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INITIAL WATERSHED ASSESSMENT

WATER RESOURCES INVENTORY AREA 62

PEND OREILLE RIVER WATERSHED

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INTRODUCTION

Washington Department of Ecology's (Ecology) Shorelands and Water Resources Program is charged with managing the state's water resources to ensure that the waters of the state are protected and used for the greatest benefit. An important component of water management relies on permitting and enforcement of water rights. The State's authority on these issues, and that of Ecology, is outlined in Chapters 90.03 and 90.44 of the Revised Code of Washington (RCW). In order to make water management decisions, particularly when considering whether to grant a permit for water use, Ecology must determine that the proposed water use passes the following four statutory tests (Chapter 90.03.290 RCW):

- The use will be beneficial;
- The use will be in the public interest;
- The water is available;
- The use will not impair senior water users.

In addition to these statutory tests, when Ecology makes a water use decision it must also consider other water management issues and concerns mandated by State and Federal Laws including non-degradation of water quality (Washington Administrative Code (WAC) 173-200 and 201A), preservation of instream flows to maintain aquatic habitat and other beneficial uses especially where specified by statute (WAC 173-500), and preservation of aquatic habitat for endangered fish stocks and other species.

The goal of this report is to document the status of surface and ground water resources in the Pend Oreille River watershed in Washington State (Water Resources Inventory Area Number 62 (WRIA 62)), and to evaluate the information that is available for addressing regulatory concerns and for making appropriate water resource management decisions. To meet this goal, key water management issues in the WRIA which impact surface water and ground water appropriation decisions are identified and documented. For this initial survey, information on hydrologic conditions within the watershed as a whole was compiled to broadly indicate the "health" of the resource. These hydrologic conditions include water quantity, hydrogeology, water demand, water quality, and status of aquatic habitat and fish stocks.

Assessment of these conditions are based on readily available information about water rights and claims, streamflow, precipitation, hydrogeology and ground water levels, fish stocks and water quality. Watershed data and information was obtained from the statewide geographic information system (GIS) which was supplied by Ecology, a limited review of literature for the geographic area, NOAA climatologic data bases, U.S. Geological Survey streamflow data (obtained from a Hydrosphere Inc. CD-ROM compilation), the STORET water quality data base for the state (obtained from EarthInfo, Inc. CD-ROM compilation), and a limited survey of organizations, tribes and local, state and federal agencies serving the watershed.

WATERSHED DESCRIPTION

GEOGRAPHY AND HYDROGRAPHY

The Pend Oreille River watershed within Washington State (WRIA 62) encompasses approximately 1,300 square miles in north-eastern Washington along the Idaho and British Columbia borders (Map 1). The area includes the majority of Pend Oreille County and a small portion of eastern Stevens County. The terrain in the WRIA is generally hilly to mountainous, bisected by the narrow valley of the Pend Oreille River. Elevations range from less than 1,500 feet above mean sea level to greater than 6,000 feet above mean sea level.

Most of the watershed drains directly into the Pend Oreille River, which is the main watercourse in the WRIA. A portion of the WRIA (approximately 15 percent) along the eastern border adjacent to Idaho flows toward Priest Lake, eventually reaching the Pend Oreille River upstream of Newport, Washington. Major lakes in the WRIA include Sullivan Lake, Bead Lake and Calispell Lake. The largest stream tributary to the Pend Oreille River within the WRIA is Sullivan Creek, which drains a basin of approximately 142 square miles. Other tributaries in the WRIA include Calispell Creek, Tacoma Creek, Ruby Creek, Lost Creek, Slate Creek, Sullivan Creek, LeClerc Creek and Skookum Creek. Basin areas draining to these creeks generally range from 50 to 100 square miles.

The Pend Oreille River originates in Lake Pend Oreille, which is fed by the Clark Fork River. The headwaters of the Clark Fork River, which is the primary tributary to Lake Pend Oreille, are in the Rocky Mountains in Montana. The Pend Oreille River flows into the Columbia River in British Columbia north of Washington State. There are several dams on the Pend Oreille - Clark Fork River system in Montana, Idaho, Washington and in Canada. In Washington, dams are located at the international boundary with Canada and at Box Canyon near Metaline Falls. The Pend Oreille River upstream of Box Canyon Dam to Albeni Falls Dam (just east of the Washington border in Idaho) is known as the Box Canyon Reservoir or Box Canyon Reach and is characterized as a slow moving "run of the river" reservoir operated by the Pend Oreille County Public Utilities District.

The basin area of the Pend Oreille River at Newport upstream of WRIA 62 is approximately 24,200 square miles, and upstream of the Canadian border is approximately 25,200 square miles. Hence, approximately 1,000 square miles of the total watershed or less than 4 percent lies within the WRIA. Comparatively, the Pend Oreille watershed in Washington State represents only a small fraction of the total area draining to the Pend Oreille River, and therefore is not a major source of water to the River.

