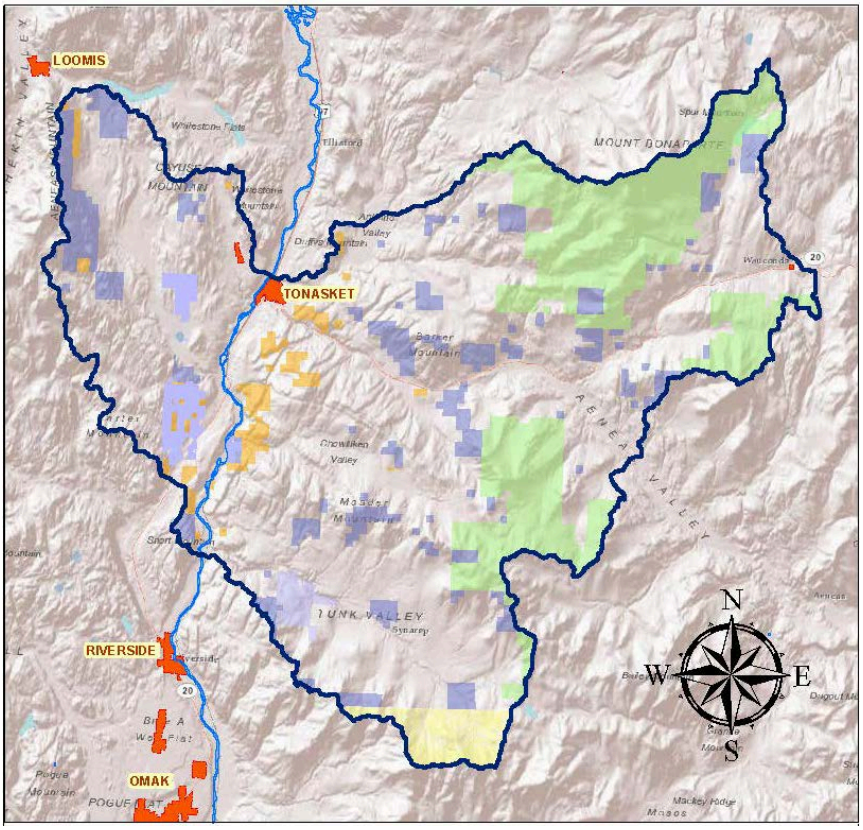
Bonaparte Creek – Okanogan River Watershed HUC #1702000602



This is a collection of quantitative and qualitative information to develop a watershed profile, analysis of that information sufficient to make qualitative statements as to resource concerns and conditions, and the generation of new information with which to make decisions about conservation needs and recommendations. These assessments are conducted through the use of Geographic Information System (GIS) technology and by conservation planning teams working within the watershed, meeting with landowners and conservation groups, inventorying agricultural areas, assessing current levels of resource management, identifying conservation recommendations, and making qualitative estimates of the impacts of conservation on local resource concerns.

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Introduction

The Bonaparte Creek – Okanogan River 10 digit Hydrologic Unit (#1702000602) is a portion of the larger Okanogan River Watershed in Okanogan County, Washington. This HUC10 is about 249,994 acres in size. Private lands in the watershed are approximately 170,040 acres, with the remainder in public land (Federal, Tribal, and State) management.

The watershed is dominated by range land with approximately 144,378 acres and forested land with approximately 100,388 acres. Cropped lands are primarily located near the valley floors, along streams and adjacent terraces. Most cropped lands are a mixture of irrigated and non-irrigated pasture and hay land. There are also proportionally significant acreages of irrigated orchard which are predominately on the Okanogan River valley floor.

The City of Tonasket is the only urban area of the watershed located along the northern edge of the watershed planning area. The remainder of the watershed is unincorporated lands wholly within Okanogan County, Washington.

Major resource concerns in the watershed include accelerated streambank erosion, impaired water quality, forest health, invasive weeds, range health, and wildlife habitat.

Primary natural resource technical assistance is provided by the USDA Natural Resources Conservation Service, Okanogan Conservation District, Colville Confederated Tribes Fish and Wildlife Department, WA Department of Natural Resources, WA Department of Fish and Wildlife, and Okanogan County Noxious Weed Control Board.

Physical Characteristics

Soils

Rock outcrops and rocky soil complexes dominate the Bonaparte Creek – Okanogan River HUC10. Elsewhere on slopes entisols (shallow, less developed soils) are the major soil type. Valleys tend to have mollisols (soils formed under grasses). These soils are rich in organic matter and are productive farmland. These descriptions are necessarily very generic. Readers are encouraged to find more site specific soils information from the USDA Natural Resources Conservation Service Soil Survey. Soil survey information can be obtained from the local Natural Resources Conservation Office or on the Internet at http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm.

Relief and Climate

The watershed planning area is dominated by a series of valleys and ridges that run generally east to west with the Okanogan River Valley bisecting smaller sub-basins in the middle of the planning area. The highest elevation of the planning area is the peak of Bonaparte Mountain located in the far northeast corner of the planning unit which stands at 7,257 feet above sea level. The lowest

elevation in the planning area is the farthest southern reach of the Okanogan River a few miles north of the community of Riverside, Washington at 855 feet above sea level.

Most of the sub-basins in the planning unit are valleys perched above the Okanogan River. The outfalls of these basins were scoured by the Okanogan Lobe of the Cordilleran ice sheet over 10,000 years ago during the most recent period of glaciation in North America. The area is dominated by moderate to steeply sloped sites with moderately erosive shallow to deep soils which are characterized as rocky to sandy silt loams.

The overall watershed receives approximately 16 inches of precipitation each year. The highest average precipitation is 33 inches per year and the lowest is approximately 11 inches per year. Most precipitation comes in the form of snow or sleet during cool winter months. The climate of the region is dominated by the high peaks of the North Cascades which create a rain shadow effect which limits precipitation. The region experiences long periods of warm and dry weather from late spring through early fall leaving the area with approximately 150 frost-free days per year. Precipitation information is from modeling reports as there are no official precipitation gauges in the upland areas of the watershed. Precipitation in the planning area varies greatly from location to location and within the year.

Landuse / Landcover

The watershed planning area is a mix of forested lands, shrub-steppe grasslands (rangeland), dryland agriculture, irrigated agriculture, and domestic home sites. Grazed rangeland comprises the largest percentage of the watershed at 62% or approximately 154,713 acres. Forested lands comprise the next highest percentage of the watershed at 21.5% or 53,171 acres. The third highest landuse is grazed forest land which comprises 11.4% or 28,500 acres. The remaining landuses (5.1% or about 12,750) acres are a mix of agricultural lands, open water, and domestic home sites. The information regarding grazed forest land is considered low by local residents and report authors. Exact acreages for grazed forest land are somewhat difficult to determine due to rotations and various ownerships. The number of grazed forest land areas is likely closer to the number of acres of forest land as it is typical to use forest lands (both private and public) for grazing domestic livestock for some time in most years.

Roads

Okanogan Conservation District geographic information system data indicate there are approximately 748 miles of roads in the watershed planning area. This number is lower than what is believed to be in the area because the data set is not complete. The data do not include all farm and ranch roads and likely do not include all forest roads that exist in the watershed.

