diverse shallow-water habitat and wave attenuation.	Protect wetland functions.	Protect-High
C10	Two Rivers (Residential)	L	L	L	L	Steep banks with patchy vegetation and numerous overwater structures limit functions.	Plant riparian vegetation.	Restore-Moderate
C11	North Finley	L	L	L	L	Levees along shoreline limit functions.	NA	NA
C12	Kennewick UGA	L	L	L	L	Levees along shoreline limit functions.	NA	NA
C13	North Richland UGA	L	L	L	L	Riparian habitat is limited. Development is generally set back from the shoreline.	Plant riparian vegetation.	Restore-Moderate
C14	Hanford	H	M	H	M	The Hanford reach provides some of the least altered shoreline habitats on the Columbia River.	Protect existing habitat. (See Section 5.1.2 and 5.1.3)	Protect-High
C15	Priest Rapids	M	M	M	L	The cliffs and bluffs associated with the reach provide unique shoreline habitats.	Protect existing habitat.	Protect-Moderate

Table 5. Reach-based restoration opportunities on the Yakima River in Benton County.

Reach Number/ Name		Average Functional Scores from Shoreline Analysis				Key alterations/ Existing functions	Restoration opportunities	Priority
		Hydrologic	Vegetative	Habitat	Hyporheic			
Y1	Richland UGA	M	M	M	M	Vegetated slope maintains stability and riparian functions.	Maintain slope vegetation.	Protect-Moderate
Y2	Riverside	M	M	L	M	The road and levee limit functions in the northern portion of the reach. Elsewhere, a band of dense vegetation separates roads and residential development from the shoreline.	Maintain riparian vegetation in the southern portion of the reach.	Protect-Low
Y3	Barker	H	H	H	H	Wetlands occur in the reach, but agricultural development has limited connectivity of these wetlands and side-channels over time.	Protect wetlands and continue to improve connectivity where feasible. Potential to increase instream complexity through engineered log jams in this reach, particularly in areas identified as coldwater seeps.	Protect/Restore-High
Y4	Harrington	M	M	M	H	Extensive floodway area is developed with residential uses. Mid-channel islands provide instream habitat diversity.	Remove or soften shoreline armoring where feasible. Plant riparian vegetation.	Restore-Moderate
Y5	Horn Rapids	M	M	M	M	Horn Rapids dam alters the reach hydrology and sediment transport and diverts streamflow into irrigation canals. Small riparian wetlands and native shrub-steppe habitat are present throughout the reach.	Maintain wildlife corridors.	Protect - Moderate
Y6	River Road	M	M	L	H	Riparian vegetation has been altered by agricultural and residential uses. Mid-channel islands provide high functions.	Plant riparian vegetation. Evaluate potential use of engineered logjams at upstream end of islands to enhance instream habitat.	Restore-Moderate
Y7	Benton City UGA	M	M	M	H	Unarmored reach with large riparian trees along a portion of the shoreline.	Maintain riparian vegetation.	Protect-Low

Reach Number/ Name		Average Functional Scores from Shoreline Analysis				Key alterations/ Existing functions	Restoration opportunities	Priority
		Hydrologic	Vegetative	Habitat	Hyporheic			
Y8	OIE	M	M	H	H	Roads running parallel to the River have altered topography and vegetation. Cool water seeps are most significant in this reach.	Pursue opportunities to enhance instream habitat in areas of cool water seeps through riparian planting, installation of woody debris, etc.	Restore-High
Y9	Prosser UGA East	M	M	H	M	Naturally steep banks limit flood and hyporheic functions. Undeveloped land provides habitat for small mammals.	Maintain wildlife corridors and existing riparian vegetation.	Protect-Low
Y10	Prosser UGA Chandler	M	H	M	H	Riparian vegetation is generally undisturbed, and upland development is limited.	Maintain riparian functions and wildlife corridors.	Protect-Moderate
Y11	Prosser UGA West	H	M	L	H	Sediment transport processes are altered by the Chandler diversion and Prosser dam. Large wood accumulates upstream of the Prosser Dam and is manually transferred just downstream. The large wetland below the dam attenuates high flows. Wetland habitat below the Prosser Dam provides significant habitat. Developed residential and agricultural shorelines elsewhere in the reach have impaired corridors.	Protect wetland functions. Evaluate opportunities to improve transport of large wood downstream to other reaches.	Protect/Restore-High
Y12	Byron Road	L	L	L	L	Roads running parallel to the River limit floodplain connectivity and vegetative, habitat, and hyporheic functions. Residential and agricultural land uses also limit vegetative and habitat functions in the reach.	Plant riparian vegetation where feasible.	Restore-Low

7.0 STRATEGIES TO ACHIEVE LOCAL RESTORATION GOALS

This section discusses programmatic measures for Benton County designed to foster shoreline restoration and achieve a net improvement in shoreline ecological processes, functions, and habitats. Benton County is constrained in its ability to implement restoration projects or programs on its own by projected budget and staff limitations. However, the County's SMP represents an important vehicle for facilitating and guiding restoration projects and programs that can be implemented through partnerships with private and/or non-profit entities. The County can provide direction and leadership to assure that restoration designs meet the identified goals of the various plans. The discussion of restoration mechanisms and strategies below highlights programmatic measures that the County may potentially implement as part of the proposed SMP, as well as parallel activities that would be managed by other governmental and non-governmental organizations.