LAND COVER AND LAND USE

This section is a summary of existing land use information available from several sources, including Stevens County, Pend Oreille County, and the Washington State Department of Natural Resources. Existing land uses within the Pend Oreille River watershed have not been

characterized in detail at this time. However, Pend Oreille County and Stevens County are currently undergoing this task due to the implementation of the Growth Management Act.

The existing land within WRIA 62 is primarily federally managed forest, with areas of rangeland and agriculture located adjacent to the river corridor. Approximately 85 percent of the watershed is within the Colville and Kaniksu National Forests, and though principally forested and available for commercial timber operations, the Forest Service management scheme appears to keep the lands as public open space. The agriculturally based areas within the watershed are composed of a variety of uses, including fruit orchards, cultivated crops, grazing, and animal husbandry. The major urban and developed area in the watershed is the town of Newport which is located along the Pend Oreille River at the Idaho border. Other developed areas are limited to several small towns (such as Cusick, Tiger, Metaline, and Ione) with populations less than 1,000 located adjacent to the river between Newport and the Canadian border.

Land uses within the watershed have not changed significantly within the past several decades. The predominant economic stimuli for the area has consistently been the timber and recreation industries. These uses are encouraged within the watershed to promote the continued economic development of the region; urban/developed areas provide services to the region.

CLIMATE AND PRECIPITATION TRENDS

The climate of WRIA 62 combines characteristics of a typical mountain/continental climate, which predominates in the Rocky Mountains, and a maritime climate, which predominates west of the area. Most of the weather variation originates as easterly flow from the Pacific (PNRBC 1970). Average annual precipitation at lower elevations for the area ranges from 20 inches near Northport (at the north end of the WRIA, to 25 inches near Newport (at the south end of the WRIA)(Figure 1). At higher elevations, average annual precipitation ranges from 35 to 55 inches. The area of greatest annual precipitation is in the northeast corner of the WRIA (Map 2). Over the entire WRIA, precipitation averages approximately 37 inches annually.

Monthly precipitation patterns (Figure 1) show that the majority falls in the winter and spring, with the highest totals occurring from November through January. Peak rainfall also occurs in May and June, particularly in the northern portions of the WRIA. Total annual snowfall averages 50 to 60 inches in the Pend Oreille River valley as measured at Newport and Northport occurring typically from November to March. Total annual snowfall represents approximately 20 percent of the average annual precipitation (assuming a water equivalent of 10 inches of fresh snow to one inch of rain).

Long term regional trends in precipitation indicate that recently, total annual precipitation has been slightly above normal compared to long term records beginning in the early 1900s for northeastern Washington (Colville and Spokane - Appendix A.1). Inspection of precipitation trends for Colville (located just west of the WRIA 62) and Northport (Figure 1) show similar trends; however, precipitation at Newport has shown somewhat lower than average values since the late 1970s. Statistical straight line trend analysis of annual precipitation totals for Newport,

Northport and Colville all show a general increase in precipitation since the 1920's, with Newport showing the least and Northport the most (Appendix A.2).

Evaporation and transpiration (evapotranspiration) from plants (water lost through plant uptake and release to the atmosphere) is highest during the summer months where water is available. Potential evapotranspiration (the amount that would occur if water were always available) is estimated to range from 20 to 25 inches at lower elevations (PNRBC 1970), and is assumed to be somewhat less at higher elevations. Actual evapotranspiration has been estimated to range between 12 and 16 inches annually (PNRBC 1970) over much of the area. Evapotranspiration occurs year round from plants and via sublimation even during periods when the air temperature is below freezing. However, the majority of the total annual evapotranspiration (80 percent or more) occurs during the months of May through September.

HYDROGEOLOGY

HYDROLOGY OF THE WATERSHED

Water availability and distribution in WRIA 62 is determined by the components of the hydrologic cycle as it occurs throughout the basin (Figure 2). The hydrologic cycle can be viewed as an overall water balance, which enables an assessment of the component inflows and outflows in the watershed. The water balance begins with the total quantity of water input to the watershed. As can be seen in Figure 2, water originates as precipitation which replenishes surface water and ground water reservoirs. Precipitation provides the only inflow to streams, lakes and ground waters whose catchment areas are completely contained in the watershed. In some watersheds, including WRIA 62, which do not encompass the entire drainage area of the main water courses, large rivers and regional aquifers (ground water reservoirs) receive inflow from upstream catchment areas outside of the watershed. Tributary streams and local ground water sources (fed by precipitation within the watershed) augment the large regional rivers and aquifers.