Streams / Fish Species / Barriers

There are six major streams in the watershed in addition to the Okanogan River which bisects the planning area from north to south. The streams are from north to south: Siwash Creek, Bonaparte Creek, Pine Creek, Chewiliken Creek, Aeneas Creek, and Tunk Creek. Each of these creeks supports local fish species such as rainbow trout, cutthroat trout, eastern brook trout, and mountain whitefish. Most of these streams provide limited habitat for anadromous fish species such as Chinook salmon, sockeye salmon, and steelhead. The creeks provide limited habitat for spawning

and rearing due to natural stream blockages such as falls which generally occur within a mile upstream of the mouth of each creek. However, each stream provides critical cooling waters for migrating anadromous species during warm summer months when the Okanogan River can easily exceed 20° C. or 68° F.

By Watershed	
Aeneas Creek	**Number**
Culvert	1
Falls	1
Confluence	1
Bonaparte Creek	
Culvert	18
Falls	1
Chewiliken Creek	
Falls	1
Insufficient Flow	1
Siwash Creek	
Gradient	1
Confluence	1
Falls	1
Tunk Creek	
Falls	1
Man made structure	1

By Barrier	
Barrier	**Number**
Confluence	2
Culvert	19
Falls	5
Gradient	1
Insufficient flow	1
Man made structure	1
Total Barriers	**29**

Table 1. Breakdown by watershed and type of barrier for known barriers to fish passage in the planning area. Data are representative and should not be construed as complete representation of watershed conditions.

Ownership

Land ownership in the watershed planning area is dominated by private landownership at 170,040 acres or 69% of the planning area. These parcels are predominately smaller acreage (less than 100 acres each) of private commercial farms and/or residences. The Federal Government manages the second largest share of the watershed at 48,224 acres or 19.3% of the planning area. Most of the federally managed lands in the planning area fall under the management of the USDA Forest Service with a smaller portion under the management of the USDI Bureau of Land Management. Agencies of the State of Washington manage approximately 22,923 acres or 9.2% of the management area. The Washington Department of Fish and Wildlife and the Washington State Department of Natural Resources manage the vast majority of these acreages. Public land management agencies often work with leases (individuals who have entered into an agreement with the agency to use the public lands for a defined purpose) to co-manage natural resources on the leased lands including implementing conservation practices. The Confederated Tribes of the Colville Reservation manage approximately 5,673 acres or 2.3% of the watershed planning area. These lands are parcels that are dispersed lands managed in trust for the members of the Confederated Tribes of the Colville Reservation. The remaining 539 acres or 0.23% are open water areas of the planning area.

Water

Water is a precious resource for the residents and wildlife of the Bonaparte Creek-Okanogan River Watershed planning unit. Limited precipitation, very porous soils, and various demands for water create challenges for residents, water managers, and wildlife. Mountain snowpack delivers the majority of water to streams and the Okanogan River as it melts each spring. Due to the high latitudes and cooler spring climate, the spring freshet (runoff) occurs later in the year than many

other areas of Washington State. Tributary streams in the planning area will see their peak flows in mid to late May on average, while the Okanogan River will not hit its peak until mid-May to mid-June. Low flows in each major tributary occur just before fall rains and cooler temperatures in late September or early October. Most of the major tributary streams to the Okanogan flow to the Okanogan River in most years. However, smaller tributaries in these sub-watersheds often have no surface flow for portions of each year.

Water quality in the planning area is generally good for most uses. The most common uses for water in the basin are irrigation, domestic water, recreation, and wildlife. Water quality parameters for surface waters are codified by the Washington Department of Ecology. The Department of Ecology base water quality criteria for a specific stream reach by the limitations of various uses of the water in that stream reach. The most common violation for water quality parameters known in the watershed is for pH. Generally, the stream segments listed for pH have higher than standard pH levels. While no specific reason has been identified for high pH in these streams it is believed by some local residents who have reviewed the information and water quality experts that much of the elevated pH levels are due to the soil types in the watershed which have naturally high pH levels.

Other water quality concerns in the watershed are fecal coliform with two stream segments listed. The fecal coliform listing for Bonaparte Creek is in the lowest section of the stream before it joins the Okanogan River. Local residents along the stream in the City of Tonasket and adjoining areas just outside of the city limits were concerned with this issue and participated in a study of possible sources and have continued to work with the Okanogan Conservation District and the City of Tonasket to address this issue. During the study and community meetings one likely source of contamination that was identified was the number of older and possibly failing on-site septic systems in the vicinity of the stream. The City of Tonasket worked with these landowners over a period of a couple of years and is currently in the process of adding city sewer services to most of these properties in anticipation of addressing this issue. The Tunk Creek listing is of unknown source and origin and there are no known current efforts to identify the source of this contaminant.

There are currently no accurate data on the amount of irrigation withdrawals from area streams and rivers or ground water sources. The Washington State Department of Ecology maintains a list of legal water withdrawals but the database is not accurate as some withdrawals are no longer used and some water diversions don't divert the amount of water indicated on file. In previous planning activities for the larger Okanogan River Watershed, which was completed in 2009, the Planning Unit (local citizens who helped guide and develop the plan) found that data sources primarily held by the Washington Department of Ecology are outdated and incomplete in many areas of the watershed. One stream was found to have active water right claims in the Tunk Creek watershed that totaled nearly four times the maximum flow that has ever been recorded in the creek. This was known to be false because this creek flows to the Okanogan River in some years. There is a concern about the watershed water resource being over appropriated on paper however because most years the lower section of the stream become dry in the lower ½ mile of the stream.

Most domestic water usage in the planning area is water drawn from single domestic wells located on-site for residential homes. The City of Tonasket, being the only municipality of the watershed, draws its water from a series of wells located throughout the city to supply domestic drinking water to its residents and a small number of residents on properties adjacent to the city limits.

Cropland Characteristics

The watershed planning was broken into four types of cropland that are the most prevalent. These include pasture/hayland, grain crops, row crops, and orchards/vineyards. Other agricultural land uses include rangeland used for grazing livestock and forestland that is used for tree production and/or grazing and harvesting of other commodities such as mushrooms, berries, and Christmas trees. The amount of acreage in non-irrigated crop land is believed to be low due to data errors associated with identifying whether non-irrigated land is cropped or vacant.

NRCS Landuse	Acres	Average contiguous area	Percent of total area
Crop - Irrigated	4,564.55	570.57	1.83%
Crop - Non-Irrigated	1,854.66	185.47	0.74%
Forest	53,171.35	4,833.76	21.26%
Grazed Forest	28,411.18	2,582.83	11.36%
Grazed Range	154,713.03	14,064.82	61.87%
Pasture	2,266.03	377.67	0.91%
Recreation	1,732.53	433.13	0.69%
Urban	2,350.92	335.85	0.94%
Water	538.50	48.95	0.22%
Wildlife	452.58	56.58	0.18%
Total	**250,055.33**		100.00%
Avg. unit size	**2,348.96**		

Table 2. USDA NRCS data on landuse types.

Crop - Irrigated	*Land used primarily for the production and harvest of annual or perennial field, forage, food, fiber, horticultural, orchards, vineyards and/or energy crops raised by means of supplying water during the growing season.*
Crop - Non-Irrigated	*Land used primarily for the production and harvest of annual or perennial field, forage, food, fiber, horticultural, orchards, vineyards and/or energy crops raised by using naturally occurring precipitation to grow the crop.*
Forest	*Land on which the primary vegetation is tree cover (climax, natural or introduced plant community) and use is primarily for production of wood products and/or non-timber forest products.*
Grazed Forest	*Forest land that produces understory vegetation that is used for the production of livestock.*
Grazed Range	*Land used primarily for the production of grazing animals. Includes native plant communities and those seeded to native or introduced species, or naturalized by introduced species, that are ecologically managed using range management principles.*

Pasture	*Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.*
Recreation	*Land and water used and managed for recreational purposes.*
Urban	*Land occupied by buildings and related facilities used for residences, industrial sites, institutional sites, public highways, airports, and similar uses associated with towns and cities.*
Water	*Geographic area whose dominant characteristic is open water/permanent ice or snow. May include intermingled land, including tidal influenced coastal marsh lands.*
Wildlife	*Land or water used, protected, and managed primarily as habitat for wildlife.*

Table 3. USDA NRCS definitions of land use types.

