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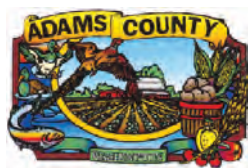
October 2014

SHORELINE ANALYSIS REPORT

FOR SHORELINES IN ADAMS COUNTY

Prepared for:

Adams County
425 E Main, Suite 200
Othello, WA 99344



THE
WATERSHED
COMPANY

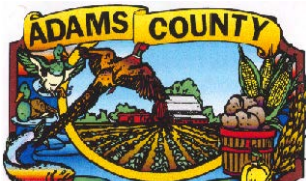
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**ADAMS COUNTY
GRANT No. G1400541**

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SHORELINE ANALYSIS REPORT

ADAMS COUNTY

1 INTRODUCTION

1.1 Background and Purpose

Adams County (County) obtained a grant from the Washington Department of Ecology (Ecology) in 2013 to complete a comprehensive update of its existing Shorelines Management Master Program (SMP). One of the first steps of the update process is to inventory and characterize the County shorelines as defined by the State's Shoreline Management Act (SMA) (RCW 90.58). This Shoreline Analysis Report was conducted in accordance with the Shoreline Master Program Guidelines (Guidelines, Chapter 173-26 WAC) and project Scope of Work promulgated by Ecology. Under these Guidelines, the County must identify and assemble the "most current, accurate, and complete scientific and technical information available that is applicable to the issues of concern" regarding natural and built environment characteristics in shoreline jurisdiction.

This Shoreline Analysis Report inventories and describes existing conditions and characterizes ecological functions in the shoreline jurisdiction. This assessment of current conditions will serve as the baseline against which the impacts of future development actions in shoreline jurisdiction will be measured. The Guidelines require that the County demonstrate that its updated SMP yields "no net loss" in shoreline ecological functions relative to the baseline (current condition) due to its implementation. By describing and inventorying existing conditions, this Shoreline Analysis Report will be used to help inform the development of appropriate SMP policies, regulations, and environment designations to help meet the "no net loss" goal.

1.2 Shoreline Jurisdiction

1.2.1 Shorelines of the State

As defined by the Shoreline Management Act 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, lakes whose area is greater than 20 acres, and all marine waters. Ecology has identified the upstream limits of shoreline streams and rivers based

on projected mean annual flow of 20 cfs (Higgins 2003), and those lakes that are 20 acres or greater in size.

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)”

The ordinary high water mark (OHWM) is:

“that mark that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, in respect to vegetation as that condition exists on June 1, 1971, as it may naturally change thereafter, or as it may change thereafter in accordance with permits issued by a local government or the department: PROVIDED, That in any area where the ordinary high water mark cannot be found, the ordinary high water mark adjoining salt water shall be the line of mean higher high tide and the ordinary high water mark adjoining fresh water shall be the line of mean high water” (RCW 90.58.030(2)(b)).

Table 1-1 identifies all of the Adams County waterbodies identified as potential shorelines during the jurisdiction assessment process. A detailed discussion of the jurisdiction assessment and determination process, including a memo from Ecology about the jurisdictional status of Cow Creek, can be reviewed in full in Appendix A of this report.

During additional investigations and aerial photo reviews during development of this report, two areas preliminarily identified as “potentially associated wetland” have now been excluded. The first area removed is a wetland complex on Lugenbeal Creek, a Cow Creek tributary, upstream of Mason Lane. The second area removed was identified during discussions with County staff and a site visit as a managed wastewater lagoon

facility southeast of Para South Lake, rather than an associated wetland. The lagoon is isolated from the lake and associated wetlands to the west by a solid berm. It also appears from some field and aerial photo observations that the main body of the lake itself may be shrinking over time and/or shifting to emergent wetland. This should be monitored in the future to assess whether it may not warrant regulation as a shoreline waterbody.

After hearing from a number of property owners on Rodeo Lake, additional review of this waterbody was conducted. The lake was originally the site of the Adams County fairgrounds. After construction of the Columbia Basin Project and other area developments, the lowest points of the former fairgrounds filled with water and formed the lake. The level of the lake is controlled by a piped outlet at the south end. In recent years, beavers have blocked the outlet, resulting in rising water levels and an increase in Rodeo Lake's size. Adams County removed the beaver dam a few years ago, and additional blocking debris in the outlet was removed in the summer of 2014. The County is required to maintain the outlet in order to prevent inundation of area residents' septic systems. With continued management of the outlet by the County, the lake's ordinary high water mark may return to its control elevation (established by the culvert), potentially reducing its size to under 20 acres.

Table 1-1. Proposed Shoreline Waterbodies in Adams County shoreline jurisdiction.

Shoreline Name	In Current SMP?	Shoreline Name	In Current SMP?
"Para South Lake"	N	Morgan Lake	N
"Para North Lake"	N	Owl Lake (includes previous unnamed lake)	Y
Alkali Lake/Pines Lake	Y	Palm Lake	Y
Black Lake	Y	Pit Lakes	N
Campbell Lake	N	Rodeo Lake	Y
Cow Lake	Y	Royal Lake	N
Finnell Lake	Y	South Teal Lake	N
Fourth of July Lake	Y	Sprague Lake	Y
Green Lake (includes previous unnamed lake)	Y	Thread Lake	Y
Hallin Lake	Y	Cow Creek	Y
Herman Lake	N	Lower Crab Creek	Y
Hutchinson Lake	N	Palouse River	Y
Linda Lake	Y	Rock Creek	Y

1.2.2 Shorelines of Statewide Significance

A subset of state shorelines, called Shorelines of Statewide Significance, receives special attention in the Shoreline Management Act and Guidelines. All streams and rivers which have mean annual flow of 200 cfs or greater or portions of waterbodies downstream from the first 300 square miles of drainage area are considered Shorelines of Statewide Significance in Eastern Washington. Additionally, any lakes larger than 1,000 acres are also Shorelines of Statewide Significance. This special status applies to all shorelines within the County along the Palouse River and Rock Creek, and Cow Creek from the mouth of Lugenbeal Creek to the confluence with the Palouse River. Sprague Lake is the only County lake large enough to be considered a Shoreline of Statewide Significance. For Shorelines of Statewide Significance, the SMA sets specific preferences for uses and calls for a higher level of effort in implementing its objectives.

1.3 Study Area

The study area for this report includes all land currently within proposed shoreline jurisdiction for Adams County. The study area also includes relevant discussion of the contributing watersheds.

Adams County encompasses 1,925 square miles and is located in the southeast part of Washington. It is predominantly rural and agricultural in nature outside of the two main cities of Ritzville and Othello. Shoreline jurisdiction is not present within either city. Other incorporated areas include the small towns of Lind, Washtucna and Hatton. The County is bordered by Whitman County to the east, Lincoln County to the north, Grant County to the east and Franklin County to the south. It includes portions of four Water Resource Inventory Areas (WRIAs). The northwest section of the County lies in the Lower Crab Watershed (WRIA 41), the eastern section is in the Palouse Watershed (WRIA 34), and the southern portion lies within the Esquatzel Coulee Watershed (WRIA 36). A small area along the middle of the northern border is within the Upper Crab-Wilson Watershed (WRIA 43).

In total, this shoreline inventory has mapped 225 miles of river and lake shoreline that meet shoreline jurisdiction criteria. Total jurisdictional shoreland area equals approximately 11.0 square miles (5.7% of the County), which includes associated wetlands and portions of associated floodplains. State lands make up approximately 12 percent (1.3 square miles) of the total shoreline area. The majority of state land is owned by the Washington State Department of Natural Resources (WDNR). Federal lands also make up approximately 15 percent (1.6 square miles) of the total shoreline area. The two

federal entities that own the majority of the federal land are the U.S. Bureau of Reclamation and the U.S. Fish and Wildlife Service (USFWS).

2 SUMMARY OF CURRENT REGULATORY FRAMEWORK

2.1 Shoreline Management Act

The Shoreline Management Act of 1971 promoted planning along shorelines and coordination among governments. The legislative findings and policy intent of the SMA states:

“There is, therefore, a clear and urgent demand for a planned, rational, and concerted effort, jointly performed by federal, state, and local governments, to prevent the inherent harm in an uncoordinated and piecemeal development of the state's shorelines (RCW 90.58.020).”

While protecting shoreline resources by regulating development, the SMA is also intended to provide balance by encouraging water-dependent or water-oriented uses while also conserving or enhancing shoreline ecological functions and values. SMPs will be based on state guidelines, but should be tailored to the specific conditions and needs of the local community.

2.2 Adams County

Adams County adopted its present Shoreline Master Program in 1977 (titled *Shorelines Management Master Program*), and it has not been updated since that time. The current shoreline designations for Adams County are briefly described below.

- **Conservancy:** The Conservancy environment is for those areas which are intended to maintain their existing character. Preferred uses are those which are non-consumptive of the physical and biological resources of the area. This designation is designed to protect, conserve and manage existing natural resources and valuable historic and cultural areas.
- **Rural:** The Rural environment is intended for those areas characterized by intensive agriculture and recreational uses and those areas having a high capability to support active agricultural practices and intensive recreational

development. It is intended to protect agricultural land from urban expansion, restrict intensive development along undeveloped shorelines, function as a buffer between suburban areas, and maintain open spaces and opportunities for recreational uses compatible with agricultural activities.

- Suburban: The suburban environment is an area of residential, commercial and industrial development. It is particularly suitable to those areas presently subjected to intensive use pressure, as well as areas planned to accommodate expansion.

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.

The County is not required to "fully" plan under the Growth Management Act (GMA), although its non-GMA plan contains many of the same elements required by the GMA. The County Comprehensive Plan, last updated in 2005, is a statement of policies and goals that guides growth and development throughout the County. The County Comprehensive Plan addresses the following elements: land use, transportation, facilities and utilities, and economic development.

County regulations applicable to critical areas are detailed in Adams County Code (ACC) Chapter 18.06 (last updated comprehensively in 2008 with a supplement in 2009). The code regulates streams and rivers as fish and wildlife habitat conservation areas, and requires that applicants with projects that may impact a fish or wildlife habitat conservation area, take measures to protect the resource including developing a plan detailing how adverse impacts will be mitigated, including establishment of appropriate and adequate buffer zones (ACC 18.06.570.E). Minimum buffers are not specified. The regulations also include recommendations and standards to protect wetlands. Required buffer widths range from 25 feet to 250 feet based on wetland classification and intensity of proposed land use (ACC 18.06.650.F). The County's critical areas regulations also apply to geologically hazardous areas, critical aquifer recharge areas, and frequently flooded areas.

Many shoreline and wetland areas within the County contain functioning buffer areas. Minimal or degraded buffers are found where developments existed prior to the critical areas regulations, where livestock have access to the waterbody, or where other agricultural activities have modified the riparian area (e.g., farming, diversions).

The County will ensure consistency between the SMP and other County codes, plans and programs by reviewing each for consistency during periodic updates of the County's Comprehensive Plan.

2.3 State Agencies and Regulations

Aside from the Shoreline Management Act, State regulations most pertinent to development in the County's shorelines include the State Hydraulic Code, State Environmental Policy Act, Watershed Planning Act, Water Resources Act, and case law. A variety of agencies (e.g., Ecology, Washington Department of Fish and Wildlife [WDFW], WDNR) is involved in implementing these regulations or otherwise manage public shoreline areas. Ecology reviews all shoreline projects that require a shoreline permit, but has specific regulatory authority over shoreline conditional use permits and shoreline variances. Other agency reviews of shoreline developments are typically triggered by in- or over-water work, discharges of fill or pollutants into the water, or substantial land clearing.

Depending on the nature of the proposed development, state regulations can play an important role in the design and implementation of a shoreline project, ensuring that impacts to shoreline functions and values are avoided, minimized, and/or mitigated. During the comprehensive SMP update, the County will consider other state regulations to ensure consistency as appropriate and feasible with the goal of streamlining the shoreline permitting process. A summary of some of the key state regulations and/or state agency responsibilities follows.

Hydraulic Code: Chapter 77.55 RCW (the Hydraulic Code) gives the WDFW the authority to review, condition, and approve or deny "any construction activity that will use, divert, obstruct, or change the bed or flow of State waters." These activities may include stream alteration, culvert installation or replacement, pier and bulkhead repair or construction, among others. In a permit called a Hydraulic Project Approval, WDFW can condition projects to avoid, minimize, restore, and compensate adverse impacts.

Section 401 Water Quality Certification: Section 401 of the federal Clean Water Act allows states to review, condition, and approve or deny certain federal permitted actions that result in discharges from fills or excavations to State waters, including wetlands and streams. In Washington, Ecology is the State agency that has been delegated responsibility for conducting that review, with their primary review criteria of ensuring that State water quality standards are met. Actions within streams or wetlands within

the shoreline zone that require a Section 404 permit (see below) or a Coast Guard Permit require a Section 401 water quality certification.

Washington Department of Natural Resources: WDNR is charged with protecting and managing use of state-owned aquatic lands. WDNR manages more than 5.6 million acres of state-owned forest, range, commercial, agricultural, conservation, and aquatic lands. WDNR manages these lands for revenue, outdoor recreation, and habitat for native fish and wildlife. Water-dependent uses waterward of the ordinary high water mark require review by WDNR to establish whether the project is on state-owned aquatic lands. WDNR recommends that all proponents of a project waterward of the ordinary high water mark make contact with WDNR to determine jurisdiction and requirements.

Watershed Planning Act: The Watershed Planning Act of 1998 (Chapter 90.82 RCW) was passed to encourage local planning of local water resources, recognizing that there are citizens and entities in each watershed that “have the greatest knowledge of both the resources and the aspirations of those who live and work in the watershed; and who have the greatest stake in the proper, long-term management of the resources.” Adams County is within four watershed basins. The Palouse Watershed Plan (WRIA 34) was approved and adopted in 2007. However, the Palouse Watershed Planning Group is not currently operating under the Watershed Planning Act and has not met for several years. The Upper Crab/Wilson (WRIA 43) Watershed Plan was approved by Adams County in 2007. From July 2009 through June 2011, the Watershed Planning Group, known as the Water Resource Management Group used watershed planning administrative support grant funds to meet with the primary focus on developing a water quality management plan addressing livestock and water quality issues. They are not currently operating with grant funding under Chapter 90.82 RCW. The Lower Crab (WRIA 41) and Esquatzel Coulee (WRIA 36) watersheds are not currently working under the Watershed Planning Act.

Water Pollution Control Act: Chapter 90.48 RCW establishes the State’s policy “to maintain the highest possible standards to insure the purity of all waters of the State consistent with public health and public enjoyment thereof, the propagation and protection of wild life, birds, game, fish and other aquatic life, and the industrial development of the State, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the State of Washington.” Ecology is the agency charged with crafting and implementing rules and regulations in accordance with this legislation.

2.4 Federal Regulations

Federal regulations most pertinent to development in the County's shorelines include the Clean Water Act and the Endangered Species Act. Other relevant federal laws include the National Environmental Policy Act, Clean Air Act, and the Migratory Bird Treaty Act. A variety of agencies (e.g., Corps, National Marine Fisheries Service, USFWS) are involved in implementing these regulations, but review by these agencies of shoreline development in most cases would be triggered by in- or over-water work, or discharges of fill or pollutants into the water. Depending on the nature of the proposed development, federal regulations can play an important role in the design and implementation of a shoreline project, ensuring that impacts to shoreline functions and values are avoided, minimized, and/or mitigated. During the SMP update, the County will consider other federal regulations to ensure consistency as appropriate and feasible with the goal of streamlining the shoreline permitting process. A summary of some of the key federal regulations and/or federal agency responsibilities follows.

Clean Water Act: Major components of the Clean Water Act include Section 404, Section 401, and the National Pollutant Discharge Elimination System (NPDES).

Section 404 provides the Corps, under the oversight of the U.S. Environmental Protection Agency, with authority to regulate "discharge of dredged or fill material into waters of the United States, including wetlands" (http://www.epa.gov/owow/wetlands/pdf/reg_authority_pr.pdf). The extent of the Corps' authority and the definition of fill have been the subject of considerable legal activity. As applicable to the County's shoreline jurisdiction, however, it generally means that the Corps must review and approve most activities in streams and wetlands. These activities may include wetland fills, stream and wetland restoration, and culvert installation or replacement, among others. The Corps requires projects to avoid, minimize, and compensate for impacts.

A Section 401 Water Quality Certification is required for any applicant for a federal permit for any activity that may result in any discharge to waters of the United States. States and tribes may deny, certify, or condition permits or licenses based on the proposed project's compliance with water quality standards. In Washington State, Ecology has been delegated the responsibility by the U.S. Environmental Protection Agency for managing implementation of this program.

The NPDES is similar to Section 401, and it applies to ongoing point-source discharge. Permits include limits on what can be discharged, monitoring and reporting

requirements, and other provisions designed to protect water quality. Examples of discharges requiring NPDES permits include municipal stormwater discharge, wastewater treatment effluent, or discharge related to industrial activities.

Endangered Species Act (ESA): Section 9 of the ESA prohibits “take” of listed species. Take has been defined in Section 3 as: “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” The take prohibitions of the ESA apply to everyone, so any action that results in a take of listed fish or wildlife would be a violation of the ESA and is strictly prohibited. Per Section 7 of the ESA, activities with potential to affect federally listed or proposed species and that either require federal approval, receive federal funding, or occur on federal land must be reviewed by the National Marine Fisheries Service and/or USFWS via a process called “consultation.” Activities requiring a Section 404 permit also require such consultation if these activities occur in waterbodies with listed species.

3 SUMMARY OF ECOSYSTEM CONDITIONS

Portions of four major watersheds are located within Adams County; these include: the Palouse (34), Lower Crab (41), Upper Crab-Wilson (43), and Esquatzel Coulee (36) Water Resource Inventory Areas (WRIAs). A map of the WRIAs within Adams County is provided in Figure 3-1. These watersheds are described in the following sections.

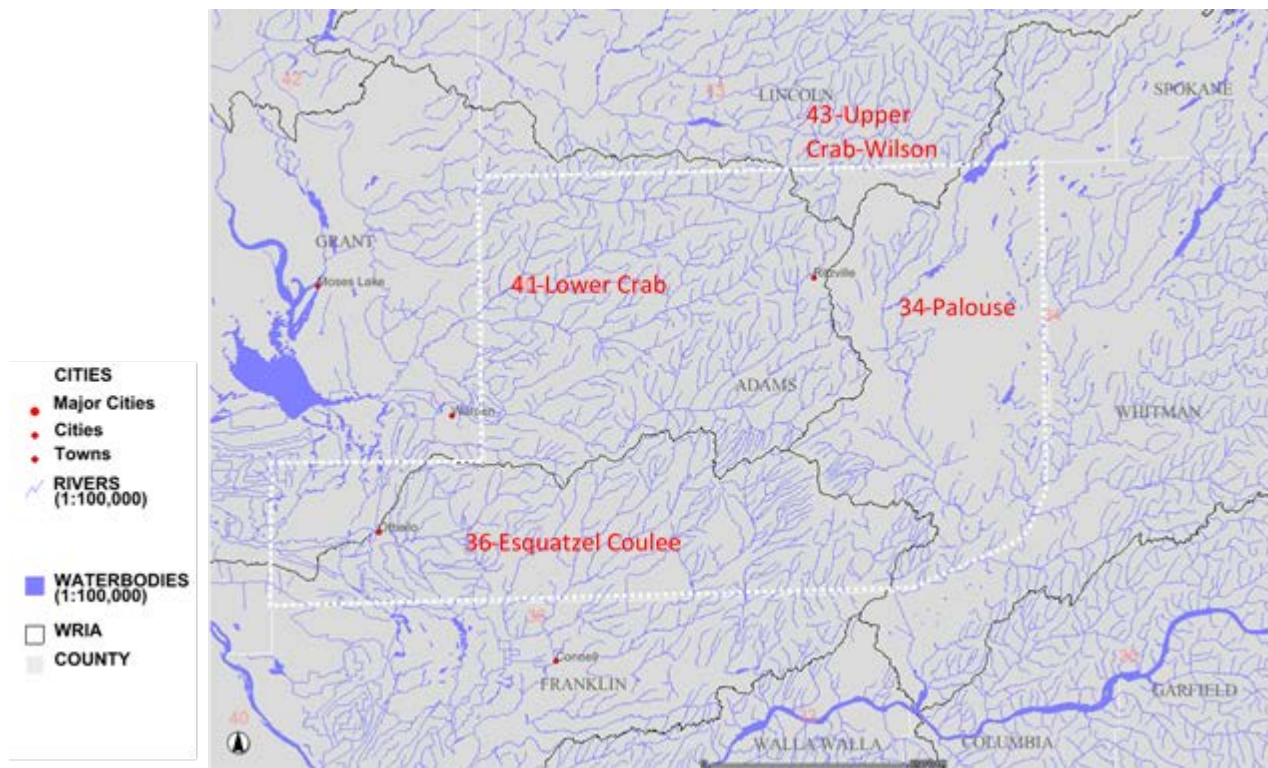


Figure 3-1. Map of Water Resource Inventory Areas in Adams County (WDFW, Salmonscape)

3.1 Geography, Topography and Drainage Patterns

3.1.1 Palouse (WRIA 34)

The Palouse River originates in the Bitterroot Mountains in northern Idaho, and flows westerly into Whitman County before joining the Snake River at the Whitman/Franklin County line. Although there are no man-made dams on the Palouse River, the 185-foot Palouse Falls, approximately 6 miles upstream from the River's confluence with the Snake River, prevents anadromous salmon passage.

The topography of the Palouse watershed transitions from mountainous terrain in Idaho to rolling hills composed of basalt covered with loess in the central portion of the watershed. The far western portion of the watershed is in an area called the Channeled Scablands. This area was shaped by massive floods over the past million years, which left behind exposed channels of the underlying basalt amongst islands of loess (HDR and EES 2007).

Precipitation primarily occurs in the winter months, and ranges from 10 inches in the west to 50 inches in the eastern portion of the watershed (HDR and EES 2007). Many of

the smaller stream channels are dry in the summer. Shoreline tributaries in the Palouse Watershed within Adams County include Rock Creek and Cow Creek. Several lakes occur in the Palouse Watershed, mostly in the Cow Creek and Rock Creek subbasins, several of which are within shoreline jurisdiction.

The Cow Creek system includes a network of disconnected, natural depressions or vernal pools which have intermittent seasonal connections. Small dams have been constructed in places along Cow Creek which backup the flow, helping to create seasonal pooling. Several such dams visible in aerial photos are not shown in the available data depicted in the Map Folio (Appendix B, Map 17). There are also a number of water withdrawal structures and irrigation diversions visible on aerial photos. From upstream to downstream, structures are visible in the following areas:

- Sprague Lake Dam in T20R37S14, between Danekas Road and the Sprague Lake outlet (mapped)
- Dam structure in T20R37S23 (not mapped)
- Structures/diversion canals in T19R37S2/11 (not mapped)
- Diversion structure in T19R37S12 (not mapped, in associated wetland complex)
- Diversion structures above Hallin Lake in T19R37S15 (not mapped)
- Diversion at outlet of Cow Lake in T19R37S20 (mapped)
- Sheep Springs Dam in T18R36S02 (mapped)
- Dam and diversion structures just north of John Wayne Trail crossing at T18R36S23 (mapped)
- Diversion structures at T18R36S36 (not mapped)
- Dam at T17R36S01 (not mapped)

Local reports indicate that flow decreases downstream, potentially because of the storage by the numerous pothole lakes and artificial impoundments, and that the stream is often dry in the southern end of the County. Many of the lakes in the system are natural depressions with basalt bottoms and no outlets (HDR and EES 2007). Extensive wetlands are present in the Rock Creek and North Fork Palouse subbasins as well.

On average, Cow Creek contributes an estimated 7 percent of the total flow of the Palouse River from an area encompassing approximately 20 percent of the land mass of the Palouse Basin. Natural baseflows in Cow Creek are low during summer months, and some areas of Cow Creek can go dry. Surface water claims were adjudicated in 1984 and surface water resources appear to be fully committed between non-agricultural and agricultural withdrawals. The following excerpt from the Palouse Watershed Plan

(HDR and EES 2007) provides a summary of the Cow Creek adjudication and its relationship to Sprague Lake:

The Cow Creek Adjudication requires a minimum stockwater flow of .5 cfs in Cow Creek from its intersection with Danekas Road to Hallin Lake; and a minimum stockwater flow of 1.0 cfs in Cow Creek from the outlet of Cow Lake to its confluence with the Palouse River (Adams County Superior Court 1984). In 1993, the Adams County Superior Court noted the impoundment level of Sprague Lake be 1877.3 feet above mean sea level (MSL), subject to another right for the lake not to exceed 1878.6 feet above MSL and that the private dam on Sprague Lake shall release a minimum flow to Cow Creek of .5 cfs to satisfy the downstream stockwater right at all times that water reaches the face of the dam. According to the Court, the stock water right has an 1868 priority date (Adams County Superior Court 1993). This, in effect, sets a default instream flow requirement for upper Cow Creek, and creates some ambiguities regarding management of lake levels.

Many of the Cow/Rock Creek surface waters and wetlands are connected to shallow gravel beds, the hydraulic role of which is uncertain although they appear to provide a storage function, acting as lakes during wet years and diverting water during dry years (HDR and EES 2007).

There are no significant increases anticipated in water demands within the Cow/Rock Creek subbasins. Population growth, the primary cause of increased municipal/domestic demands within WRIA 34, is anticipated to largely occur in the existing population centers, largely bypassing the Cow/Rock Creek subbasin.

3.1.2 Lower Crab Watershed (WRIA 41)

The Lower Crab Watershed encompasses a large area east of the Columbia River and stretches across parts of Grant, Adams and Lincoln counties. It includes the portion of Crab Creek between Ephrata and its confluence with the Columbia River and includes numerous, mostly seasonal tributaries. Lower Crab Creek and several lakes within Adams County shoreline jurisdiction are within WRIA 41.

The upland landscape is characterized by gently rolling hills interspersed with channeled scablands. Much of the landscape was sculpted by the Spokane Floods approximately 12,000 to 15,000 years ago (KWA Ecological Sciences Inc. 2004). Annual precipitation ranges from seven inches to somewhat over 10 inches per year in the higher elevations, most arriving during the winter months. Only a fraction becomes

groundwater available for human and economic use. Stream flows are naturally low in the summer (Ecology 2012a).

3.1.3 Upper Crab-Wilson Watershed (WRIA 43)

The Upper Crab-Wilson Watershed includes the portion of Upper Crab Creek above Stratford and Wilson Creek and a number of predominantly seasonal tributary creeks (WRIA 43 Water Resource Management Group 2008). Rainfall averages from 8 inches to 15 inches, most occurring in the winter months (Ecology 2012b). None of the waterbodies within this watershed in Adams County qualify as shorelines of the state. Therefore, this watershed is excluded from specific discussion in the sections below.

3.1.4 Esquatzel Coulee Watershed (WRIA 36)

The Esquatzel Coulee Watershed includes a number of small streams that are tributary to the Columbia River. Most are seasonal. The Saddle Mountain Range and Priest Rapids Dam are located in the western part of the watershed. Significant waterbodies include the Esquatzel Coulee, Wahluke Branch, Potholes and East Low Canals. Annual precipitation ranges from seven to 10 inches per year, most arriving during the winter months (Ecology 2012c).

Rodeo Lake is the only shoreline waterbody in Adams County that lies within WRIA 36.

3.2 Key Species and Habitats

A steppe or shrub-steppe vegetation vegetative community dominates the Adams county watersheds. Riparian vegetation is usually restricted to narrow strips along rivers and streams. The County's shorelands support significant populations of shorebirds and waterfowl including sandhill cranes and American white pelicans. Four regions identified as Important Bird Areas (IBA) by the Audubon Society and WDFW are present in the County: Sprague Lake, North Potholes Preserve, Potholes Reservoir, and the Columbia National Wildlife Refuge (Cullinan 2001). These areas are considered critical to birds during some part of their lifecycle. The Columbia National Wildlife Refuge is a unit of the federal National Wildlife Refuge System. It is present in the southwest portion of the County which encompasses portions of several shoreline lakes and part of Lower Crab Creek. Habitat in the wildlife refuge includes basalt cliffs and talus, marshes, farm fields, and shallow-water lakes.

Shorelands also support populations of small mammals, which are highly responsive to changes in vegetation cover and play important roles in ecosystem functions, including water infiltration, habitat formation, and prey source for predators. Small mammal

species inhabiting the shoreline riparian area include shrews, jackrabbits, and ground squirrels. The larger mammals, coyotes and Rocky Mountain mule deer, are also commonly present.

There is presumed presence of ESA listed summer steelhead (*Oncorhynchus mykiss*) in Lower Crab Creek and several shoreline lakes. While portions of the Palouse River outside of the County do have listed salmonids, there are no listed aquatic species above the Palouse Falls. Resident fish species above the falls include rainbow trout, brown trout, smallmouth bass, sculpin, largescale sucker, northern squawfish, shiner perch and speckled dace (HDR and EES 2007). Trout are less common in the lower portions of the watershed, presumably as a result of temperature and water quality constraints in the lower watershed.

Several fish species are present in the shoreline jurisdiction lakes. Cow Lake was rehabilitated in 2007 to eradicate nuisance fish and restore a mixed species fishery. Species present include black crappie, largemouth bass, bluegill sunfish, grass pickerel and brown bullhead catfish. WDFW also stocks the lake with catchable size rainbow trout. Fourth of July Lake is also annually stocked with rainbow trout. Species present in Sprague Lake include rainbow trout, largemouth bass, and bluegill sunfish, as well as both brown bullhead and channel catfish.

WDFW listed priority habitats and species found in Adams County are listed in Table 3-1, below.

Table 3-1. Priority Habitats and Species in Adams County (WDFW 2008)

Priority Habitat/Species	State Status	Federal Status
Aspen Stands		
Biodiversity Areas & Corridors		
Inland Dunes		
Eastside Steppe		
Shrub-Steppe		
Riparian		
Freshwater Wetlands & Freshwater Deepwater		
Instream		
Caves		
Cliffs		
Snags and Logs		
Talus		
Rainbow Trout/Steelhead/Inland Redband Trout	Candidate*	Threatened*
Westslope Cutthroat		
Columbia Spotted Frog	Candidate	
Sagebrush Lizard	Candidate	Species of Concern
American White Pelican	Endangered	
Clark's Grebe	Candidate	

Priority Habitat/Species	State Status	Federal Status
Western Grebe	Candidate	
E WA breeding concentrations of: Grebes, Cormorants		
E WA breeding: Terns		
Black-crowned Night-heron		
Great Blue Heron		
Waterfowl Concentrations		
Bald Eagle	Sensitive	Species of Concern
Ferruginous Hawk	Threatened	Species of Concern
Golden Eagle	Candidate	
Northern Goshawk	Candidate	Species of Concern
Peregrine Falcon	Sensitive	Species of Concern
Prairie Falcon		
Ring-necked Pheasant		
Greater Sage-grouse	Threatened	Candidate
Sandhill Crane	Endangered	
Upland Sandpiper	Endangered	
E WA breeding occurrences of: Phalaropes, Stilts and Avocets		
Yellow-billed Cuckoo	Candidate	Candidate
Burrowing Owl	Candidate	Species of Concern
Loggerhead Shrike	Candidate	Species of Concern
Sage Sparrow	Candidate	
Sage Thrasher	Candidate	
Merriam's Shrew	Candidate	
Preble's Shrew	Candidate	Species of Concern
Roosting Concentrations of: Big-brown Bat, Myotis bats, Pallid Bat		
Townsend's Big-eared Bat	Candidate	Species of Concern
Black-tailed Jackrabbit	Candidate	
White-tailed Jackrabbit	Candidate	
Washington Ground Squirrel	Candidate	Candidate
Rocky Mountain Mule Deer		

*Steelhead only

3.3 Major Land Use Changes and Current Shoreline Condition

3.3.1 Palouse (WRIA 34)

Historically, the dominant vegetation in the Palouse watershed was a bunchgrass association. Much of that vegetation has been converted to dryland agriculture or altered by rangeland uses. Soil erosion resulting from stormwater runoff has been a continuing problem throughout WRIA 34 as a result of land conversions to agriculture. An estimated 40 percent of the topsoil in the Palouse has been lost to erosion during this time (HDR and EES 2007). Most livestock grazing occurs in the westernmost portion of the basin, within the Channeled Scablands. Urban development makes up a small portion of the watershed; however, several cities are located directly adjacent to the Palouse River and its tributaries upstream of Adams County in neighboring Whitman

County. Chapter 6 contains a detailed assessment of current land use practices throughout the Adams County portion of the watershed.

Water quality concerns are primarily from non-point sources throughout most of the watershed, including erosion, livestock, fertilizers, and septic systems, which contribute sediment, fecal coliforms, and nutrients. Temperature is also a concern in many of the waterbodies in the watershed. Table 3-2 below identifies shoreline waterbodies in WRIA 34 with impaired water quality.

Table 3-2. Impaired water quality parameters for Adams County shoreline waterbodies in WRIA 34 (Ecology 2012d).

Waterbody	Parameter	Year of qualifying data	Category/Status
Palouse River	pH	2012	5- 303(d) list
	Temperature	2012	5- 303(d) list
	Dissolved Oxygen	2012	5- 303(d) list
	Bacteria	2012	4a- has a TMDL
	PCB (polychlorinated biphenyl)	2012	4a- has a TMDL
Sprague Lake	PCB	2012	5- 303(d) list
	2,3,7,8-TCDD	2012	5- 303(d) list
Crab Creek	pH	2012	5- 303(d) list (TMDL under development)
Cow Creek	Temperature	2012	4b- Pollution Control Program
	Dissolved Oxygen	2012	4b- Pollution Control Program
	pH	2012	4b- Pollution Control Program
	Bacteria	2012	4b- Pollution Control Program

3.3.2 Lower Crab Watershed (WRIA 41)

WRIA 41 within Adams County includes a portion of the Columbia National Wildlife Refuge. Development is very limited and landscape alterations are predominantly from agricultural practices. Lower Crab Creek has a Category 5 water quality listing for pH. See Chapter 6 for a thorough assessment of land use in this region.

3.3.3 Esquatzel Coulee Watershed (WRIA 36)

WRIA 36 encompasses the City of Othello where much of the commerce and industry of Adams County is located. The Rodeo Lake shoreline, the only Adams County shoreline within WRIA 36, is located just outside of Othello and has been altered by residential development and roads, including Highway 26, the main access point into the Othello

region from the west. See Chapter 6 for a thorough assessment of land use in this region.

4 SHORELINE INVENTORY

4.1 Inventory Data Sources, Assumptions and Gaps

Development of a shoreline inventory is intended to record the existing or baseline conditions upon which the development of SMP provisions will be examined to ensure the adopted regulations provide no net loss of shoreline ecological functions. At a minimum, local jurisdictions shall gather the inventory elements listed in the Guidelines, to the extent information is relevant and readily available. Collected information principally included Watershed Resource Inventory Area (WRIA) and other basin documents, Adams County studies, scientific literature, aerial photographs, and Geographic Information Systems (GIS) data from a variety of data providers.

Appendix C identifies the data sources used in the development of each of the map folio elements. The table in Appendix C also describes the information collected for each of the required inventory elements. Map figures are provided in the Map Folio (Appendix B), and they depict the various inventory pieces listed in the table, as well as additional analysis. Data gaps and limitations are discussed further in the sections below. The Guidelines do not require generation of new information or mapping to fill identified data gaps.

4.1.1 Ecological Characterization

The following discussion identifies assumptions and limitations for each of the inventory elements, and may provide a brief Countywide or watershed-wide narrative where qualitative descriptions provide more information than quantitative measures. Despite data gaps and limitations, a substantial quantity of information is available for the shorelines of Adams County to aid in the development of the inventory and analysis report, as well as the SMP.

Vegetation Coverage

The data was generated using multi-spectral satellite imagery with 30x30-meter cell resolution. Spectral data was classified using Multi-Resolution Land Characteristics (MRLC) Consortium, National Land Cover (NLC) Database. Because each cell represents 900 square meters, the classification may over or under represent coverage when the type of coverage within cells is mixed. The spatial resolution of the NLC data

provides a good foundation for broad scale assessment of vegetation coverage. Its utility is higher in rural areas where vegetative cover is more uniform over broad areas compared to more developed UGAs.

Because the data is based on interpretation of multi-spectral imagery, classification of some data may be inaccurate. Most notably, shrub steppe vegetation on steeper slopes is frequently miscategorized as “cultivated crops” using the NLC model. So long as the inherent inaccuracies of the data are recognized, the NLC data provides a good broad-scale assessment of vegetation coverage.

Finally, because the OHWM changes over time, water is occasionally included within the total shoreline area used for the calculation of vegetation coverage. For this reason, any area identified as “Water” was excluded from the calculation of percent coverage.

Impervious Surfaces

Similar to the vegetation coverage data, impervious surface data was generated using MRLC Consortium NLC data (2006) of multispectral satellite imagery with 30x30-meter cell resolution. National Land Cover categories that apply to areas of higher impervious surface coverage include Developed- Low, Medium, and High Intensity categories. The same limitation as the vegetation coverage data apply to impervious surfaces. With these limitations in mind, a comparison of impervious surface coverage among reaches provides useful information on broad scale spatial trends in development.

Wetlands

Wetland mapping was assembled from the National Wetlands Inventory (NWI). Adams County has not completed a County-wide inventory of potential wetlands and therefore the NWI dataset was used as the most relevant and useful information. The NWI dataset is based on many factors, including soil inventories and aerial interpretations. Although it is very comprehensive and is fairly accurate in approximating wetland locations, it is acknowledged that many wetlands, especially small wetlands, are not identified by NWI. Likewise, some areas identified as NWI wetlands may not meet wetland criteria. The NWI map was reviewed for obvious inaccuracies, but site scale investigation is needed to conclusively include or exclude potential wetland areas. Whether or not they are captured by this mapping effort and included in the preliminary shoreline jurisdiction maps, actual wetland conditions that may or may not be found on a site will determine shoreline jurisdiction (as a potential shoreline-associated wetland) on a site-specific basis.

Soils

Soil data are derived from the Natural Resource Conservation Service national soil survey. This data represents soils over broad areas; therefore, site-specific soil characteristics may differ from what is mapped.

Surficial Geology

Data on surficial geology are based on information from Washington DNR. Information on alluvial soil presence and distribution was used to assess hyporheic functions.

Fish and Wildlife Habitat Conservation Areas

WDFW Priority Habitat and Species (PHS) maps are presented as three separate units: PHS Regions (species or habitat ranges by area), PHS Occurrences (precise species locations), and PHS Fish (fish species presence).

These maps do not capture every priority species location or habitat in shoreline jurisdiction, particularly rare species or species that use the water for foraging and drinking, but that nest or den farther from the shoreline. Absence of mapping information does not indicate that a particular species does not or could not utilize the shoreline or adjacent lands. Furthermore, the number of documented species may reflect the relative amount of past survey efforts rather than the presence or absence of suitable habitat.

Frequently Flooded Areas

For all practical purposes, “frequently flooded areas” are those areas within the 100-year floodplain. Floodplain maps were developed using FEMA’s DFIRM map for Adams County. Adams County has no mapped floodway.

Channel Migration Zone

Existing Channel Migration Zone (CMZ) data was not available for shorelines within Adams County. Therefore, the 100-year floodplain, developed using FEMA’s DFIRM floodplain data, was generally used as a proxy for the CMZ extent except where areas were found to be separated from the channel by a legally existing artificial structure, or where other available data indicated the floodplain was not an appropriate proxy.

Floodplain areas excluded from the CMZ were subject to the following conditions per WAC 173-26-221(3)(b):

Areas separated from the active channel by a legally existing artificial structure(s) that is/are likely to restrain channel migration, built above or constructed to remain

intact through the one hundred-year flood. Such structures were limited to significant transportation infrastructure including state and federal paved roads and railroads considered to be significant public investments that would be repaired and maintained even if damaged in the future, therefore sustaining the limitation to channel migration. Private and unpaved roads were not excluded.

Additionally, a visual spot check of aerial photos was used to search for evidence of historic migration outside the floodplain. Those areas would have been considered within the CMZ; however, no such areas were identified within the subject area.

Floodplain is generally very limited throughout all of Adams County due to the environment of the region, so the CMZ is also, therefore, very limited. In the upper Cow Creek region in particular, a visual assessment conducted during a site visit, along with local knowledge of flow levels and surface geology, suggest that the floodplain proxy may too greatly overestimate channel migration in this area. Therefore, the CMZ was further refined using WDNR surface geology data. This data is based on broad-scale geologic classification and is useful for broad-scale assessments of geologic conditions.

Much of the Cow Creek area is mapped within a large and distinct basalt-flow region. These areas were excluded from the CMZ due to the unlikely nature that such geology would allow for channel migration, particularly given the generally low flows of Cow Creek. Floodplain areas mapped as alluvium or outburst flood deposits were included in the CMZ. A surface geology map is included as Map 11 of the draft map folio (Appendix B). Near where the Bengel-Washtucna Road crosses Cow Creek, the surface geology changes to a more mixed type, including larger areas of alluvium and flood deposits, so the conventional floodplain methodology was resumed.

The CMZ map represents a graphical overlay of the different elements and does not include field surveys or onsite data collection. Approvals for projects and permits relying on these boundaries should include detailed assessments with stream surveys.

Geologically Hazardous Areas

Maps of geologically hazardous areas were developed by WDNR. The data primarily focus on seismic hazards, and landslide hazard data seems limited. Data on the distribution and location of steep slopes within the proposed shoreline jurisdiction was not available, and this represents a data gap. Steep slopes should be evaluated for landslide hazard potential on a site and project specific basis.

The presence of geologically hazardous areas in shorelines can be a factor in determining suitability of the area for certain activities, including restoration and development. Human safety is an important concern for development in geologically hazardous areas. In addition, geologically hazardous areas can be important sources of large woody debris and sediment to the aquatic system, the latter to the benefit or detriment of aquatic life.

Water Quality

As a requirement of Section 303(d) of the federal Clean Water Act that all waterbodies be “fishable and swimmable,” Ecology classifies waterbodies into five categories:

- Category 1: Meets tested standards,
- Category 2: Waters of concern,
- Category 3: No data,
- Category 4: polluted waters that either have or do not require a TMDL, and
- Category 5: polluted waters requiring a TMDL.

Individual waterbodies are assigned to particular “beneficial uses” (public water supply; protection for fish, shellfish, and wildlife; recreational, agricultural, industrial, navigational and aesthetic purposes). Waterbodies must meet certain numeric and narrative water quality criteria established to protect each of those established beneficial uses. Waterbodies may provide more than one beneficial use, and may have different levels of compliance with different criteria for those beneficial uses in different segments of the stream or lake. As a result, many waterbodies may be on the 303(d) list for more than one parameter in multiple locations.

As presented in the Water Quality map of Appendix B, only Category 4 and 5 waters are depicted. For more information on specific waterbodies and their water quality classifications, Ecology provides an interactive on-line viewer at the following website: <http://apps.ecy.wa.gov/wqawa2008/viewer.htm>.

Shoreline Modifications

Shoreline modifications are human-caused alterations to the natural water’s edge. The most common types of shoreline modifications include overwater structures and shoreline armoring. In Adams County, the only overwater structures mapped by WDNR are limited to road crossings of the Palouse River. Except for two dock structures on Sprague Lake and one other dock on the Palouse River, no other over-

water structures were noted on aerial photographs. Dams were mapped based on data from Ecology; as noted earlier, the data is missing several dams and other diversion structures on Cow Creek. Countywide data were not available for shoreline stabilization, including rip rap armoring and dikes.

Critical Aquifer Recharge Areas

GIS data on critical aquifer recharge areas were not available, and this represents a mapping data gap.

4.1.2 Land Use Characterization

The following discussion identifies assumptions, data gaps and limitations for land use inventory elements. Despite data gaps and limitations, a substantial quantity of information is available for the shorelines of Adams County to aid in the development of the inventory and analysis report, as well as the SMP. The data discussed below, as well as other information on shoreline land use, is presented in Chapter 6, Land Use Analysis.

Existing and Potential Shoreline Land Use

Existing and potential shoreline land use is focused on three primary components: current land use, ownership, and zoning. Current land use data was mapped based on Ecology data from 2010. As a statewide dataset, its accuracy as applied to Adams County may be limited. Ownership information for County-owned properties was unavailable.

Shoreline Transportation and Utilities

Roads, bridges and railroads are mapped. However, the summary data for roads and bridges should not be considered complete. Based on a comparison of the roads and bridges GIS data with aerial imagery, the GIS data appear to exclude a variety of features, particularly private access roads and minor bridges. Of additional note, railroad data reflect active railroads only.

Common utility infrastructure such as water, wastewater, electrical, communication, and other facilities are found throughout the County. However, no GIS data for common utilities were available. Accordingly, quantitative utility data is limited to dams. Supplementary information about County dams was provided by the Inventory of Dams in the State of Washington (Ecology 2013).

Existing and Potential Shoreline Public Access

The primary source for the inventory of existing shoreline public access sites was a database of boat launch facilities published by the Washington State Recreation and Conservation Office. This information was refined by reviewing the webpages of agencies that typically provided shoreline public access facilities, such as the WDFW. No published data on potential shoreline public access sites were identified.

Historic and Archaeological Resources

Historic resources were inventoried based on publically available data obtained from the Washington State Department of Archaeology and Historic Preservation. Because of the potential for vandalism and looting, archaeological site locations are not publicly available.

4.2 Summary of Shoreline Inventory Results

In order to assess shoreline conditions and functions at a local scale, each shoreline waterbody's jurisdictional area was broken into discrete segments known as reaches (see Section 5.1.1 for a description of how the reaches were determined). Appendix D expands upon the relevant required inventory elements, providing specific detail and data for each reach (see Section 5.1.1 below for description of reach delineation). Unless otherwise noted, the results reported in Appendix D consider only information available within the boundaries of shoreline jurisdiction of each reach.

5 ANALYSIS OF ECOLOGICAL FUNCTIONS

5.1 Approach, Rationale and Limitations of Functional Analysis

A GIS-based semi-quantitative method was developed to characterize the relative performance of relevant ecological processes and functions by shoreline reach, as outlined in WAC 173-26-201(3)(d)(i). The assessment used the available information gathered as part of the shoreline inventory and applied a standardized ranking criterion for each independent shoreline reach to provide a consistent methodological treatment among reaches. These semi-quantitative results will ensure consistent and well-documented treatment of all reaches when assessing existing ecological conditions, yet allow for a qualitative evaluation of functions for data that are not easily summarized by GIS data alone. The results are intended to complement the inventory information in Chapter 4 and Appendix D, and provide a comparison of watershed functions relative to other reaches in the County. Analysis scores and descriptions are accompanied by

photographs taken during site visits or aerial images from Google Earth or Ecology's Coastal Atlas (Google, electronic reference) (Ecology, electronic reference).

5.1.1 **Reach Delineation**

In order to assess shoreline functions at a local scale, each shoreline waterbody's jurisdictional area was broken into discrete reaches based on a review of maps and aerial photography. Land use (e.g., land use patterns, zoning, vegetation coverage, and shoreline modifications) was weighted heavily in determining reach break locations because the intensity and type of land use has affected and will continue to affect shoreline ecological conditions. Furthermore, functional analysis outcomes will be more relevant for future determination of appropriate shoreline environment designations if the reach breaks occur at potential transition points in environment designations (note: every attempt has been made to create reach breaks along parcel boundaries). Regardless, reaches have been created for informational purposes only and are not intended to represent regulatory boundaries. While reach-scale analysis of ecological functions is one aspect of evaluating appropriate environment designations, several other inventory elements also play a significant role.

In addition to land use, physical drivers of shoreline processes were used to establish an overall framework for determining reach break locations. As noted throughout this report, ecological function scores at the reach level are intended to be indicators of function and not an absolute metric.

The following criteria in the following general order were used for determining reach break locations:

- Jurisdictional boundaries (primarily relevant to National Wildlife Refuge, no shoreline jurisdiction is present within any city boundaries),
- Changes in land use,
- Changes in vegetation (coverage and type),
- Shoreline modifications (dams),
- FEMA floodplains, and
- Significant wetland areas.

In all of the above criteria (except jurisdictional boundaries), reach breaks were made where fairly significant changes were evident. For example, the presence of a couple of single-family residences along a stretch of agricultural shoreline would not necessitate creation of a reach break to separate out those two different uses.

The following is a complete list of the 42 reaches initially created for this effort. Each reach has been given a unique identifier to signify the waterbody name, reach number along that waterbody, and a general locator name for reference. The map of shoreline reaches includes color-coded waterbodies and the reach name/number (Map 21, Appendix B).

Table 5-1. Shoreline Reaches Used in Functional Analysis

Shoreline Reaches		
Lakes		
Black Lake	Hutchinson Lake	Rodeo Lake 2- Residential
Campbell Lake	Linda Lake	Rodeo Lake 3- PAW
Cow Lake	Morgan Lake	South Teal Lake
Finnell Lake	Owl Lake	Sprague Lake 1- Open Space
Fourth of July Lake	Palm Lake	Sprague Lake 2- Harper Island
Green Lake	Para North Lake	Sprague Lake 3- Agriculture
Hallin Lake 1- Public Access	Para South Lake	Sprague Lake 4- Developed
Hallin Lake 2- Agriculture	Pines Lake	Thread Lake
Herman Lake	Rodeo Lake 1- South of Hwy 26	
National Wildlife Refuge Lakes ¹		
Streams		
Cow Creek 1- Palouse to Bengue-Washtucna Road		
Cow Creek 2- Scablands		
Cow Creek 3- Wetland Complex		
Cow Creek 4- Harder Road Area		
Cow Creek 5- Hills Road Area		
Cow Creek 6- Finnell to Cow Lake		
Cow Creek 7- Sprague Lake Outlet		
Cow Creek PAW ²		
Lower Crab Creek 1- Agriculture		
Lower Crab Creek 2- NWR		
Lower Crab Creek 3- Seep Lake Wildlife Area		
Palouse River 1- Rural Residential		
Palouse River 2- Agriculture		
Palouse River 3- Scablands		
Palouse River 4- Braided Channel		
Rock Creek		

¹ Portions of several lakes in the southwest portion of the County lie within the boundaries of the Columbia National Wildlife Refuge. For descriptive purposes, these shorelines were aggregated together into one reach which includes portions of Morgan, Herman, Campbell, Black and Hutchinson Lakes, and all of Royal and Pit Lakes.

² For descriptive purposes, areas of potentially associated wetland within shoreline jurisdiction of Cow Creek that are not directly connected to the creek itself were aggregated into one reach.

5.1.2 Functions and Impairments

The analysis of reach functions was based on Ecology's list of processes and functions for freshwater lakes and streams (WAC 173-26-201(3)(d)(i)(C)). The list includes the evaluation of three major processes: 1) hydrologic, 2) vegetative, and 3) habitat.

Table 5-2. Ecological processes and functions used to evaluate shoreline reaches.

Lake Processes and Functions	Stream Processes and Functions
1. Hydrologic Functions <ul style="list-style-type: none"> Storing water and sediment Attenuating wave energy Removing excess nutrients and toxic compounds Recruitment of large woody debris (LWD) and other organic material 	1. Hydrologic Functions <ul style="list-style-type: none"> Storing water and sediment Moderating erosion processes and the transport of water and sediment Attenuating flow energy Developing pools, riffles, and gravel bars Removing excess nutrients and toxic compounds Recruitment of LWD and other organic material
2. Vegetative Functions <ul style="list-style-type: none"> Temperature regulation Water quality improvement Attenuating wave energy Sediment removal and bank stabilization LWD and organic matter recruitment 	2. Vegetative Functions <ul style="list-style-type: none"> Temperature regulation Water quality improvement Slowing riverbank erosion; bank stabilization Attenuating of flow energy Sediment removal Provision of LWD and organic matter
3. Habitat Functions <ul style="list-style-type: none"> Physical space and conditions for life history Food production and delivery 	3. Habitat Functions <ul style="list-style-type: none"> Physical space (upland and aquatic, including migration corridors) and conditions for life history Food production and delivery
	4. Hyporheic Functions <ul style="list-style-type: none"> Removing excess nutrients and toxic compounds Water storage and maintenance of base flows Support of vegetation Sediment storage

Based on data availability, these functions were further broken down into those most meaningful for the purposes of this analysis. The available information gathered County-wide in the Shoreline Inventory Map Folio (Appendix B) was used to determine the performance of these functions (High, Moderate, or Low) (Tables 5-4 and 5-5). Metrics were developed based on best professional judgment related to known impacts of different parameters and the data available. Rankings were developed for each

function based on the distribution of conditions within the County for each waterbody, so that each ranking provides a relative measure of functions compared to other reaches.

Table 5-3 provides a description of the significance of each function, and how each function may be affected by human alterations. It should be noted that alterations to watershed-wide processes (e.g., flow regulation) affect functions throughout all reaches of each stream or lake. Since the purpose of this analysis is to differentiate between levels of function and anthropogenic alterations, the effects of these watershed-wide impairments are addressed in Table 5-3, and not incorporated into the scoring of each reach.

5.1.3 **Limitations**

This evaluation was limited by the quality and availability of inventory data. Therefore, limitations presented in Sections 4.2.1 also apply to this evaluation.

In evaluating shoreline functions, the area of shoreline impacts and conditions assessed was generally limited to the area of shoreline jurisdiction. In many cases, shoreline impacts may occur at a site due to ecological and geomorphological processes that are disturbed at a remote site upstream, farther inland, or up-current. This evaluation approach may not identify all of the functional responses occurring as a result of impacts to nearby or remote areas.

In general, the majority of shoreline reaches in the County are largely unmodified. The vast majority of impacts that are present are from agricultural use, though even those are limited in much of the County due to limits on the extent of available irrigation water. Residential or commercial development is limited to just a few reaches. The channeled scablands that characterize much of the County consist of a rugged basalt landscape with naturally limited shoreland vegetation. Some of the ecological process and functions in Table 5-2 are less appropriate to apply to a system such as this. For example, vegetative processes providing bank stabilization do not commonly occur throughout the County's shorelines and was not included in the functional scoring.

Table 5-3. Description of shoreline functions and common sources of human disturbance.

Hydrology	Vegetative	Habitat	Hyporheic (Rivers/Streams Only)
Functions			
<p><u>Sediment Production</u> Sediment transport is an integral process to building and maintaining instream habitat features. Gravel beds and sand bars help form diverse geomorphic conditions. Metered sediment delivery typically occurs through bank erosion, landslides, and bedload transport. Excessive fine sediment delivered to channels can suffocate salmonid eggs, inhibit emergence of fry from gravels, decrease feeding success, increase physiological stress, and through adsorption, may facilitate the transport and persistence of chemical contaminants. Alternatively, if banks are too stable in reaches without bedrock control, the erosive power of high flows may scour the bed of the river, causing channel incision and disconnecting the river from its floodplain.</p> <p><u>Development of Instream Habitat Features</u> Diverse channel habitat features are formed by islands and backwaters. Large woody debris (LWD) that is transported downstream from mature tree cover influences stream channel morphology and habitat complexity.</p> <p><u>Wave and Flow Attenuation</u> Floodway areas and riverine wetlands provide a transition between upland and riverine habitats. Vegetated floodways help slow and disperse flood flows. The extent to which local conditions affect flow is related to the position of a reach within a watershed and the size of the floodplain or wetland area relative to watershed size.</p> <p><u>Water quantity</u> For the lakes of Adams County, water quantity is the main hydrologic function. Lakes capture and store water and can help retain flood flows. Lakes with in-flow from shoreline streams have higher opportunity to provide water and sediment storage.</p>	<p><u>Shade</u> Riparian vegetation helps maintain cool water temperatures through provision of shade and creation of a cool and humid microclimate over the stream. Thermal refugia can also be derived by hyporheic activity, groundwater inputs, and small tributaries (which can significantly benefit from riparian shading). These are the primary mechanisms along wider rivers, or areas where the natural vegetation present is not a type to provide much overbank shade.</p> <p><u>Large Woody Debris/Organic Inputs</u> Riparian vegetation provides a source of large woody debris recruitment, and provides organic matter which is important to the ecosystem in the form of leaves, branches, and terrestrial insects.</p> <p><u>Removing Excess Nutrients</u> Dense riparian vegetation encourages infiltration of surface water. Nutrients and contaminants in subsurface water are filtered out of the soil and taken up by the roots of plants.</p> <p><u>Shoreline Stabilization</u> In some areas woody vegetation helps stabilize shoreline soils and prevents excessive erosion. The geology of the region naturally limits this function.</p>	<p><u>Wetland/Riparian Habitats</u> Continuous riparian vegetation along the length of a waterbody provides a dispersal corridor for animals using riparian habitats. Larger and wider riparian and wetland areas tend to have more complex vegetation communities and more habitat types. Wetlands adjacent to streams provide an important habitat niche for a variety of species, particularly amphibians.</p> <p><u>Physical Space for Life History</u> Some areas support important or rare species assemblages or habitat features that require an elevated level of protection to ensure that these natural features are conserved. Many aquatic species, including some species of salmon, rely heavily on off-channel areas, for rearing. Riparian vegetated habitats are particularly important for breeding, foraging, and rearing of many terrestrial species.</p>	<p><u>Water storage, cool water refugia, and filtration</u> Storage of peak flows is provided by floodplains, off channel areas and large wetland complexes; these features serve to reduce peak flows and contribute to summer low flows.</p> <p>Groundwater from shallow aquifers is often a substantial component of base flows, and groundwater seeps provide an important source of cool water refugia. Storage of peak flows is provided by local topography.</p> <p>Within shallow alluvial soils adjacent to stream nutrients and toxic compounds may be filtered or removed by uptake, especially in floodplain areas.</p> <p><u>Support of Vegetation</u> Hyporheic flow helps support vegetated riparian floodways and floodplains.</p>
Watershed-wide Alterations			
<p>Dam regulation along Cow Creek affects the timing, duration, and frequency of flood events. By limiting the frequency and intensity of flood events, flow regulation reduces floodplain connectivity and habitat-forming processes.</p> <p>Irrigated agriculture has transformed much of Adams County's watersheds. Irrigation water is drawn from groundwater and late spring and summer surface flow and</p>	<p>Dam regulation, channelization, and armoring limit floodplain connectivity, which helps support the establishment of riparian vegetation. Over time, as flood events are reduced in magnitude and frequency, the area of riparian vegetation is reduced.</p> <p>As described in Section 4, LWD recruitment from within Adams County was likely always limited given the climate and type of riparian and upland vegetation naturally occurring in the County. Instead, LWD was transported</p>	<p>Roads and railroads running parallel to the shoreline limit wildlife dispersal opportunities. Agriculture production has led to native vegetation clearing, limiting riparian habitat widths in many places.</p> <p>On Cow Creek, hydrologic alteration from dams interrupts natural habitat forming processes, which create diversity in channel form and suitable instream habitat function.</p>	<p>Irrigation-induced groundwater flows and agricultural return flows discharge to the rivers to provide cool water refugia.</p> <p>On Cow Creek, dam regulation limits the frequency and intensity of flooding events, which limits the recharge capacity of the aquifer.</p>

Hydrology	Vegetative	Habitat	Hyporheic (Rivers/Streams Only)
irrigation returns have substantially replaced natural groundwater recharge.	from upstream reaches. Clearing and development in the upper watersheds has limited recruitment of LWD to Adams County shoreline reaches.		
Localized Alterations			
<p>Armored shorelines prevent natural erosion and sediment delivery processes. Shoreline armoring can limit floodway interactions, accelerate streamflow along the bank, and contributing to erosion of adjacent properties.</p> <p>Loss of mature native vegetation and wetlands affects the timing, rate, magnitude, and duration of stream flows. An increase in impervious surfaces results in increased frequency and intensity of flooding. Changes in flow volume or frequency can alter channel morphology and the sediment balance of the stream.</p> <p>In addition to watershed scale effects, irrigation withdrawals can have localized effects on stream flow. The effect of withdrawals on stream flow may depend on the withdrawal rate, as well as the local groundwater interchange (i.e. if the reach is a gaining or losing reach).</p>	<p>Clearing and grading for development often results in the removal of significant vegetation. Impervious surfaces related to roadways, driveways and parking areas tend to produce hydrocarbon pollutants and heavy metals. Depending on management activities, even pervious surfaces such as lawns and pastures can substantially increase nutrients from fertilizers and pollutants and toxins through herbicides and pesticides.</p> <p>Armored shorelines can isolate the river from potential sources of organic matter and eliminate filtration potential.</p>	<p>Historic draining, ditching, and fill of wetlands for agriculture and development have reduced the availability of suitable habitat for aquatic and terrestrial species.</p> <p>In water structures interrupt the longitudinal flow of sediment and alter habitat associations.</p>	<p>Impervious surfaces reduce infiltration, increasing surface flows. The net result is a reduction in shallow groundwater and hyporheic flows capable of maintaining summer low flows in streams and rivers.</p>

Table 5-4. Functional score ranking criteria for streams and rivers

Process/Function		High	Moderate	Low
Hydrologic	Moderation of sediment transport	<ul style="list-style-type: none"> No armoring¹ or dams present within the reach AND If present, creek mouths have natural deltas 	<ul style="list-style-type: none"> Steep slopes present, but well-vegetated or not developed AND Limited armoring present 	<ul style="list-style-type: none"> Steep slopes present with development OR Majority of the reach is armored
	Development/maintenance of in-stream habitat features	Backwater areas, islands, and/or wetlands occupy >50% of the reach	Backwater areas, islands, and/or wetlands occupy 20-50% of the reach	Backwater areas, islands, and/or wetlands occupy <20% of the reach
	Attenuation of flow energy	<ul style="list-style-type: none"> Majority of the reach is not armored AND Floodplain >60% of the reach 	<ul style="list-style-type: none"> Majority of the reach is not armored AND Floodplain 5-60% of the reach 	<ul style="list-style-type: none"> Majority of the reach is armored OR Floodplain area <5% of the reach
Vegetative	LWD and organic matter recruitment	Woody or wetland vegetation >90% of area within immediate proximity of shoreline	Woody or wetland vegetation 50-90% of area within immediate proximity of shoreline	Forest, shrub, or wetland vegetation <50% of area within immediate proximity of shoreline
	Filtration of upland inputs	A broad band of dense vegetation separates uplands from the river	A narrow band of dense vegetation or a broad band of sparse vegetation separates uplands from the river	<ul style="list-style-type: none"> No vegetation along the shoreline OR A narrow band of sparse vegetation separates uplands from the river

Process/Function		High	Moderate	Low
Habitat	Wetland/ riparian habitat	<ul style="list-style-type: none"> Wetland area >50% of total area OR A broad band of dense riparian vegetation is present 	<ul style="list-style-type: none"> Wetland area 20-50% of total area OR Limited areas of dense riparian vegetation are present 	<ul style="list-style-type: none"> Wetland area <20% of total area AND Dense riparian vegetation is absent
	Space and conditions supporting wildlife, including PHS species	<ul style="list-style-type: none"> Two PHS regions > 50% of area OR Three or more different PHS regions present OR Significant wetland, riparian, or unique habitat features are present and corridors between habitats are free from roads and other development 	Significant wetland, riparian, or unique habitat features are present within the reach, but the corridors between habitats are impaired by development	Significant wetland, riparian, or unique habitat features are absent or significantly degraded
Hyporheic	Support of vegetation, water storage and filtration	<ul style="list-style-type: none"> Large, riverine wetlands occur within the reach OR Alluvial soils comprise over 50% of the reach 	<ul style="list-style-type: none"> Stream banks support moderate density of scrub or forested vegetation AND Alluvial soils are present up to 50% of the reach 	<ul style="list-style-type: none"> Stream banks support little, if any, vegetation OR Alluvial soils are not present in the reach

¹ Artificial armoring is very limited throughout County shoreline reaches; however, similarly functioning naturally occurring features such as bedrock are prevalent. For the purposes of this scoring, "armoring" includes both artificial structures and similarly functioning naturally occurring features.

Table 5-5. Functional score ranking criteria for lakes

Process/Function		High	Moderate	Low
Hydrologic	Water and sediment storage	Significant surface water inflows are present	Significant surface water inflows are absent	NA ²
	LWD and organic matter recruitment	Woody or wetland vegetation >90% of area within immediate proximity of shoreline	Woody or wetland vegetation 50-90% of area within immediate proximity of shoreline	Woody or wetland vegetation <50% of area within immediate proximity of shoreline
Vegetative	Filtration of upland inputs	A broad band of dense vegetation separates uplands from the lake	A narrow band of dense vegetation or a broad band of sparse vegetation separates uplands from the lake	<ul style="list-style-type: none"> • No vegetation along the shoreline OR • A narrow band of sparse vegetation separates uplands from the lake
	Wetland/riparian habitat	<ul style="list-style-type: none"> • Wetland area >50% of total area OR • A broad band of dense riparian vegetation is present 	<ul style="list-style-type: none"> • Wetland area 20-50% of total area OR • Limited areas of dense riparian vegetation are present 	<ul style="list-style-type: none"> • Wetland area <20% of total area AND • Dense riparian vegetation is absent
Habitat	Space and conditions supporting wildlife, including PHS species	<ul style="list-style-type: none"> • Two PHS regions >50% of area OR • Three or more different PHS regions present OR • Significant wetland, riparian, or unique habitat features are present and corridors between habitats are free from roads and other development 	Significant wetland, riparian, or unique habitat features are present within the reach, but the corridors between habitats are impaired by development	Significant wetland, riparian, or unique habitat features are absent or significantly degraded

² Water quantity function is the primary hydrologic function occurring in all of the shoreline lakes. All lakes are providing water and sediment storage and are given at least a moderate score. For purposes of ranking, and based on the data available, hydrologic function is differentiated only by the type of inflow present.

5.2 Results of Functional Analysis

The following sections summarize the results of the functional analysis for each shoreline waterbody.

5.2.1 Lakes

There are 22 shoreline lakes present in the County, located within three distinct regions. The majority of the lakes are located in the southwest portion of the County, four are associated with Cow Creek, and the rest are located in the northeast corner of the County. The following sections describe the lakes within each of these regions.

Southwest Lakes

Fourteen lakes are located in the southwest region of the County, near Lower Crab Creek and the Columbia National Wildlife Refuge. This area is part of what is known as the Channeled Scablands - an area shaped by massive floods over the past million years, which left behind exposed channels of the underlying basalt amongst islands of loess (wind-blown dust) (HDR and EES 2007). Many of the lakes are natural depressions with basalt bottoms and no outlets (HDR and EES 2007).

Royal Lake, South Teal Lake, and Pit Lake all include portions that lie within Grant County. The portions of Royal Lake and Pit Lakes that are within Adams County are entirely within the borders of the Columbia National Wildlife Refuge. Portions of Morgan, Herman, Campbell, Black and Hutchinson Lakes are also within the Refuge. For the purposes of this analysis, all of the portions of lakes within the Refuge have been aggregated together into one reach.

The level of existing and potential future development surrounding the majority of the lakes in this region is generally low. For this reason, and because of fairly consistent conditions along each lake's shorelines, all but one lake has a single reach. The lakes' shoreline areas range in size from approximately 28 acres (South Teal Lake) to 177 acres (Para North Lake).

Rodeo Lake is located just outside of the city limits of Othello and has more diversity of land use surrounding it than the other lakes, as well as more development pressure. For analysis, it is rated and its reaches are ranked separately from the other lakes in the tables below.

There is documented presence of rainbow trout in Herman, Owl, Para North, South Teal and Thread Lakes and presumed presence in Hutchinson Lake and the National Wildlife

Refuge Lakes reach. Smallmouth bass is documented in Herman Lake and Thread Lake, and largemouth bass in Hutchinson, Linda and Morgan Lakes. Finally, there is documented presence of summer steelhead and westslope cutthroat in Hutchinson Lake and presumed presence of the same species in the National Wildlife Refuge Lakes reach.

The tables below show the functional scores for each of the southwest lakes for each of the three ecological processes categories identified in Table 5-2. Following are summary pages which provide further detail of the main functional attributes and impacts contributing to the scores for the Southwest Lakes reaches. Due to their distinct characteristics which differentiate them from the other lakes in the southwest region, the National Wildlife Refuge Lakes and Rodeo Lake are given separate summary pages.

Table 5-6. Functional scoring for shoreline lakes in southwest Adams County

Lake/Reach	Rank	Hydrologic	Vegetative		Habitat	
		Storage of water and sediment	LWD and organic matter recruitment	Filtration of upland inputs	Wetland/riparian habitat	Space and conditions supporting wildlife
Para North Lake	1	M	M	H	H	H
Para South Lake	2	M	L	H	H	H
South Teal Lake	2	M	H	H	M	M
National Wildlife Refuge Lakes ¹	2	M	H	M	M	H
Campbell Lake	3	M	H	M	M	M
Herman Lake	3	M	M	M	H	M
Owl Lake	4	M	H	M	L	M
Black Lake	4	M	M	M	L	H
Thread Lake	4	M	H	M	L	M
Hutchinson Lake	5	M	L	M	M	M
Morgan Lake	5	M	M	M	L	M
Linda Lake	6	M	M	L	M	L

Relative ranking order from highest to lowest function based on mean reach scores (L= Low function, M=Medium function, H= High function).

¹ Royal Lake and Pit Lakes, and portions of Morgan, Herman, Campbell, Black and Hutchinson Lakes.

Southwest Lakes

Para North Lake, Para South Lake, South Teal Lake, Campbell Lake, Herman Lake, Owl Lake, Black Lake, Thread Lake, Hutchinson Lake, Morgan Lake, Linda Lake

Process	Function	Notes
Hydrologic	Water and sediment storage	Moderate hydrologic function is present. These lakes range in size from 28 to 177 acres and all contribute some hydrologic water quantity functions. However, significant surface water inflows are absent limiting the opportunity to provide storage.
Vegetation	LWD and organic matter recruitment	The geology of the area naturally limits riparian vegetation along most lakes. Function is highest in South Teal Lake where a relatively broad band of dense woody and wetland vegetation separates the lake from uplands. Function is lowest in Hutchinson and Linda Lakes where shoreline vegetation is very sparse.
	Filtration of upland inputs	
Habitat	Wetland/riparian habitat	Wetland/riparian habitat is low for several lakes, but moderate to high habitat function is present overall. Development around the lakes is extremely limited and undisturbed connectivity to other habitat types is present.
	Space and conditions supporting wildlife, including PHS species	

Key Environmental or Land Use Factors Affecting Processes/Functions:

Existing and potential future development around these lakes are low. Functions are largely unaltered.



National Wildlife Refuge Lakes

Portions of Royal Lake, Pit Lakes, Morgan Lake, Herman Lake, Campbell Lake, Black Lake and Hutchinson Lake which lie within the boundary of the National Wildlife Refuge

Process	Function	Notes
Hydrologic	Water and sediment storage	Moderate function is present. The lakes with portions within the NWS all contribute some hydrologic water quantity functions. However, none have significant surface water inflows, limiting opportunity for water or sediment storage.
Vegetation	LWD and organic matter recruitment	Relatively high amounts of woody and wetland vegetation are present which provide LWD and organic matter recruitment. However, the landscape naturally limits vegetative function and vegetation is generally in a narrow and/or sparse band separating the lakes from upland.
	Filtration of upland inputs	
Habitat	Wetland/riparian habitat	Moderate to high function is present. Only moderate amounts of wetland and limited areas of dense riparian vegetation are present. However, protection within the refuge boundaries provides high habitat function potential. Development around the lakes is extremely limited and undisturbed connectivity to other habitat types is present.
	Space and conditions supporting wildlife, including PHS species	

Key Environmental or Land Use Factors Affecting Processes/Functions:

Existing and potential future development around these lakes are low. Functions are largely unaltered.



Some of the lakes in the National Wildlife Refuge Lakes reach (within yellow hatch boundary)



Table 5-7. Functional scoring for Rodeo Lake reaches

Lake/Reach	Rank	Hydrologic	Vegetative		Habitat	
		Storage of water and sediment	LWD and organic matter recruitment	Filtration of upland inputs	Wetland/riparian habitat	Space and conditions supporting wildlife
Rodeo Lake 3- PAW	1	M	H	H	H	M
Rodeo Lake 1- South of Hwy 26	2	M	M	M	M	L
Rodeo Lake 2- Residential	3	M	L	L	L	L

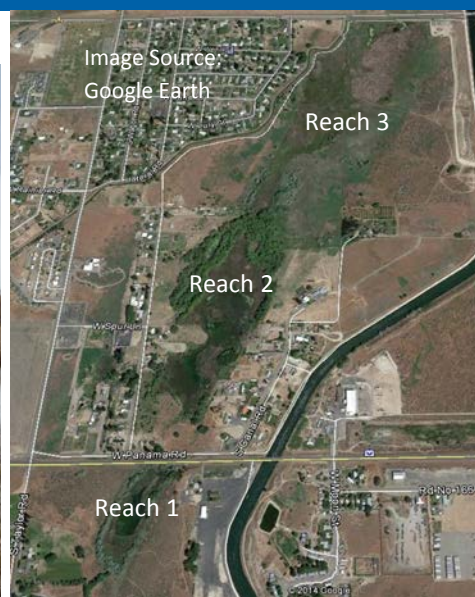
Relative ranking order from highest to lowest function based on mean reach scores (L= Low function, M=Medium function, H= High function).

Rodeo Lake

Process	Function	Notes
Hydrologic	Water and sediment storage	The main portion of the lake and associated uplands (Reach 2) is just over 30 acres, the smaller portion hydrologically connected across Hwy 26 (Reach 1) is another 5.8 acres, and the wetland to the north (Reach 3) is 38.3 acres. All areas contribute hydrologic water quantity functions. This lake has high opportunity for providing water and sediment storage function as there are stormwater runoff and sediment sources from the surrounding residential development.
Vegetation	LWD and organic matter recruitment	Lowest vegetation function is present in Reach 2 where shorelands are impacted by residential development and agriculture, in particular a residential property that appears to have some significant encroachment by stored vehicles and other waste. Functions are highest in Reach 3 that is entirely wetland with no development present.
	Filtration of upland inputs	
Habitat	Wetland/riparian habitat	Low to moderate habitat function is present overall. The lake is the most urban of all the shoreline lakes, but there is some open space for waterfowl and extensive adjacent wetland present. Sandhill cranes are known to use the area.
	Space and conditions supporting wildlife, including PHS species	

Key Environmental or Land Use Factors Affecting Processes/Functions:

The main modification to Rodeo Lake reaches is residential use and agriculture.



Northeast Lakes

Four shoreline lakes are present in the northeast corner of the County. These are located in a more remote region of the Channeled Scablands than the southwest lakes, and are largely unmodified. Agriculture is not common in this area of the County. Fourth of July Lake extends into Spokane County; all others are entirely within Adams County.

The level of existing and potential future development surrounding the lakes in this region is very low. For this reason, and because of fairly consistent conditions along the lakes' shorelines, all have been kept as discrete reaches for the purposes of this analysis. The lakes' shoreline areas range in size from 66.5 acres (Palm Lake) to 378.2 acres (Green Lake).

All of the lakes in this region are predominantly unmodified and have similar, intact function. A railroad bed runs through a portion of the Pine Lake and Palm Lake shorelines, but no other significant roads or development are present. Relative to the other two lakes in the region, Fourth of July Lake and Palm Lake have low amounts of wetland and riparian habitat. Palm Lake has the highest amount of woody scrub/shrub landcover present in its shorelands. A small percentage of Prairies and Steppe PHS habitat is mapped in the Fourth of July Reach. No other PHS habitat is mapped; however, all reaches include Spalding's catchfly habitat and Pines Lake and Fourth of July Lake are included in the Scabland Lakes Bird Habitat Conservation Area.

The table below shows the functional scores for each lake for each of the three ecological processes categories identified in Table 5-2.

Table 5-8. Functional scoring for shoreline lakes in northeast Adams County

Lake	Rank	Hydrologic	Vegetative		Habitat	
		Storage of water and sediment	LWD and organic matter recruitment	Filtration of upland inputs	Wetland/riparian habitat	Space and conditions supporting wildlife
Green Lake	1	M	H	M	H	M
Pines Lake	2	M	M	M	H	M
Fourth of July Lake	3	M	M	M	L	H
Palm Lake	3	M	H	M	L	M

Relative ranking order from highest to lowest function based on mean reach scores (L= Low function, M=Medium function, H= High function).

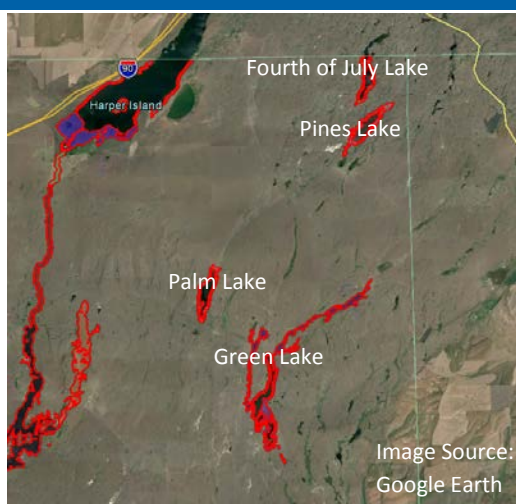
Northeast Lakes

Green Lake, Pines Lake, Fourth of July Lake, Palm Lake

Process	Function	Notes
Hydrologic	Water and sediment storage	Moderate hydrologic function is present. All of these lakes contribute some hydrologic water quantity functions. However, significant surface water inflows are absent limiting the opportunity to provide storage.
Vegetation	LWD and organic matter recruitment Filtration of upland inputs	The geology of the area naturally limits riparian vegetation along most lakes. Function is highest along Green Lake and Palm Lake where more scrub/shrub vegetation and/or wetlands are mapped.
Habitat	Wetland/riparian habitat Space and conditions supporting wildlife, including PHS species	Wetland/riparian habitat is relatively high at Green Lake and Pines Lake but low at the others. However, Fourth of July Lake has a small amount of Prairie and Steppe PHS habitat mapped. Unbroken connectivity to other undisturbed habitat is abundant for all lakes.

Key Environmental or Land Use Factors Affecting Processes/Functions:

Existing and potential future development around these lakes are low. Functions are largely unaltered.



Cow Creek Lakes

Four lakes intersect Cow Creek as it flows south through the entire length of the eastern half of the County, through the Channeled Scablands. Flow connections between the lakes are intermittent.

All of the shoreline lakes occur in the upper half of the creek. The largest, Sprague Lake, lies at the head of the creek in the northeast corner of the County. A large open space wetland area is present at the mouth of the lake; this wetland area and some adjacent uplands is part of WDFW's Sprague Lake Unit, which is part of the Columbia Basin Wildlife Area. The wetlands in the Unit are protected under the federal Wetlands Reserve Program (WRP). The uplands are protected under a WDFW Conservation Easement with a private property owner

http://wdfw.wa.gov/lands/wildlife_areas/columbia_basin/Sprague%20Lake/). Outside of the open space area, agricultural use is the most common modification to the shoreline. A portion of the northern shoreline is developed with a resort facility. On the other side of the lake from the resort, there is a public access boat launch. Some recreation occurs on the lake, including fishing, but it is not a highly used area. Privately owned Harper Island is present in the middle of the lake. For the purposes of this analysis, Sprague Lake has been divided into four discrete reaches.

South of Sprague Lake are Hallin Lake, Cow Lake and Finnell Lake. For the purposes of this analysis, Hallin Lake has been divided into two reaches based on the presence of a designated public access area. Cow and Finnell Lakes were each considered a single reach. No development is present along these lake shorelines.

Table 5-9 shows the functional scores for Cow Lake, Finnell Lake and Hallin Lake, for each of the three ecological processes categories identified in Table 5-2. Table 5-10 shows the functional scores for the Sprague Lake reaches, followed by a summary page detailing the main functional attributes and impacts contributing to the scores.

Table 5-9. Functional scoring for lower Cow Creek lakes

Lake/Reach	Rank	Hydrologic	Vegetative		Habitat	
		Storage of water and sediment	LWD and organic matter recruitment	Filtration of upland inputs	Wetland/riparian habitat	Space and conditions supporting wildlife
Cow Lake	1	H	H	M	M	H
Finnell Lake	2	H	H	M	L	H
Hallin Lake 2- Agriculture	3	H	H	M	L	H
Hallin Lake 1- Public Access	4	H	M	L	L	M

Relative ranking order from highest to lowest function based on mean reach scores (L= Low function, M=Medium function, H= High function).

Cow Creek Lakes

Cow Lake, Finnell Lake and Hallin Lake

Process	Function	Notes
Hydrologic	Water and sediment storage	These lakes have a hydrologic connection to Cow Creek. High hydrologic function is present due to the significant surface water inflows. Cow Lake is by far the largest and contributes significant water and sediment storage function.
Vegetation	LWD and organic matter recruitment	Woody or wetland vegetation dominate the shoreline and high LWD and organic matter recruitment function is present overall. However, vegetation is generally sparse or narrow limiting filtration function. Function is lowest around the public access area of Hallin Lake where vegetation is more limited.
	Filtration of upland inputs	
Habitat	Wetland/riparian habitat	Wetland habitat is very limited, however adjacent uplands provide extensive undisturbed connectivity to other habitat types. PHS waterfowl concentrations are mapped for all lakes.
	Space and conditions supporting wildlife, including PHS species	

Key Environmental or Land Use Factors Affecting Processes/Functions:

Existing and potential future development around these lakes are low. Agricultural use is the primary modification, but is not a dominant use in the shoreline area. The hydrology of the lakes is affected by the connectivity with Cow Creek.



Cow Lake



Hallin Lake

Table 5-10. Functional scoring for Sprague Lake reaches

Lake/Reach	Rank	Hydrologic	Vegetative		Habitat	
		Storage of water and sediment	LWD and organic matter recruitment	Filtration of upland inputs	Wetland/riparian habitat	Space and conditions supporting wildlife
Sprague Lake 1- Open Space	1	H	H	H	H	H
Sprague Lake 2- Harper Island	2	H	M	M	M	H
Sprague Lake 3- Agriculture	2	H	H	M	M	M
Sprague Lake 4- Developed	3	H	M	L	M	L

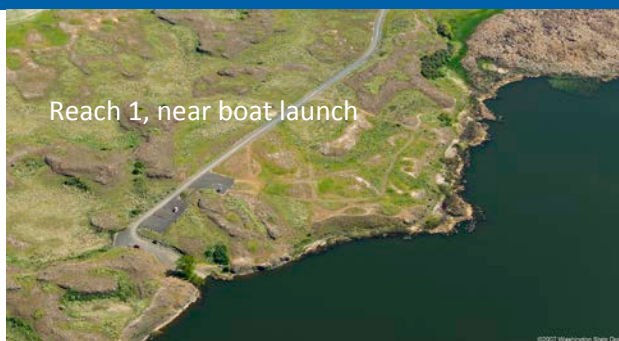
Relative ranking order from highest to lowest function based on mean reach scores (L= Low function, M=Medium function, H= High function).

Sprague Lake

Process	Function	Notes
Hydrologic	Water storage and sediment	High hydrologic function is present. Sprague Lake is the largest lake in the County and part of the headwaters to Cow Creek. A large area to the north drains into Sprague Lake which helps hold back flood flows and sediment from these areas from flowing downstream into Cow Creek.
Vegetation	LWD and organic matter recruitment	Vegetative function varies. A narrow but dense strip of vegetation is generally present along most of the shoreline. Highest amounts of woody and wetland vegetation are present in Reaches 1 and 3. Comparatively, the lowest vegetation scores are for Reach 4 where the shoreline has been developed, though a row of trees is present between the development and the lake in most places.
	Filtration of upland inputs	
Habitat	Wetland/riparian habitat	Moderate to high habitat function is present overall, especially for bird species. Development around the lake is limited to Reach 4 and the public access boat launch in Reach 1. PHS Waterfowl concentration regions are mapped through all reaches. Additional PHS regions are mapped in Reaches 1 and 2 including American white pelican (1 and 2) and tundra swan (2).
	Space and conditions supporting wildlife, including PHS species	

Key Environmental or Land Use Factors Affecting Processes/Functions:

The main modification to the Sprague Lake shoreline is the resort development on the northern side of the lake and some agricultural practices. Reach 3 has a Category 5 water quality listing for PCB and TCDD.



5.2.2 Cow Creek

Cow Creek flows south from Sprague Lake through the entire length of the County to enter the Palouse River near the town of Hooper. According to the County's Planning Director, the outlet from Sprague Lake is artificial and was created by blasting the basalt to provide flow connectivity into Cow Creek. The Cow Creek system includes a network of disconnected, natural depressions or vernal pools which have intermittent seasonal connections. Small dams have been constructed in places along Cow Creek which backup the flow helping to create seasonal pooling. Several such dams appear not to be shown in the available data depicted in the Map Folio (Appendix B). The northern half of the creek includes several shoreline lakes (see Section 5.2.1) and areas of wetland complex, while the southern end has less diverse characteristics. Local reports indicate that flow of Cow Creek decreases downstream, potentially because of the storage by the numerous pothole lakes and artificial impoundments, and that the stream is often dry in the southern end of the County. For the purposes of this analysis, Cow Creek has been broken into seven reaches. Reaches are numbered sequentially upstream.

An eighth area has been designated as "Cow Creek PAW." This area is not considered a reach of the creek itself, but rather is comprised of multiple areas of potentially associated wetland which are within shoreline jurisdiction and may be hydrologically associated with the creek, but which are not directly abutting it. This area is not included with the functional rankings of the rest of the reaches in Table 5-11 as the area is spatially separated from the creek's immediate shorelands. This area is generally assumed to provide high function for water storage, filtration and habitat as most of the wetlands appear unmodified.

The Cow Creek shorelines are part of the Channeled Scablands and are largely rural and undeveloped. Shrub/scrub vegetation dominates the vegetated areas which are generally limited to a narrow band immediately adjacent to the channel. Flow in Cow Creek is low during the summer months and some areas can go dry. Surface water claims were adjudicated in 1984 and surface water resources "appear to be fully committed between non-agricultural and agricultural withdrawals." The water rights adjudication, in effect, set instream flow requirements for upper Cow Creek which relate to the regulation of Sprague Lake levels (see Section 3.1.1 above). Groundwater supplies approximately 40 percent of the existing agriculture use water rights and 13 percent of the non-agricultural use water rights in WRIA 34. Existing water withdrawals contribute to reduced stream flows (HDR and EES 2007).

The following table provides the functional scores for each Cow Creek reach for each of the four ecological processes categories identified in Table 5-2. Reaches are ranked according to their overall functional score. The table is followed by a summary page which discusses the main functional attributes and impacts contributing to the scores.

Table 5-11. Functional scoring for Cow Creek reaches

Reach Name	Rank	Hydrologic			Vegetative		Habitat		Hyporheic
		Moderation of sediment transport	In-stream habitat features	Attenuating flow energy	LWD and organic matter recruitment	Filtration of upland inputs	Wetland/riparian habitat	Space and conditions supporting wildlife	Support of vegetation, water storage and filtration
Cow Creek 3- Wetland Complex	1	M	H	H	H	M	H	M	H
Cow Creek 5- Hills Road Area	2	M	L	H	H	H	M	M	M
Cow Creek 4- Harder Road Area	2	M	M	H	H	M	M	M	M
Cow Creek 6- Finnell to Cow Lake	2	M	H	H	H	M	M	M	L
Cow Creek 2- Scablands	3	M	L	H	H	M	L	M	M
Cow Creek 7- Sprague Lake Outlet	4	M	L	H	M	L	L	H	M
Cow Creek 1- Palouse to Benge-Washtucna Road	4	M	L	H	L	M	L	M	H

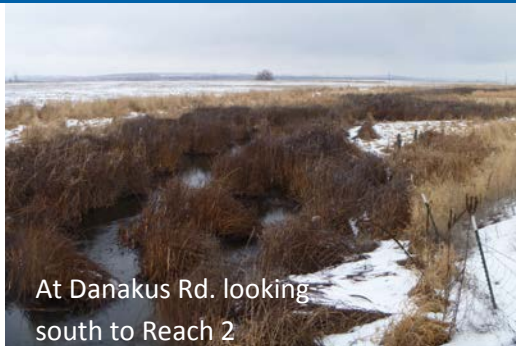
Relative ranking order from highest to lowest function based on mean reach scores (L= Low function, M=Medium function, H= High function).

Cow Creek

Process	Function	Notes
Hydrologic	Moderation of sediment transport	High amounts of floodplain are present throughout all Cow Creek reaches. Armoring is limited, but some steep slopes and road crossings are present. Reach 2 has a railroad present through much of the shoreline. Flow levels are generally low and shoreline complexity is limited overall. Reach 4 has meanders present which increases instream features. Wetland areas are minimal in all reaches except Reaches 3 and 6.
	Development and maintenance of in-stream habitat features	
	Attenuating flow energy	
Vegetation	LWD and organic matter recruitment	Function is lowest in Reaches 1 and 7 where riparian vegetation is limited to a thin strip adjacent to the bank. Reaches 2-6 have high amounts of wetland and/or woody vegetation providing LWD and organic matter to the channel. Reach 5 has the most filtration function as it has the most amount of dense vegetation separating uplands from the stream.
	Filtration of upland inputs	
Habitat	Wetland/riparian habitat	Wetland and riparian vegetation is lowest in Reaches 1, 2 and 7, and highest in Reach 3. However, the wetland complex in Reach 3 has been modified by agricultural use. Natural area and open space provide habitat for waterfowl and multiple PHS regions and important bird areas are present in all reaches, with the most in Reach 7.
	Space and conditions supporting wildlife, including PHS species	
Hyporheic	Support of vegetation, water storage and filtration	Presence of alluvial soils is highest in Reaches 1 and 3 and lowest in Reach 7; however, natural geology of the region prevents development of extensive floodplain vegetation in places.

Key Environmental or Land Use Factors Affecting Processes/Functions:

Agricultural uses are the main modification to Cow Creek shorelands. High amounts of floodplain are present with generally good connectivity to the channel.



At Danakus Rd. looking south to Reach 2



Reach 7 near Sprague Lake

5.2.3 Lower Crab Creek

Lower Crab Creek enters Adams County from Lincoln County to the north. It flows southwest through the southwest corner of the County. A portion of the creek lies within the Columbia National Wildlife Refuge. For the purposes of this report, the shoreline jurisdiction area of Lower Crab Creek that lies within the County has been divided into three reaches. Spatially divergent portions of the shoreline with similar characteristics have been aggregated together into one reach. For example, several agricultural areas are present throughout the entire length of the creek which have been joined together into one agriculture reach for the purpose of this analysis. Reaches are numbered sequentially upstream from where the first instance of that reach type occurs.

No floodplain is mapped along Lower Crab Creek. Wetland is very limited in Reach 1, but high amounts are present in Reaches 2 and 3. All three reaches are mapped within a portion of the Columbia Important Bird Area and Moses Lake Potholes Bird Habitat Conservation Area. PHS mule deer habitat is also mapped in all three reaches. Reach 1 also has a small percentage of mapped sandhill crane habitat.

The following table provides the functional scores for each Lower Crab Creek reach for each of the four ecological processes categories identified in Table 5-2. Reaches are ranked according to their overall functional score. The table is followed by a summary page which discusses the main functional attributes and impacts contributing to the scores.

Table 5-12. Functional scoring for Lower Crab Creek reaches

Reach Name	Rank	Hydrologic			Vegetative		Habitat		Hyporheic
		Moderation of sediment transport	In-stream habitat features	Attenuating flow energy	LWD and organic matter recruitment	Filtration of upland inputs	Wetland/riparian habitat	Space and conditions supporting wildlife	Support of vegetation, Water storage and filtration
Lower Crab Creek 3- Seep Lake Wildlife Area	1	H	H	L	H	M	H	H	L
Lower Crab Creek 2- National Wildlife Refuge	2	H	M	L	M	M	M	H	M
Lower Crab Creek 1- Agriculture	3	H	L	L	L	L	L	M	H

Relative ranking order from highest to lowest function based on mean reach scores (L= Low function, M=Medium function, H= High function).

Lower Crab Creek

Process	Function	Notes
Hydrologic	Moderation of sediment transport	No floodplain is present. Instream complexity varies with highest function in the Seep Lake Wildlife Area (Reach 3) where backwater areas and wetlands are present, and lowest function in the agricultural reach (Reach 1).
	Development and maintenance of in-stream habitat features	
	Attenuating flow energy	
Vegetation	LWD and organic matter recruitment	Woody vegetation cover is highest in Reach 3. Herbaceous species dominate much of the shoreline and dense vegetation is limited to a thin strip adjacent to the bank in places.
	Filtration of upland inputs	
Habitat	Wetland/riparian habitat	Habitat function is highest in Reaches 2 and 3 which are within designated wildlife reserves. PHS regions are mapped in all reaches. Agriculture has modified vegetation in Reach 1, but sandhill crane presence is documented. Riparian habitat is highest in Reach 3; elsewhere wetlands and riparian vegetation are more limited, but upland shrub/scrub and unmodified open space with connectivity to other habitat types is plentiful.
	Space and conditions supporting wildlife, including PHS species	
Hyporheic	Support of vegetation, water storage and filtration	Presence of alluvial soils varies greatly from 0% in Reach 3 to over 50% of Reach 1. Banks support moderate density of vegetation in most places.

Key Environmental or Land Use Factors Affecting Processes/Functions:

Function is highest in the protected wildlife refuge reaches and lowest in Reach 1 which is heavily modified by agriculture. No floodplain is present.



5.2.4 Palouse River

The Palouse River flows for approximately 20 miles along the southeast County border separating Adams County from Whitman County. For the purposes of this report, the shoreline jurisdiction area of the Palouse River that lies within Adams County has been divided into four reaches. Reach 3 consists of two spatially divergent portions of the shoreline with similar characteristics which have been aggregated together into one reach. Reaches are numbered sequentially upstream from where the first instance of that reach type occurs.

Agricultural modifications are found along much of the Palouse River shoreline, particularly in the lower reaches (1 and 2). Upper reaches are less modified, though vegetation is naturally limited by the scabland geology. The greatest complexity is found in Reach 4, where braided channels and backwater areas are present.

There are no ESA-listed salmonids or other listed aquatic species in the Palouse River above the Palouse Falls, which is located downstream of Adams County. Upstream of the falls, resident rainbow trout are present in all reaches.

The following table provides the functional scores for each reach for each of the four ecological processes categories identified in Table 5-2. Reaches are ranked according to their overall functional score. The table is followed by a summary page which discusses the main functional attributes and impacts contributing to the scores.

Table 5-13. Functional scoring for Palouse River reaches

Reach Name	Rank	Hydrologic			Vegetative		Habitat		Hyporheic
		Moderation of sediment transport	In-stream habitat features	Attenuating flow energy	LWD and organic matter recruitment	Filtration of upland inputs	Wetland/riparian habitat	Space and conditions supporting wildlife	Water storage and filtration, Support of vegetation
Palouse River 4- Braided Channel	1	H	M	H	L	L	M	H	H
Palouse River 3- Scablands	2	M	L	H	M	L	M	H	H
Palouse River 2- Agriculture	3	M	L	H	L	L	M	H	M
Palouse River 1- Rural Residential	4	M	L	H	L	L	L	M	H

Relative ranking order from highest to lowest function based on mean reach scores (L= Low function, M=Medium function, H= High function).

Palouse River

Process	Function	Notes
Hydrologic	Moderation of sediment transport	Shoreline armoring is minimal, but instream habitat complexity is limited. Very high amounts of floodplain are present in all reaches with good connectivity to the channel. Shoreline complexity is limited. One dock/pier (Reach 1) and several bridges (Reach 2) alter instream hydrology.
	Development and maintenance of in-stream habitat features	
	Attenuating flow energy	
Vegetation	LWD and organic matter recruitment	Low vegetative function is present overall. Naturally sparse vegetation is present through all of the reaches and agriculture has impacted the riparian vegetation in Reaches 1 and 2. Riparian shrub vegetation is limited to a thin strip adjacent to the bank in most places. Upland shrub-scrub vegetation is most abundant in Reach 3.
	Filtration of upland inputs	
Habitat	Wetland/riparian habitat	Habitat function is lowest in Reaches 1 and 2 where there are more agricultural and residential uses. Upper reaches have very little human presence. Multiple PHS regions are mapped throughout all reaches. Riparian vegetation and wetland habitat is limited, but upland shrub/scrub and unmodified open space with connectivity to other habitat types is plentiful.
	Space and conditions supporting wildlife, including PHS species	
Hyporheic	Support of vegetation Water storage and filtration	High percentages of alluvial soils are present in Reaches 1, 3 and 4; less in Reach 2.

Key Environmental or Land Use Factors Affecting Processes/Functions:

Agricultural modifications in Reaches 1 and 2 are the main impacts to the Palouse shoreline.



5.2.5 Rock Creek

Rock Creek flows west into Adams County from Whitman County. It flows briefly south near the center of Adams County's eastern border before heading back east and re-entering Whitman County. For the purposes of this report, the shoreline jurisdiction area of Rock Creek in Adams County has been kept as one reach.

One road crosses through the Rock Creek shoreline. No other development is present. In places, the creek flows at the base of some steep, though fairly well vegetated, slopes. Half of the shoreline is mapped as floodplain. There are no ESA-listed salmonids documented in Rock Creek, but rainbow trout and largemouth bass are documented throughout the reach.

The following table provides the functional scores for Rock Creek for each of the four ecological processes categories identified in Table 5-2. The table is followed by a summary page which discusses the main functional attributes and impacts contributing to the scores.

Table 5-14. Functional scoring for Rock Creek

Reach Name	Rank	Hydrologic			Vegetative		Habitat		Hyporheic
		Moderation of sediment transport	In-stream habitat features	Attenuating flow energy	LWD and organic matter recruitment	Filtration of upland inputs	Wetland/riparian habitat	Space and conditions supporting wildlife	Support of vegetation, Water storage and filtration
Rock Creek	NA	M	L	M	H	H	M	H	L

Reach scores (L= Low function, M=Medium function, H= High function).

Rock Creek

Process	Function	Notes
Hydrologic	Moderation of sediment transport	Armoring is limited to one road crossing. Some steep slopes are present but are not developed, and are fairly well vegetated. No wetlands are mapped and channel complexity is low, limiting in-stream habitat features. Floodplain is mapped for just over half of the reach area.
	Development and maintenance of in-stream habitat features	
	Attenuating flow energy	
Vegetation	LWD and organic matter recruitment	Vegetative function is generally high. A small amount of forested land cover is mapped in this reach which is rare for the County. Forested and shrubby riparian vegetation is present separating the channel from uplands and stabilizing banks
	Filtration of upland inputs	
Habitat	Wetland/riparian habitat	Bird Habitat Conservation Area and Spalding's catchfly habitat are mapped in the reach as well as PHS mule deer habitat. No NWI wetlands are mapped but extensive open space and undisturbed connectivity exists to other habitat types.
	Space and conditions supporting wildlife, including PHS species	
Hyporheic	Support of vegetation, Water storage and filtration	Low hyporheic function is present. No alluvial soils are present in the reach and no NWI wetlands are mapped. However, the banks do support upland vegetation.

Key Environmental or Land Use Factors Affecting Processes/Functions:

This reach is remote and predominantly unmodified other than one road crossing. Vegetation function is generally high in this reach compared to the surrounding basalt landscape with naturally limited vegetation.

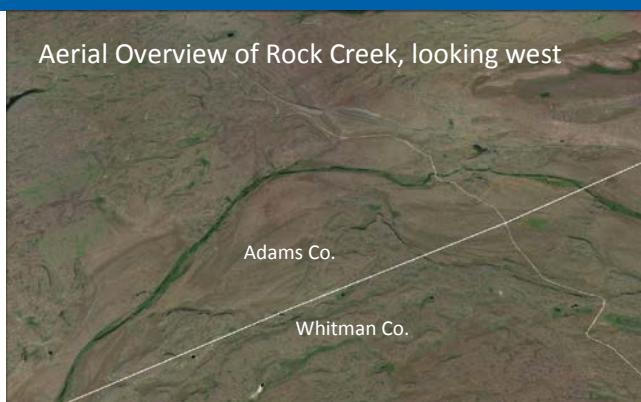


Image Source: Google Earth

5.3 Restoration Opportunities

Some of the primary issues affecting the region's streams and lakes that may be addressed with restoration or protection include: (1) habitat degradation with the alteration of riparian zones through crops and cattle; and (2) poor water quality where fecal coliform bacteria, nutrient levels, and water temperatures often exceed Washington state standards. Ground and surface water quantity is another pressing issue in the region, but these problems are addressed through other regulatory processes and planning pathways and won't be addressed in this report.

Of the four watersheds in Adams County, only the Palouse (34) and the Upper Crab-Wilson (43) watersheds had active planning groups that produced Watershed Plans. In the Palouse River basin, land use changes have led to the loss of most of the basin's riparian habitat and wetlands contributing to erosion, increased sedimentation, and higher water temperatures (HDR and EES 2007). Water quality concerns are primarily from non-point sources, including: erosion, livestock, fertilizers, and septic systems (HDR and EES 2007).

These conditions lead to the following restoration opportunities (found in the Palouse Watershed Plan but generally applicable County-wide):

- Implement habitat improvement projects involving construction or placement of instream structures
- Implement riparian restoration or enhancement measures
- Manage grazing in riparian areas by installing livestock exclusion fencing and off-stream watering
- Work with individual landowners to review pesticide and fertilizer use, and to implement the following best management practices to limit water quality impacts:
1) Manage Sprague Lake inputs to reduce nutrient loading, 2) Enhance riparian areas, 3) Urban/rural education program, and 4) Conservation tillage.

In addition, the Palouse Watershed Plan (HDR and EES 2007) identified the need for a fish passage barrier on Cow Creek below Sprague Lake to prevent repopulation of Sprague Lake with undesirable species that had been previously eliminated with application of rotenone.

The Adams Conservation District is a local agency that has actively partnered with landowners to implement exclusion fencing and riparian enhancement projects,

particularly on Cow Creek. The projects have been successful at improving habitat conditions and water quality.

6 LAND USE ANALYSIS

6.1 Overview

This land use analysis reviews current shoreline use patterns and projected trends to ensure appropriate shoreline use consistent with the Shoreline Management Act and the Guidelines.

Under the Guidelines (WAC 173-26-201(2)(d)), local governments, when determining allowable uses and resolving use conflicts within their shoreline jurisdiction, must apply, in order, the following preferences and priorities:

1. Reserve appropriate areas for protecting and restoring ecological functions to control pollution and prevent damage to the natural environment and public health. In reserving areas, local governments should consider areas that are ecologically intact from the uplands through the aquatic zone of the area, aquatic areas that adjoin permanently protected uplands, and tidelands in public ownership. Local governments should ensure that these areas are reserved consistent with constitutional limits.
2. Reserve shoreline areas for water-dependent and associated water-related uses. Harbor areas, established pursuant to Article XV of the state Constitution, and other areas that have reasonable commercial navigational accessibility and necessary support facilities, such as transportation and utilities, should be reserved for water-dependent and water-related uses that are associated with commercial navigation unless the local governments can demonstrate that adequate shoreline is reserved for future water-dependent and water-related uses and unless protection of the existing natural resource values of such areas preclude such uses. Local governments may prepare master program provisions to allow mixed-use developments that include and support water-dependent uses and address specific conditions that affect water-dependent 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 nonwater-oriented uses to those locations where the above described uses are inappropriate or where nonwater-oriented uses demonstrably contribute to the objectives of the Shoreline Management Act.

Additionally, for Shorelines of Statewide Significance, the Shoreline Management Act (in RCW 90.58.020) advanced a special set of use preferences. As discussed in Section 1.2.2, in Adams County Shorelines of Statewide Significance include all shorelines within the County along the Palouse River, Rock Creek, and Sprague Lake; and Cow Creek from the mouth of Lugenbeal Creek to the confluence with the Palouse River. As set forth in RCW 90.58.020, for its Shorelines of Statewide Significance, Adams County must give preference to uses in the following order that:

1. Recognize and protect the statewide interest over local interest;
2. Preserve the natural character of the shoreline;
3. Result in long term over short term benefit;
4. Protect the resources and ecology of the shoreline;
5. Increase public access to publicly owned areas of the shorelines;
6. Increase recreational opportunities for the public in the shoreline;
7. Provide for any other element as defined in RCW 90.58.100 deemed appropriate or necessary.

6.2 Land Use Context: Population

Information about the County's current and potential future population provides some basic context for understanding current and potential future land use and development. According to the most recent data from the Washington State Office of Financial Management (2014), in 2013 Adams County had a total population of 19,200 (9,040 in unincorporated areas; 10,160 in incorporated areas). This ranks the County 31st of Washington's 39 counties in terms of total population. With a land area of approximately 1,925 square miles, its population density was 9.97 people per square mile, or 0.016 people per acre.

Regarding the County's potential future population, the Office of Financial Management (2012) has issued population projections for growth management planning purposes. These population projections include low, medium, and high series projections (Table 6-

1), though “the medium series is considered the most likely because it is the best foreseeable future based on assumptions that have been validated with past and current information.” Under the medium series projection, the County population would grow to 27,205 by the year 2040. Put another way, under this projection the County would typically grow by about 278 people each year.

Table 6-1. Adams County population projections (Office of Financial Management 2012).

Year	Low Series	Medium Series	High Series
2015	19,147	20,257	21,085
2020	19,605	21,640	23,158
2025	20,004	22,964	25,172
2030	20,404	24,289	27,187
2035	20,880	25,690	29,278
2040	21,470	27,205	31,483

6.3 Development Permit History

In comparison to other Washington counties, Adams County issues a relatively small number of development permits. For example, in 2013 the County issued just 147 building permits. Based on previously issued shoreline permits, shoreline development activities are very rare in the County. Since 2006, only two shoreline permits have been issued (one in 2006, one in 2008).

6.4 Shoreline Land Use Analysis by Area

The below subsections provide the results of a reach-based shoreline land use analysis. Similar to other chapters of this report, the results of the shoreline land use analysis are summarized according to six areas: Southwest Lakes, Northeast Lakes, Cow Creek and Cow Creek Lakes, Lower Crab Creek, Palouse River, and Rock Creek.

6.4.1 Approach and Methodology

For each of the six areas, the shoreline land use analysis is organized around four topics: existing and potential shoreline land use, shoreline transportation and utilities, existing and potential shoreline public access, and historic and archaeological resources. In general, the methodology for the land use analysis involved the extensive use of geographic information systems (GIS) to calculate quantitative data for the shoreline reaches (see Section 4.1.2 above and Appendix D). Information supplementary to three of these topics is further provided below.

Existing and Potential Shoreline Land Use

The current land use data in Appendix D indicates that a substantial portion of County lands feature the current land use “Agriculture classified under current use chapter 84.34 RCW” or “Open space land classified under chapter 84.34 RCW.” Chapter 84.34 RCW, along with WAC 458-30, are known as Washington’s “open space laws.” In enacting these laws, the Washington State Legislature stated “that it is in the best interest of the state to maintain, preserve, conserve and otherwise continue in existence adequate open space lands for the production of food, fiber and forest crops, and to assure the use and enjoyment of natural resources and scenic beauty for the economic and social well-being of the state and its citizens” and “that assessment practices must be so designed as to permit the continued availability of open space lands for these purposes” (RCW 84.34.010). Accordingly, the open space laws allow property owners to have their open space, farm and agricultural, or timber lands valued at their current use rather than their “highest and best” use.

Also included under this topic heading is a discussion of any water-oriented uses. According to the Guidelines (WAC 173-26-020), a “water-oriented use means a use that is water-dependent, water-related, or water-enjoyment, or a combination of such uses.” The Shoreline Management Act promotes uses that are “unique to or dependent upon use of the state's shoreline,” as well as “ports, shoreline recreational uses including but not limited to parks, marinas, piers, and other improvements facilitating public access to shorelines of the state, industrial and commercial developments which are particularly dependent on their location on or use of the shorelines of the state and other development that will provide an opportunity for substantial numbers of the people to enjoy the shorelines of the state” (RCW 90.58.020). Definitions and examples of water-oriented uses are included in Table 6-2 below.

Table 6-2. Water-oriented uses: definitions and examples.

Water-Oriented Use Definitions	Examples
"Water-dependent use" means a use or portion of a use which cannot exist in a location that is not adjacent to the water and which is dependent on the water by reason of the intrinsic nature of its operations. (WAC 173-26-020(39))	Examples of water-dependent uses may include ship cargo terminal loading areas, ferry and passenger terminals, barge loading facilities, ship building and dry docking, marinas, aquaculture, and sewer outfalls.
"Water-related use" means a use or portion of a use which is not intrinsically dependent on a waterfront location but whose economic viability is dependent upon a waterfront location because: (a) The use has a functional requirement for a waterfront location such as the arrival or shipment of materials by water or the need for large quantities of water; or	Examples of water-related uses may include warehousing of goods transported by water, seafood processing plants, hydroelectric generating plants, gravel storage when transported by barge, oil refineries where transport is by tanker, log storage, and potentially agriculture and

Water-Oriented Use Definitions	Examples
(b) The use provides a necessary service supportive of the water-dependent uses and the proximity of the use to its customers makes its services less expensive and/or more convenient. (WAC 173-26-020(43))	agriculturally related water transportation systems.
"Water-enjoyment use" means a recreational use or other use that facilitates public access to the shoreline as a primary characteristic of the use; or a use that provides for recreational use or aesthetic enjoyment of the shoreline for a substantial number of people as a general characteristic of the use and which through location, design, and operation ensures the public's ability to enjoy the physical and aesthetic qualities of the shoreline. In order to qualify as a water-enjoyment use, the use must be open to the general public and the shoreline-oriented space within the project must be devoted to the specific aspects of the use that fosters shoreline enjoyment. (WAC 173-26-020(40))	Primary water-enjoyment uses may include, but are not limited to, parks, piers and other improvements facilitating public access to the shorelines of the state; and general water-enjoyment uses may include, but are not limited to restaurants, museums, aquariums, scientific/ecological reserves, and resorts/hotels (as part of mixed-use development or with significant public access or restoration components), and commercial/office as part of a mixed-use development.

Existing and Potential Shoreline Public Access

Potential shoreline public access opportunities were identified based on the input of County staff. Other information on potential shoreline public access was obtained through a review of the Adams County Comprehensive Plan (Adams County 2005).

Historic and Archaeological Resources

Additional information about historic resources was obtained via the Washington Information System for Architectural and Archaeological Records Data. Because of the potential for vandalism and looting, archaeological site locations are not publicly available. However, given the traditional tribal presence in the County and the use of shorelines for sustenance and spiritual practices, archaeological features could be present along shorelines.

6.4.2 Southwest Lakes

Existing and Potential Shoreline Land Use

With the exception of Rodeo Lake, shoreline jurisdiction in the Southwest Lakes is currently almost entirely in agricultural or open space use. Roughly one-third of Rodeo Lake's shoreline jurisdiction (excluding potentially associated wetlands), is in single-family residential use, with roughly another two-thirds undeveloped (some of this undeveloped land on the south side of the lake is owned by the County). One of the single-family parcels seems to be used for some other storage or light industrial use as well.

Several of the Southwest Lakes feature government ownership or management. This is in part due to the presence of the Columbia National Wildlife Refuge and the Seep Lake Wildlife Area.

Again with the exception of Rodeo Lake, shoreline jurisdiction in the Southwest Lakes is zoned General Agriculture. Rodeo Lake's shoreline jurisdiction is mostly zoned Rural Residential, though some potentially associated wetlands are zoned Light Industrial.

Water-oriented uses consist of recreational sites and utility infrastructure, described further below.

Relative to other shoreline areas, this area has the greatest potential for redevelopment and some new development, mostly on Rodeo Lake.

Shoreline Transportation and Utilities

The Southwest Lakes feature several roads and two dams (Table 6-3). In general, the roads in the Southwest Lakes transect shoreline jurisdiction for relatively brief periods (rather than running through shoreline jurisdiction for extended periods).

The Black Lake dam (State ID: AD41-312) dates to 1938 and is used for recreation purposes. The dam near Para South Lake is McCain Foods' East Wastewater Lagoon Dam.

Table 6-3. Southwest Lakes: transportation and utilities.

Lake/Reach	Roads (lineal feet)	Bridges	Rail (lineal feet)	Dams
Black Lake	--	--	--	1
Campbell Lake	--	--	--	--
Herman Lake	--	--	--	--
Hutchinson Lake	--	--	--	--
Linda Lake	451	--	--	--
Morgan Lake	145	--	--	--
National Wildlife Refuge Lakes	135	--	--	--
Owl Lake	--	--	--	--
Para North Lake	--	--	--	--
Para South Lake	954	--	--	1
Rodeo Lake 1- South of Hwy 26	--	--	--	--
Rodeo Lake 2- Residential	281	--	--	--
Rodeo Lake 3- PAW	--	--	--	--
South Teal Lake	--	--	--	--

Lake/Reach	Roads (lineal feet)	Bridges	Rail (lineal feet)	Dams
Thread Lake	88	--	--	--

Existing and Potential Shoreline Public Access

WDFW maintains two Water Access Sites in the Southwest Lakes. The first site is on the south shore of Herman Lake. The site includes a boat launch (launch type: hand). Motorized boats are allowed. Camping is available. The second site is on the north side of Linda Lake. This site is “primitive.” No boat launch is available.

On the north shore of Hutchinson Lake are a boat launch and canoe launch dock. These facilities are maintained by the USFWS.

Potential future public access is possible at some County-owned property at Rodeo Lake located on the south side of the lake north of State Route 26. While no formal plans have been made, County staff indicated that this property has been discussed as a potential location for future shoreline public access.

Historic and Archaeological Resources

The Southwest Lakes shoreline jurisdiction does not include any sites known to be on State or federal historic registers.

6.4.3 Northeast Lakes

Existing and Potential Shoreline Land Use

Nearly all of the Northeast Lakes are currently in agricultural use. Only Green Lake features land that is government owned or managed (12% by the WDNR). All land is zoned General Agriculture. No water-oriented uses were identified.

No changes in land use are projected, with continued low-intensity agricultural expected to remain.

Shoreline Transportation and Utilities

The dominant transportation feature in the Northeast Lakes is a rail line owned by Union Pacific (Table 6-4). This rail line runs along the eastern sides of Palm Lake and Pines Lake.

Table 6-4. Northeast Lakes: transportation and utilities.

Lake/Reach	Roads (lineal feet)	Bridges	Rail (lineal feet)	Dams
Fourth of July Lake	--	--	--	--
Green Lake	--	--	--	--
Palm Lake	--	--	3,372	--
Pines Lake	--	--	468	--

Existing and Potential Shoreline Public Access

The Northeast Lakes shoreline jurisdiction does not include any existing public access sites. No plans for future public access are known.

Historic and Archaeological Resources

The Northeast Lakes shoreline jurisdiction does not include any sites known to be on State or federal historic registers.

6.4.4 Cow Creek and Cow Creek Lakes

Existing and Potential Shoreline Land Use

Existing land use in shoreline jurisdiction along Cow Creek and its associated lakes is overwhelmingly in agricultural or open space use. The main exception is Sprague Lake, which features approximately 4.5 acres currently used for resorts and group camps, as well as 2.5 acres of undeveloped land. State and federally owned or managed lands are generally located along the Cow Creek lakes. All land is zoned General Agriculture. Water-oriented uses consist of recreational sites and utility infrastructure, described further below.

Except for limited new or re-development potential at the existing sites on Sprague Lake, no changes in land use are expected. Low-intensity agriculture will remain, and the state and federal lands will likely remain unchanged except for public access upgrades and ecological enhancements. This area has some ongoing cooperative restoration efforts between Adams Conservation District, Ecology, and property owners.

Shoreline Transportation and Utilities

Cow Creek and Cow Creek Lakes feature a variety of transportation and utilities (Table 6-5). Several bridges or creek crossings were not captured in the GIS-generated summary data. This includes four features in the Cow Creek 1- Palouse to Benge-Washtucna Road reach: a road bridge serving State Route 26, a former railroad crossing

(now serving the Columbia Plateau Trail), and two other crossings serving minor roads. This includes a railroad crossing in the Cow Creek 2- Scablands reach. In the Cow Creek 3- Wetland Complex reach, this includes a crossing for the East Ralston-Benge Road and about a half dozen other minor crossings. Finally, in the Cow Creek 7- Sprague Lake Outlet reach, this includes a bridge serving Danekas Road and one other crossing.

Four dams are located in this area. All four of these dams are used for irrigation and recreation purposes. In the Cow Creek 4- Harder Road Area reach is Harder Dam (State ID: AD34-1256), which dates to 1930. In the Cow Creek 5- Hills Road Area reach is Sheep Springs Dam (State ID: AD34-440), which dates to 1906. In the Cow Creek 7- Sprague Lake Outlet reach is Sprague Lake Dam (State ID: AD34-313), which dates to 1920. Sprague Lake Dam impounds Sprague Lake, by far the largest impoundment in the County. In the Cow Lake reach is Cow Lake Dam (State ID: AD34-1267), which dates to 1935.

Table 6-5. Cow Creek and Cow Creek Lakes: transportation and utilities.

Lake/Reach	Roads (lineal feet)	Bridges	Rail (lineal feet)	Dams
Cow Creek 1- Palouse to Benge-Washtucna Road	3,422	2	2,851	--
Cow Creek 2- Scablands	1,072	--	11,990	--
Cow Creek 3- Wetland Complex	1,938	--	3,195	--
Cow Creek 4- Harder Road Area	342	--	--	1
Cow Creek 5- Hills Road Area	416	1	--	1
Cow Creek 6- Finnel to Cow Lake	--	--	--	--
Cow Creek 7- Sprague Lake Outlet	1,284	--	--	1
Cow Creek PAW	--	--	--	--
Cow Lake	--	--	--	1
Finnell Lake	--	--	--	--
Hallin Lake 1- Public Access	--	--	--	--
Hallin Lake 2- Agriculture	--	--	--	--
Sprague Lake 1- Open Space	--	--	2,004	--
Sprague Lake 2- Residential	--	--	--	--
Sprague Lake 3- Harper Island	--	--	1,510	--
Sprague Lake 4- Developed	--	--	--	--

Existing and Potential Shoreline Public Access

WDFW maintains a Water Access Site at Cow Lake. The site includes boat launch (launch type: hand launch [dirt]). Motorized boats are allowed. Camping is also available at this location.



Figure 6-1. WDFW Cow Lake Water Access Site (Source: WDFW)

Sprague Lake features several locations with access to the water, including a WDFW Water Access Site. The WDFW site includes a boat launch (launch type: concrete). Motorized boats are not allowed. Also located on Sprague Lake are two private resorts that offer a boat launch. On the northwest shore is the Four Seasons Campground and Resort. On the eastern shore is Sprague Lake Resort (located in Lincoln County).

A notable opportunity for visual public access is the Columbia Plateau Trail, which crosses through shoreline jurisdiction in the Cow Creek 1- Palouse to Benge-Washtucna Road reach. Columbia Plateau Trail State Park is a 4,109-acre, 130-mile-long rail-bed trail that traces the 1908 original path of the Spokane, Portland, and Seattle Railroad. The Burlington Northern Company abandoned the rail line in 1987, and Washington State Parks acquired the land in 1991. A second regional trail, John Wayne Pioneer Trail/Iron Horse Trail, crosses Cow Creek farther upstream, between the Cow Creek 3- Wetland Complex and Cow Creek 4- Harder Road Area reaches. The trail is the old railbed of the Chicago-Milwaukee-St. Paul-Pacific Railroad, which has been converted to full access from North Bend to Vantage, with the remaining sections east of Vantage with more limited accessibility.

As far as potential public access, in the Recreational Uses section of the Land Use Element of the Comprehensive Plan, Policy 4 states that “Sprague Lake is a natural location to allow and promote recreational opportunities. Other waterbodies, such as Cow Creek and those identified within Adams County’s Shoreline Master Program, also may be suitable for outdoor recreational development.”

Historic and Archaeological Resources

The lone historic register site in Adams County shoreline jurisdiction spans Cow Creek. The Cow Creek Viaduct (shown in Figure 6-2), dating to 1908, is listed on the Washington Historic Register.



Figure 6-2. Cow Creek Viaduct (Source: DAHP)

6.4.5 Lower Crab Creek

Existing and Potential Shoreline Land Use

Existing land use in shoreline jurisdiction along Lower Crab Creek is agriculture or open space, though a relatively small amount (8.1 acres) in the Lower Crab Creek 1-Agriculture reach is single-family residential. Much of Lower Crab Creek shoreline jurisdiction is government owned or managed, in large part due to the presence of the Columbia National Wildlife Refuge and the Seep Lake Wildlife Area. Most land is zoned General Agriculture, with the exception of 8.8 acres that is zoned Rural Residential. No water-oriented uses were identified.

Except for limited re-development and improvements at the existing single-family residential properties, no changes in land use are expected. Moderate-intensity

agriculture will remain, and the state and federal lands will likely remain unchanged except for public access upgrades and ecological enhancements.

Shoreline Transportation and Utilities

A limited number of roads are found in the Lower Crab Creek shoreline jurisdiction (Table 6-6). While only one bridge (over McManamon Road) is identified in the GIS-generated summary data, at least four more appear to cross Lower Crab Creek. This includes two bridges in the Lower Crab Creek 1- Agriculture reach: one road bridge serving State Route 26 and another serving South Solbeck Road. This also includes two bridges in the Lower Crab Creek 2- National Wildlife Refuge reach: one road bridge serving South Barton Road and a footbridge located to the south of Black Lake.

Table 6-6. Lower Crab Creek: transportation and utilities.

Lake/Reach	Roads (lineal feet)	Bridges	Rail (lineal feet)	Dams
Lower Crab Creek 1- Agriculture	446	--	--	--
Lower Crab Creek 2- National Wildlife Refuge	805	1	--	--
Lower Crab Creek 3- Seep Lake Wildlife Area	--	--	--	--

Existing and Potential Shoreline Public Access

The Lower Crab Creek shoreline jurisdiction does not include any existing public access sites. No plans for future public access are known.

Historic and Archaeological Resources

The Lower Crab Creek shoreline jurisdiction does not include any sites known to be on State or federal historic registers.

6.4.6 Palouse River

Existing and Potential Shoreline Land Use

Existing land use in shoreline jurisdiction along the Palouse River is entirely classified as agriculture. Relatively little of this land is government owned or managed. Land in the shoreline jurisdiction of the Palouse River is predominantly zoned General Agriculture, with the exception of the western portion, which is zoned Rural Residential. No water-oriented uses were identified.

Except for limited re-development and improvements at the existing single-family residential properties, no changes in land use are expected. Low- and moderate-intensity agriculture will remain.

Transportation and Utilities

The Palouse River 2- Agriculture reach features less than a half mile each of both roads and railroads (Table 6-7). While no bridges are indicated by the GIS-generated summary data, four bridges appear to cross the Palouse River in this area. One bridge is in the Palouse River 1- Rural Residential reach: a road bridge serving Old Washington 26. Three bridges are in the Palouse River 2 reach: a railroad bridge southwest of Hooper, a road bridge serving Old Washington 26 at Hooper, and a road bridge serving State Route 26 at the eastern end of the reach.

Table 6-7. Palouse River: transportation and utilities.

Lake/Reach	Roads (lineal feet)	Bridges	Rail (lineal feet)	Dams
Palouse River 1- Rural Residential	212	--	--	--
Palouse River 2- Agriculture	2,091	--	1,782	--
Palouse River 3- Scablands	--	--	--	--
Palouse River 4- Braided Channel	--	--	--	--

Existing and Potential Shoreline Public Access

The Palouse River shoreline jurisdiction does not include any existing public access sites, although the bridges described above do provide viewing opportunities. No plans for future public access are known.

Historic and Archaeological Resources

The Palouse River shoreline jurisdiction does not include any sites known to be on State or federal historic registers.

6.4.7 Rock Creek

Existing and Potential Shoreline Land Use

Three-quarters of the land in shoreline jurisdiction along Rock Creek is currently used for open space; the remaining quarter is used for agriculture. The majority (77%) of land along Rock Creek is under the control of the Bureau of Land Management. Land in this area is zoned General Agriculture. No water-oriented uses were identified.

No changes in land use are expected.

Transportation and Utilities

Although no roads, bridges, rails or dams are included in the land use analysis results, one road (Breedon Road) appears to transect shoreline jurisdiction via a bridge.

Existing and Potential Shoreline Public Access

The Rock Creek shoreline jurisdiction does not include any existing public access sites. No plans for future public access are known.

Historic and Archaeological Resources

The Rock Creek shoreline jurisdiction does not include any sites known to be on State or federal historic registers.

6.5 Summary

With a total population of 19,200, the County ranks thirty-first of Washington's thirty-nine counties in terms of total population. Under the most likely population projection, the County population would grow to 27,205 by the year 2040.

Based on previously issued shoreline permits, shoreline development activities are very rare in the County. Only two shoreline permits have been issued since 2006.

Current land use in shoreline jurisdiction is dominated by agriculture and open space. Government ownership or management in the County's shoreline jurisdiction is common: approximately 27 percent of shoreline jurisdiction is owned or managed by state or federal government agencies. Zoning in shoreline jurisdiction is typically General Agriculture. Water-oriented uses in the County are typically limited to recreational sites such as boat launches, or uses related to water resource management, such as dams or withdrawals.

The County's shoreline jurisdiction includes extensive amounts of roads and railroads. Six dams are located in shoreline jurisdiction.

The County features several existing locations for accessing waters in shoreline jurisdiction. The one location identified for potential future public access is at County-owned property on the south side of Rodeo Lake.

The County includes just one historic register property in shoreline jurisdiction, the Cow Creek Viaduct.

Adams County as a whole has a low level of anticipated growth or land use changes, and that growth and change would be concentrated in urban areas outside of shoreline jurisdiction. As mentioned above, the primarily agriculture/open space use of shoreline jurisdiction would remain into the foreseeable future. Some new, but limited, development/redevelopment is likely on Rodeo Lake and Sprague Lake.

7 SHORELINE MANAGEMENT RECOMMENDATIONS

The following are recommended actions for translating inventory and characterization findings into the draft SMP policies, regulations, environment designations, and restoration strategies for areas within shoreline jurisdiction. In addition to the following analysis-specific recommendations, the updated SMP will incorporate all other requirements of the Shoreline Management Act (RCW 90.58) and the Shoreline Master Program Guidelines (WAC 173-26).

7.1 Environment Designations

As outlined in WAC 173-26-191(1)(d), “Shoreline management must address a wide range of physical conditions and development settings along shoreline areas. Effective shoreline management requires that the shoreline master program prescribe different sets of environmental protection measures, allowable use provisions, and development standards for each of these shoreline segments.” In WAC 173-26-211(2)(a), the Guidelines further direct development and assignment of environment designations based on “existing use pattern, the biological and physical character of the shoreline, and the goals and aspirations of the community as expressed through comprehensive plans...”

The County’s current Shorelines Management Master Program utilizes a system of three environment designations: Conservancy, Rural, and Suburban. Suburban is applied only to a portion of Sprague Lake that contains the Four Seasons Campground and Resort (Sprague Lake 4- Developed) and to the developed portion of Rodeo Lake (Rodeo Lake 2- Residential). Rural applies to a portion of the Sprague Lake 1- Open Space reach, Owl Lake, Rock Creek, Cow Creek, and the Palouse River. The remainder of the lakes included in the original SMP are designated Conservancy. An environment designation for Lower Crab Creek was not included in the original maps. The shoreline environment designation map has not been modified since it was originally developed

in 1977, and thus the environment designation assignments may no longer provide the best fit with the existing biological and land use character; in addition, several waterbodies have been added or removed from shoreline jurisdiction.