Outflows from the watershed include water lost to the atmosphere from evapotranspiration (direct evaporation from water bodies and transpiration via plant uptake of water from the soil), and flow out of the watershed from rivers and aquifers, and also from consumptive human use. A balance exists between the inflows and outflows within the watershed. Outflow cannot exceed inflow unless water stored within the watershed (in lakes, rivers and ground water reservoirs) is depleted. When inflow exceeds outflow, stored water increases in the watershed. Over the long term, gains and losses from storage tend to equalize, and outflow equals inflow. Thus, the total amount of water potentially available for maintaining streamflow, habitat and consumptive use is limited by the total inflow to the watershed.

The general hydrologic cycle or water balance for the Pend Oreille watershed in Washington State is described by the following equation:

$$P + IF = OF + Q + ET + \Delta S \qquad (1)$$

where

- P = total precipitation;
- IF = inflow from upstream sources (surface and ground);
- OF = outflow from the watershed via rivers, streams and natural ground water discharge;
- Q = consumptive water withdrawal and water diverted out of the watershed from ground water and surface water sources for human uses;
- ET = evapotranspiration;
- ΔS = change in water stored within surface and ground water reservoirs in the watershed.

Applying the above equation and using general climatic data for the WRIA, greater than 1 million acre-feet of water replenishes streams and ground water reservoirs each year on average. In addition to water available climatically, inflow from the Pend Oreille River brings more than 17 million acre feet into the watershed annually.

The above analyses do not differentiate between surface water and ground water runoff. Outflow is derived from precipitation not lost to evapotranspiration. This water, called runoff, can either infiltrate into the ground recharging ground water, or it can flow to a stream over the ground surface. Runoff which recharges ground water causes ground water levels to rise (increasing storage). Ground water levels can also rise from water inputs originating outside of the watershed. For example, flood waters brought into a watershed from upstream can flow overland and seep into the ground (recharging ground water) or can seep into the ground from the river banks. Water recharging ground water in this way will also eventually flow back to surface water when the flood waters recede. When the ground water levels are higher than water levels in streams, ground water drainage occurs through openings in sediments and rock formations, slowly returning the infiltrated water to streams resulting in increased outflow. Hence there is hydraulic continuity between surface water and ground water which is a function of flow velocities through the ground. Ground water contained in rock fractures and pore spaces in sediments provides storage similar to a large lake or surface water reservoir.

The surface water and ground water runoff components of the water balance as they relate to watershed outflow are expressed as follows:

$$OF = IF + SR + GB - \Delta S \qquad (2)$$

where

- OF = outflow from the watershed via rivers, streams, and natural ground water discharge;
- IF = inflow from upstream sources;
- SR = runoff to surface water via overland flow and direct precipitation;
- GB = infiltrating runoff, ground water recharge and subsequent discharge as baseflow to streams.
- ΔS = change in water stored within surface and ground water reservoirs in the watershed.

Consideration of the water balance equations show that increased consumptive uses and/or reduction in surface or ground water storage via consumptive use will reduce outflow from streams and rivers. This will reduce the amount of water available in the watershed for instream uses, either in the form of storage or streamflow. As discussed above, the components of the annual water balance equation would be expected to be in balance with precipitation and inflow over the long term, with storage changes being minimized (Gray 1973). However, seasonal variability occurs in response to differences in precipitation and evapotranspiration patterns, as well as the affects of water storage in the snowpack.

The seasonal variability in the water balance results in seasonal variability in streamflow. Figures 3 and 4 show long term annual and average monthly hydrographs for streams and rivers

in WRIA 62, as well as the hydrograph for the Clark Fork River upstream of the major dams and upstream of Washington State. The average monthly hydrographs for all of the Pend Oreille River stations and the Clark Fork River exhibit similar characteristics including a strong seasonal peak in early to late spring, followed by the lowest flows during late summer and low to moderate flows during fall and winter. This pattern reflects the dominance of snowmelt as the main hydrologic event in the Clark Fork and Pend Oreille Rivers. The persistence of this pattern in a downstream direction indicates that the majority of flow in the Pend Oreille River is derived from snowmelt dominated regions. The snowmelt dominated peak flow occurs consistently from year to year during the same approximate time period, as indicated on Figure 5 and 6.

Outlet Creek near Metaline Falls is the only currently operating stream gaging station in the WRIA that is not on the Pend Oreille River. Outlet Creek drains a basin area of 51 square miles and is tributary to Sullivan Creek. The monthly hydrograph for this creek is considered typical for uncontrolled medium to large streams in the WRIA which are tributary to the Pend Oreille River. This assumption is based on the similarity in climatic conditions found across the WRIA; however, variability in flow conditions may also be affected by underlying geology. The monthly hydrograph characteristics of Outlet Creek show a distinctly different pattern than those for the Pend Oreille River, with the highest flows occurring in October and November in response to rainfall, and an additional peak occurring in June resulting from snowmelt and rainfall. The lowest flows occur in late winter during periods of water storage in the snowpack, and during late summer during periods of low precipitation and high evapotranspiration.