7.1 Funding Opportunities

Table 6 outlines potential funding sources for implementation of a variety of efforts that could improve shoreline ecological function.

Table 6. Potential Funding for Restoration Projects, Programs and Plans.

Restoration Project/Program	Description	Funding source/ Grant Administrator
Watershed Planning Act	Funding for local development of watershed plans for managing water resources and for protecting existing water rights.	Washington Department of Ecology
Centennial Clean Water Fund	Funds water quality infrastructure and projects to control non-point source pollution.	
Section 319	Funds non-point source pollution control projects.	
Clean Water State Revolving Fund	Provides low interest and forgivable principal loan funding for wastewater treatment construction projects, eligible nonpoint source pollution control projects, and eligible Green projects.	
Salmon Recovery Funding Board	Funds projects to protect or restore salmon habitat and assist in related activities.	Washington Recreation and Conservation Office
Aquatic Lands Enhancement Account	Funds the acquisition, improvement, or protection of aquatic lands for public purposes.	
Washington Wildlife Recreation Program	Funds a range of land protection and outdoor recreation, including park acquisition and development, habitat conservation, farmland preservation, and construction of outdoor recreation facilities.	

Restoration Project/Program	Description	Funding source/ Grant Administrator
Partners for Fish and Wildlife	Provides technical and financial assistance to landowners to improve their property for targeted fish and wildlife species without a long-term easement contract.	U.S. Fish and Wildlife Service
Fisheries Restoration and Irrigation Mitigation Program	Funds governments and tribes to install fish screens and fish passage improvements associated with water diversions.	
Wetlands Reserve Program	This program provides technical support and will fund riparian and wetland restoration in exchange for protection.	Natural Resources Conservation Service
Conservation Reserves Enhancement Program	This program provides funds to farmers who maintain riparian buffers on on-site waterbodies. The funds cover technical assistance, plant costs, and land “rental” fees.	Benton Conservation District
Bonneville Power Administration	Funding for habitat projects to mitigate impacts of dam operations	Bonneville Power Administration
Columbia Basin Water Transactions Program	Funds permanent acquisitions, leases, investments in efficiency and other incentive-based approaches to assist landowners who wish to restore instream flows for habitat.	National Fish and Wildlife Foundation

7.2 County Planning

The County could incorporate shoreline restoration goals and projects into the County’s Capital Improvement Plan (CIP), Parks facility plans, and the Six-Year Road Plan to facilitate implementation of restoration within the County. The County could also review the various elements of previously adopted and proposed plans that apply to shoreline areas and develop a prioritized list of projects.

7.3 Regional Coordination

The County will continue its association and involvement with the Yakima Basin Fish and Wildlife Recovery Board, and participation with WRIA 31 planning, and the Yakima River Basin Integrated Water Resource Management Plan. The County may also look for other time sensitive opportunities for involvement in regional restoration planning and implementation.

8.0 CONCLUSION

The Benton County Shoreline Restoration Plan builds on the goals and policies proposed in the Shoreline Master Program. The Shoreline Restoration Plan provides an important non-regulatory component of the SMP to ensure that shoreline functions are maintained or improved despite potential incremental losses that may occur in spite of SMP regulations and mitigation actions.

The Shoreline Restoration Plan draws on multiple past planning efforts to identify possible restoration projects and reach-based priorities, key partners in implementing shoreline restoration, and existing funding opportunities. Many of the projects and strategies identified are focused on restoring hydrologic processes where possible and protecting high functioning areas. The Shoreline Restoration Plan represents a long-term vision for restoration that will be implemented over time, resulting in ongoing improvement to the functions and processes in the County's shorelines.

9.0 WEBSITE RESOURCES

The following is a sampling of helpful web resources, in addition to the websites listed above in Section 5.0.

Native plant landscaping guides:

1. http://midcolumbiarfeg.com/wp-content/uploads/2011/02/Yakima_Benton_Co.pdf
2. http://www.nwcb.wa.gov/publications/Eastern_Garden_Wise.pdf

Backyard wildlife sanctuary certification: <http://wdfw.wa.gov/living/backyard/>

Landscape design for wildlife: <http://wdfw.wa.gov/living/landscaping/index.html>

Guide to noxious weeds – identification and removal:

<http://www.nwcb.wa.gov/publications/EasternFieldGuide2009.pdf>

Other materials about native plantings, xeriscaping, and native plant sources:

<http://www.bentoncd.org/library.aspx>

Grant/funding opportunities: <http://www.ybfwrp.org/other-sources-of-project-funding/>

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