Cultural and Historic Sites

The only site listed by the USDI National Park Service on the Nation Register of Historic Places in the watershed planning unit is the Bonaparte Mountain Cabin. This site is on the tallest peak in the watershed at the far northeast corner of the planning area.

There are archeological and cultural resources that are not listed on public databases within the planning area. These are most often sites of particular interest to the Confederated Tribes of the Colville Indian Reservation. Sites may or may not include burial grounds, hieroglyphics, and historic meeting and encampment sites.

There are several locally significant cultural and historic sites throughout the watershed planning area. These include McLaughlin Canyon battle site, the historic Anglin Town site, and various other sites that include pictographs and cemeteries.

Socio-Economic Data

The watershed planning area is dominantly rural in nature. The area has significant agricultural and open space lands with sizeable acreages under public land management. The only municipality in the area is the small City of Tonasket located near the northern border of the watershed with a population of approximately 1,020 people.

Census Data

The population of the watershed planning area is not easily accounted for because of the rural nature of Okanogan County and the lack of more specific census data. However, taking a percentage of the watershed planning area compared to the area of Okanogan County and multiplying that by the latest census data for Okanogan County we have estimated the population of the planning area at approximately 5,560 people. This population estimate would give the planning area a population density of 12.8 people per square mile.

United States Census data shows the following information for residents of Okanogan County. For the purposes of this planning effort we are using the county wide data to reflect the general status of the population of the planning area because there are no specific data sets to just this planning area.

High school graduates, percent of persons age 25+, 2006-2010	83.8%
Bachelor's degree or higher, pct of persons age 25+, 2006-2010	17.7%
Housing units, 2010	22,245
Households, 2006-2010	15,747
Persons per household, 2006-2010	2.54
Per capita money income in past 12 months	$20,093
Persons below poverty level, percent, 2006-2010	19.5%

Table 4. United States Census Data for Okanogan County, Washington. Not just planning area.

Ag Census Data

According to the USDA Agricultural Census Data most recently collected and compiled in 2007 there are approximately 225 farms in the watershed planning area. The majority range in size from 1 to 179 acres in size. There are approximately 17 of the largest farm sizes (over 1,000 acres) in the planning area.

The majority of the agricultural operations in the watershed planning area fall into one of three broad categories. The most common type of agricultural operations includes beef cows with a mix of pasture and hayland to grow forage for livestock. The other two common agricultural operations include hay forage operations or fruit orchards. The most common types of fruit grown in the planning area are apples, cherries, and pears. Other small blocks of tree fruit are also grown.

Resource Concerns

Resource concerns are natural resource conditions that do not meet planning criteria as established by the USDA Natural Resources Conservation Service. These may include soil erosion, water quality degradation, air quality, forage health, invasive species, and others. The identification of resource concerns in the planning area is a critical step to addressing overall watershed health to ensure a healthy and productive ecosystem. When considering the broad scope of this planning effort it is very difficult to pinpoint specific areas with identified resource concerns. Rather, it is our objective to list the known resource concerns that occur in the planning area as a step to identifying the overall needs for conservation activities to correct conditions and move towards achieving planning criteria.

Soil

As stated earlier, soils in the watershed planning area are derived from glaciation, historic volcanic activity, and weathering events that have combined with geologic processes over time to create a mix of soil types and conditions. Soils are dominantly loose unconsolidated material derived from

granitic and andic base material. This base type of soil allows for easy erosion under moderate rainfall events or other conditions where good stabilizing plant materials are not present.

Soils in the planning area are generally stable except along limited reaches of stream banks, road cuts, and areas with diminished plant quality and invasive species. These areas contribute a moderate to severe levels of erosion during isolated thunderstorms which can produce high intensity precipitation in a short period of time. Another concern for erosion is bank instability in areas where vegetation has been purposefully removed or has been denuded by improper livestock grazing practices. While these areas are not widespread there are reaches of streams that are of greater concern for erosional processes.

Water

The Washington State Department of Ecology is required by section 303(d) of the US Clean Water Act of 1972 to maintain a list of water bodies that are impaired. The Department of Ecology collects data with their own staff and compiles data from other sources as they are made available to determine which stream segments are meeting established water quality criteria. Each stream segment has a list of known uses which can include one or more of the following uses: irrigation water, domestic water supply, wildlife, recreation, and other uses. For each of these uses there are established quality criteria that each stream segment must meet or exceed. The Department of Ecology lists streams in one of five categories. Category 1 streams are streams that are known to meet all water quality standards. The highest or most serious listings are category 5 streams that are polluted and are formally listed on the state 303(d) list. The most current 303(d) list for Washington State is the 2008 list. The Category 2-4 listings are for streams that are believed to have some level of impairment. However, there are no known listings for these categories in the planning area.

303(d) Category 5 list

Creek	Pollutant	Miles
Bonaparte Creek	Fecal Coliform	1.499
Tunk Creek	Fecal Coliform	0.047
Tunk Creek	pH	2.458
Tunk Creek	pH	0.471
Bonaparte Creek	pH	3.184
Siwash Creek	pH	2.633
Siwash Creek	pH	0.909
Bonaparte Creek	pH	1.499
Total Miles:	12.699	
Fecal Coliform	1.546	
pH	11.153	

Table 5. Washington State Department of Ecology 303(d) category 5 water quality impaired streams.

Generally, streams in the planning unit meet all water quality criteria for known uses. There are 88 miles of perennial and 258 miles of ephemeral (seasonal) streams in the watershed planning area. Of these only 12.7 miles of stream are listed as category 5 impaired streams on the most current Washington State Department of Ecology 303(d) list of impaired streams. This equates to just 3.7% of streams in the watershed listed as impaired.

As described earlier, the water quality impairments for pH may be caused by the high pH levels of local soils. This has not been clearly linked as the source but to many local resource professionals this appears to be the most likely cause. Fecal coliform impairments are likely a combination of human influences with on-site septic systems, livestock and domestic pets, as well as wildlife. Again, there has been not enough data collected to identify the specific source and the sources likely vary from point to point.

Stream temperatures are not listed as an impairment by the Washington Department of Ecology but there is concern with the relatively high water temperatures of some stream segments (primarily in the Okanogan River) that may be leading to increased stress on aquatic species, particularly species listed under the Endangered Species Act such as steelhead, and Chinook salmon. Even though this parameter is not officially listed as an impairment, it is a resource concern that should be addressed as reasonably possible.

Most of the smaller tributaries in the planning area have no surface water for some portion of each year. Some of these streams naturally go dry, others go dry or have such significant reduction in flow to only flow in limited reaches due to irrigation withdrawals, domestic uses, and other causes. The Okanogan Watershed Plan (2010) notes that, due to inadequate precipitation data, it was essentially impossible to develop a single water budget that explains the expected amount of water available in each sub-basin. The result of their planning efforts led to two water budgets being developed and neither was accurate enough for the Planning Unit (local stakeholders/landowners) to select one water budget as the most accurate.

Plants

The native plants of the watershed planning area are diverse. Below is a very brief sample of common native plant species to the planning area. This list is by no means comprehensive. It is intended for general information as to the types of plant species in the watershed.

There is only one species on the threatened or endangered plant species list in the watershed. Showy stickseed (*Hackelia venusta*) is located in several counties in Washington State. Fire suppression activities and fire occurrences are the largest threats to this species.

Scientific Name	*Common Name*	*Family Name*
Agropyron spicatum	Blue-bunch wheatgrass	Poaceae
Arctostaphylos nevadensis	Kinnikinnik	Ericaceae
Artemesia tridentata	Big sagebrush	Asteraceae
Balsamorhiza sagittata	Arrow-leaf balsamroot	Asteraceae
Bromus erectus	Erect brome	Poaceae
Ceanothus velutinus	Snowbrush	Rhamnaceae
Cornus stolonifera	Red-osier dogwood	Cornaceae
Festuca idahoensis	Blue bunchgrass	Poaceae
Festuca microstachys	Small fescue	Poaceae
Pinus ponderosa	Ponderosa pine	Pinaceae
Populus tremuloides	Quaking aspen	Salicaceae
Populus trichocarpa	Black cottonwood	Salicaceae
Pseudotsuga menziesii	Douglas fir	Pinaceae
Rosa woodsii	Wood's rose	Rosaceae
Salix drummondiana	Drummond's willow	Salicaceae
Salix exigua	Coyote willow	Salicaceae
Sambucus cerulea	Blue elderberry	Caprifoliaceae
Sambucus racemosa	Red elderberry	Caprifoliaceae
Symphoricarpos albus	Common snowberry	Caprifoliaceae
Vaccinium membranaceum	Mountain huckleberry	Ericaceae

Table 6. Abbreviated plant list from the Washington Native Plant Society as compiled in 2004 by Don Knoke. Source: http://www.wnps.org/plant_lists/counties/okanogan/okanogan_county.html

In general, threats to plant health and vigor in the watershed planning area are limited to wildfire (presence and absence depending upon the species), grazing activities, invasive species (plant and animal), agricultural activities such as cultivation, and other human activities.

Animals

There are numerous wildlife species in the watershed planning area ranging from white-tailed and mule deer to migratory waterfowl and song birds. Overall wildlife habitat is functional for most species. The greatest threats to wildlife habitats include domestic animals, loss of connectivity between habitat values such as food, cover, and water, and wildfire repression which diminishes forage for many species.

The diversity of wildlife species in the planning area is due to the high diversity of plant communities and access to different habitat values such as cropped agricultural fields, native range lands, and forest lands. Human activities have influenced wildlife populations negatively and positively. While some human activities such as farming can produce more forage for some species it also can eradicate necessary cover and nesting habitat for other species. These changes have caused for significant swings in species populations. Interspecies competition for food, forage, and cover also has a profound impact on wildlife populations and locations.

Species	Acres
Bald Eagle	854
Barrows's Goldeneye	244
Bighorn Sheep	4,476
Blue Grouse	211
Cavity Nesting Ducks	854
Chukar	4,825
Cliff/Bluff Birds	646
Golden Eagle	4,777
Mule Deer	11,1347
NW White-Tailed Deer	1,9306
Riparian Zone Wildlife	1,371
Sharp Tailed Grouse	40,989
Wetland Mammals	424

Table 7. Priority Habitat species 2012 data from Washington Department of Fish and Wildlife. This list is only a limited example of species currently present in the planning area.

One of the issues that are currently being addressed but needs continued efforts is the screening of irrigation pumps in the Okanogan River and in tributary streams. Many irrigation pump screens in the Okanogan River watershed do not meet current standards to prevent entrainment. Improperly screened intakes can cause a high mortality rate to juvenile and occasionally adult fish when in proximity to pumps during operation.

Human

Humans have been in this watershed for over 7,000 years. The earliest inhabitants were moved into the area and harvested a bounty of wildlife, berries, roots, and fish. These earliest ancestors of the Confederated Tribes of the Colville Indian Reservation became very adept at using the resources the watershed offered to survive and even thrive.

In the early 1800s, European fur traders first entered the watershed looking for pelts and other goods to trade and barter with the local native inhabitants. Not long after, the first settlers came to the watershed and immediately began cultivating fields in mostly dryland crop production. Within a few short years the first series of surface irrigation systems were constructed and cropped acreages began increasing rapidly. Over the next century, thousands of people moved to this semi-

remote portion of Washington State to homestead and began constructing homes, businesses, roads, and tilling the Earth to support themselves, their families, and the community.

Today, Okanogan County is home to a little over 40,000 residents with approximately 5,560 residents in the planning area. The local economy is largely dominated by resource industries from agriculture, to forestry, to mining, and recreation. While the local economy has never been robust by the standards of larger and more industrialized areas of Washington State and beyond, local residents have found ways to make a living and continue to provide for their families and community.

Energy

Local energy resources are limited to traditional hydropower and newer green energy such as solar and wind energy. There are no known coal or oil deposits in the planning area or close by. While hydropower is a significant energy source in the larger Columbia River basin, there is currently no commercial hydropower facilities in this planning area.

Green energy operations on a small scale have begun to gain momentum. These facilities are largely grid tied or off-grid solar systems used to generate small amounts of electricity for homes, water wells, and stockwater facilities that are far removed from established electrical utilities. Wind energy is not feasible in most areas as the region does not have the necessary sustained winds to generate reliable electrical feeds. Some have expressed interest in this type of energy production but when their sites are tested they are usually found to be inadequate.

One other possible component of energy that has gained interest in local leaders and community members is the possibility to generate bio fuels. There are two main methods for doing this. The first method is to grow crops with high oil content such as canola that can then be processed into a fuel that can be used in diesel engines. While the technology exists, the costs for production of the crop and conversion to a useable fuel have kept this technology from expanding much beyond some early trials in the region. The other method is the potential to harvest woody biomass primarily from forest lands and use the material as fuel in a generator process that would create electricity. This option has been explored by a few different entities and so far has not passed beyond evaluation due to high costs to harvest and transport the biomass from where it is located to generation facilities.

One final source of energy production that has only recently begun to increase in evaluation is small scale hydropower that would provide electrical production for single home and farmsteads. There are natural resource and other constrictions currently that are limiting this energy production but it remains a potential for future energy demands.

Conservation Programs

There are many entities that offer conservation programs to private landowners in the region. Most of these programs offer some form of technical assistance from knowledgeable resource professionals and/or financial assistance to implement practices that provide conservation benefits to natural resources. While there has been a significant increase in efforts to coordinate these efforts in the watershed planning area and beyond there remains more effort to better coordinate activities to achieve widespread conservation application.

Federal

Several Federal agencies offer landowners conservation assistance in the watershed. The largest provider of such service is the USDA Natural Resources Conservation Service (NRCS). The agency works collaboratively with landowners to identify site specific resource concerns, develop goals for stewardship, and establish conservation practices and management activities necessary to achieve the landowners operational and conservation goals. NRCS staff located in Okanogan County are responsible for implementing the majority of the conservation title of the US Farm Bill. The flagship program of the Farm Bill is the Environmental Quality Incentives Program (EQIP). This program was first created in the 2000 Farm Bill and has become the primary source of technical assistance and cost-share (financial payments to landowners who enter into contracts with the agency to implement specific conservation practices) funds in the watershed. Other Farm Bill programs implemented by the NRCS include the Conservation Stewardship Program, Agricultural Water Enhancement Program, Farm and Ranchlands Protection Program, Grassland Protection Program, Wetland Reserve Program, Wildlife Habitat Incentives Program, and others.

The USDI Fish and Wildlife Service (USF&WS) works with private landowners on a limited basis in the region to implement conservation activities that provide wildlife habitat. These activities are not necessarily program driven such as Farm Bill programs but rather are targeted to specific species or areas with high or potentially high habitat values. USF&WS staff works one-on-one with private landowners when called upon by the landowners themselves or partnering agencies and organizations.

The USDA Forest Service occasionally works with private landowners who own or manage lands adjacent to National Forest lands to implement conservation practices. These are limited due to Congressional constraints on how and where funding is used. The agency does work collaboratively with ranchers, foresters, and others who have permits to graze cattle on agency managed lands to implement conservation practices. These activities are the most common for the agency as they are not as significantly restricted by national mandates.

The Bonneville Power Administration is a pseudo federal agency that has a Congressional mandate to provide funding for restoring or protecting critical wildlife habitat as mitigation for the operation of Columbia River hydropower facilities. While the agency does not work with private landowners directly, they do provide funding to other entities in the form of contracts and grants to work with private landowners to implement priority conservation practices.

Tribal

The Confederated Tribes of the Colville Indian Reservation works with landowners on and off the Colville Indian Reservation to restore and protect priority habitats for numerous wildlife species. These activities are primarily conducted by the Tribal Fish and Wildlife Program staff. The majority of their work has centered upon restoring and conserving habitat for culturally significant fisheries such as steelhead and Chinook salmon. Tribal employees have reached out to landowners throughout the Okanogan River Watershed and the planning area to begin discussions of conservation activities the landowners may wish to implement that will provide quality habitat for these species. They have worked with landowners to implement stream bank restoration projects that will provide habitat diversity and structure for spawning and rearing of fish, to install riparian plantings that will provide shade to help maintain cool water temperatures, and to compromise fish passage barriers which allow access to additional spawning and rearing habitat.

State

There are primarily four state agencies that provide conservation programs that assist with conserving natural resources in the watershed. These agencies each have their own mission and while there is some overlap of roles their dominant priorities and functions don't readily lend to duplication of activity.

The Washington State Department of Natural Resources (DNR) is mandated to manage state forests and other lands that are held in trust for revenue generation that funds schools and other state programs. They are also tasked with working with private forest landowners with the production of forest resources, protection of forestland conservation values, and regulating tree harvesting activities. The agency has local foresters who work with landowners to conduct forest thinning activities to improve resource stands, limit invasive species, and develop wildfire defensible space around homes and other buildings. The agency also provides limited cost-share funds to private landowners who enter into contracts with the agency to implement site specific conservation practices.

The Washington State Department of Fish and Wildlife (WDFW) works with private landowners to implement conservation programs that primarily target priority species and their habitats. Much of the work the agency has done in the past 20 years has centered upon improving habitat values for Endangered Species Act listed species such as steelhead and Chinook salmon and game species such as Mule Deer, grouse, and others. The agency provides limited cost-share funds to private landowners who enter into contracts with the agency to implement site specific conservation practices. The agency also works with a limited number of ranchers who have lease agreements to grazing land on department managed lands.

The Washington State Department of Ecology provides grants to other entities to implement projects that primarily protect water quality, water quantity, and air quality. The agency has traditionally worked directly with these other entities to implement grants that provide conservation benefits to priority natural resource concerns. The agency also maintains a regulatory

role in protecting ground and surface water quality, air quality, and other programs such as toxic waste.

The Recreation and Conservation Office is a smaller state agency that provides grant funding to other entities to provide public parks and other recreational facilities but also manages Washington States efforts to address habitat and access concerns for Endangered Species Act listed salmonid fish species such as steelhead.

Local

The Okanogan Conservation District (OCD) is a small sub-division of state government that is directed by a board of five local supervisors. The OCD provides services to the public in much the same manner as the USDA Natural Resources Conservation Service. The OCD Board maintains a five year strategic plan that outlines the greatest natural resource concerns in the District and directs staff to seek grant funding and partnerships with agencies, organizations, and members of the public to implement programs and projects that directly relate to the priority concerns. The District is non-regulatory and is primarily funded by grants.

The Okanogan County Natural Resources Department is a sub-division of the Okanogan County Planning and Development Department. The Natural Resources Department is primarily involved with private landowners through permit administration for projects and activities that occur in the shoreline or other sensitive areas.

Washington State University Extension – Okanogan County is the local department of the greater Washington State University Extension Service. The local office works with local private landowners, agencies, businesses, organizations, and the public to provide education and technical assistance on a multitude of subjects ranging from grazing management to gardening. They implement many educational programs that reach out to local citizens to provide much needed training and information on the latest trends in agri-business, product marketing, natural resource conservation, and general natural resource education.

Private

The Cascade Fisheries Enhancement Group (CFEG) is a private non-profit that is closely tied to the Washington Department of Fish and Wildlife. The CFEG is partially funded from the sales of commercial and non-commercial fishing licenses. They use these funds as well as grants and other sources to implement projects that protect and conserve natural resources directly related to fisheries habitat with a significant focus on threatened and endangered fish species. The CFEG covers Chelan, Douglas, Okanogan, and Ferry Counties.

The Okanogan Land Trust is a private non-profit that works with private landowners to accept and manage conservation easements on private lands to keep open spaces, working lands, and wildlife habitat. The organization is funded through donations and grants. They work collaboratively with only those landowners who are interested in setting aside part or all of their property into a

conservation easement that limits or in some cases eliminates future development or other activities on the enrolled property. These easements are voluntary on the part of the landowner who receives financial compensation and/or a tax benefit for the enrolled easement from the Okanogan Land Trust.

Recommended Actions

The following recommended actions are not listed in any particular order. They are intended to be recommended activities that landowners, agencies, and conservation groups should look to collaboratively implement as opportunities arise.

1. One of the early data gaps of this rapid assessment was the lack of known roads and their current conditions. We recommend an inventory of roads (jurisdiction, surface type, etc.) where feasible in the planning area using remote sensing along with an assessment of their condition and potential to contribute sediment (proximity to waterways) and other road borne runoff (chemicals).
2. Irrigation pump screens continue to pose a lethal hazard to fish and other aquatic species. Expanded implementation of current programs to properly screen intakes is necessary to protect fish species, particularly federally-listed summer steelhead.
3. Proper irrigation water management is necessary for ecological and economic reasons. Many irrigators continue to manage water on schedules that either apply too much or not enough water for the most effective crop production. Providing growers with the technology and training on how to best apply irrigation water at the proper time and proper duration will improve production, possibly reduce pumping costs, and ensure the water resource is better managed for all resources within the planning area. Many irrigation systems in the watershed are far past their expected life span leading to leaks and inefficient application of a limited resource. Efforts should be made to provide assistance to irrigators to upgrade systems to newer, more efficient irrigation systems, to improve irrigation water application. While the cost of the capital improvement is expensive, the long-term cost-savings in pumping and maintenance can make the upgrades more palatable to producers.
4. Stream barriers continue to suppress fish populations by limiting access to adequate habitat within the planning area. Efforts should be made to remove or modify man-made barriers to accommodate fish to access habitat up and downstream. This will increase production and strengthen currently weak sub-populations. Stream bank stabilization needs to be increased in some reaches of the watershed planning area. Accelerated stream bank erosion can produce significant levels of soils into streams which can substantially reduce fish and aquatic insect production, increase health issues in aquatic species, and cost irrigators money to repair pumps and irrigation systems which prematurely wear out from pumping suspended sediment.
5. Riparian plantings in areas where the riparian conditions have been damaged should take place to improve overall functionality of this important ecosystem. Riparian areas are extremely important areas of refuge for aquatic and upland wildlife species alike. They

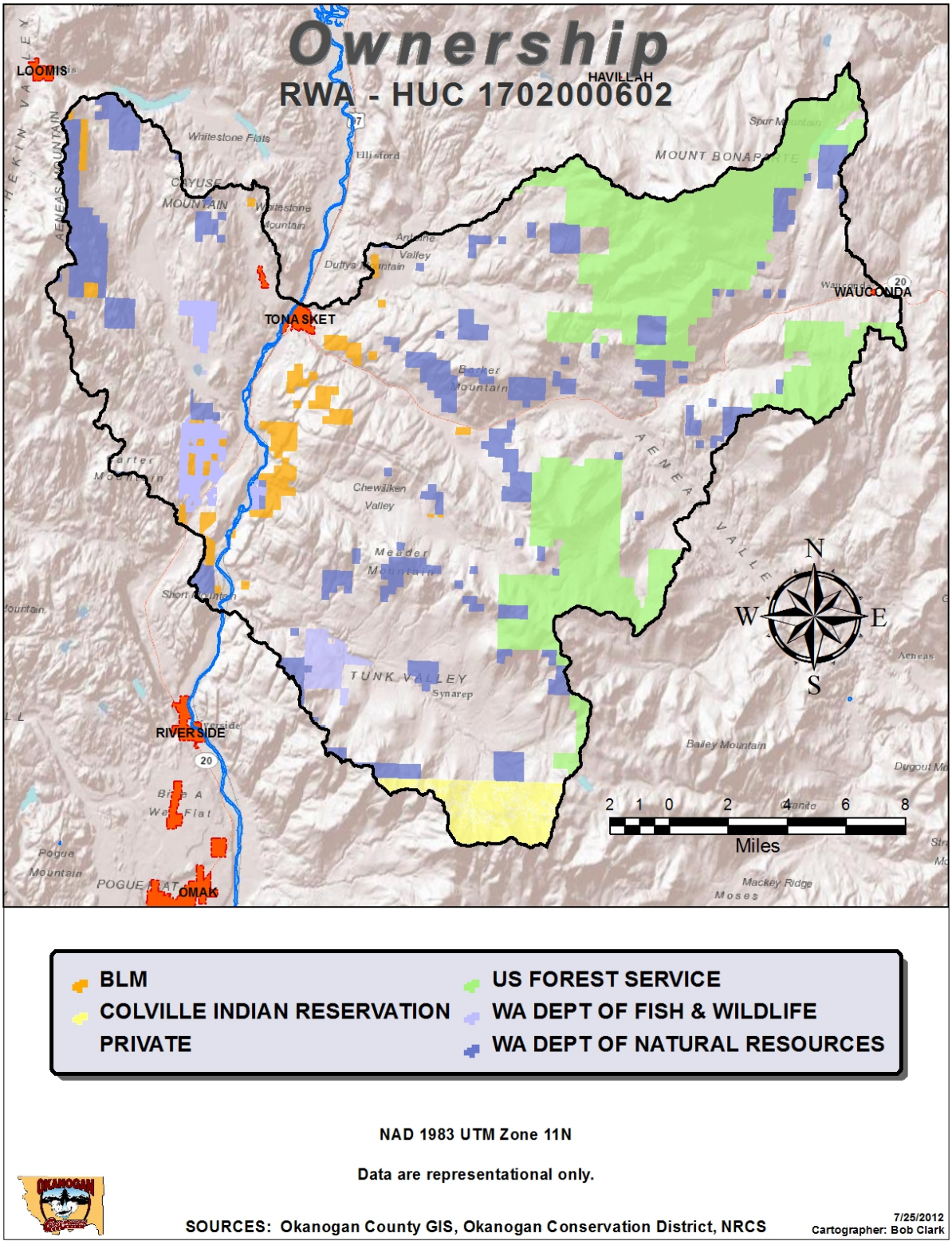
provide food, cover, and shelter for both terrestrial and aquatic species during all stages of their life cycle.