The Guidelines recommend use of six unique environments: Aquatic, Natural, Urban Conservancy, Rural Conservancy, Shoreline Residential, and High Intensity. Urban Conservancy, Shoreline Residential, and High Intensity are each intended by the Guidelines to be applied only in Cities, UGAs, and intensely developed rural areas. However, each jurisdiction may use “alternative” environment designations, as appropriate, as long as they provide equal or better protection than the standard.

Based on the existing SMP’s characterization and mapping of its three environment designations, it appears that the County’s “Conservancy” designation is generally equivalent to Ecology’s “Natural” and “Rural Conservancy” designations, the County’s “Rural” designation is generally equivalent to Ecology’s “Rural Conservancy” designation, and the County’s “Suburban” designation is generally equivalent to Ecology’s “Shoreline Residential” and “High Intensity” designations. If the County decides to retain the existing three designation categories, this could likely be accomplished with some careful revision and development of clear purpose, designation criteria, and management policies. Preliminarily, it also appears that much of the original mapping of environment designations could be retained, with few alterations.

An additional option would be to add Ecology’s “Natural” designation to the County’s existing categories, which could be applied strictly to federal lands such as the National Wildlife Refuge.

7.2 General Policies and Regulations

7.2.1 Archaeological and Historic Resources

- The findings of this Shoreline Analysis Report do not suggest a need for additional regulations beyond those mandated by the SMP Guidelines.

7.2.2 Critical Areas

The County and Cities should consider whether their critical areas regulations should be incorporated into the SMP by reference or through direct inclusion. The latter method is generally recommended, particularly when the critical areas regulations have not been updated recently and thus may require considerable revision to meet the most current scientific standards as mandated by WAC 173-26-201(2)(a). Either method of

incorporation will require some modification of the County's critical areas regulations as they apply in shoreline jurisdiction to meet SMA criteria. For example:

- Any exceptions, such as reasonable use, will need to be removed as the appropriate SMA process for such action is through the Shoreline Variance.
- The County's critical areas regulations do not establish a stream typing system or establish buffers for streams based on their type. Most of the County's streams are either shorelines (and thus will have a buffer developed for them as part of the SMP update) or are non-regulated artificial features created for agriculture. However, these regulations should be revisited to assess if changes are needed.
- The County's wetlands regulations generally look up-to-date, except that the delineation method needs to be amended to reference the latest federal manual. They will still need to be reviewed carefully to ensure consistency with the latest Ecology guidance.

7.2.3 Flood Hazard Reduction

There aren't any known flooding problems that impact developed areas in unincorporated Adams County, and there do not appear to be any structural flood hazard reduction measures within shoreline jurisdiction. The County typically struggles with limited water supply. Aside from providing the minimum required language, no additional regulatory emphasis or attention seems necessary.

7.2.4 Public Access

- Through visioning and other SMP outreach processes, identify opportunities to improve existing public access sites or to provide new sites. One topic for potential community discussion is whether there is sufficient shoreline public access in proximity to County population centers. A second topic for potential community discussion is whether there is sufficient public access to rivers and streams (most existing public access sites are at lakes). While some rivers and streams may not be amenable to certain types of active recreation (e.g. boating), public access sites along rivers and streams can provide great opportunities for passive recreation (e.g. wildlife watching) and visual access to the shoreline.
- As plans for future shoreline public access are developed, coordinate with other agencies that provide public access in the County (e.g. WDFW) to harmonize plans.

7.2.5 Shoreline Vegetation Conservation

Build on the existing protections provided in the County's critical areas regulations, paying special attention to measures that will promote retention of shoreline vegetation,

replacement of invasive vegetation with native vegetation, and development of a well-functioning shoreline which provides both physical and habitat processes.

- Ensure that vegetation provisions allow for appropriate modifications to accommodate preferred uses, particularly important agriculture modifications, water-dependent developments, other water-oriented uses, and public access and recreation.
- Consider development of environment designation-specific, and possibly waterbody-specific, buffer and/or setback strategies that meet requirements for environmental protection and recognition of local conditions.

7.2.6 Water Quality, Stormwater, and Nonpoint Pollution

Consider incorporating regulations to facilitate maximum implementation of TMDL plans and Pollution Control Programs, and controlling introduction of 303(d)-listed pollutants for which TMDLs have not yet been prepared.

7.3 Shoreline Modification Provisions

7.3.1 Shoreline Stabilization

There are only a few known areas of shoreline stabilization, generally associated with stream crossings. Aside from providing the minimum required language, no additional regulatory emphasis or attention seems necessary.

7.3.2 Piers and Docks

There do not appear to be any private residential pier or dock structures in Adams County. If that is the case, this section may not be needed and all standards for over- and in-water structures could be addressed in Boating Facilities.

7.3.3 Fill

Restoration fills can benefit shoreline functions and should be encouraged, including improvements to shoreline habitats, material to anchor LWD placements, and as needed to implement shoreline restoration.

7.3.4 Breakwaters, Jetties, Groins and Weirs

Consider prohibiting new breakwaters, jetties, groins, or weirs except where they are essential to restoration or maintenance of existing water-dependent uses or support maintenance of water supply for livestock.

7.3.5 Dredging and Dredge Material Disposal

Based on the County's existing shoreline condition and uses, there appears to be little to no demand for dredging or dredge material disposal. Consider prohibiting these modifications except for rare circumstances where it might be used in shoreline restoration.

7.3.6 Shoreline Habitat and Natural Systems Enhancement Projects

Consider incentives to encourage restoration projects, particularly in areas identified as having lower function. Emphasize that certain fills, such as streambed gravels or material to anchor logs, can be an important component of some restoration projects.

7.4 Shoreline Uses

7.4.1 Agriculture

Maintenance of existing agriculture is commercially and culturally important to Adams County. This should be recognized in shoreline policies.

7.4.2 Aquaculture

Based on the County's existing shoreline condition and uses, there appears to be little to no demand for aquaculture facilities or practices. Consider prohibiting this use.

7.4.3 Boating Facilities

Adams County includes only a couple of commercial and public boating facilities, primarily on Sprague Lake (public boat launch and a boat launch and docks at the Four Seasons Campground and Resort), and little likelihood of new facilities. Regulations for the over- and in-water components should be developed to provide applicants with as much predictability as possible, while still allowing for an appropriate amount of flexibility based on site-specific conditions and use-specific needs.

7.4.4 Forest Practices

The forest practices use is not found in Adams County; consider prohibiting it.

7.4.5 Industry

The County has very limited industrial use in shoreline jurisdiction.

7.4.6 In-stream Structural Uses

Small-scale in-stream structures (dams) intended to increase water storage are found in Adams County, particularly on Cow Creek. There are also a number of irrigation diversion and discharge structures in many waterbodies. Regulations need to

accommodate anticipated new diversion structures, and repair/maintenance and possible expansion of existing projects.

7.4.7 Mining

This use is not found in Adams County. Recommend prohibiting it or requiring a shoreline conditional use permit.

7.4.8 Recreational Development

- Consider whether any policies and regulations are needed to address off-road vehicle use in shoreline jurisdiction.
- Work with local, state and federal agencies that provide shoreline recreation to ensure consistency between recreational area management plans and SMP policies and regulations.

7.4.9 Residential Development

Residential uses are extremely limited in the unincorporated County, and are found in shoreline jurisdiction only on Rodeo Lake and a couple of locations on Cow Creek. Where allowed, residential development should proceed in a manner consistent with the control of pollution and prevention of damage to the shoreline environment.

7.4.10 Transportation and Parking

Allow for maintenance and improvements to existing roads, railroads and parking areas, and for necessary new roads and parking areas where other locations outside of shoreline jurisdiction are not feasible.

7.4.11 Utilities

Allow for new, expanded, and maintained utilities with criteria for location and vegetation restoration as appropriate.

7.5 Restoration Plan

A Restoration Plan document will be prepared at a later phase of the Shoreline Master Program update process, consistent with WAC 173-26-201(2)(f). The Shoreline Restoration Plan will address the following six subjects (WAC 173-26-201(2)(f)(i-vi)) and incorporate findings from this Shoreline Analysis Report:

- (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;*
- (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; and*
- (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.*

The Restoration Plan will “include goals, policies and actions for restoration of impaired shoreline ecological functions. These master program provisions should be designed to achieve overall improvements in shoreline ecological functions over time, when compared to the status upon adoption of the master program.” The Restoration Plan will mesh potential projects identified in this report with additional projects, regional or local efforts, and programs of each jurisdiction, watershed groups, and environmental organizations that contribute or could potentially contribute to improved ecological functions of the shoreline.

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9 LIST OF ACRONYMS AND ABBREVIATIONS

ACC.....	Adams County Code
cfs.....	Cubic Feet per Second
CMZ	Channel Migration Zone
Corps.....	U.S. Army Corps of Engineers
Ecology	Washington Department of Ecology
ESA.....	Endangered Species Act
FEMA	Federal Emergency Management Agency
GIS.....	Geographic information systems
GMA.....	Growth Management Act
IBA.....	Important Bird Area
LWD	Large Woody Debris
MRLC.....	Multi-Resolution Land Characteristics
NLC.....	National Land Cover
NPDES	National Pollutant Discharge Elimination System
NWI.....	National Wetlands Inventory
OHWM	Ordinary High Water Mark
PHS.....	Priority Habitats and Species
RCW	Revised Code of Washington
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SMP	Shoreline Master Program
TMDL.....	Total Maximum Daily Load
USFWS.....	U.S. Fish and Wildlife Service
USGS	U.S. Geological Service
WAC.....	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WRIA	Water Resource Inventory Area

APPENDIX A

Adams County Assessment of Shoreline Jurisdiction

20 March 2014

Loren Wiltse
Planning Director
Adams County Building and Planning
425 E Main, Suite 200
Othello, WA 99344

Re: Proposed Adams County Shoreline Jurisdiction

Dear Loren:

The Watershed Company has developed the attached proposed maps of shoreline jurisdiction, illustrating the minimum jurisdiction option. The floodplain and wetland buffers options are not illustrated, but are described below. This information is provided to assist the County in selecting its preferred shoreline jurisdiction option.

EXISTING SHORELINE JURISDICTION PER CURRENT SMP

Under the County's current Shoreline Master Program (SMP), the following 3 streams and 17 lakes are shorelines of the state:

- Palouse River (mainstem)
- Cow Creek
- Rock Creek
- Black Lakes
- Cow Lake
- Finnell Lake
- Fourth of July Lake
- Green Lake
- Hallin Lake
- Linda Lake
- Owl Lake
- Palm Lake
- Pines Lake (Alkali Lake)
- Rodeo Lake
- Sprague Lake
- Thread Lake
- Twelve Mile Lake
- Twelve Mile Slough
- Two unnamed lakes

Existing shoreline jurisdiction includes the shorelands extending 200 feet from the ordinary high water mark and identified associated wetlands, and includes the floodway and 200 feet of floodway-adjacent floodplain where present.

PROPOSED SHORELINE JURISDICTION

The first step in updating the map of shoreline jurisdiction is to collect data relevant to the jurisdiction assessment, namely:

1. Shoreline Management Act Suggested Points, Arcs and Polygons: Under contract to Ecology, the United States Geological Survey (USGS) has identified the upstream limits of shoreline streams and rivers based on projected mean annual flow of 20 cubic feet per second (cfs) (Higgins 2003). The mapping only included stream centerlines (not ordinary high water marks), which were manually adjusted to match the 2013 aerial.

Ecology also provided a data set of “suggested” lakes (using the USGS’ National Hydrography Dataset) that may be 20 acres or greater in size upon analysis. Data representing lake shorelines was compared to 2013 aerial photos. An overlay of the data with the aerial generally revealed some large-scale inconsistencies – in some cases, the NHD showed a larger waterbody than is present and in other cases, a smaller waterbody. Where neither the NHD nor NWI polygons provided a good representation of the probable lake area, the boundary was either manually digitized or the NHD layer was modified, and the resulting polygon area was measured using GIS.

NWI mapping also provided supplementary information for purposes of determining whether some features were lakes or wetlands.

2. Floodways and Floodplains: FEMA DFIRM digital data representing floodways and floodplains was collected through Ecology. There was no FEMA-mapped floodway associated with the shorelines.
3. Wetlands: The U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) data set was used to identify wetlands that are potentially associated with the shoreline. For mapping purposes, all wetlands are shown as potentially being an element of shoreline jurisdiction if they are in or partially in the area 200 feet upland of the OHWM or are in or partially in the floodplain. Other wetlands outside those parameters may also be shoreline-associated wetlands, but that assessment would need to be made at the site-specific scale at the time of a development application.

MINIMUM JURISDICTION

The proposed illustration of the minimum shoreline jurisdiction is provided on the *Minimum Shoreline Jurisdiction* exhibit. The basic steps are to illustrate 200 feet upland of OHWM, add floodways and floodplains, and then clip jurisdiction to extend the greater

of 200 feet from the OHWM or 200 feet of floodplain upland from the floodway (where present). Shoreline-associated wetlands remain a separate feature on the shoreline jurisdiction map because they have lower accuracy and are more subject to variation based on future site-specific delineation and analysis. The minimum upland shoreline jurisdiction area, including the potentially associated wetlands, is approximately 7,560 acres.

Rivers/Streams

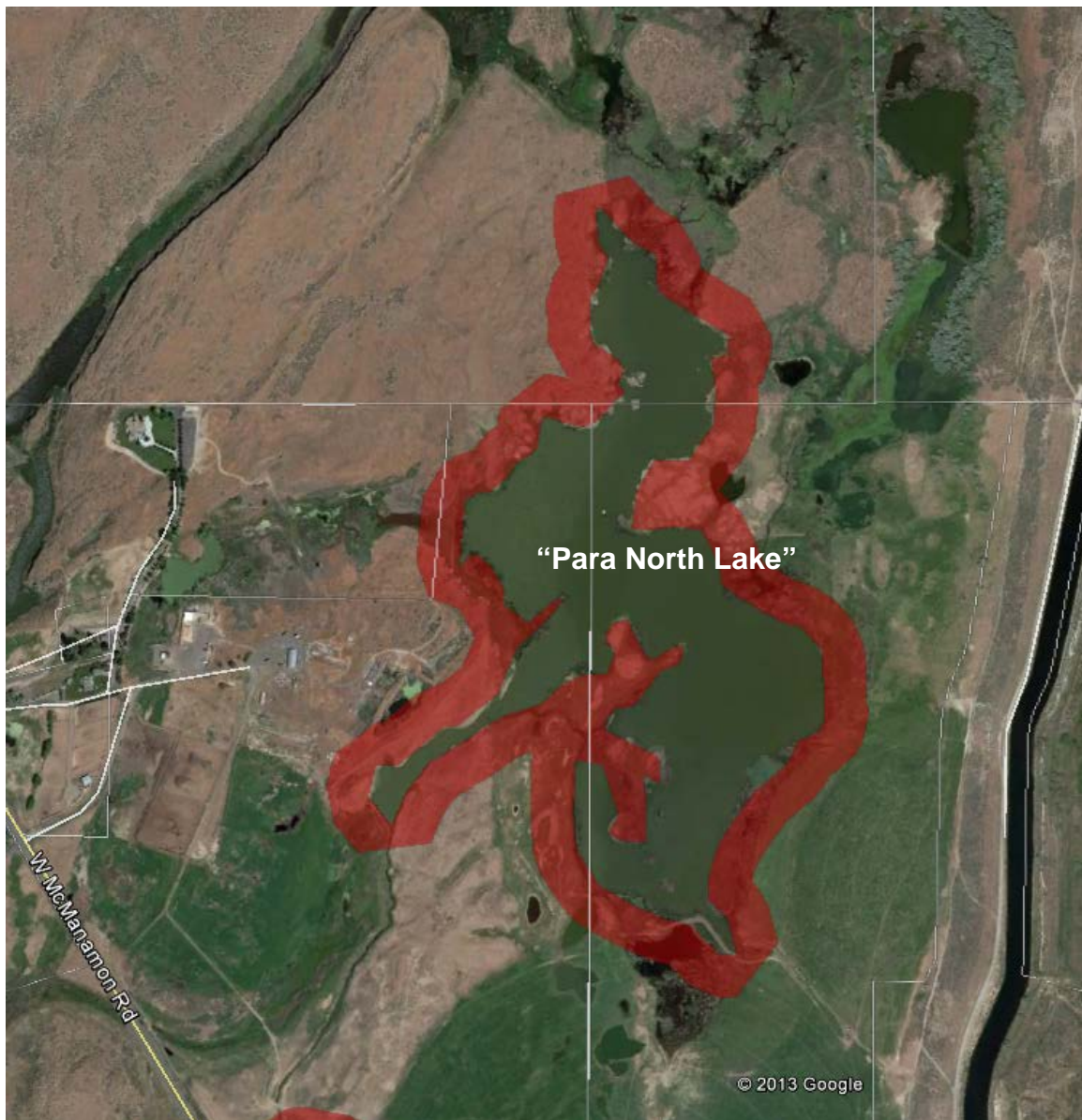
Based on Ecology's "suggested shoreline points" and "suggested shoreline arcs" data and consistent with the existing SMP, Rock Creek, Crab Creek and the Palouse River are all shoreline jurisdictional streams for their entire lengths in Adams County. Ecology's map layer also indicates that Cow Creek should be considered part of shoreline jurisdiction. However, the USGS report does not support that, and a number of sources provided anecdotal information that suggests Cow Creek should be investigated further to assess whether there is adequate data to remove it from shoreline jurisdiction. The attached maps include Cow Creek while that investigation continues.

Adams County contains other features that may meet the minimum flow requirement (East Low Canal and Potholes Canal, for example), but these are artificial waterbodies constructed and managed as part of the federal Columbia Basin Project. Streams must be a "naturally occurring" body of water in order to be classified as a shoreline stream (WAC 173-22-030(8)).

Lakes

According to Ecology's shoreline data, there are 36 suggested "waterbodies" (lakes, sloughs, etc) present in the County that may be 20 acres or greater. Eight of the 36 waterbodies were eliminated from potential shoreline jurisdiction because they are lakes smaller than 20 acres. Another eight waterbodies were eliminated from shoreline jurisdiction because they are wetlands (as indicated by professional judgment based on aerial photos and NWI assessment). A single lake shown by Ecology as a separate waterbody is actually part of Green Lake.

During review of the aerial photos, two additional waterbodies not previously identified in the existing SMP or in the NHD were mapped as shoreline lakes: "Para North Lake" and "Para South Lake" (see images below). These names are placeholders assigned temporarily based on present land ownership. The two lakes are still under investigation to assess whether they should be excluded from shoreline jurisdiction based on criteria other than their size (e.g., whether they were constructed to meet a specific farm need, among others).





Finally, two waterbodies that were mapped in the existing SMP as shoreline lakes have been removed from shoreline jurisdiction: Twelve Mile Creek and Twelve Mile Slough. These features show little to no surface water in aerial photos as far back as 1996. The final proposed list of shoreline lakes is provided below, and includes nine new lakes.

Shoreline Lake Name	In Current SMP?	Shoreline Lake Name	In Current SMP?
"Para South Lake"	N	Hutchinson Lake	N
"Para North Lake"	N	Linda Lake	Y
Alkali Lake/Pines Lake	Y	Morgan Lake	N
Black Lake	Y	Owl Lake (includes previous unnamed lake)	Y
Campbell Lake	N	Palm Lake	Y
Cow Lake	Y	Pit Lakes	N
Finnell Lake	Y	Rodeo Lake	Y
Fourth of July Lake	Y	Royal Lake	N

Shoreline Lake Name	In Current SMP?	Shoreline Lake Name	In Current SMP?
Green Lake (includes previous unnamed lake)	Y	South Teal Lake	N
Hallin Lake	Y	Sprague Lake	Y
Herman Lake	N	Thread Lake	Y

Rodeo Lake is connected by a mostly submerged culvert to a small wetland/pond system south of SR 26. Because the two features are not connected by an OHWM, and regular flooding events do not connect the two features, the southerly pond system is considered an associated wetland rather than a portion of the shoreline lake.

OTHER JURISDICTION OPTIONS

The information above describes assembly of the minimum shoreline jurisdiction. The County may further elect to expand jurisdiction to include 1) all or part of the 100-year floodplain, and/or 2) buffers of associated wetlands¹ that would otherwise encompass areas outside of shoreline jurisdiction. Under either of these options, the area of shoreline jurisdiction increases and additional properties or areas of properties would be subject to the SMP and its additional layer of permitting requirements. These options should be considered by the County.

Floodplain

The 100-year floodplain option would encompass the minimum shoreline jurisdiction depicted on the maps and the remaining floodplain that is beyond the 200 feet of floodplain adjacent to the OHWM. This option would increase the total area of jurisdiction by 5,427 acres.

Use of this option would allow for maximum integration and consistency of the SMP with Adams County Municipal Code flood management regulations.

Wetland Buffers

The attached maps do not depict the expansion of shoreline jurisdiction to include wetland buffers. Classification of associated wetlands, which would ultimately

¹ The RCW actually allows for expansion of jurisdiction to include *critical area* buffers, not just wetland buffers. However, this generally is limited to wetland buffers in practice. The nature of non-shoreline streams as a mostly perpendicular element to a shoreline waterbody already brings their full buffer into shoreline jurisdiction. Geologically hazardous areas are generally assigned a setback, not a buffer. Critical aquifer recharge areas (CARAs) are not addressed in the SMA or SMP Guidelines, and CARAs further are not assigned a setback or a buffer.

determine the regulatory buffer, has not been conducted and would be done on a site-by-site basis at the time of a development application.

RCW 36.70A.480(6) says "If a local jurisdiction's master program does not include land necessary for buffers for critical areas that occur within shorelines of the state, as authorized by RCW 90.58.030(2)(f), then the local jurisdiction shall continue to regulate those critical areas and their required buffers pursuant to RCW 36.70A.060(2)."

Ecology's SMP Handbook chapter on Shoreline Jurisdiction explains the implications of this RCW as follows:

If the local government chooses not to extend its shoreline jurisdiction under RCW 90.58.030(2)(f)(ii), the CAO will protect the entire critical area and its buffers (see RCW 36.70A.480(6)). The CAO will continue to apply to the entire critical area and its buffers, even after SMP approval. However, the SMP will also apply to the portion(s) of the critical area and its buffers that lie within shoreline jurisdiction. This means the subject critical area and some or all of its buffers will have "dual coverage" with regulation by both the SMP and the CAO.

Please call if you have any questions.

Sincerely,



Amy Summe
Environmental Planner

Enclosures

Memo

To: Angela San Filippo, Shoreline Planner, SEA CRO
From: Patricia L Olson, PhD, LHG, Senior Hydrogeologist, SEA HQ
CC: Sara Hunt, ERO SEA Section Manager
Brian Lynn, Coastal Zone and Shorelines Unit Manager, SEA, HQ
Date: August 12, 2014
Re: SMP Jurisdiction determination request for Cow Creek Adams County

SMP JURISDICTION EVALUATION: COW CREEK, ADAMS COUNTY

Angela San Filippo requested assistance in determining the SMP jurisdiction point on Cow Creek. The most recent USGS study that estimates the upper SMP jurisdiction points (Higgins 2003) identifies the Cow Creek (Adams County) SMP jurisdiction point located on Negro Creek approximately 4.3 miles upstream from Sprague Lake (Figure 1). Cow Creek is the outlet of Sprague Lake and Negro Creek is the inlet. WAC 173-18-050 identifies Cow Creek as a SMP stream from Lugenbeal Creek confluence (Sec 15, T19N, R37E) located upstream of Cow Lake downstream to the Palouse River. The WAC identifies Negro Creek (Lincoln County) as a SMP stream from the confluence of Negro Creek and unnamed creek in the town of Sprague (Sec.23, T21N, R38E) downstream to mouth at Sprague Lake (Sec.21, same township). Higgins (2003) study shows SMP jurisdiction to include all of Cow Creek and extends to a point higher upstream on Negro Creek.

Cow Creek is a major tributary to Palouse River. Its contributing area is the largest at 22% of the Palouse watershed (Carroll 2007). Cow Creek is located in the more arid area of the watershed with precipitation ranging from 17.2 inches in the upper watershed to 12.5 inches at the Cow Creek confluence with the Palouse River resulting in less runoff contribution in cubic feet per square mile (cfs) than other major tributaries (Tables 1 and 2).

Table 1: Ritzville appears to be more representative of Cow Creek watershed downstream of Sprague Lake.

Stations/ points	Average Precipitation (inches) by WY at USHCN stations			Range of MAP (inches) by point			
	Ritzville, WA	Spokane Airport, WA	St John's, WA	Negro Creek headwaters	Negro Creek at Sprague Lake inlet	Cow Creek at Sprague Lake outlet	Cow Creek at Hooper gage
Total record	11.5	16.4	19.7	17.2	14.6	13.6	12.5

Cow Creek flows through a scabland channel formed during the glacial Lake Missoula floods. The creek is underfit now which means that the present day stream is much smaller with lower stream slope, discharge and stream power than the flow that created the valley. Lower stream slope, reduced stream power and a moderate floodplain have contributed to natural ponding as well as artificial impoundments which reduces velocity. While Cow Creek is a perennial stream, flow may become negligible or approach zero in some reaches during the low-flow season of June-

November (data from USGS gaging station 13352300 Cow Creek at Hooper, WA). These conditions may give an impression of mean annual flow less than 20 cfs.

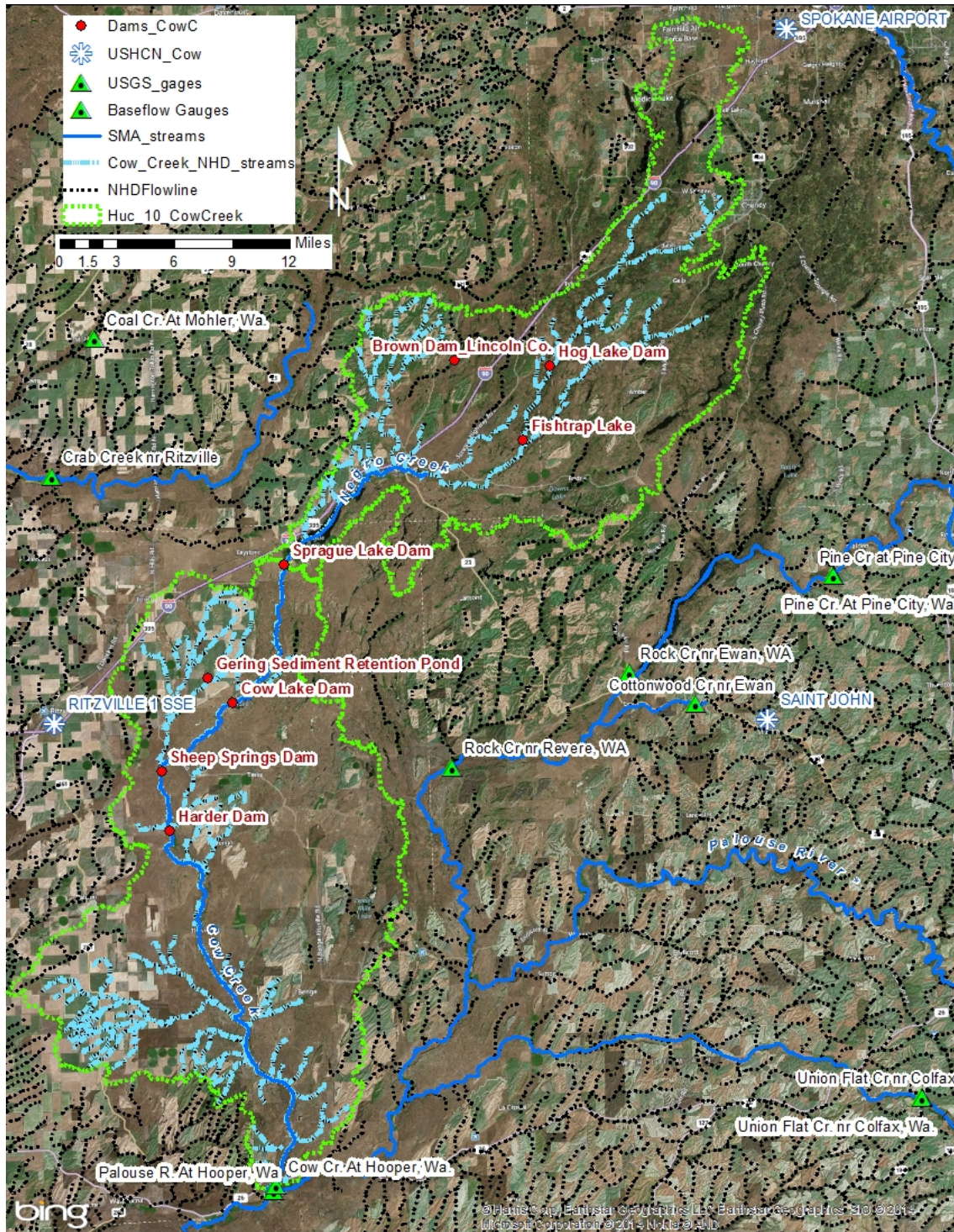


Figure 1: The map shows the USGS gages and NOAA US Historical Climate Network (USHCN) precipitation stations used in the analysis. SMA_streams are the GIS layer shoreline arcs based on Higgins (2003). The light blue stream lines are Cow and Negro Creeks and tributaries extracted from the NHD (National Hydrography Dataset) Plus flow lines. The dam locations on Cow and Negro Creeks are red points.

There are six dams and impoundments along the main channel and major headwater tributaries (Figure 1). Discharge quantity and timing of releases are not known. Sprague Lake Dam construction date is not listed. Cow Lake and Harder Dams were constructed in 1899. Sheep Creek Dam was constructed in 1993. This dam does not have an outlet. Some water flows out of the reservoir west of the dam. The landowners siphon some flow over the dam. Quantities are not known. Hog Lake Dam is owned by WDFW. WDFW requested a permit to raise the dam crest. WDFW may have some information on discharge releases but the dam is in the upper headwaters and any releases will be affected by downstream impoundments. Fishtrap Creek dam was constructed in 1958.

Assessing the SMP jurisdiction point for Cow Creek is not straightforward or conclusive. There is little long-term discharge data and discharge releases and timing from the dams are not known. Moreover groundwater contribution is high (base flow 64-92% of streamflow) during non-snow melt months (Sinclair and Pitz 1999). Thus groundwater appropriations from the Wanapum Basalt (Rosa and Frenchman Springs members) and outburst flood deposits (Glacial Lake Missoula floods) may affect Cow Creek flow especially during low flow season (e.g. Sinclair and Kardouni 2009). Ponding may add to groundwater recharge which then becomes groundwater discharge downstream such as found in Crab Creek (Mastin 2012). Mastin (2009) found that along Crab Creek some reaches require a threshold groundwater flow volume during spring to “wet up” the channel before significant outflow to the stream can occur. Cow Creek has similar groundwater geologic conditions so this phenomenon may occur along Cow Creek. If so stream discharge may vary substantially in a reach depending on whether it is losing or gaining flow through the channel and reaches may appear to have less than 20 cfs MAF during losing conditions.

Assessment

Three USGS regression equations are used to evaluate the mean annual flow (MAF) at gage locations specified in Table 2 and at Cow Creek below Cow Lake and Negro Creek at the suggested SMP point. The regression equations are:

- Determination of upstream boundary points on southeastern Washington streams and rivers under the Requirements of the Shoreline Management Act of 1971 (Higgins 2003). Cow Creek and the other stream gages used in this assessment are located within the Columbia Plateau and Palouse Region identified in Higgins (2003).
- NHDPlus V2, Enhanced Unit Runoff Method (EROM) http://www.horizon-systems.com/nhdplus/NHDPlusV2_documentation.php
- NHDPlus V2, Vogel http://www.horizon-systems.com/nhdplus/NHDPlusV2_documentation.php

The EROM regression includes a “losing streams” methodology that estimates stream flow losses due to excess evapotranspiration (EET) in the stream channels. For example, EROM estimates MAF at the Harder Dam location as 28.5. After EET factor and corrections for reference gages and base flow are applied, the MAF is reduced to 27.4. Both EROM and Vogel use precipitation and temperature data from PRISM data set (1970-2000). Vogel does not include correction or adjustment factors in the NHDPlusV2 database. Both EROM and Vogel methods compute mean

annual precipitation (MAP) using a grid based on the Parameter-elevation Regressions on Independent Slopes Model data (PRISM) from 1970-2000 (<http://www.prismclimate.org>).

Higgins used mean annual precipitation digitized and gridded from the 1930 to 1957 U.S. Weather Bureau (1965) Mean Annual Precipitation, 1930-57, State of Washington maps and didn't use temperature, stream loss assumptions or regulation. Both the PRISM and 1930-57 precipitation maps cover wet, dry and normal precipitation periods (Figure 2).

There is also some limited discharge data on Cow Creek (USGS Station 13352500, Cow Creek at Hooper, WA) (Figure 1). This gage measured continuous daily flow from 02/01/1951 to 11/30/1953 (MAF 35.6 cfs); 4/1/1962-9/30/1972 (MAF 23cfs). This gage has 10 years of continuous daily discharge data. The period of record included wet, dry and normal precipitation (Figure 2, Ritzville USHCN station). There are also miscellaneous discharge measurements (time span ranging from 1904-05; 1970-2001) at the gage location. The MAF annual flow based on the miscellaneous discharge measurements taken during normal precipitation years at Ritzville climate station is 39 cfs. All available data indicate that the MAF at the Cow Creek gage is 29 cfs. Additional USGS gaging stations were used to supplement the evaluation (Table 2). All discharge measurements were converted into cubic foot per square mile (cfs) which provides areal runoff per square mile (Table 2).

Higgins was used to estimate of mean annual discharge (MAF) at the gaging stations, Cow Creek outlet to Cow Lake, and SMP point on Negro Creek use two mean annual precipitation (MAP) scenarios:

- The MAP (14.96 inches) for the Columbia Plateau and Palouse Region basin from Higgins (2003)
- The MAP for the watersheds upstream of each gage and other points from the PRISM grid (1970-2000 data) obtained from the NHDPlus v2 data.

The MAF was also estimated at the above locations using the EROM and Vogel regression equations results from the NHDPlus V2 data. Estimates of MAF for Cow Creek outlet from Cow Lake and the upstream SMP jurisdiction point (Negro Creek) were estimated based on average areal runoff, as cubic feet per square mile (cfs). The average runoff (cfs) for Cow Creek downstream of Cow Lake was an average of cfs from continuous discharge data and miscellaneous discharge data at Cow Creek gage (Table 2). Upstream of Cow Lake, the average runoff was an average of cfs at Cow Creek, Coal Creek and Crab Creek gages (Table 2). For Negro Creek, the average runoff was an average cfs at Coal Creek, Crab Creek and Rock Creek gages (Table 2). The results are shown in Table 2 and summarized:

- Estimated MAFs at Cow Creek gage using Higgins, EROM and Vogel are generally too high. None of these regression methods incorporate regulation.
- The Vogel regression equation MAF estimates MAF are too high, perhaps due to excess evapotranspiration not being incorporated into the equation used to calculate the MAF in the NHDPlusV2 data.
- The MAF estimated using Higgins (2003) has mixed results. When the MAP (14.96 inches) for the Columbia Plateau and Palouse Region basin is used, gages with MAP less than 14.96

inches have MAF estimates higher than measured and those with MAP greater than the average have MAF estimates less than those measured. When the MAP estimated from the PRISM data is used in the Higgins equation, the estimates are closer to measured data. However, the MAP from the PRISM data is not the same mean annual precipitation used to develop the regression equations in Higgins (2003).

- EROM appears to provide reasonable estimates for the Cow Creek basin as does the areal runoff (cfsm).
- The average areal runoff MAF estimates are reasonable and may include some regulation at Sprague, Cow Lake and Harder Dams as these were operating during the continuous discharge record at the gage.

There are many unknowns, such as outflows below each dam and changes to baseflow (groundwater) that can affect the MAF. Without having necessary additional flow data, the USGS regression equations and areal runoff provide the best estimates at this time.

Table 2: The 3 USGS developed regression estimates for mean annual flow (MAF) were used to calculate MAF at gage locations, the SMP jurisdiction point on Negro Creek and at the outlet from Cow Lake. The mean annual precipitation (MAP) used in Higgins was: 1) the average basin MAP for Columbia Plateaus and Palouse Region and 2) the MAP of the Watersheds upstream of each gage and point calculated from the PRISM 1970-2000 grids. Estimated MAFs at Cow Creek gage using Higgins, EROM and Vogel are too high. None of these methods incorporate regulation. The average areal runoff estimate likely does include regulation of Sprague, Cow Lake and Harder Dams as these were operating during the continuous discharge record at the gage.

Discharge estimate methods	USGS 13352300 Cow Creek at Hooper	Cow Creek at Cow Lake dam	Negro Creek at SMP pt	USGS 13349500 Rock Creek nr Ewan	USGS 12464800 Coal Creek At Mohler	USGS 12464770 Crab Creek at Rocky Ford Road nr Ritzville	USGS 1335100 Palouse River at Hooper	# USGS 1335050 Union Flat Creek near Colfax
Drainage area (square miles)	679	324.5	195	523	664.7	384	2500	189
MAF (cfs)	29			84	3.65	44.9	599	37.1
Areal mean annual runoff (cfs/mi)	0.05			0.161	0.056	0.117	0.239	0.196
MAP for watershed above points based on PRISM (inches)	12.5	12.6	16	16.6	12.9	12.1	12.6	17.4
Higgins 2003 using average MAP (14.96 inches)	89.9	37.6	20.6	66	5.6	45.9	418.4	32.6
Higgins using PRISM MAP	46.7	20.1	26.2	97.8	3.2	21.2	224	26.2
EROM	37	25	22	28	1.8	24.1	636	78.2
Vogel	122	75	57	85	11	95.5	923	87.6
Estimate based on average areal runoff (as cfs/mi)	34	22	24					

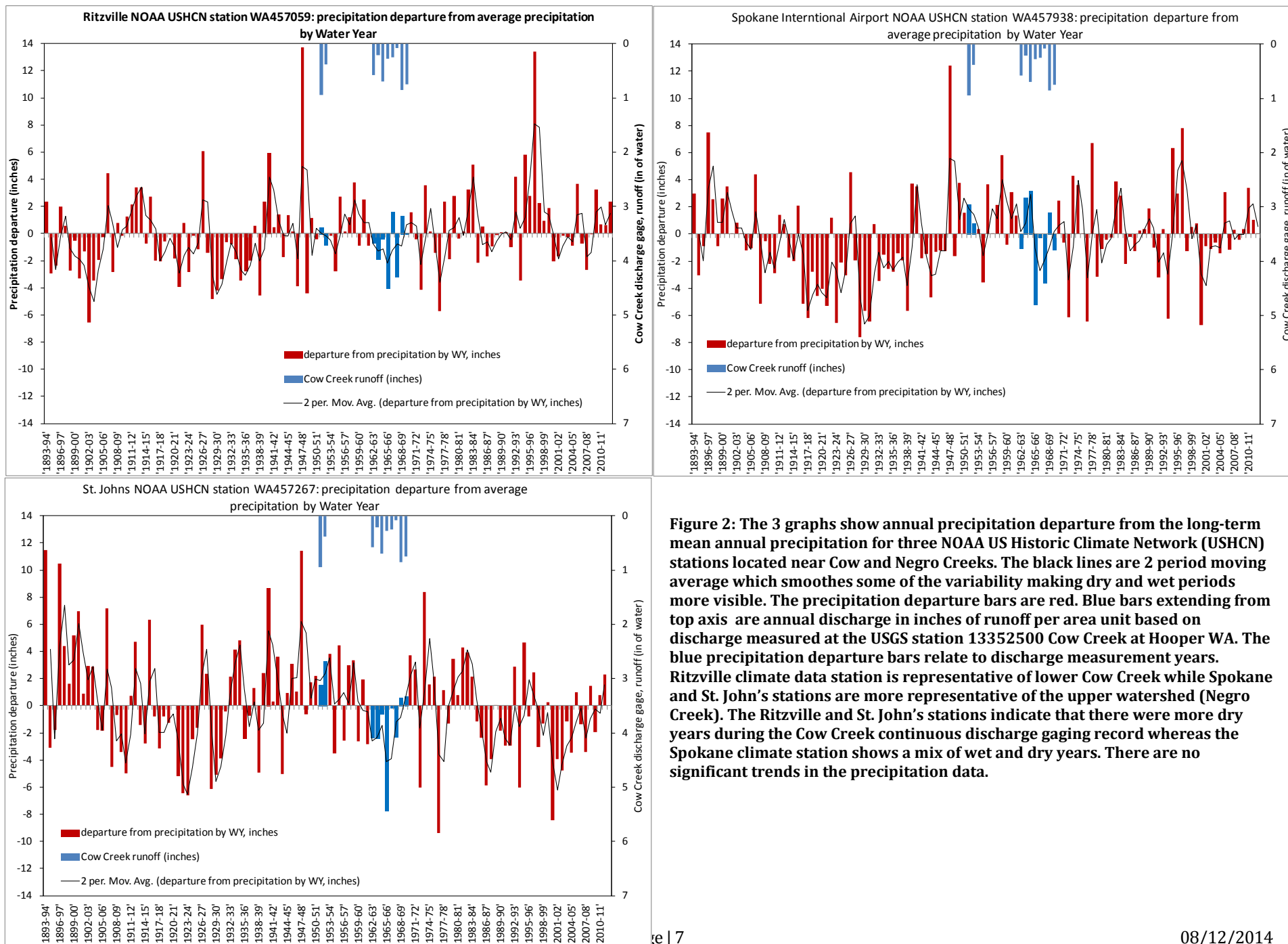


Figure 2: The 3 graphs show annual precipitation departure from the long-term mean annual precipitation for three NOAA US Historic Climate Network (USHCN) stations located near Cow and Negro Creeks. The black lines are 2 period moving average which smoothes some of the variability making dry and wet periods more visible. The precipitation departure bars are red. Blue bars extending from top axis are annual discharge in inches of runoff per area unit based on discharge measured at the USGS station 13352500 Cow Creek at Hooper WA. The blue precipitation departure bars relate to discharge measurement years. Ritzville climate data station is representative of lower Cow Creek while Spokane and St. John's stations are more representative of the upper watershed (Negro Creek). The Ritzville and St. John's stations indicate that there were more dry years during the Cow Creek continuous discharge gaging record whereas the Spokane climate station shows a mix of wet and dry years. There are no significant trends in the precipitation data.

REFERENCES

Carroll, J., 2007. Palouse River Dissolved Oxygen and pH Total Maximum Daily Load study, Water Quality Study Design, Washington State Department of Ecology, Publication No. 07-03-110. <https://fortress.wa.gov/ecy/publications/summarypages/0703110.html> 48 p.

Higgins, J.L., 2003, Determination of upstream boundary points on southeastern Washington streams under the requirements of the Shoreline Management Act of 1971, USGS Water-Resources Investigations Report 03-4042, US Geologic Survey, Tacoma, WA.

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Sinclair, K. and J. Kardouni, 2009, Surface-water/groundwater interactions and near-stream groundwater quality along the Palouse River, South Fork Palouse River, and Paradise Creek, Ecology Publication Number 09-03-007
<https://fortress.wa.gov/ecy/publications/SummaryPages/0903007.html> .

US Weather Bureau, 1965, Mean Annual Precipitation, 1930-57, State of Washington: Portland, Oregon, US Soil Conservation Service, Map M-4430.

APPENDIX B

Shoreline Inventory Map Folio

Available on DVD

APPENDIX C

Shoreline Inventory Data Sources

Appendix C. Shoreline Inventory Elements and Information Sources.

Inventory Element	Information Gathered	Data Source(s)	Assumptions/Limitations
Physical Setting			
Surficial Geology	Geologic classifications	WA Department of Natural Resources, Division of Geology and Earth Resources, Surface Geology	<ul style="list-style-type: none"> Based on broad-scale geologic classifications Useful for broad-scale assessment of geologic conditions Not to be used in place of site-specific studies
Soils	Soil types	USDA NRCS (SSURGO)	<ul style="list-style-type: none"> Based on broad-scale soil mapping Useful for broad-scale assessment of soil conditions Not to be used in place of site-specific studies
Land Use/Development			
Land Use Patterns	Current land use	<ul style="list-style-type: none"> WA Department of Ecology Aerial photos County and public input 	<ul style="list-style-type: none"> Gross-scale characterization (e.g., residential, agriculture) Useful in assessing existing intensity and type of development at broad-scale planning level Data may not be up-to-date
	Future land use	NA	<ul style="list-style-type: none"> Data not available – data gap Useful to anticipate future land use changes at broad-scale planning level
	<ul style="list-style-type: none"> Zoning Comprehensive plan designation 	<ul style="list-style-type: none"> County planning 	<ul style="list-style-type: none"> Zoning data not keyed to parcels Comprehensive Plan data not available – data gap
	Water-oriented uses	<ul style="list-style-type: none"> WA Department of Natural Resources WA Department of Ecology Washington State Parks WA Recreation and Conservation Office Aerial photos County and public input 	<ul style="list-style-type: none"> Map was generated by compiling known public access features, as well as shoreline modifications such as dams Mapping will be further refined as part of analysis
Ownership	Land ownership for parcels within shoreline jurisdiction	State/federal agencies, and derive from assessor and County/public input as well	<ul style="list-style-type: none"> Ownership data is limited to public lands only Data may not be up to date

Inventory Element	Information Gathered	Data Source(s)	Assumptions/Limitations
Transportation	<ul style="list-style-type: none"> Highways Railroads 	WA Department of Transportation	<ul style="list-style-type: none"> Road centerlines are drawn at large-scale, and do not always agree with aerial photo.
	Other Roads	County	
Stormwater/ Sewer facilities	NA	NA	Data not available - data gap
Water Supply	NA	NA	Data not available - data gap
Impervious Surfaces	High-, medium-, and low-intensity land cover areas from USDA land cover map	US Department of Agriculture	<ul style="list-style-type: none"> Useful for broad-scale assessment of impervious surfaces only. Data aggregated to a 30-meter grid
Land Cover (Vegetation)	<ul style="list-style-type: none"> Land cover Vegetation type 	US Geological Survey National Land Cover Data (NLCD)	<ul style="list-style-type: none"> Data aggregated to a 30-meter grid Useful for broad-scale assessment of vegetation coverage only Not useful for accurate characterization of fine-scale data (e.g., parcel level, species composition)
Shoreline Modifications	Overwater structures	<ul style="list-style-type: none"> WA Department of Natural Resources WA Department of Ecology 	<ul style="list-style-type: none"> Overwater structures includes structures such as bridges and dams Data may not be up-to-date Not useful for accurate characterization of fine scale data (e.g., parcel level)
Public Access Areas	<ul style="list-style-type: none"> Parks Trails Launches Recreation sites and areas Water Access Sites 	<ul style="list-style-type: none"> County maps and plans Washington State Parks WA Recreation and Conservation Office WA Department of Natural Resources WA Department of Fish and Wildlife Bureau of Land Management OR/WA US Fish and Wildlife Service 	<ul style="list-style-type: none"> Data may not be up-to-date and may not include all features Data layers from different sources were compiled at different scales

Inventory Element	Information Gathered	Data Source(s)	Assumptions/Limitations
Historical/ Archaeological/ Cultural Sites	<ul style="list-style-type: none"> Historical sites Archaeologically significant sites 	WA Department of Archaeology and Historic Preservation	<ul style="list-style-type: none"> Data represent only known sites; additional, presently unknown sites may exist Protected sites are not mapped
Critical Areas/Other Ecological Conditions			
Geologically hazardous areas	Geohazards, includes: <ul style="list-style-type: none"> Earthquakes Faults and Folds Liquefaction Susceptibility Seismic Design Site Class 	WA Department of Natural Resources, Geology and Earth Sciences Division	<ul style="list-style-type: none"> Data represent only known hazards; additional, presently unknown hazards may exist Useful for broad-scale assessment of geologically hazardous areas Requires site-specific review to verify presence/absence of geohazards
Channel migration zone (CMZ)	Channel Migration Zone data was not available for shorelines within Adams County. Instead, the 100-year floodplain is being used as a proxy for the CMZ extent, with modifications made by TWC per WAC 173-26-221(3)(b).		
Frequently flooded areas	Floodplains	Federal Emergency Management Agency (FEMA) DFIRM, provided by Adams County	<ul style="list-style-type: none"> Floodplain based on federally established models. May be used at site scale, although further refinement at site scale may also be desired
Wetlands	<ul style="list-style-type: none"> Potential wetlands 	US Fish and Wildlife Service National Wetland Inventory (NWI)	<ul style="list-style-type: none"> Useful for broad scale assessment of potential wetlands NWI mapping based on interpretation of multi-spectral imagery and ground truthing Many wetlands are not identified by NWI; mapped wetlands may not meet wetland criteria Not to be used in place of site-specific studies
Surface water system	<ul style="list-style-type: none"> Streams, lakes Other hydrologic features Gages and other monitoring points 	USGS National Hydrography Dataset	<ul style="list-style-type: none"> Data may not reflect changes to surface water flow due to modifications of topography surface or other factors. Data is prepared at large map scale. Features may not be accurately depicted at smaller scales.
WDFW Priority Habitats & Species	<ul style="list-style-type: none"> Priority fish Priority wildlife Priority habitats 	WA Department of Fish and Wildlife	<ul style="list-style-type: none"> WDFW maps do not capture every priority species location or habitat, particularly for rare species or species that use shoreline habitats seasonally or intermittently

Inventory Element	Information Gathered	Data Source(s)	Assumptions/Limitations
			<ul style="list-style-type: none"> • Absence of mapping information does not indicate absence of a particular species • The number of documented species may reflect the relative amount of past survey efforts • New data will need to be obtained at the time of project application
Other wildlife and habitat areas	<ul style="list-style-type: none"> • Bird habitat conservation areas • Ecologically important areas 	Bureau of Land Management OR/WA	<ul style="list-style-type: none"> • Data is prepared at statewide map scale. Features may not be accurately depicted at smaller scales. • Data may not be up-to-date
Aquifer Recharge Areas	NA	NA	Data not available – data gap
Water quality impairment	303(d) and 305(b) waters and regulated sites	WA Department of Ecology	<ul style="list-style-type: none"> • Water quality impairments are based on monitoring at specific locations • Impairments may extend beyond the mapped area
Restoration opportunities (Future map in Restoration Plan)	Site-specific and general projects	<ul style="list-style-type: none"> • Watershed Plans • Subbasin Plans • Tribes • Adams Conservation District • Palouse Conservation District • County and public input 	

APPENDIX D

Summary of Shoreline Inventory Results

Appendix D. Summary of Shoreline Inventory by Reach.¹

Reach	Unit Area (Acres)	Shoreline Length (Feet)	Dominant Land Use Patterns ² (% of reach, only categories ≥1% reported)	Government Ownership or Management (% of reach by agency)	Land Cover (% of reach, only categories ≥1% reported)	Floodplain Area (% of reach)	Critical Areas (% of reach or # and type of occurrence, only categories ≥1% reported)	Water Quality Listings (Only Category 4 and 5 listings reported)
Lakes								
Black Lake	62.7	15,254	Zoning: General Agriculture, 100	Federal Government: Bureau of Reclamation, 96.7 Fish and Wildlife Service, 3.3	Unclassified land- 9.8 Shrub/Scrub- 89.8	0	Wetlands: 7.7% Priority Habitats and Species: <i>Regions</i> - Mule Deer, 100% Wetlands, 33.6%	none
			Current Land Use: Open space land classified under chapter 84.34 RCW, 100					
Campbell Lake	78.8	17,487	Zoning: General Agriculture, 100	Federal Government: Fish and Wildlife Service, 0.6	Developed, Low Intensity- 2.7 Developed, Open Space-1.1 Emergent Herbaceous Wetlands- 9.1 Unclassified land- 6.3 Shrub/Scrub- 67.7 Woody Wetlands- 12.3	0	Wetlands: 25.3% Priority Habitats and Species: none	none
			Current Land Use: Agriculture classified under chapter 84.34 RCW, 100					
Cow Lake	158.4	34,485	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 8.7 Dept of Fish and Wildlife, 6.2	Developed, Open Space- 4.8 Emergent Herbaceous Wetlands- 36.2 Unclassified land- 4.9 Shrub/Scrub- 53.8	57.6	Wetlands: 15.5% Priority Habitats and Species: <i>Regions</i> - Waterfowl Concentrations, 59.0%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 85.1 Open space land classified under chapter 84.34 RCW, 14.9					
Finnell Lake	42.1	10,737	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 100	Emergent Herbaceous Wetlands- 1.2 Shrub/Scrub- 94.3 Unclassified land- 4.5	21.5	Wetlands: 2.2% Priority Habitats and Species: <i>Regions</i> - Waterfowl Concentrations, 25.4%	none
			Current Land Use: Open space land classified under chapter 84.34 RCW, 89.4 Agriculture classified under current use chapter 84.34 RCW,10.6					
Fourth of July Lake	62.0	12,976	Zoning: General Agriculture, 99.2	None	Emergent Herbaceous Wetlands- 5.7 Shrub/Scrub- 74.4 Unclassified land- 19.9	40.8	Wetlands: 18.2% Priority Habitats and Species: <i>Regions</i> - Prairies and Steppe, 1.2%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 100					
Green Lake	378.2	34,537	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 12.8	Emergent Herbaceous Wetlands- 60.7 Evergreen Forest- 4.3 Unclassified land- 3.4 Shrub/Scrub- 30.2	41.3	Wetlands: 74.1% Priority Habitats and Species: none	none

¹ Data sources, assumptions, and limitations summarized in Appendix C.

² Zoning percentages may not always sum to 100 due to data limitations.

Reach	Unit Area (Acres)	Shoreline Length (Feet)	Dominant Land Use Patterns ² (% of reach, only categories ≥1% reported)	Government Ownership or Management (% of reach by agency)	Land Cover (% of reach, only categories ≥1% reported)	Floodplain Area (% of reach)	Critical Areas (% of reach or # and type of occurrence, only categories ≥1% reported)	Water Quality Listings (Only Category 4 and 5 listings reported)
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 98.8 Open space land classified under chapter 84.34 RCW, 1.2					
Hallin Lake 1- Public Access	5.2	1,391	Zoning: General Agriculture, 100	State Government: Dept of Fish and Wildlife, 99.9	Developed, Open Space- 5.5 Unclassified land- 3.2 Shrub/Scrub- 71.1 Woody Wetlands- 20.2	80.0	Wetlands: 1.0%	none
			Current Land Use: Open space land classified under chapter 84.34 RCW, 100				Priority Habitats and Species: <i>Regions</i> - Waterfowl Concentrations, 20.6	
Hallin Lake 2- Agriculture	39.3	9,015	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 18.1	Emergent Herbaceous Wetlands- 15.8 Developed, Open Space- 3.3 Shrub/Scrub- 76.1 Woody Wetlands- 4.0	62.6	Wetlands: 4.3%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 83.4 Open space land classified under chapter 84.34 RCW, 16.6				Priority Habitats and Species: <i>Regions</i> - Mule Deer, 6.8% Waterfowl Concentrations, 24.5	
Herman Lake	51.6	7,286	Zoning: General Agriculture, 100	Federal Government: Fish and Wildlife Service, 15.6	Emergent Herbaceous Wetlands- 3.9 Unclassified land- 23.6 Shrub/Scrub- 70.1 Woody Wetlands- 2.3	30.9	Wetlands: 50.4%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 81.7 Open space land classified under chapter 84.34 RCW, 18.3				Priority Habitats and Species: none	
Hutchinson Lake	38.0	5,527	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 100	Developed, Open Space- 1.9 Emergent Herbaceous Wetlands- 5.6 Hay/Pasture- 47.9 Unclassified land- 7.3 Shrub/Scrub- 32.2 Woody Wetlands- 5.2	0	Wetlands: 49.4%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 99.9				Priority Habitats and Species: none	
Linda Lake	74.6	13,860	Zoning: General Agriculture, 100	None	Cultivated Crops- 10.1 Deciduous Forest- 2.2 Emergent Herbaceous Wetlands- 13.0 Evergreen Forest- 7.2 Hay/Pasture- 13.3 Unclassified land- 9.3 Shrub/Scrub- 33.7 Woody Wetlands- 9.3 Developed, Medium Intensity- 1.1	16.7	Wetlands: 33.1%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 100				Priority Habitats and Species: <i>Regions</i> - Wetlands, 50.0%	
Morgan Lake	55.8	12,320	Zoning: General Agriculture, 100	Federal Government: Fish and Wildlife Service, .2	Emergent Herbaceous Wetlands- 6.8 Hay/Pasture- 5.6 Herbaceous- 1.1 Unclassified land- 11.1 Shrub/Scrub- 75.3	0	Wetlands: 10.1%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 100				Priority Habitats and Species: <i>Regions</i> - Mule Deer, 100%	

Reach	Unit Area (Acres)	Shoreline Length (Feet)	Dominant Land Use Patterns ² (% of reach, only categories ≥1% reported)	Government Ownership or Management (% of reach by agency)	Land Cover (% of reach, only categories ≥1% reported)	Floodplain Area (% of reach)	Critical Areas (% of reach or # and type of occurrence, only categories ≥1% reported)	Water Quality Listings (Only Category 4 and 5 listings reported)
Owl Lake	93.8	21,254	Zoning: General Agriculture, 100	None	Developed, Open Space- 2.5 Unclassified land- 9.1 Shrub/Scrub- 86.9	7.1	Wetlands: 10.5% Priority Habitats and Species: none	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 100					
Palm Lake	66.5	14,394	Zoning: General Agriculture, 100	None	Emergent Herbaceous Wetlands- 22.9 Unclassified land- 8.0 Shrub/Scrub- 68.8	38.7	Wetlands: 15.3% Priority Habitats and Species: none	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 100					
Para North Lake	177.4	14,872	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 40.6	Cultivated Crops- 7.1 Emergent Herbaceous Wetlands- 22.1 Unclassified land- 12.6 Shrub/Scrub- 29.3 Woody Wetlands- 27.8	12.2	Wetlands: 69.9% Priority Habitats and Species: <i>Regions</i> - Shorebird Concentrations, 26.6% Waterfowl Concentrations, 26.6% Wetlands, 27.1%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 55.9 Open space land classified under chapter 84.34 RCW, 40.4 Household, single family units, 3.7					
Para South Lake	44.98	7,477	Zoning: General Agriculture, 100	None	Cultivated Crops- 17.8 Developed, Open Space- 9.6 Emergent Herbaceous Wetlands- 16.9 Unclassified land- 28.9 Shrub/Scrub- 19.7 Woody Wetlands- 5.8	0	Wetlands: 38.1% Priority Habitats and Species: <i>Regions</i> - Shorebird Concentrations, 38.1% Waterfowl Concentrations, 38.1% Wetlands, 38.1% <i>Occurrences</i> - Black-necked stilt, 1 nest	None
			Current Land Use: Agriculture (not classified under current use law), 9.6 Agriculture classified under current use chapter 84.34 RCW, 90.4					
Pines Lake	94.6	16,399	Zoning: General Agriculture, 100	None	Emergent Herbaceous Wetlands- 6.6 Evergreen Forest- 2.5 Unclassified land- 36.4 Shrub/Scrub- 54.5	59.5	Wetlands: 68.9% Priority Habitats and Species: none	None
			Current Land Use: Agriculture classified under chapter 84.34 RCW, 100					
Rodeo Lake 1- South of Hwy 26	5.8	0	Zoning: Rural Residential, 100	None	Developed, Low Intensity- 13.5 Developed, Open Space- 33.3 Open water- 35.7 Shrub/Scrub- 12.5 Woody Wetlands- 4.8	0	Wetlands: 100% Priority Habitats and Species: <i>Regions</i> - Wetlands, 93.3%	None
			Current Land Use: Undeveloped land, 100					
Rodeo Lake 2- Residential	30.5	5,798	Zoning: Rural Residential, 100.0	None	Cultivated Crops- 38.8 Developed, Low Intensity- 6.3 Developed, Open Space- 26.8 Emergent Herbaceous Wetlands- 1.2 Unclassified land- 1.8 Shrub/Scrub- 2.6 Woody Wetlands- 22.6	0	Wetlands: 47.6% Priority Habitats and Species: <i>Regions</i> - Wetlands, 33.1%	none
			Current Land Use: Undeveloped land, 53.7 Household, single family units, 44.3 Unclassified, 1.9					

Reach	Unit Area (Acres)	Shoreline Length (Feet)	Dominant Land Use Patterns ² (% of reach, only categories ≥1% reported)	Government Ownership or Management (% of reach by agency)	Land Cover (% of reach, only categories ≥1% reported)	Floodplain Area (% of reach)	Critical Areas (% of reach or # and type of occurrence, only categories ≥1% reported)	Water Quality Listings (Only Category 4 and 5 listings reported)
Rodeo Lake 3- PAW	38.3	0	Zoning: Rural Residential, 53.5 Light Industrial, 46.8	None	Cultivated Crops- 21.6 Developed, Open Space- 2.8 Emergent Herbaceous Wetlands- 39.8 Unclassified land- 3.2 Shrub/Scrub- 1.7 Woody Wetlands- 29.6	0	Wetlands: 99.9% Priority Habitats and Species: <i>Regions</i> - Wetlands, 10.2%	none
			Current Land Use: Agriculture (not classified under current use law), 100					
South Teal Lake	27.6	6,136	Zoning: General Agriculture, 100	None	Emergent Herbaceous Wetlands- 4.8 Unclassified land- 6.7 Shrub/Scrub- 87.9	0	Wetlands: 20.1% Priority Habitats and Species: none	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 100					
Sprague Lake 1- Open Space	342.7	31,953	Zoning: General Agriculture, 100	Federal Government: Bureau of Reclamation, 1.4 State Government: Dept of Fish and Wildlife, 87.9	Emergent Herbaceous Wetlands- 79.5 Evergreen Forest- 1.6 Hay/Pasture- 1.4 Unclassified land- 5.7 Shrub/Scrub- 6.9 Woody Wetlands- 5.0	87.9	Wetlands: 87.1% Priority Habitats and Species: <i>Regions</i> - American White Pelican, 89.5% Waterfowl Concentrations, 100% Western Grebe, 89.5%	Category 4b for bacteria, dissolved oxygen, pH and temperature
			Current Land Use: Open space land classified under chapter 84.34 RCW, 81.6 Agriculture classified under current use chapter 84.34 RCW, 17.0					
Sprague Lake 2- Harper Island	24.0	7,345	Zoning: General Agriculture, 100	None	Emergent Herbaceous Wetlands- 69.4 Open Water- 9.1 Shrub/Scrub- 21.4	27.9	Wetlands: 22.5% Priority Habitats and Species: <i>Regions</i> - American White Pelican, 100% Caspian Tern, 9.9% Gull Species, 98.4% Tundra Swan, 4.7% Waterfowl Concentrations, 100% Western Grebe, 100%	none
			Current Land Use: Open space land classified under chapter 84.34 RCW, 98.3 Water Areas, 1.7					
Sprague Lake 3- Agriculture	62.8	12,804	Zoning: General Agriculture, 100	None	Deciduous Forest- 1.6 Emergent Herbaceous Wetland- 61.5 Evergreen Forest- 8.1 Unclassified land- 3.7 Shrub/Scrub- 21.0 Woody Wetlands- 4.0	32.6	Wetlands: 31.7% Priority Habitats and Species: <i>Regions</i> - Waterfowl Concentrations, 14.3%	Category 5 for 2,3,7,8- TCDD and PCB
			Current Land Use: Agriculture (not classified under current use law), 30.1 Agriculture classified under chapter 84.34 RCW, 64.5 Unclassified, 4.0					
Sprague Lake 4- Developed	6.7	1,252	Zoning: General Agriculture, 100	None	Emergent Herbaceous Wetland- 92.3 Shrub/Scrub- 1.0 Woody Wetlands- 6.2	68.1	Wetlands: 20.9% Priority Habitats and Species: <i>Regions</i> - Waterfowl Concentrations, 18.9%	none
			Current Land Use: Resorts and group camps, 62.9 Undeveloped land, 37.1					

Reach	Unit Area (Acres)	Shoreline Length (Feet)	Dominant Land Use Patterns ² (% of reach, only categories ≥1% reported)	Government Ownership or Management (% of reach by agency)	Land Cover (% of reach, only categories ≥1% reported)	Floodplain Area (% of reach)	Critical Areas (% of reach or # and type of occurrence, only categories ≥1% reported)	Water Quality Listings (Only Category 4 and 5 listings reported)
Thread Lake	78.9	17,685	Zoning: General Agriculture, 100	Federal Government: Fish & Wildlife Service, 11.4 State Government: Dept of Natural Resources, 15.0	Emergent Herbaceous Wetland- 1.1 Unclassified land- 9.6 Shrub/Scrub- 88.9	53.2	Wetlands: 16.1%	Category 5 for dissolved oxygen
			Current Land Use: Agriculture classified under chapter 84.34 RCW, 70.9 Open space land classified under chapter 84.34 RCW, 28.4				Priority Habitats and Species: <i>Regions</i> - Wetlands, 41.1%	
National Wildlife Refuge Lakes ³	308.0	55,353	Zoning: General Agriculture, 100	Federal Government: Fish & Wildlife Service, 99.6 State Government: Dept of Natural Resources, 0.3	Emergent Herbaceous Wetlands- 8.9 Unclassified land- 12.8 Shrub/Scrub- 65.7 Woody Wetlands- 12.1	0	Wetlands: 33.8%	Category 5 for 4,4'- DDE, Dieldrin and pH Category 4c for invasive exotic species
			Current Land Use: Open space land classified under chapter 84.34 RCW, 100				Priority Habitats and Species: <i>Regions</i> - Mule Deer, 9.3% Waterfowl Concentrations, 45.0% <i>Occurrences</i> - Big brown bat, 4, biotic detection Little brown myotis, 4, biotic detection Pallid bat, 4, biotic detection Townsend's Big-eared Bat, 4, biotic detection	
Streams								
Cow Creek 1- Palouse to Benge- Washtucna Road	673.7	155,163	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 4.3 State Parks & Recreation Commission, .5	Cultivated Crops- 3.6 Developed, Open Space- 2.0 Emergent Herbaceous Wetlands- 3.0 Hay/Pasture- 56.8 Shrub/Scrub- 32.8	79.7	Wetlands: 16.9%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 95.7 Open space land classified under chapter 84.34 RCW, 4.3				Priority Habitats and Species: <i>Regions</i> - Mule Deer, 100% Northwest White-tailed Deer, 12.4% Ring-necked Pheasant, 31.5% <i>Occurrences</i> - Prairie falcon, 1 nest	
Cow Creek 2- Scablands	452.6	99,249	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 9.2	Emergent Herbaceous Wetlands- 39.2 Shrub/Scrub- 60.0	68.1	Wetlands: 16.5% Priority Habitats and Species: <i>Regions</i> - Mule Deer, 100% Waterfowl Concentrations, 14.2% <i>Occurrences</i> - Burrowing owl, 1 nest Ferruginous hawk, 1 nest	none

³ Aggregate reach encompassing all portions of the various lakes that are within jurisdiction of Columbia National Wildlife Refuge. Includes portions of Morgan, Herman, Campbell, Black and Hutchinson Lakes and all of Royal and Pit Lakes.

Reach	Unit Area (Acres)	Shoreline Length (Feet)	Dominant Land Use Patterns ² (% of reach, only categories ≥1% reported)	Government Ownership or Management (% of reach by agency)	Land Cover (% of reach, only categories ≥1% reported)	Floodplain Area (% of reach)	Critical Areas (% of reach or # and type of occurrence, only categories ≥1% reported)	Water Quality Listings (Only Category 4 and 5 listings reported)
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 91.7 Open space land classified under chapter 84.34 RCW, 8.3				Washington ground squirrel, 1 biotic detection	
Cow Creek 3- Wetland Complex	1,396.0	121,707	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 4.6	Emergent Herbaceous Wetlands- 82.9 Shrub/Scrub- 16.1	81.7	Wetlands: 85.5%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 96.4 Open space land classified under chapter 84.34 RCW, 2.7 Household, single family units, 1.0				Priority Habitats and Species: <i>Regions-</i> Mule Deer, 76.5% Waterfowl Concentrations, 19.8% <i>Occurrences-</i> Washington ground squirrel, 1 biotic detection	
Cow Creek 4- Harder Road Area	189.2	37,851	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 1.6	Emergent Herbaceous Wetlands- 75.1 Shrub/Scrub- 17.8 Developed, Open Space- 6.3	84.1	Wetlands: 26.1%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 100				Priority Habitats and Species: none	
Cow Creek 5- Hills Road Area	143.3	38,981	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 10.3	Emergent Herbaceous Wetlands- 20.2 Shrub/Scrub- 72.3 Developed, Open Space- 4.2 Evergreen Forest- 1.4 Unclassified land- 1.4	61.9	Wetlands: 14.0%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 99.5				Priority Habitats and Species: <i>Regions-</i> Waterfowl Concentrations, 52.6% <i>Occurrences-</i> Black-necked stilt, 1 nest	
Cow Creek 6- Finnell to Cow Lake	213.2	41,231	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 13.0	Emergent Herbaceous Wetlands- 63.3 Shrub/Scrub- 35.2 Woody Wetlands- 1.3	83.4	Wetlands: 43.4%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 86.9 Open space land classified under chapter 84.34 RCW, 13.1				Priority Habitats and Species: <i>Regions-</i> Waterfowl Concentrations, 38.4%	
Cow Creek 7- Sprague Lake Outlet	43.0	9,395	Zoning: General Agriculture, 100	Federal Government: Bureau of Reclamation, .2 State Government: Dept of Fish & Wildlife, 26.8	Cultivated Crops- 14.8 Developed, Low Intensity- 1.9 Developed, Open Space- 2.1 Emergent Herbaceous Wetlands- 67.9 Shrub/Scrub- 7.6 Woody Wetlands- 5.3	97.4	Wetlands: 19.9%	none
			Current Land Use: Open space land classified under chapter 84.34 RCW, 59.1 Agriculture classified under chapter 84.34 RCW, 40.9				Priority Habitats and Species: <i>Regions-</i> American White Pelican, 3.3% Mule Deer, 18.6% Waterfowl Concentrations, 59.2% Western Grebe, 3.3% <i>Occurrences-</i> Burrowing owl, 1 nest	
	55.77	0	Zoning: General Agriculture, 100	State Government: Dept of Natural Resources, 3.4	Emergent Herbaceous Wetlands- 55.2	78.3	Wetlands: 100%	none

Reach	Unit Area (Acres)	Shoreline Length (Feet)	Dominant Land Use Patterns ² (% of reach, only categories ≥1% reported)	Government Ownership or Management (% of reach by agency)	Land Cover (% of reach, only categories ≥1% reported)	Floodplain Area (% of reach)	Critical Areas (% of reach or # and type of occurrence, only categories ≥1% reported)	Water Quality Listings (Only Category 4 and 5 listings reported)
Cow Creek PAW ⁴			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 95.9 Open space land classified under chapter 84.34 RCW, 3.4		Shrub/Scrub- 43.3		Priority Habitats and Species: <i>Regions</i> - Mule Deer, 18.7%	
Lower Crab Creek 1- Agriculture	204.9	44,828	Zoning: General Agriculture, 95.7 Rural Residential, 4.3	Federal Government: Fish & Wildlife Service, .7 State Government: Dept of Natural Resources, 35.0	Developed, Low Intensity- 1.3 Developed, Open Space- 2.1 Emergent Herbaceous Wetlands- 4.7 Hay/Pasture- 53.7 Shrub/Scrub- 34.6 Woody Wetlands- 3.3	0	Wetlands: 10.0% Priority Habitats and Species: <i>Regions</i> - Mule Deer, 12.0% Sandhill Crane, 3.4%	Category 5 for pH
			Current Land Use: Agriculture classified under chapter 84.34 RCW, 79.2 Open space land classified under chapter 84.34 RCW, 16.5 Household single family units, 3.9					
Lower Crab Creek 2- NWR	479.6	88,572	Zoning: General Agriculture, 100	Federal Government: Fish & Wildlife Service, 99.6 Bureau of Reclamation, 0.2	Emergent Herbaceous Wetlands- 17.4 Hay/Pasture- 2.0 Herbaceous- 1.8 Unclassified land- 3.9 Shrub/Scrub- 63.6 Woody Wetlands- 10.5	0	Wetlands: 32.8% Priority Habitats and Species: <i>Regions</i> - Mule Deer, 51.7% <i>Occurrences</i> - Little brown myotis, 2 biotic detection Long-legged myotis, 2 biotic detection	Category 5 for pH
			Current Land Use: Open space land classified under chapter 84.34 RCW, 100					
Lower Crab Creek 3- Seep Lake Wildlife Refuge	3.8	0	Zoning: General Agriculture, 100	Federal Government: Fish & Wildlife Service, 86.5 Bureau of Reclamation, 13.5	Emergent Herbaceous Wetlands- 50.8 Shrub/Scrub- 10.4 Woody Wetlands- 38.8	0	Wetlands: 88.6% Priority Habitats and Species: <i>Regions</i> - Mule Deer, 100%	none
			Current Land Use: Open space land classified under chapter 84.34 RCW, 100					
Palouse River 1- Rural Residential	20.7	3,876	Zoning: Rural Residential, 95.1 General Agriculture, 8.3	None	Emergent Herbaceous Wetlands- 5.0 Evergreen Forest- 2.7 Hay/Pasture- 55.6 Unclassified land- 7.4 Shrub/Scrub- 27.2	78.1	Wetlands: 7.6% Priority Habitats and Species: <i>Regions</i> - Mule Deer, 100% Waterfowl Concentrations, 32.0%	Category 5 for dissolved oxygen and pH Category 4a for bacteria
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 100					
Palouse River 2- Agriculture	243.2	52,529	Zoning: General Agriculture, 95.0	Federal Government: Bureau of Land Management, 2.5	Deciduous Forest- 1.1 Developed, Open Space- 7.4 Emergent Herbaceous Wetlands- 12.7 Evergreen Forest- 8.2	74.2	Wetlands: 19.5% Priority Habitats and Species: <i>Regions</i> - Mule Deer, 100%	Category 5 for dissolved oxygen, pH and temperature

⁴ Aggregate reach of all potentially associated wetland along Cow Creek within shoreline jurisdiction but not directly abutting a shoreline waterbody

Reach	Unit Area (Acres)	Shoreline Length (Feet)	Dominant Land Use Patterns ² (% of reach, only categories ≥1% reported)	Government Ownership or Management (% of reach by agency)	Land Cover (% of reach, only categories ≥1% reported)	Floodplain Area (% of reach)	Critical Areas (% of reach or # and type of occurrence, only categories ≥1% reported)	Water Quality Listings (Only Category 4 and 5 listings reported)
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 100		Hay/Pasture- 40.3 Herbaceous- 1.2 Unclassified land- 1.8 Shrub/Scrub- 19.6 Woody Wetlands- 3.1 Developed, Medium Intensity- 3.0		Northwest White-tailed Deer, 75.5% Waterfowl Concentrations, 44.7% <i>Occurrences-</i> Prairie falcon, 1 nest	Category 4a for bacteria and PCB
Palouse River 3- Scablands	190.2	44,377	Zoning: General Agriculture, 92.2	None	Emergent Herbaceous Wetlands- 4.6 Evergreen Forest- 8.3 Hay/Pasture- 27.8 Herbaceous- 6.8 Shrub/Scrub- 50.7	78.1	Wetlands: 18.2% Priority Habitats and Species: <i>Regions-</i> Mule Deer, 100% Northwest White-tailed Deer, 60.0%	Category 5 for dissolved oxygen and pH Category 4a for bacteria
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 100					
Palouse River 4- Braided Channel	142.7	34,298	Zoning: General Agriculture, 99.1	State Government: Dept of Natural Resources, 12.7	Barren Land- 1.4 Emergent Herbaceous Wetlands- 1.0 Evergreen Forest- 3.6 Hay/Pasture- 49.0 Herbaceous- 1.9 Shrub/Scrub- 41.6	90.2	Wetlands: 24.3% Priority Habitats and Species: <i>Regions-</i> Mule Deer, 100% Northwest White-tailed Deer, 46.1%	none
			Current Land Use: Agriculture classified under current use chapter 84.34 RCW, 100					
Rock Creek	146.9	32,582	Zoning: General Agriculture, 99.6	Federal Government: Bureau of Land Management, 76.5	Deciduous Forest- 1.1 Developed, Open Space- 7.4 Emergent Herbaceous Wetlands- 30.8 Evergreen Forest- 3.1 Herbaceous- 7.3 Shrub/Scrub- 57.4	55.3	Wetlands: none Priority Habitats and Species: <i>Regions-</i> Mule Deer, 100% <i>Occurrences-</i> Prairie falcon, 2 nests Yuma myotis, 1 biotic detection	none
			Current Land Use: Open space land classified under chapter 84.34 RCW, 77.0 Agriculture classified under current use chapter 84.34 RCW, 23.0					