The monthly hydrograph for Outlet Creek shows that even though precipitation levels are comparable during both spring and fall, streamflow during the spring, (including melting of accumulated snow), is lower than rainfall runoff generated flows observed in the fall. This difference is apparently the result of high evapotranspiration in May and June. This pattern illustrates the seasonal nature of the water balance and also indicates that water is least available in the winter and summer in streams located wholly within the WRIA (other than the Pend Oreille River).

The general water balance equations defined above for the watershed can be used to assess the magnitude and importance of the various hydrologic components. For example, total inflow and outflow from the watershed in the Pend Oreille River as measured at Newport and at the international boundary are both on the order of 18 million acre-feet annually (average inflow of 25,740 cfs), whereas the amount of inflow from precipitation to the entire WRIA is on the order of 1.9 million acre-feet per year (37 inches annually). These comparative values indicate that inflow from the Pend Oreille River is by far the dominant hydrologic variable in magnitude. The available data base is sufficiently accurate to quantify the components of the water balance in a general sense, questions regarding long term average and basin wide water availability can be addressed. However; the accuracy is not sufficient to address seasonal, year to year or localized variations in water availability.

The climatic variables of the water balance equation (P and ET) have been previously estimated for the WRIA; however, they tend to have less accuracy than streamflow because they require extrapolation over the entire area from few data points. Consumptive use (Q) is also

relatively inaccurate because actual water use is not documented by the water users (except for the commercial or municipal users), and is not tracked by Ecology; also, undocumented or illegal water uses occur within the WRIA. Although changes in water storage within the WRIA could be tracked for both surface water and ground water reservoirs (e.g., ponds, lakes and aquifers), comprehensive monitoring of water levels in ground water and surface water is not being conducted and would be impractical. River flow is probably also the most accurately measured variable, generally being reported to within 10 percent of the actual values (USGS 1992)

GEOLOGY

WRIA 62 is located in the northeastern corner of Washington and lies within the western portion of the Northern Rocky Mountain physiographic/landform province of North America (Fenneman 1931). The province includes the Rocky Mountains of Canada, Western Montana, Idaho, and northeastern Washington and is characterized by long, somewhat linear belts of mountain ranges oriented north to south, separated by similarly oriented valleys. The lower ranges are rounded in appearance, while the higher ranges, having been affected by alpine-type glaciers in the past, are sharply crested. The Selkirk Range, which occupies the northern three-fourths of the watershed, is typical of the Northern Rockies with its rounded lower summits (i.e., Moon Hill and Skookman Peak) and craggy high peaks (i.e., North and South Mt. Baldy and Gypsy Ridge). The valley of the Pend Oreille River is generally aligned north to south. The mountains of the Selkirk Range from moderately steep to steep sided canyons surrounding the river valley.

The geologic units in the area have been broadly categorized into three stratigraphic units based on geologic time relationships and type of deposit. These are from oldest to youngest: sedimentary, meta-sedimentary and igneous basement rock, consolidated sediments of the Tiger formation, and glacial and alluvial deposits (Alt and Hyndman 1984).

Most of the watershed is underlain by metamorphic or igneous bedrock. The geologic basement rocks (bedrock) found within the Pend Oreille River watershed consist primarily of metamorphosed sedimentary rocks (quartzite) in the southern portion of the watershed, highly metamorphosed volcanics and marine sediments including carbonates, conglomerates and quartzite in the northern portion of the watershed, and intrusive igneous granite and granodiorites in the central portion of the watershed. The bedrock outcrops at the surface in the high mountain ranges and is encountered as depths of greater than 100 feet deep in the valleys. Several regional faults have been identified in the metamorphic basement rocks (especially in the northern portion of the watershed) (Stoffel et al. 1991). Generally, these faults are orientated from northeast to southwest. The faults are primarily classified as reverse, dip-slip and thrust faults.

The Newport fault became active approximately 50 million years ago. The Newport fault is a "horseshoe-shaped" fault which is centered near Newport and continues northward and slightly westward toward the town of Tiger and eastward and northward into Idaho. East of the Newport Fault, the bedrock is overlain by volcanic flow deposits and the Tiger sandstone formation. The Tiger formation consists of a thick sequence of slightly tilted sandstones and pebble conglomerates which was deposited in a basin created by the activity along the Newport

Fault. The formation is weakly cemented. In most areas, the Tiger formation and volcanic flow deposits are covered by glacial and alluvial deposits; however, limited outcrops of the Tiger formation and the underlying volcanic flow deposits are found on the valley terraces of the southern portion of the Pend Oreille River between Newport and Tiger.

In river and stream valleys, the bedrock and Tiger formation are covered with Quaternary glacial and alluvial sediments. