

# DRAFT RESTORATION PLAN

## GRANT COUNTY SMP UPDATE

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Source: <https://fortress.wa.gov/ecy/coastalatlantools/UICoastalAtlas/Tools/ShorePhotos.aspx>

### **Prepared for**

Grant County, Coulee City, Electric City, City of Grand Coulee, City of Soap Lake, Towns of Krupp and Wilson Creek

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*This report was funded through a grant from the Washington State Department of Ecology*

**May 2014**

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## LIST OF ACRONYMS AND ABBREVIATIONS

BLM	Bureau of Land Management
CBP	Columbia Basin Project
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
IAC	Inventory, Analysis, and Characterization Report
NOAA	National Oceanographic and Atmospheric Administration
Plan	Restoration Plan
PUD	Public Utility District
Reclamation	U.S. Bureau of Reclamation
SMA	Shoreline Management Act
SMP	Shoreline Master Program
TMDL	Total Maximum Daily Load
USDOE	U.S. Department of Energy
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife

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## **1 INTRODUCTION**

This Restoration Plan (Plan) has been prepared in support of the County and cities and towns participating in the development or update of individual Shoreline Master Programs (SMP). The SMPs are being prepared to comply with the Washington State Shoreline Management Act (SMA) requirements (Revised Code of Washington 90.58) and the state's SMP guidelines (Washington Administrative Code [WAC] 173-26, Part III-201 2(f)), which were adopted in 2003. The Grant County Coalition SMPs are composed of policies and regulations that regulate the use and development of the river, streams, and lakes shorelines in Grant County and within the respective cities and towns. The area covered by this Plan includes the SMP jurisdiction in four cities and two towns, as well as unincorporated areas of Grant County. The cities and towns are Coulee City, Electric City, Grand Coulee, Soap Lake, Krupp, and Wilson Creek.

Restoration and enhancement elements discussed in this Plan, in addition to the environmental protection and mitigation measures set forth in the individual SMPs, are intended to work together to achieve the SMA's goal of "no net loss" of shoreline ecological function. The Plan was formulated based on a detailed inventory and characterization of the shoreline ecosystem and impaired functions in the Inventory, Analysis, and Characterization Report (IAC) for Grant County (Anchor QEA 2013). A Cumulative Impacts Analysis report was also prepared by Grant County (Anchor QEA 2014) to demonstrate how future development under the proposed SMP and elements included in this Plan will result in no net loss of shoreline ecological functions in the County and the respective jurisdictions of Coalition members.

The scope of this document, the definition of restoration and enhancement, and the key elements in restoration planning in the SMP process are discussed next.

### **1.1 Purpose and Scope of Plan**

The purpose of this Plan is to describe how and where shoreline ecological functions can be protected, restored, or enhanced within Grant County SMP jurisdiction.

Grant County is unique from most other local jurisdictions in the State, with the Columbia Basin Project (CBP) improving hydrologic conditions throughout many areas of the County to overall historical conditions, which has increased the quantity of aquatic and riparian habitat that exists. Additionally, some degradation of these Columbia Basin-enhanced conditions occurs as the system is operated to meet irrigation needs. This Plan identifies protection, restoration, and enhancement actions within this SMP “restoration” context.

The SMP guidelines (WAC 173-26-201(2)(f)) articulate that the Plan is to include specific elements, which are identified below along with the section in which the element occurs in this Plan:

1. Identification of degraded areas, impaired ecological functions, and sites with potential for ecological restoration – Section 4
2. Establishment of overall goals and priorities for restoration of degraded areas and impaired ecological functions – Section 4
3. Identification of existing and ongoing projects and programs that are currently being implemented that are designed to contribute to local restoration goals (such as capital improvement programs and watershed planning efforts) – Section 3
4. Identification of additional projects and programs needed to achieve local restoration goals, and implementation strategies including identifying prospective funding sources for those projects and programs – Sections 4 and 5
5. Identification of timelines and benchmarks for implementing restoration projects and programs and achieving local restoration goals – Section 5
6. Provisions 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 – Section 5

While the Plan incorporates elements of other shoreline restoration planning documents that involve the shorelines under the County’s SMP jurisdiction, the scope of this Plan under the SMA guidance does not extend to that of a master document combining and aligning priorities of other shoreline restoration documents, plans, or efforts. It is expected that alignment or conflict between this Plan and the goals of other plans (such as Comprehensive

Plans) that occurs during implementation will be addressed within the context of the applicable regulations.

It is important to clarify that restoration as it is discussed here is distinct from the concept of protection or no net loss. The WAC defines “restoration” or “ecological restoration” as follows:

*“...the reestablishment or upgrading of impaired ecological shoreline processes or functions. This may be accomplished through measures including, but not limited to, revegetation, removal of intrusive shoreline structures and removal or treatment of toxic materials. Restoration does not imply a requirement for returning the shoreline area to aboriginal or pre-European settlement conditions.”*

The state’s SMP policies include a standard of no net loss of ecological functions that are necessary to sustain shoreline natural resources that must be adhered to by new SMPs. The Washington State Department of Ecology (Ecology) has clarified that no net loss means that “establishing uses or conducting development are identified and mitigated with a final result that is no worse than maintaining the current level of environmental resource productivity” and “no uses or development supersede the requirement for environmental protection” (Ecology 2004). Thus, mitigation activities are the method by which no net loss is compensated. The distinction between no net loss and SMP restoration is that restoration goes beyond no net loss by establishing an increase in the amount, size, and/or functions of an ecosystem or components of an ecosystem compared to a baseline condition (Thom et al. 2005). Therefore, mitigation activities, including re-development and new development that include mitigation activities, could not be considered as part of restoration under this Plan unless there was a “beyond no net loss” component to the work.

## **1.2 Key Elements of Restoration Planning in SMP Process**

The state’s SMP guidelines state that the SMP must give preference to certain shoreline uses, in the order as follows:

1. Reserve appropriate areas for protecting and restoring ecological functions to control pollution and prevent damage to the natural environment and public health.
2. Reserve shoreline areas for water-dependent and associated water-related uses.

3. Reserve shoreline areas for other water-related and water-enjoyment uses that are compatible with ecological protection and restoration objectives.
4. Locate single-family residential uses where they are appropriate and can be developed without significant impact to ecological functions or displacement of water-dependent uses.
5. Limit non-water-oriented uses to those locations where the above described uses are inappropriate or where non-water-oriented uses demonstrably contribute to the objectives of the SMA (WAC 173-26-201(2)(d)).

The guidelines also state that SMPs are to “include goals, policies and actions for restoration of impaired shoreline ecological functions” (WAC 173-26-186). The impaired functions are to be identified based on a detailed inventory and characterization of the shoreline ecosystem, and a restoration plan is to be formulated based on that information (WAC 137-26-201). The results of the inventory assessment were presented in the shoreline IAC (Anchor QEA 2013). This Plan uses the information from the IAC to address the restoration plan requirements discussed in the SMP guidelines. This Plan is not a regulatory document or a set of regulatory requirements. However, the SMP points to this Plan as a guide outlining opportunities for improving shoreline ecological function.

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## **2 BACKGROUND**

Grant County is located in the geographic center of Washington State and encompasses a total area of 2,791 square miles (7,228.7 square kilometers), of which 2,681 square miles (6,943.8 square kilometers; 96%) is land and 110 square miles (284.9 square kilometers; 4%) is water (Anchor QEA 2013). The County is bordered by Douglas and Okanogan counties to the north, Adams and Lincoln counties to the east, Franklin and Benton counties to the south, and Yakima and Kittitas counties to the west. The Columbia River flows in a deep valley along the southwestern boundary of the County. The northern part of the County is characterized by loess-mantled volcanic bedrock hills that have been eroded by floodwaters to form canyons and coulees. Babcock Ridge and Beezley Hills border the southern portion of the County, which in general is a smooth, southward-sloping plain that is interrupted by the Saddle Mountains and Frenchman Hills. This plain includes the Quincy Basin and Wahluke Slope. Elevations in the County range from 380 feet along the Columbia River in the southern part of the County to 2,882 feet at the top of Monument Hill.

### **2.1 Planning Area Characteristics**

The area covered by this SMP includes three cities and three towns as well as unincorporated areas of Grant County. The town of Coulee City is located at the south end of Banks Lake and the city of Electric City is located at the north end of Banks Lake. The city of Grand Coulee is located between Banks Lake and Lake Roosevelt on the Columbia River. The town of Krupp is located along Crab Creek and the town of Wilson Creek is located at the confluence of Wilson and Crab Creeks. The City of Soap Lake is located on the southern end of Soap Lake, the southern-most of the Sun Lakes in the north-central portion of the County.