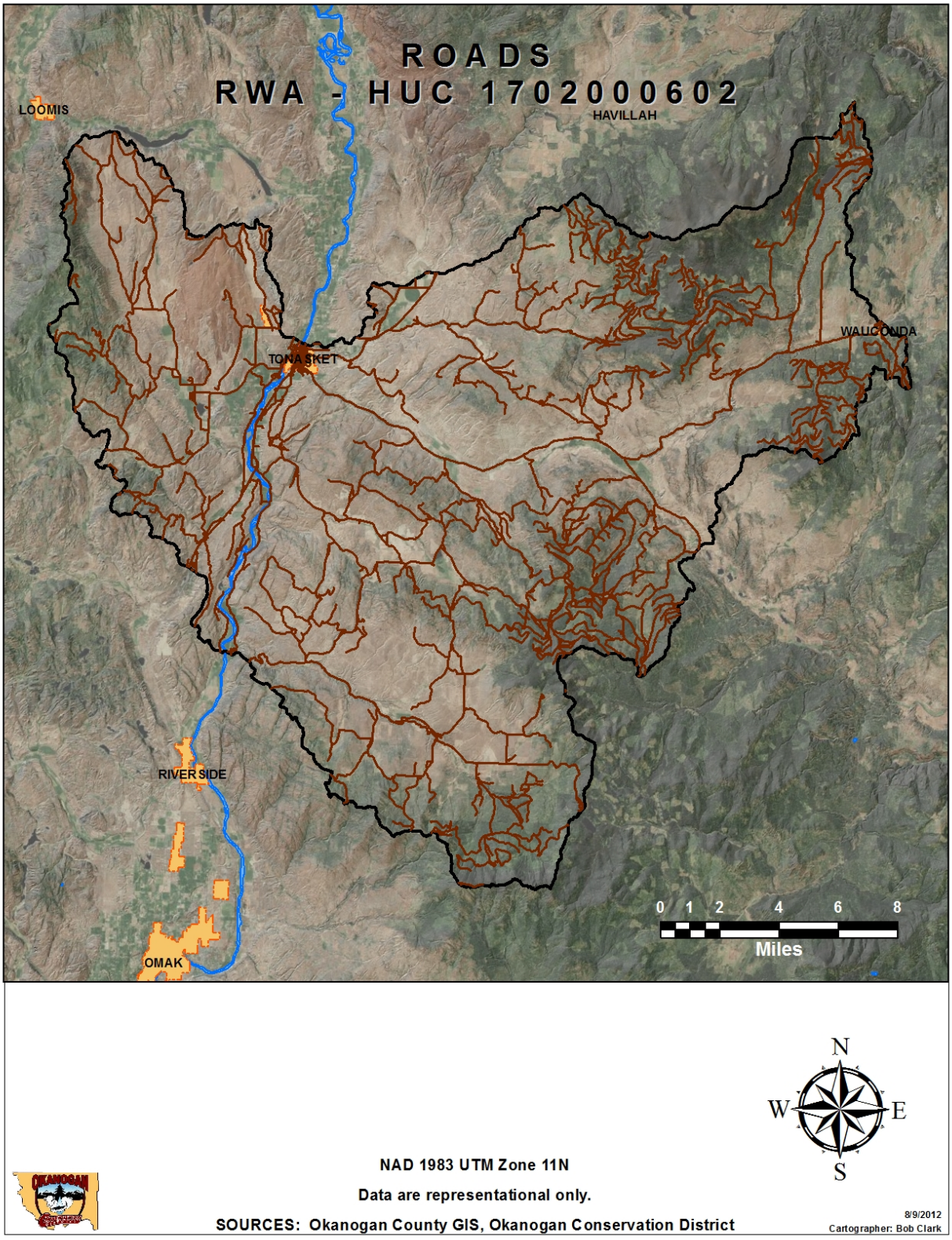
6. As one means to improve the hydrology of tributary streams, a beaver relocation program should be assessed for these watersheds. Beavers can help local ground water levels by impounding water behind their dams which infiltrates stream banks and some of this water moves to sub-surface aquifers. Beaver populations that are distributed throughout a watershed can significantly improve hydrology by reducing the impacts from high spring runoff, sustain higher flows in-stream throughout the dry summer months, and provide quality habitat for other aquatic species. This should be done with community support so that beavers are not introduced in areas where they will become a nuisance or damage other resources.
7. Forest health should be addressed with increased programs to assist private forest landowners and public land mangers with the technical assistance and where possible financial assistance to reduce overstocked stands, reduce catastrophic wildfire risks, reduce forest health risks associated with invasive pests, and improve hydrology.
8. Implement a range condition and production potential analysis to assess the health of this landuse and identify specific resource concerns. This is the largest landuse type in the planning area but there is only limited sporadic data as to the overall condition.
9. Provide livestock producers with technical and where appropriate and requested financial assistance to better manage livestock in the watershed. With proper grazing management, access to clean water off-stream or at hardened stream crossings, and management of concentrated livestock facilities could lead to reduce pathogens in streams, improve herd health, and reduce sediment contributions to streams.
10. Collect precipitation data throughout the watershed planning area at various elevations, particularly in the uplands, aspects, landuse types, and canopy cover conditions. This information is critical to fully understanding the hydrology and water resources of the watersheds.
11. Provide assistance to landowners to address invasive species. Plant and insect species have caused extensive ecological damage throughout the planning area. Noxious weeds of various classes lead to erosion, low native plant production, and decreased forage. Insect invasive species have become a significant issue, particularly in the eastern portions of the planning area as they have moved into overstocked forest stands causing stands to die or be significantly impacted.
12. Explore the potential for water storage facilities that can be used to provide late season water to meet multiple demands for water. Water storage options should be explored to make full use of this limited resource. While generally the soils of the planning area are not conducive to larger storage basins, there remains a potential for multiple smaller storage facilities that would allow for greater use of water through the growing season for irrigation and year-round use for domestic and other uses.
13. Provide natural resource and conservation education to local residents. Educating local residents about the need for natural resource conservation and how they can be better stewards of the natural resources they manage and impact is critical. Providing natural resource education to children and adults will provide the greatest long term benefits to the natural resources of the planning area.

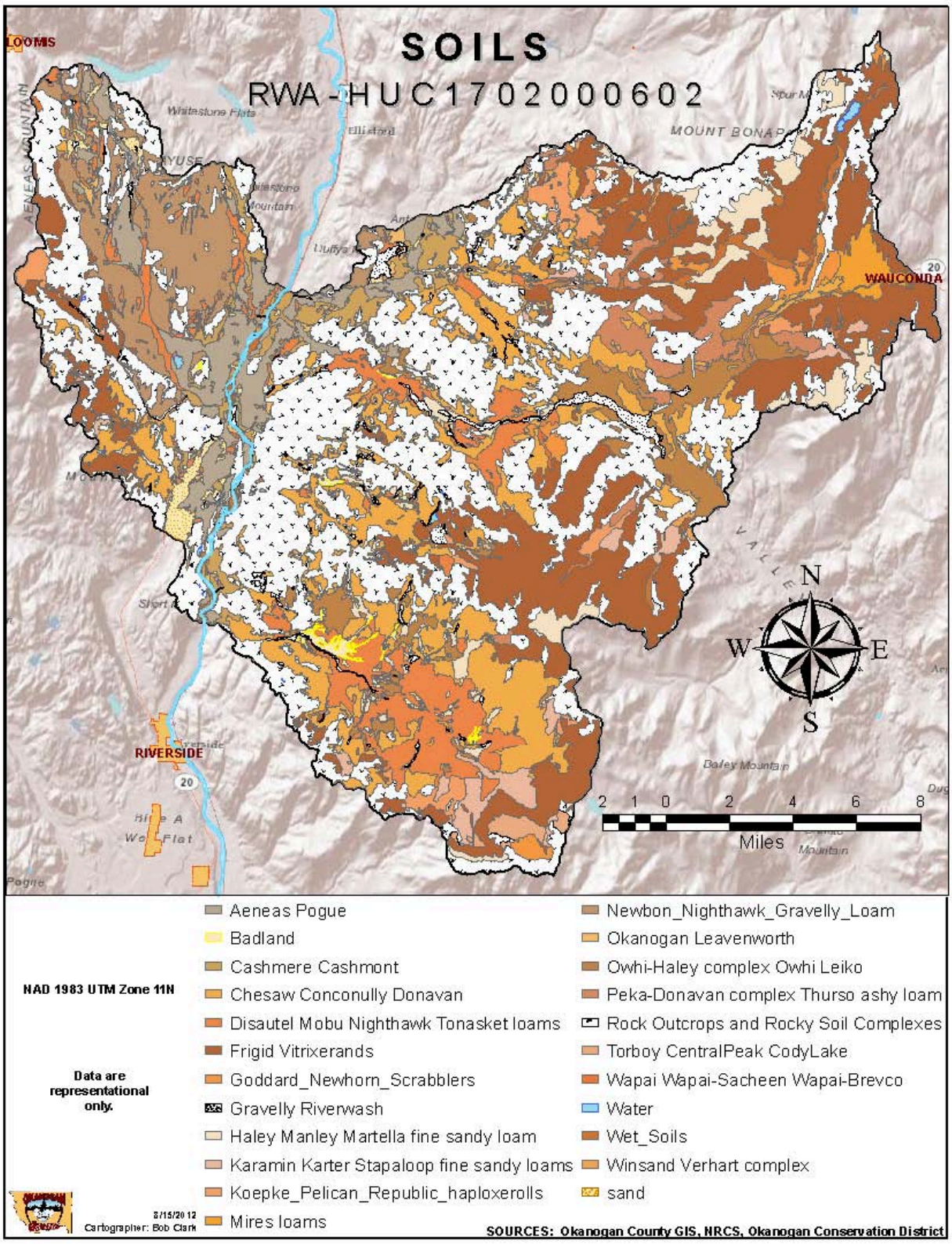
14. Explore opportunities for small hydropower electrical production facilities. Energy production needs will continue to increase due to rising costs of energy throughout the planning area and beyond. Providing opportunities for landowners to install small hydropower electrical production facilities will provide greater security and economic stability to landowners and the community.

Maps

Below are a series of maps that were produced from data collected from a number of sources. This data provided much of the information that has been captured in this analysis.


Ownership
RWA - HUC 1702000602
LOOMIS
HAVILLAH
TONASKET
WAUCONDA
RIVERSIDE
OMAK
Whitestone Flats
Ellisford
MOUNT BONAPARTE
OKUSE MOUNTAIN
Whitestone Mountain
Antoine Valley
Duffys Mountain
Barker Mountain
AENEAS VALLEY
Chewiliken Valley
Meader Mountain
TUNK VALLEY
Synarep
Bailey Mountain
Mackey Ridge
Moses
Pogue Mountain
POGUE FLAT
N
W
E
S
2 1 0 2 4 6 8
Miles
BLM
COLVILLE INDIAN RESERVATION
PRIVATE
US FOREST SERVICE
WA DEPT OF FISH & WILDLIFE
WA DEPT OF NATURAL RESOURCES
NAD 1983 UTM Zone 11N
Data are representational only.
SOURCES: Okanogan County GIS, Okanogan Conservation District, NRCS
7/25/2012
Cartographer: Bob Clark


ROADS
RWA - HUC 1702000602
LOOMIS
HAVILLAH
TONASKET
WAUCONDA
RIVERSIDE
OMAK
0 1 2 4 6 8
Miles
N
W
E
S
NAD 1983 UTM Zone 11N
Data are representational only.
SOURCES: Okanogan County GIS, Okanogan Conservation District
8/9/2012
Cartographer: Bob Clark


SOILS
RWA - HUC1702000602
LOOMS
WAUCONDA
RIVERSIDE
Whitestone Flats
Ellisford
MOUNT BONAPARTE
Bailey Mountain
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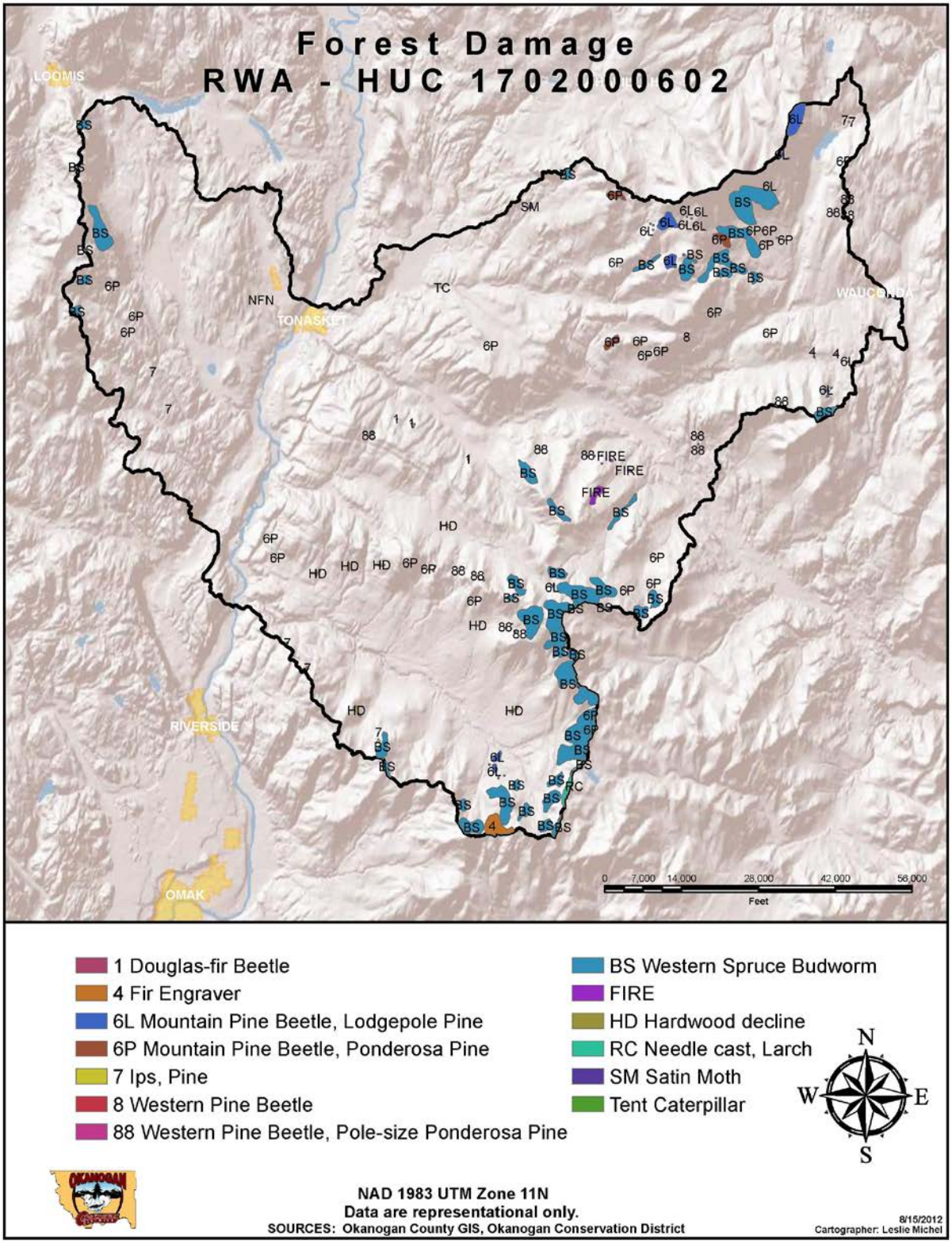
2 1 0 2 4 6 8
Miles
NAD 1983 UTM Zone 11N
Data are representational only.
Aeneas Pogue
Badland
Cashmere Cashmont
Chesaw Conconully Donavan
Disautel Mobu Nighthawk Tonasket loams
Frigid Vitrixerands
Goddard_Newhorn_Scrabblers
Gravelly Riverwash
Haley Manley Martella fine sandy loam
Karamin Karter Stapaloop fine sandy loams
Koepke_Pelican_Republic_haploxerolls
Mires loams
Newbon_Nighthawk_Gravelly_Loam
Okanogan Leavenworth
Owhi-Haley complex Owhi Leiko
Peka-Donavan complex Thurso ashy loam
Rock Outcrops and Rocky Soil Complexes
Torboy CentralPeak CodyLake
Wapai Wapai-Sacheen Wapai-Brevco
Water
Wet_Soils
Winsand Verhart complex
sand
8/15/2012
Cartographer: Bob Clark
SOURCES: Okanogan County GIS, NRCS, Okanogan Conservation District


Forest Damage
RWA - HUC 1702000602
LOOMIS
NFN
TONASKET
TC
SM
WAUCONDA
RIVERSIDE
OMAK
FIRE
HD
RC
0 7,000 14,000 28,000 42,000 56,000
Feet
1 Douglas-fir Beetle
4 Fir Engraver
6L Mountain Pine Beetle, Lodgepole Pine
6P Mountain Pine Beetle, Ponderosa Pine
7 Ips, Pine
8 Western Pine Beetle
88 Western Pine Beetle, Pole-size Ponderosa Pine
BS Western Spruce Budworm
FIRE
HD Hardwood decline
RC Needle cast, Larch
SM Satin Moth
Tent Caterpillar
N
W
E
S
NAD 1983 UTM Zone 11N
Data are representational only.
SOURCES: Okanogan County GIS, Okanogan Conservation District
8/15/2012
Cartographer: Leslie Michel

Data Sources

Below is a list of data sources that were used to compile natural resource data for this report.

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