A majority of the County is primarily used for agriculture with irrigation. Irrigated cropland covers approximately 40% of the County, and irrigation wasteways are located throughout the County (Anchor QEA 2013). Non-irrigated lands are primarily used for rangeland, wildlife areas, and non-irrigated cropland. Recreation and developed urban areas make up a small percentage of County land use/land cover. Land ownership is predominantly private farms (78%) and public lands (19%); most public land is owned by the federal government and designated as federal and state wildlife and recreation areas. State (3.5%), public utilities

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(0.7%), and municipal (0.01%) ownerships are small in Grant County. Maps for each jurisdiction are provided in the IAC.

### **2.1.1 Geology**

The geology, soils, and topography of Grant County are primarily dictated by the glacial outburst Missoula Floods that covered the area approximately 18,000 to 20,000 years before present. The base layers of modern-day topography are Miocene-aged Columbia River Basalts capped with varying thicknesses of wind-blown fine sands and silt known as loess, in addition to the Miocene/Pliocene-aged lacustrine sedimentary rock known as the Ringold Formation, and Eocene-aged intrusive crystalline rocks in the northern portion of the County (Grolier and Bingham 1978).

The Missoula Floods resulted in high-erosive energy flows that created Grant County's steep-walled canyons and coulees such as the Grand Coulee and the Crab Creek Valley. The wide, flat, Quincy Basin is located at the outlet of two Missoula flowpaths; the surficial geology of the Wahluke Slope is similarly dominated by these outburst deposits (Easterbrook and Rahm 1970). Wind-driven fine material from these outburst flood deposits has more recently formed active sand dunes. Several smaller-scale erosional features are present throughout the County, such as complexes of lakes that were once scour pools of flooding channels; many of these have eroded to bedrock at the surface. Additional prominent geologic features present in the County include loess (wind-blown silt) deposits atop high-relief areas and talus and landslide deposits-associated uplift features such as the Beezley Hills and Saddle Mountains. Recent sand and gravel deposits are present in most of the major stream valleys.

### **2.1.2 Climate**

Grant County falls within the Central Basin region of Washington, which has the lowest precipitation rates within Washington State. Annual precipitation in the areas of Saddle Mountain, Frenchman Hills, and Rattlesnake Mountain average around 7 inches and precipitation is commonly associated with summer thunderstorms and winter rains and snowfall. Snowfall depths rarely exceed 8 to 15 inches and occur from December through February. High temperatures in January can range from 30 to 40 degrees with low

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temperatures between 15 to 25 degrees. Summer high temperatures are usually in the lower 90s with low temperatures in the upper 50s (WRCC 2012).

### **2.1.3 Water Resources**

Approximately 4% (110 square miles) of Grant County surface area is water (Anchor QEA 2013). Water resources in the County are significantly affected by the CBP. The CBP is a large multi-purpose development that utilizes Columbia River water for irrigation, power, recreation, and flood control. Grand Coulee Dam is the key structure that provides water and energy for the CBP. Water is pumped from Grand Coulee Dam to Banks Lake, an equalizing reservoir, where water is stored for future irrigation (Anchor 2007).

Water from Banks Lake travels to Billy Clapp Lake through the Main Canal before being distributed to the irrigation districts. Much of the irrigation water delivered is recycled and recaptured in drains, wasteways, and natural channels before being used again to irrigate additional farmland, and ultimately, returning to the Columbia River. Potholes Reservoir and O'Sullivan Dam are the key structures that facilitate water conservation for the CBP (Anchor 2007).

Development of the CBP has caused an increase of water available for recreation. Before the CBP was developed, there were 35 lakes in the project area, including portions of Grant, Lincoln, Adams, and Franklin counties. There are now more than 140 lakes, ponds, and reservoirs (Reclamation 2011).

The Columbia River within Grant County is regulated through the operation of multiple hydroelectric dams within and upstream of the County. Columbia River flows are dependent on the coordination of dam operations of all seven dams situated in the mid-Columbia River, which range from Grand Coulee Dam to Priest Rapids Dam. Flows and water levels for the Columbia River within Grant County are regulated by operations of Wanapum and Priest Rapids Dams in accordance with Federal Energy Regulatory Commission (FERC) licensing for the Priest Rapids Hydroelectric Project.

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### 3 EXISTING RESTORATION PLANNING, PROGRAMS, AND PARTNERS

This section describes the range of restoration planning, programs, and partners at work in the Grant County region.

There is a sizable body of literature on recent habitat and environmental planning that pertain to shoreline ecosystems, flora, and fauna in Grant County and in the region. These documents collectively describe a number of plans, projects, and status of the science. The primary resource documents utilized are:

- Banks Lake Resource Management Plan, Grant County, Washington (Reclamation 2001)
- Columbia Basin Wildlife Area Management Plan (WDFW 2006)
- Columbia National Wildlife Refuge Comprehensive Conservation Plan (USFWS 2011)
- Columbia Plateau Ecoregional Assessment (TNC 2004)
- Draft Crab Creek Subbasin Plan (KWA 2004)
- Fish and Wildlife Coordination Act Report for the Odessa Subarea Special Study (USFWS 2010)
- Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement (USFWS 2008)
- Interior Columbia Basin Strategy (ICBEMP 2003)
- Priest Rapids Hydroelectric Project Shoreline Management Plan (Grant PUD and Alliance Consulting Group 2010)

Many groups are involved in shoreline restoration and protection in and around Grant County, including the federal and state government, the public utilities, the Grant/Columbia Basin Conservation District, Ducks Unlimited, Nature Conservancy and other conservation organizations, and the local cities and towns. A list of the key groups and their contributions is included in brief below. This is intended to be a list of key parties and may not name all groups that have contributed to shoreline restoration or protection in the past and may in the future.

### **3.1 U.S. Bureau of Land Management**

The Bureau of Land Management (BLM) administers many acres of federal lands in Grant County. In its land acquisitions, the bureau targets shrub-steppe and associated riparian zones, and BLM policy gives priority to habitat for sensitive species and riparian areas. The BLM implements the Interior Columbia Basin Strategy, aimed at managing eastside forests in a scientifically-sound and ecosystem-based manner. It also implements integrated weed management, including shoreline areas.

### **3.2 U.S. Bureau of Reclamation**

U.S. Bureau of Reclamation (Reclamation) owns land managed as part of the CBP, Columbia Basin Wildlife Areas (managed by Washington Department of Fish and Wildlife [WDFW]) or as part of the Columbia National Wildlife Refuge (managed by the U.S. Fish and Wildlife Service). Reclamation owns the Banks Lake area, which is jointly managed by WDFW and Washington State Parks and Recreation Commission as a wildlife refuge area. They also own the land around Grand Coulee Dam and on Lake Roosevelt, and this land is managed by the National Park Service. All of these Reclamation-owned lands provide recreational opportunities and also contain shoreline habitats that are protected for species use.

### **3.3 U.S. Department of Agriculture**

The U.S. Department of Agriculture administers several programs through its Natural Resource Conservation Service that protect and restore shorelines, including the Wetlands Protection Program, the Resource Conservation and Development Program, the Wildlife Habitat Incentives Program, and the Conservation Reserve Program, among several others.

### **3.4 U.S. Department of Energy**

The U.S. Department of Energy owns and the U.S. Fish and Wildlife Service (USFWS) manages the Hanford Nuclear Reservation located within Grant County, which contains the Hanford Reach National Monument. The USDOE has a comprehensive conservation plan for its natural resources, including shorelines.

### **3.5 National Park Service**

The National Park Service manages the Grand Coulee and the Lake Roosevelt National Recreation Area consistent with operational needs for Reclamation, and the National Park Service mission to preserve unimpaired the natural resources and values of the national park system, including shorelines.

### **3.6 National Oceanographic and Atmospheric Administration Fisheries**

National Oceanographic and Atmospheric Administration (NOAA) Fisheries leads recovery efforts for populations of salmon and steelhead in Washington and other states, which often includes consideration of protection and restoration of shoreline habitat that supports various life stages of these fish. NOAA Fisheries also administers the Watershed Program, which evaluates the effectiveness of habitat and watershed restoration strategies or techniques.

### **3.7 U.S. Fish and Wildlife Service**

As indicated above, the USFWS manages the Columbia National Wildlife Refuge, a protected wetland and shrub-steppe area intended for species use. It also administers a number of programs that restore and protect other shoreline and aquatic habitats. The Partners for Fish and Wildlife Program helps private landowners restore wetlands and other habitats on their properties through voluntary cooperative agreements. Coordinated and managed through the Water Management and Evaluation Program are issues that affect instream flows and shorelines.

### **3.8 U.S. Forest Service**

In the 1990s, the U.S. Forest Service (USFS) and BLM developed the Interior Columbia Basin Ecosystem Management Project, which was a large-scale ecosystem assessment and plan for ecological integrity in the region containing Grant County. The plan was set into action by the Interior Columbia Basin Strategy (ICBEMP 2003), which provides guidance to manage the large-scale effort by developing practical resource management plans and projects. The strategy is implemented by a group of federal participants, including the USFS, BLM, USFWS, NOAA Fisheries, and the U.S. Environmental Protection Agency (EPA).

### **3.9 Washington State Department of Fish and Wildlife**

WDFW administrates the Columbia Basin Wildlife Areas, which protect, restore, and enhance shorelines for fish and wildlife, including federal and state listed and candidate species. Its strategies include supporting species research and documentation as time allows, and enhancing native shrub-steppe habitats, wetlands, uplands, streambanks, and other species-specific habitats. The Area also ensures that all activities, programs, facilities, and lands are consistent with federal and local protection and recovery efforts for species and habitats.

### **3.10 Washington State Parks and Recreation Commission**

The Washington State Parks and Recreation Commission acquires, operates, enhances, and conserves natural sites, including shorelines, and fosters protection and preservation of important habitat within its properties.

### **3.11 Washington State Conservation Commission**

The Washington State Conservation Commission provides incentives to restore and improve salmon and steelhead habitat on private land under its Conservation Reserve Enhancement Program.

### **3.12 Washington State Department of Ecology**

Ecology works with local jurisdictions, agricultural interests and others to develop clean-up plans, or Total Maximum Daily Loads (TMDLs) for waterbodies that contain pollutants that exceed state water quality criteria. Currently, there are TMDLs under development for dissolved oxygen, fecal coliform, and pH for lower Crab Creek, and for nitrogen and total phosphorus for Moses Lake. In addition, there is an EPA-approved TMDL for biological oxygen demand for several of Quincy's wasteways. Ecology also administers water quality monitoring grants to various jurisdictions.

### **3.13 Washington State Department of Natural Resources**

Washington State Department of Natural Resources (DNR) manages state trust lands in Grant County as Natural Area Preserves, which are protected areas earmarked for protection, research, and education. The DNR restores freshwater and marine habitat under its Aquatic Lands Enhancement Account Grant Program.

### **3.14 Grant County Public Utility District**

As required in its 2008 federal license to operate Priest Rapids and Wanapum dams (collective area referred to as the Priest Rapids Hydroelectric Project, or “Project”), Grant County Public Utility District (PUD) implements a set of protection, mitigation, and enhancement measures that address impacts on fish, wildlife and botanical resources arising from the operation the dam. License measures relevant to shorelines include protecting and enhancing wildlife habitat on Grant County PUD-owned properties at Crescent Bar Island, and managing and monitoring wildlife habitats within the Project boundary. The license also required the preparation of a Shoreline Management Plan, which guides the completion of the required license measures as well as assists in decision-making and coordination with others that use or manage properties within and/or adjacent to the Priest Rapids Hydroelectric Project.

### **3.15 Grant County Conservation District**

The Grant County Conservation District assists county landowners with local natural resource conservation (e.g., soil, air, water) through providing technical, financial, and educational resources. The Grant County, Moses Lake, and Warden Conservation Districts, which were previously and collectively known as the Columbia Basin Conservation Districts, recently consolidated into the Grant County Conservation District.

### **3.16 The Nature Conservancy**

The Nature Conservancy restores and protects land in Grant County for the benefit of shrub-steppe habitat and wildlife, also allowing educational, research and permitted recreational uses on its properties. Many shrub-steppe habitats are within the shoreline jurisdiction of the SMP. The Columbia Plateau Ecoregional Assessment (TNC 1999) identified a group of sites that could maintain biota and community viability, and provided an assessment of risks and strategies to conserve biodiversity in the area.

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## **4 RESTORATION CONTEXT, GOALS, AND PRIORITIES**

Shoreline restoration is a response to habitat impairment that has occurred as a result of alterations to the hydrology and physical structure of the shore. To plan restoration, there must be an understanding of the major existing impairments, an overarching set of goals to guide the work, a prioritization context to organize the efforts, and a list of the available opportunities.

### **4.1 Shoreline Impairments**

The ecosystem-wide processes and structure of Grant County shorelines were described in detail in the IAC for Grant County (Section 4; Anchor QEA 2013). In addition, the alterations to these processes were discussed in terms of how the processes are interrupted or curtailed within the County, and how physical and biological functions of habitat are affected.

Table 4-1 of the IAC, reproduced here as Table 1, provides a summary of the major Grant County shoreline processes, alterations, and impairments. As shown in Table 1, alterations have occurred and impact shoreline processes involving hydrology, sediment, water quality, and habitat. These alterations include CBP water storage and conveyance, impervious surfaces, vegetation alterations, water quality impacts, structural effects on habitat, shoreline hardening/stabilization, channel realignment, and other alterations such as lighting, noise, recreation, and species competition.

**Table 1**  
**Ecological Processes and Structures Affected by Major Alterations**

Major Alterations	Impairments	Ecological Processes and Structure																		
		Hydrology					Sediment	Water Quality			Habitat									
		Physical and Biological Functions	Storage	Subsurface Infiltration and flow	Surface flows	Hyporheic Exchange	Groundwater Recharge	Soil Erosion	Deposition/Storage	Nutrient Sources	Temperature/Dissolved Oxygen	Toxins/Pathogen sources	Riparian Vegetation Recruitment	Native grasslands and shrub steppe	Terrestrial Species - Foraging	Terrestrial Species - Breeding/Nesting	Terrestrial Species - Migration	Aquatic Species - Spawning	Aquatic Species - Rearing	Aquatic Species - Migration
Columbia Basin Project Storage	Restricts water movement		x		x						x	x						x	x	x
	Restricts sediment movement						x	x	x											
	New lakes and wetlands					x							x	x	x	x	x	x	x	x
	More rapid pool elevation fluctuations				x		x					x						x	x	x
Columbia Basin Project Diversion/Conveyance	New or relocated channels and wetlands					x							x	x	x	x	x	x	x	x
	New recharge areas					x														
	Water velocity increases						x	x			x									
Impervious Surfaces	Runoff rather than infiltration	x	x	x			x			x	x							x	x	
	Stormwater management/infrastructure	x	x			x			x		x									
	Habitat loss											x	x	x	x	x				
Vegetation Alterations	Loss of nutrient and organic inputs, reduced evapotranspiration and bioinfiltration, increased toxin and nutrient loading								x	x	x	x	x							
	Invasive species (terrestrial and aquatic)											x	x					x	x	
	Aquatic species														x	x			x	x
	Increased soil erosion						x					x		x						
Water Quality Impacts	Fertilizer/pesticide/herbicide Inputs										x									
	Effluent inputs										x									
	Temperature increases									x										
	Bioaccumulation of toxins													x	x					
Structural Effects on Habitat	Habitat fragmentation by roads											x	x	x	x	x				
	Over-water structures alter sediment,organic material pathways, and the photic zone			x													x	x	x	
	Aquatic fill, reduced water storage																x			
Shoreline Hardening/Stabilization	Habitat loss, replacement of variable-sized material with large homogenous substrate											x		x	x	x	x	x	x	x
	Increased wave energy at toe of slope and energy transfer downstream/down current of hardening						x	x												
	Sediment and subsurface water cycle disruption				x			x												
	Organic material cycle disruption								x											
Channel Realignment	Water velocity increases			x				x										x	x	x
	Reduced floodplain connection and functions				x															
	Decreased temporary storage of sediment, nutrient-, toxin-, or pathogen-laden water in streams							x	x		x									
Other Alterations	Artificial lighting increases light delivery at unnatural times													x	x	x	x	x	x	x
	Increased noise													x	x	x				
	Recreation infrastructure increases wave energy at shoreline (boat ramps, wakes)						x	x									x	x	x	
	Non-native species predation													x	x	x	x	x	x	
	Competition for resources from non-native species											x	x	x	x	x	x	x	x	

## 4.2 Restoration Goals and Objectives

As described in Section 3, much work has been done with regard to setting the direction for habitat management in the Grant County region. The general management goals identified in the plans for these areas and jurisdictions were used to formulate a list of goals and example objectives for this Restoration Plan. These goals and objectives, as follows, will guide the restoration actions described herein and can be used to formulate metrics to monitor progress in implementing the Plan.

1. Protect, maintain, and where feasible, enhance and restore riparian, aquatic, shrub-steppe, and wetland habitats. Example objectives could include removing invasive vegetation, replanting natives, and consolidating livestock or recreation access to sensitive habitats.
2. Promote and enhance habitat diversity, especially for sensitive or rare areas (e.g., seasonal alkali wetlands, shrub-steppe, emergent marsh, and seep streams and channels). Example objectives could include incorporating habitat complexity and vegetative components into with soft bank stabilization techniques, or involving channel sinuosity into stream projects.
3. Protect and maintain lakes and stream channels, especially those that contribute to the recovery of sensitive species and impaired waters. Example objectives could include implementing stormwater controls consistent with state standards, and protecting steep slope areas from runoff and sedimentation.

## 4.3 Restoration Opportunities

Several opportunities now exist for restoration of Grant County shorelines, presented below in terms of general areas (County, cities, and towns) and also in terms of specific identified projects or sites.

### 4.3.1 General Restoration Opportunities

Various ecological benefits can be realized if shoreline impairments are addressed by restoration in Grant County. The habitat plans and programs described in Section 3 of this document describe direction and/or recommendations for actions to address many of the impairments that occur within their jurisdiction or area of interest. Table 2 shows the

restoration or protection opportunities that these plans and programs have identified, including the reasons for the habitat impairment and a summary of the ecological benefits to be realized from the project.

Major opportunities identified include establishing or protecting sensitive habitats such as riparian, wetland, or shrub-steppe habitats. This could be accomplished by consolidating or restricting access to these areas by livestock and recreationists. In addition, plans and programs suggested incorporating habitat diversity and complexity into new or enhanced habitats, especially aquatic areas that have been simplified by channelization or shoreline hardening. Former wetland and floodplain areas could be reconnected to their source waters, and removal of shoreline armoring could be conducted where soft shore stabilization techniques may be appropriate. For shrub-steppe in particular, WDFW has recommended specific measures for shrub-steppe habitat restoration (WDFW 2011a) and has given direction for managing these habitats in developed areas (WDFW 2011b). Protecting or improving water quality was also a key element of habitat management under these plans, including using the most recent stormwater controls and managing temperature and nutrient loading from local sources.

#### **4.3.2 Site-specific Restoration and Protection Opportunities**

While most plans and programs from the SMP jurisdictional area address large-scale direction and management, there is a small set of actions that are named or planned for specific areas. Table 3 lists these locations and opportunities, and includes the source document or project proponent, as well as the impairment to be addressed and the key benefits to ecological function expected as a result of the project implementation.

**Table 2**  
**General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns**

Restoration/Protection Opportunities		Key Impairments*	Key Benefits to Ecological Functions*	Columbia River A	Crescent Bay and Lake Roosevelt B	City of Grand Coulee (Crescent Bay) C	City of Grand Coulee (Lake Roosevelt) D	Banks, Osborn, Thompson Lakes E	Town of Coulee City (Banks Lake) F	City of Electric City (Banks and Osborn Bay Lakes) G	City of Grand Coulee (Banks Lake) H	Coffee and Long Lakes I	Blue Lake J
1	Establish riparian buffers where absent and/or remove invasives where present	Loss of nutrient and organic inputs, reduced evapotranspiration and bioinfiltration	Riparian vegetation recruitment Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration	IAC, HR-CCP, GCPUD	IAC	IAC	IAC	BLRMP	IAC, BLRMP	BLRMP	IAC, BLRMP		IAC
2	Concentrate and better manage recreation and public access to intact riparian, wetland, and shrub-steppe habitats	Habitat loss - riparian and wetland	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat Temperature/dissolved oxygen improvements Improve toxin/pathogen management capabilities	IAC, GCPUD				BLRMP		IAC, BLRMP	BLRMP		
3	Incorporate aquatic habitat complexity and vegetation with future development along with soft bank stabilization techniques	Habitat loss along shoreline Increased wave energy due to shoreline armoring	Maintained or increased habitat for aquatic species – rearing/migration Reduced soil erosion	IAC, GCPUD				IAC		IAC	IAC	IAC	IAC
4	Implement stormwater controls consistent with Eastern WA Stormwater manual	Fertilizer/Pesticide/Herbicide inputs Temperature increases Bioaccumulation of toxins	Reduced excess nutrient sources to improve water quality Temperature/dissolved oxygen improvements Toxin/pathogen reduction	IAC	IAC	IAC	IAC		IAC, BLRMP	IAC, BLRMP	IAC, BLRMP		IAC
5	Restore shrub-steppe along shorelines	Habitat loss - shrub-steppe	Increased native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration	IAC, HR-CCP, GCPUD				BLRMP	BLRMP	BLRMP	BLRMP		IAC

Table 2

General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns

Restoration/Protection Opportunities		Key Impairments*	Key Benefits to Ecological Functions*	Columbia River A	Crescent Bay and Lake Roosevelt B	City of Grand Coulee (Crescent Bay) C	City of Grand Coulee (Lake Roosevelt) D	Banks, Osborn, Thompson Lakes E	Town of Coulee City (Banks Lake) F	City of Electric City (Banks and Osborn Bay Lakes) G	City of Grand Coulee (Banks Lake) H	Coffee and Long Lakes I	Blue Lake J
6	Protect intact shrub-steppe habitat	(none)	Increase native shrub-steppe habitat for terrestrial species foraging/ breeding/ nesting/ migration	HR-CCP, GCPUD	IAC	IAC	IAC	BLRMP	IAC, BLRMP	IAC, BLRMP	IAC, BLRMP		CBWAMP
7	Protect steep slope areas from runoff and sedimentation	Sediment cycle disruption	Increased subsurface infiltration and flow, protect surface water quality Reductions in soil erosion		IAC	IAC	IAC			IAC			
8	Monitor shoreline periodically and evaluate protection measures if grazing impacts appear	NA	Reductions in soil erosion Riparian vegetation recruitment Protections for temperature/ dissolved oxygen conditions and protection against toxin/pathogen addition			N/A	N/A	BLRMP	N/A	N/A	N/A	IAC	
9	Protect existing wetland and riparian habitats	NA	Protections for temperature/dissolved oxygen conditions and protection against toxin/pathogen addition Protection for aquatic and terrestrial species - foraging/ breeding/ nesting/ rearing	HR-CCP, GCPUD				CBWAMP, BLRMP	BLRMP	BLRMP	BLRMP		
10	Grass or woody plant strips between agricultural fields and either lakes or streams	Habitat loss	Soil erosion protection Support native grassland and shrub steppe features Increase habitat for terrestrial species - foraging/ breeding/ nesting/ migration			N/A	N/A		N/A	N/A	N/A		
11	Concentrate livestock water access, including exclusion fencing if feasible	NA	Reductions in soil erosion Riparian vegetation recruitment Protections for temperature/dissolved oxygen conditions and protection against toxin/pathogen addition			N/A	N/A	BLRMP	N/A	N/A	N/A		

**Table 2**

**General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns**

Restoration/Protection Opportunities		Key Impairments*	Key Benefits to Ecological Functions*	A Columbia River	B Crescent Bay and Lake Roosevelt	C City of Grand Coulee (Crescent Bay)	D City of Grand Coulee (Lake Roosevelt)	E Banks, Osborn, Thompson Lakes	F Town of Coulee City (Banks Lake)	G City of Electric City (Banks and Osborn Bay Lakes)	H City of Grand Coulee (Banks Lake)	I Coffee and Long Lakes	J Blue Lake
12	Manage nutrient and temperature loading at nearby hatchery	Effluent inputs - nutrient sources and elevated temperature water	Decrease nutrient sources										
		Temperature increases	Improved temperature/dissolved oxygen and protect against elevated toxin/pathogen conditions										
			Aquatic species - rearing/migration										
13	Evaluate opportunities for existing hardened shoreline/armoring removal and native vegetation replanting with soft shoreline stabilization.	Habitat loss	Terrestrial and aquatic species - foraging/breeding/nesting/migration/rearing	GCPUD		IAC			IAC	IAC			
		Increased wave energy due to shoreline armoring	Decrease soil erosion										
		Sediment cycle disruption	Riparian vegetation recruitment										
14	Substrate enhancement	Sediment cycle disruption due to periodic flooding and ice dams	Decrease sedimentation/excessive deposition										
15	Reconnect floodplain and/or wetland connectivity where appropriate	Habitat fragmentation	Increased water storage	HR-CCP				BLRMP	BLRMP	BLRMP	BLRMP		
		Reduced water storage, and reduced filtration of sediment, nutrient-, toxin-, or pathogen-laden water	Increased subsurface infiltration and flow, protect surface water quality										
		Habitat loss	Increased hyporheic exchange and groundwater recharge										
		Sediment and organic material cycle disruption	Terrestrial and aquatic species - foraging/breeding/nesting/migration/rearing										

Table 2

General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns

Restoration/Protection Opportunities		Key Impairments*	Key Benefits to Ecological Functions*	K Alkali, Deep, Dry Falls, Lenore, and Little Soap Lakes	L Park Lake	M Soap Lake	N City of Soap Lake (Soap Lake)	O Trail, Billy Clapp, and Brook Lakes	P Sand Coulee Syphon, Round Lake, and Un-named Lake	Q Ephrata and Rocky Ford Lakes	R Babcock Ridge Lake, Crater Lake, Frenchman Hills Lake, Hiawatha Lake, Martha Lake, Sand Lake, Un-named Lakes, Winchester Lakes	S Moses Lake
1	Establish riparian buffers where absent and/or remove invasives where present	Loss of nutrient and organic inputs, reduced evapotranspiration and bioinfiltration	Riparian vegetation recruitment Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration		IAC		IAC					IAC, CCSBP
2	Concentrate and better manage recreation and public access to intact riparian, wetland, and shrub-steppe habitats	Habitat loss - riparian and wetland	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat Temperature/dissolved oxygen improvements Improve toxin/pathogen management capabilities	CBWAMP	CBWAMP			CBWAMP			CBWAMP	CCSBP
3	Incorporate aquatic habitat complexity and vegetation with future development along with soft bank stabilization techniques	Habitat loss along shoreline Increased wave energy due to shoreline armoring	Maintained or increased habitat for aquatic species – rearing/migration Reduced soil erosion	IAC	IAC	IAC	IAC	IAC	IAC	IAC		IAC
4	Implement stormwater controls consistent with Eastern WA Stormwater manual	Fertilizer/Pesticide/Herbicide inputs Temperature increases Bioaccumulation of toxins	Reduced excess nutrient sources to improve water quality Temperature/dissolved oxygen improvements Toxin/pathogen reduction	IAC	IAC		IAC					IAC
5	Restore shrub-steppe along shorelines	Habitat loss - shrub-steppe	Increased native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration									IAC

**Table 2**  
**General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns**

Restoration/Protection Opportunities		Key Impairments*	Key Benefits to Ecological Functions*	K Alkali, Deep, Dry Falls, Lenore, and Little Soap Lakes	L Park Lake	M Soap Lake	N City of Soap Lake (Soap Lake)	O Trail, Billy Clapp, and Brook Lakes	P Sand Coulee Syphon, Round Lake, and Un-named Lake	Q Ephrata and Rocky Ford Lakes	R Babcock Ridge Lake, Crater Lake, Frenchman Hills Lake, Hiawatha Lake, Martha Lake, Sand Lake, Un-named Lakes, Winchester Lakes	S Moses Lake
6	Protect intact shrub-steppe habitat	(none)	Increase native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration	CBWAMP	CBWAMP		IAC	CBWAMP			CBWAMP	
7	Protect steep slope areas from runoff and sedimentation	Sediment cycle disruption	Increased subsurface infiltration and flow, protect surface water quality Reductions in soil erosion									IAC
8	Monitor shoreline periodically and evaluate protection measures if grazing impacts appear	NA	Reductions in soil erosion Riparian vegetation recruitment Protections for temperature/dissolved oxygen conditions and protection against toxin/pathogen addition				N/A		IAC	IAC		
9	Protect existing wetland and riparian habitats	NA	Protections for temperature/dissolved oxygen conditions and protection against toxin/pathogen addition Protection for aquatic and terrestrial species - foraging/breeding/nesting/rearing		CBWAMP	IAC	IAC	IAC, CBWAMP			CBWAMP	
10	Grass or woody plant strips between agricultural fields and either lakes or streams	Habitat loss	Soil erosion protection Support native grassland and shrub steppe features Increase habitat for terrestrial species - foraging/breeding/nesting/migration				N/A					
11	Concentrate livestock water access, including exclusion fencing if feasible	NA	Reductions in soil erosion Riparian vegetation recruitment Protections for temperature/dissolved oxygen conditions and protection against toxin/pathogen addition				N/A					IAC

Table 2

General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns

Restoration/Protection Opportunities		Key Impairments*	Key Benefits to Ecological Functions*	K Alkali, Deep, Dry Falls, Lenore, and Little Soap Lakes	L Park Lake	M Soap Lake	N City of Soap Lake (Soap Lake)	O Trail, Billy Clapp, and Brook Lakes	P Sand Coulee Syphon, Round Lake, and Un-named Lake	Q Ephrata and Rocky Ford Lakes	R Babcock Ridge Lake, Crater Lake, Frenchman Hills Lake, Hiawatha Lake, Martha Lake, Sand Lake, Un-named Lakes, Winchester Lakes	S Moses Lake
12	Manage nutrient and temperature loading at nearby hatchery	Effluent inputs - nutrient sources and elevated temperature water	Decrease nutrient sources									
		Temperature increases	Improved temperature/dissolved oxygen and protect against elevated toxin/pathogen conditions									
			Aquatic species - rearing/migration									
13	Evaluate opportunities for existing hardened shoreline/armoring removal and native vegetation replanting with soft shoreline stabilization.	Habitat loss	Terrestrial and aquatic species - foraging/breeding/nesting/migration/rearing				IAC					
		Increased wave energy due to shoreline armoring	Decrease soil erosion									
		Sediment cycle disruption	Riparian vegetation recruitment									
14	Substrate enhancement	Sediment cycle disruption due to periodic flooding and ice dams	Decrease sedimentation/excessive deposition									
15	Reconnect floodplain and/or wetland connectivity where appropriate	Habitat fragmentation	Increased water storage									
		Reduced water storage, and reduced filtration of sediment, nutrient-, toxin-, or pathogen-laden water	Increased subsurface infiltration and flow, protect surface water quality									
		Habitat loss	Increased hyporheic exchange and groundwater recharge									
		Sediment and organic material cycle disruption	Terrestrial and aquatic species - foraging/breeding/nesting/migration/rearing									

Table 2

General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns

Restoration/Protection Opportunities		Key Impairments*	Key Benefits to Ecological Functions*	T Ancient Lake, Burke Lake, Dusty Lake, Evergreen Reservoir, Flat Lake, Hilltop Lake, Quincy Lake, Stan Coffin Lake	U Potholes Reservoir	V Blythe Lake, Canal Lake, Chukar Lake, Corral Lake, Crescent Lake, Hampton Lake, Heart Lake, Long Lake (South), Lower Goose Lake, Marsh Unit One, North Teal Lake, Pit Lakes, Royal Lake, Soda Lake, South Teal Lake, South Warden Lake, Susan Lake, Un-named Lake in T17-0N R29-0E S34, Upper Goose Lake, Warden Lake, Windmill Lake	W Bobby Lake, Burkett Lake, Lenice Lake, Nunnally Lake, Red Rock Lake, Sand Hollow Lake	X Un-named Lake in T15 0N R23 0E S 28, Saddle Mountain Lake, Saddle Mountain Wasteway
1	Establish riparian buffers where absent and/or remove invasives where present	Loss of nutrient and organic inputs, reduced evapotranspiration and bioinfiltration	Riparian vegetation recruitment Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration		IAC, CCSBP		CCSBP	
2	Concentrate and better manage recreation and public access to intact riparian, wetland, and shrub-steppe habitats	Habitat loss - riparian and wetland	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat Temperature/dissolved oxygen improvements Improve toxin/pathogen management capabilities	CBWAMP	CBWAMP, CCSBP	CBWAMP		
3	Incorporate aquatic habitat complexity and vegetation with future development along with soft bank stabilization techniques	Habitat loss along shoreline Increased wave energy due to shoreline armoring	Maintained or increased habitat for aquatic species – rearing/migration Reduced soil erosion		IAC			
4	Implement stormwater controls consistent with Eastern WA Stormwater manual	Fertilizer/Pesticide/Herbicide inputs Temperature increases Bioaccumulation of toxins	Reduced excess nutrient sources to improve water quality Temperature/dissolved oxygen improvements Toxin/pathogen reduction	IAC			IAC	IAC
5	Restore shrub-steppe along shorelines	Habitat loss - shrub-steppe	Increased native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration			IAC	IAC	

Table 2

General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns

Restoration/Protection Opportunities		Key Impairments*	Key Benefits to Ecological Functions*	Ancient Lake, Burke Lake, Dusty Lake, Evergreen Reservoir, Flat Lake, Hilltop Lake, Quincy Lake, Stan Coffin Lake	Potholes Reservoir	Blythe Lake, Canal Lake, Chukar Lake, Corral Lake, Crescent Lake, Hampton Lake, Heart Lake, Long Lake (South), Lower Goose Lake, Marsh Unit One, North Teal Lake, Pit Lakes, Royal Lake, Soda Lake, South Teal Lake, South Warden Lake, Susan Lake, Un-named Lake in T17-0N R29-0E S34, Upper Goose Lake, Warden Lake, Windmill Lake	Bobby Lake, Burkett Lake, Lenice Lake, Nunnally Lake, Red Rock Lake, Sand Hollow Lake	Un-named Lake in T15 0N R23 0E S 28, Saddle Mountain Lake, Saddle Mountain Wasteway
				T	U	V	W	X
6	Protect intact shrub-steppe habitat	(none)	Increase native shrub-steppe habitat for terrestrial species foraging/ breeding/ nesting/ migration	IAC, CBWAMP	IAC, CBWAMP	CBWAMP	IAC	IAC
7	Protect steep slope areas from runoff and sedimentation	Sediment cycle disruption	Increased subsurface infiltration and flow, protect surface water quality Reductions in soil erosion					
8	Monitor shoreline periodically and evaluate protection measures if grazing impacts appear	NA	Reductions in soil erosion Riparian vegetation recruitment Protections for temperature/ dissolved oxygen conditions and protection against toxin/pathogen addition					
9	Protect existing wetland and riparian habitats	NA	Protections for temperature/dissolved oxygen conditions and protection against toxin/pathogen addition Protection for aquatic and terrestrial species - foraging/ breeding/ nesting/ rearing	CBWAMP	CBWAMP	CBWAMP	CCSBP	
10	Grass or woody plant strips between agricultural fields and either lakes or streams	Habitat loss	Soil erosion protection Support native grassland and shrub steppe features Increase habitat for terrestrial species - foraging/ breeding/ nesting/ migration	IAC	IAC	IAC	IAC	IAC
11	Concentrate livestock water access, including exclusion fencing if feasible	NA	Reductions in soil erosion Riparian vegetation recruitment Protections for temperature/dissolved oxygen conditions and protection against toxin/pathogen addition			IAC	IAC	

**Table 2**

**General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns**

Restoration/Protection Opportunities		Key Impairments*	Key Benefits to Ecological Functions*	T Ancient Lake, Burke Lake, Dusty Lake, Evergreen Reservoir, Flat Lake, Hilltop Lake, Quincy Lake, Stan Coffin Lake	C Potholes Reservoir	V Blythe Lake, Canal Lake, Chukar Lake, Corral Lake, Crescent Lake, Hampton Lake, Heart Lake, Long Lake (South), Lower Goose Lake, Marsh Unit One, North Teal Lake, Pit Lakes, Royal Lake, Soda Lake, South Teal Lake, South Warden Lake, Susan Lake, Un-named Lake in T17-0N R29-0E S34, Upper Goose Lake, Warden Lake, Windmill Lake	W Bobby Lake, Burkett Lake, Lenice Lake, Nunnally Lake, Red Rock Lake, Sand Hollow Lake	X Un-named Lake in T15 0N R23 0E S 28, Saddle Mountain Lake, Saddle Mountain Wasteway
12	Manage nutrient and temperature loading at nearby hatchery	Effluent inputs - nutrient sources and elevated temperature water	Decrease nutrient sources					
		Temperature increases	Improved temperature/dissolved oxygen and protect against elevated toxin/pathogen conditions					
			Aquatic species - rearing/migration					
13	Evaluate opportunities for existing hardened shoreline/armoring removal and native vegetation replanting with soft shoreline stabilization.	Habitat loss	Terrestrial and aquatic species - foraging/breeding/nesting/migration/rearing					
		Increased wave energy due to shoreline armoring	Decrease soil erosion					
		Sediment cycle disruption	Riparian vegetation recruitment					
14	Substrate enhancement	Sediment cycle disruption due to periodic flooding and ice dams	Decrease sedimentation/excessive deposition					
15	Reconnect floodplain and/or wetland connectivity where appropriate	Habitat fragmentation	Increased water storage				CCSBP	
		Reduced water storage, and reduced filtration of sediment, nutrient-, toxin-, or pathogen-laden water	Increased subsurface infiltration and flow, protect surface water quality					
		Habitat loss	Increased hyporheic exchange and groundwater recharge					
		Sediment and organic material cycle disruption	Terrestrial and aquatic species - foraging/breeding/nesting/migration/rearing					

**Table 2**

**General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns**

Restoration/Protection Opportunities		Key Impairments*	Key Benefits to Ecological Functions*	Lind Coulee	Lower Crab Creek	Rocky Ford Creek	Upper Crab Creek	Town of Krupp (Upper Crab Creek)	Town of Wilson Creek (Upper Crab Creek)
				Y	Z	AA	BB	CC	DD
1	Establish riparian buffers where absent and/or remove invasives where present	Loss of nutrient and organic inputs, reduced evapotranspiration and bioinfiltration	Riparian vegetation recruitment		CCSBP, CNWR-CCP	IAC, CCSBP	IAC, CCSBP	IAC, CCSBP	CCSBP
			Increased habitat for aquatic and terrestrial species foraging/breeding/nesting/migration						
2	Concentrate and better manage recreation and public access to intact riparian, wetland, and shrub-steppe habitats	Habitat loss - riparian and wetland	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat		CBWAMP, CNWR-CCP				
			Temperature/dissolved oxygen improvements						
			Improve toxin/pathogen management capabilities						
3	Incorporate aquatic habitat complexity and vegetation with future development along with soft bank stabilization techniques	Habitat loss along shoreline	Maintained or increased habitat for aquatic species – rearing/migration	IAC					
		Increased wave energy due to shoreline armoring	Reduced soil erosion						
4	Implement stormwater controls consistent with Eastern WA Stormwater manual	Fertilizer/Pesticide/Herbicide inputs	Reduced excess nutrient sources to improve water quality	IAC	IAC		IAC	IAC	IAC
		Temperature increases	Temperature/dissolved oxygen improvements						
		Bioaccumulation of toxins	Toxin/pathogen reduction						
5	Restore shrub-steppe along shorelines	Habitat loss - shrub-steppe	Increased native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration	IAC	IAC	IAC	IAC	IAC	

**Table 2**

**General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns**

Restoration/Protection Opportunities	Key Impairments*	Key Benefits to Ecological Functions*	Lind Coulee	Lower Crab Creek	Rocky Ford Creek	Upper Crab Creek	Town of Krupp (Upper Crab Creek)	Town of Wilson Creek (Upper Crab Creek)
			Y	Z	AA	BB	CC	DD
6	Protect intact shrub-steppe habitat	(none)		IAC, CBWAMP				
7	Protect steep slope areas from runoff and sedimentation	Sediment cycle disruption						
8	Monitor shoreline periodically and evaluate protection measures if grazing impacts appear	Reductions in soil erosion						
		Riparian vegetation recruitment				IAC		
		Protections for temperature/dissolved oxygen conditions and protection against toxin/pathogen addition						
9	Protect existing wetland and riparian habitats	NA		IAC, CBWAMP, CCSBP, CNWR-CCP	CCSBP	CCSBP	CCSBP	CCSBP
10	Grass or woody plant strips between agricultural fields and either lakes or streams	Habitat loss						
		Soil erosion protection	IAC	IAC		IAC		
		Support native grassland and shrub steppe features						
11	Concentrate livestock water access, including exclusion fencing if feasible	Increase habitat for terrestrial species - foraging/feeding/nesting/migration						
		Reductions in soil erosion						
		Riparian vegetation recruitment		IAC	IAC	CCSBP	IAC	
		Protections for temperature/dissolved oxygen conditions and protection against toxin/pathogen addition						

**Table 2**  
**General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns**

Restoration/Protection Opportunities		Key Impairments*	Key Benefits to Ecological Functions*	Lind Coulee	Lower Crab Creek	Rocky Ford Creek	Upper Crab Creek	Town of Krupp (Upper Crab Creek)	Town of Wilson Creek (Upper Crab Creek)
				Y	Z	AA	BB	CC	DD
12	Manage nutrient and temperature loading at nearby hatchery	Effluent inputs - nutrient sources and elevated temperature water	Decrease nutrient sources						
		Temperature increases	Improved temperature/dissolved oxygen and protect against elevated toxin/pathogen conditions			IAC			
			Aquatic species - rearing/migration						
13	Evaluate opportunities for existing hardened shoreline/armoring removal and native vegetation replanting with soft shoreline stabilization.	Habitat loss	Terrestrial and aquatic species - foraging/breeding/nesting/migration/rearing						
		Increased wave energy due to shoreline armoring	Decrease soil erosion						
		Sediment cycle disruption	Riparian vegetation recruitment						
14	Substrate enhancement	Sediment cycle disruption due to periodic flooding and ice dams	Decrease sedimentation/excessive deposition						IAC
15	Reconnect floodplain and/or wetland connectivity where appropriate	Habitat fragmentation	Increased water storage						
		Reduced water storage, and reduced filtration of sediment, nutrient-, toxin-, or pathogen-laden water	Increased subsurface infiltration and flow, protect surface water quality						
		Habitat loss	Increased hyporheic exchange and groundwater recharge						
		Sediment and organic material cycle disruption	Terrestrial and aquatic species - foraging/breeding/nesting/migration/rearing						

**Table 2**  
**General Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns**

Notes:

BLRMP – Banks Lake Resource Management Plan

CBWAMP – Columbia Basin Wildlife Area Management Plan

CCSBP – Crab Creek Subbasin Plan

CNWR-CCP – Columbia National Wildlife Refuge – Cooperative Conservation Plan

GCPUD – Grant County PUD Article 418 of Priest Rapids Project License

HR-CCP – Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement

IAC – Inventory, Analysis, and Characterization Report (Anchor QEA )

NA – not applicable

\* Impairment and benefits general categories come from Table 1 of this Restoration Plan

Grant County areas

Cities and Towns

**Table 3**  
**Site-specific Restoration and Protection Opportunities in Grant County and Surrounding Cities and Towns**

No.	Area	Site	Restoration/Protection Opportunities	Priority*	Source	Key Impairments**	Key Benefits to Ecological Functions**
1	County	Upper Crab Creek between Brook Lake and Moses Lake (known as Potholes Supplemental Feed Route)	Establish wetlands/waterfowl habitat and associated riparian enhancement and bank stabilization	<i>High</i>	Washington Department of Fish and Wildlife Project (WDFW 2013), Bureau of Reclamation project, Washington Department of Ecology	Restricted water movement	Increased subsurface infiltration and flow
						Restricted sediment movement	Increased habitat for terrestrial species foraging/breeding/nesting/migration
						Habitat loss	Improved temperature/dissolved oxygen conditions and protection against toxin/pathogen addition
						Increased soil erosion	Reductions in soil erosion
2	County	Buckshot Ranch Boat Launch, Burkett Lake Recreation Area,	Protect/enhance riparian vegetation	<i>Very High</i>	GCPUD	Habitat loss	Increased native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration Riparian vegetation recruitment
3	County	Priest Rapids Recreation Area/Desert Aire	Protect/enhance riparian vegetation	<i>Very High</i>	GCPUD	Habitat loss	Increased native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration
			Protect existing shrub-steppe vegetation				Riparian vegetation recruitment
4	County	Crescent Bar Island Recreation Area	Stabilize shoreline using soft shoreline techniques	<i>Moderate</i>	GCPUD	Increased soil erosion	Reductions in soil erosion
			Protect/enhance shoreline vegetation	<i>Very High</i>			Increased native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration
							Protect surface water quality
5	Coulee City	Coulee City Community Park	Stabilize shoreline using soft shoreline techniques	<i>Moderate</i>	Coulee City	Increased soil erosion	Reductions in soil erosion Increased habitat for aquatic species foraging/spawning
		Conservancy Area	Enhance riparian vegetation and remove invasives where present	<i>Moderate</i>	Coulee City	Habitat loss	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat
			Protect existing shrub-steppe vegetation	<i>Very High</i>			Increased native shrub-steppe habitat for terrestrial species foraging/breeding/nesting/migration
6	Electric City	Northeast and Southeast Edge of Lake	Restore beach restoration and stabilize shoreline using soft shore techniques	<i>Moderate</i>	Electric City	Habitat loss due to invasive species and shoreline erosion	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat
			Protect/enhance shoreline vegetation and remove invasive vegetation	<i>Very High</i>			Reductions in soil erosion
7	Grand Coulee	Columbia River/Lake Roosevelt Shoreline	Remove invasive vegetation	<i>Moderate</i>	Grand Coulee	Habitat loss due to invasive species	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat
			Protect/enhance riparian vegetation	<i>Very High</i>			
8	Soap Lake	Soap Lake Shoreline Along Highway 17	Stabilize shoreline using soft shore techniques	<i>Moderate</i>	Soap Lake	Increased soil erosion	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat
			Enhance riparian vegetation and remove invasives where present	<i>Moderate</i>		Habitat loss due to invasive species and shoreline erosion	Reductions in soil erosion
			Protect lake water quality by implementing stormwater controls consistent with Eastern Washington Stormwater manual, and by evaluating feasibility of establishing a stormwater management mitigation program	<i>Very High</i>		Fertilizer/pesticide/herbicide inputs	Reduced excess nutrient sources to improve water quality
						Temperature increases	Temperature/dissolved oxygen improvements
						Bioaccumulation of toxins	Toxin/pathogen reduction
9	Krupp	Upper Crab Creek Shoreline	Remove invasive vegetation and protect existing riparian and shrub-steppe vegetation	<i>Very High</i>	Krupp	Habitat loss due to invasive species	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat
10	Wilson Creek	Upper Crab Creek Shoreline	Remove invasive vegetation and protect existing riparian and shrub-steppe vegetation	<i>Very High</i>	Wilson Creek	Habitat loss due to invasive species	Riparian vegetation recruitment for native terrestrial species foraging/breeding/nesting habitat

Notes:

GCPUD - Grant County PUD Article 418 of Priest Rapids Project License

\* Categories are Very High (habitat protection actions), High (actions that restore ecosystem function), and Moderate (actions that restore habitat structure). Funded projects take priority over other projects within each category. *Italics* indicate funded projects as of the date of this Restoration Plan.

\*\* Impairments and Benefits categories are from Table 1 of this Restoration Plan.

### **4.3.3 County**

Identified restoration actions for areas not contained within cities or towns are primarily related to a large suite of Grant County PUD activities associated with the Priest Rapids Hydroelectric Project License (Table 3). The projects include work protecting and enhancing riparian vegetation, protecting existing shrub-steppe habitat, and employing soft shoreline stabilization where applicable. In addition, a multi-agency group proposes restoration work on Upper Crab Creek, which will involve changes to hydrology aimed at creation and enhancement of wetlands and waterfowl habitat, and which will also entail the stabilization of existing banks (Wick 2013).

### **4.3.4 Cities and Towns**

Restoration opportunities exist for various cities within this SMP's jurisdiction. The following ideas for potential restoration actions have been suggested:

- Coulee City has opportunities for soft shoreline stabilization and revegetation with in the shoreline area recently stabilized in Coulee City Community Park, as well as control of invasive vegetation and protection of shrub-steppe along the trail in the conservancy area.
- Electric City opportunities include beach restoration and shoreline stabilization, as well as control/removal of invasive vegetation and enhancement of existing riparian vegetation along the northeast and southeast edge of lake. These measures would help to curtail erosion from the eddy that forms south of the outlet of the canal along the shoreline.
- Grand Coulee has opportunities to control invasive vegetation and protect and enhance existing riparian vegetation where feasible.
- Soap Lake opportunities are to replace the existing riprap with softer shoreline stabilization constructions, and include revegetation and removal of invasive vegetation. In addition, lake water quality could be protected by using stormwater protections within the SMP shoreline jurisdiction. Lake water quality could be further protected by developing and implementing a debit/credit format stormwater protection program for areas outside the shoreline zone.
- Krupp and Wilson Creek opportunities include controlling invasive vegetation and protecting existing riparian vegetation along Upper Crab Creek shorelines.

#### 4.4 Project Evaluation and Prioritization Criteria

Projects and opportunities in this Plan can be evaluated against various criteria to prioritize implementation. The following list includes a description of criteria that indicate that a project is viewed as implementable under this Plan.

Potential projects should:

- Meet goals and objectives for shoreline restoration (see Section 4.2)
- Maintain consistency with existing plans and programs as described in Section 3
- Have public support
- Be located on public property or property owned by a willing partner for restoration projects
- Restore ecosystem processes or provide habitat protection (those that restore function by providing habitat structure only would take a lesser priority)
- Improve a rapidly deteriorating habitat condition
- Have high benefit to ecosystem function relative to cost
- Provide riparian, shoreline, or instream habitat for spawning and rearing listed salmonids, or improve conditions in sensitive shrub-steppe systems for state and federally listed native wildlife (a list of wildlife are given in WDFW 2011b; e.g., Greater Sage grouse, burrowing owl, Townsend's ground squirrel)

All specific projects or actions that comprise a project listed in Table 3 exhibit some, if not all, of the above criteria. To prioritize these actions, they were assigned to a category of Very High, High, and Moderate relative to their value in achieving the SMP goal of no net loss for shorelines within Grant County SMP jurisdiction (Table 3). Projects were categorized as follows:

1. Very High: Habitat protection projects or actions
2. High: Restoration of ecosystem functions (funded actions take higher priority within this category)
3. Moderate: Restoration of habitat structure (funded actions take higher priority within this category)

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## 5 IMPLEMENTATION, MONITORING, AND REVIEW (COUNTY AND CITIES AND TOWNS)

Implementation of the restoration plan will require close coordination within Grant County and the cities and towns, as well as with the agencies and organizational partners noted in Section 3 of this Plan.

### 5.1 Potential Restoration Funding Partners

There is currently no single dedicated funding source for the restoration actions presented here. Resources have been dedicated by Grant County PUD for projects along the Columbia River and by Reclamation for the Upper Crab feeder route project.

Restoration described in this Plan is dependent on federal, state, and local budgets; grant funding; and the variety of outside funding sources available for restoration work. Funds are distributed through grant-making agencies at the local, state, and federal level; opportunities described below are primarily administered by state and federal agencies. It is expected that funding will be derived from various sources. Sources listed here do not represent an exhaustive list of potential funding opportunities, but are meant to provide an overview of the types of opportunities available. These sources include the following:

- Recreation and Conservation Office of Washington/Salmon Recovery Funding Board
- Grant County PUD Funding
- Reclamation CBP Funding
- Ecology
  - Aquatic Weeds Financial Assistance Program
  - Water Quality Grants, including federal Clean Water Act Section 319 Program
  - Coastal Protection Fund (Terry Hussman) Grant Program
  - Coastal Zone Management Administration/Implementation Awards
- WDFW
  - Aquatic Lands Enhancement Account Volunteer Cooperative Projects Program
  - Landowner Incentive Program

- National Fish and Wildlife Foundation
  - Bring Back the Natives: A Public-Private Partnership for Restoring Populations of Native Aquatic Species
  - Five-Star Restoration Matching Grants Program
  - Marine Debris Prevention and Removal Program
  - Native Plant Conservation Initiative
  - The Migratory Bird Conservancy
- Grant County Conservation District
- NOAA Restoration Center
  - Community-based Restoration Program
  - NOAA CRP 3-Year Partnership Grants
  - NOAA CRP Project Grants
- American Sportfishing Association's FishAmerica Foundation Grants
- EPA Region 10: Pacific Northwest
  - The Clean Water State Revolving Fund Program
  - Nonpoint Source Implementation Grant (319) Program
  - Wetland Protection, Restoration, and Stewardship Discretionary Funding
- USFWS
  - Partners for Fish and Wildlife Program
  - National Fish Passage Program
  - Cooperative Endangered Species Conservation Fund
  - North American Wetlands Conservation Act Grants Program
- Washington Department of Natural Resources Small Forest Landowner Office
- Private foundations, businesses, and other groups administer grant programs that include funding for shoreline habitat and ecosystems, including:
  - The Russell Family Foundation
  - William C. Kenney Watershed Protection Foundation
  - Northwest Fund for the Environment
  - Kongsgaard-Goldman Foundation
  - The Bullitt Foundation

- The Compton Foundation
- Doris Duke Charitable Foundation
- The Hugh and Jane Ferguson Foundation
- Washington Trout
- Midsound Fisheries Enhancement Group

## **5.2 Timelines, Benchmarks, and Monitoring**

The County and cities and towns' restoration work as it relates to this Plan will be monitored and evaluated on a set timeline against a suite of benchmarks to determine consistency with the State's SMP policy standard of no net loss of ecological functions. This Plan will be implemented when the SMP is adopted by Ecology, and is expected to be implemented consistent with the timeline provided in Table 4 below, subject to funding availability.

Within 8 years of Plan adoption, the Coalition members will complete monitoring and implementing measures as described in Table 4.

**Table 4**  
**Timelines, Benchmarks, and Monitoring Summary**

No.	Monitoring/Implementation Effort	Benchmarks/Strategy	Timeline	
1	Monitor, verify, and characterize results from restoration projects implemented by Grant County PUD (consistent with Grant County PUD's FERC license) as described in Table 3.	Review progress of Grant County PUD restoration projects and summarize results, including net area of riparian, wetland, and shrub steppe habitat improvements.	2016, 2021	
2	Seek funding and, if secured, implement two additional restoration projects listed in Table 3.	a	Submit three grant applications.	2018
			Implement funded projects.	2021
		b	Submit two additional grant applications.	2021
			Implement funded projects by 2024.	2024
3	Protect riparian and shrub steppe vegetation consistent with the SMP.	Coalition members meet with federal, state, and local natural resource management agencies to: 1) document protection, restoration, and enhancement activities; and 2) identify additional protection and restoration opportunities. Summarize findings from each meeting, update implementation approaches, and make updated information available to the agencies and the public.	2016, 2018, 2020	

## Notes:

FERC - Federal Energy Regulatory Commission

PUD - Public Utility District

SMP - Shoreline Master Program

Information identified for tracking and monitoring includes permit information, project applications, and completion reports filed with various jurisdictions. At the end of 2015 and at the end of every other year thereafter, the following data will be tracked:

- Location and effects of each type of shoreline permit and approval by type and classification, including:
  - Shoreline development permits
  - Conditional permits
  - Shoreline variances and reasons/nature of variance
  - Exempt use activity approvals
- Activities involving development, conservation, restoration, and mitigation
- Net change of developments using indicators, such as:
  - Linear length of stabilization and flood hazard structures
  - Number of overwater structures (e.g., piers and docks)
  - Number of decommissioned structures
  - Road length within shoreline
  - Number of road crossings over waterbodies
  - Number of levees/dikes
  - Acres of impervious surface areas
  - Acres of vegetation
  - Acres of permanently protected areas or areas within limited development

### **5.3 SMP Review**

Grant County and the applicable cities will be required to conduct periodic SMP updates, which will include an evaluation of the efficacy of the SMP and this Restoration Plan. This review will involve comparing past conditions with existing conditions, and assessing whether the actions, policies, and regulations set since the last SMP update have been valuable in ensuring no net loss. The evaluation will be an opportunity to adjust these measures as applicable for the benefit of future shoreline conditions.

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## 6 REFERENCES

- Anchor (Environmental Anchor), 2007. *East Columbia Basin Irrigation District Comprehensive Water Conservation Plan*. May 2007.
- Anchor QEA (Anchor QEA, LLC), 2013. *Final Shoreline Inventory, Analysis, and Characterization Report*. Grant County Shoreline Master Program Update, Prepared for Grant County, Coulee City, Electric City, City of Grand Coulee, City of Soap Lake, Krupp, and Wilson Creek.
- Anchor QEA, 2014. *Cumulative Impact Analysis Report*. Grant County Shoreline Master Program Update. Prepared for Grant County, Coulee City, Electric City, City of Grand Coulee, City of Soap Lake, Krupp, and Wilson Creek.
- Reclamation (Bureau of Reclamation), 2001. Banks Lake Resource Management Plan, Grant County, Washington. U.S. Department of the Interior, Bureau of Reclamation, Pacific Northwest Region, Boise, Idaho and Upper Columbia Area Office, Ephrata Field Office, Ephrata, Washington.
- Reclamation, 2011. Columbia Basin Project. Available from:  
[http://www.usbr.gov/projects/Project.jsp?proj\\_Name=Columbia Basin Project&pageType=ProjectPage](http://www.usbr.gov/projects/Project.jsp?proj_Name=Columbia%20Basin%20Project&pageType=ProjectPage). Updated February 15, 2011.
- Easterbrook, D.J. and D. A. Rahm, 1970. *Landforms of Washington*. Western Washington State College, Bellingham, Washington.
- Grant PUD and Alliance Consulting Group (Public Utility District No. 2 of Grant County and Alliance Consulting Group), 2010. *Priest Rapids Hydroelectric Project Shoreline Management Plan*. License Article 419. March 4, 2010. Available from Grant PUD website.
- Grolier, M.J. and J.W. Bingham, 1978. Bulletin No. 71: Geology of Parts of Grant, Adams, and Franklin Counties, East-Central Washington. Washington State Division of Geology and Earth Resources.
- ICBEMP (Interior Columbia Basin Ecosystem Management Project), 2003. Interior Columbia Basin Strategy. Available from: <http://www.icbemp.gov/>
- KWA (KWA Ecological Sciences KWA), 2004. *Crab Creek Subbasin Plan*. Prepared for the Washington Department of Fish and Wildlife and Lincoln County Conservation District.

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- TNC (The Nature Conservancy), 1999. *Columbia Plateau Ecoregional Assessment*. Available from: <http://waconservation.org/projects/ecoregions/>
- Thom, R.M., G. Williams, A. Borde, J. Southard, S. Sargeant, D. Woodruff, J.C. Laufle, and S. Glasoe, 2005. Adaptively addressing uncertainty in estuarine and near coastal restoration projects. *Journal of Coastal Research* 40:94-108.
- USFWS (U.S. Fish and Wildlife Service), 2008. *Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement*. Available from: <http://www.fws.gov/hanfordreach/management.html#finalccp>
- USFWS, 2010. Fish and Wildlife Coordination Act Report for the Odessa Subarea Special Study. Prepared by USFWS for the U.S. Bureau of Reclamation Pacific Northwest Region, Yakima, Washington. September 2010.
- USFWS, 2011. Columbia National Wildlife Refuge Comprehensive Conservation Plan. Prepared by Columbia National Wildlife Refuge and USFWS. September 2011.
- Washington State Department of Ecology (Ecology), 2004. *A Department of Ecology Report: What Does No Net Loss Mean in the 2003 SMA Guidelines?* June 2004.
- WDFW (Washington Department of Fish and Wildlife), 2006. Columbia Basin Wildlife Area Management Plan.
- WDFW, 2013. Personal communication from Eric Pentico, WDFW Area Habitat Biologist, to Ali Wick, Anchor QEA. May 16, 2013.
- WDFW, 2011a. Shrub-Steppe and Grassland Restoration Manual for the Columbia River Basin. October 2011. Available from: <http://wdfw.wa.gov/publications/01330/>
- WDFW, 2011b. Management Recommendations for Washington's Priority Habitats. Managing Shrub-steppe in Developing Landscapes. November 2011. Available from: <http://wdfw.wa.gov/publications/01333/wdfw01333.pdf>
- WRCC (Western Regional Climate Center), 2012. Climate of Washington: Central Basin. Available from: <http://www.wrcc.dri.edu/narratives/washington/>. August 1, 2012.
- Wick, A., 2013. Personal communication with Eric Pentico, WDFW Area Habitat Biologist. Ephrata, Washington. May 16, 2013.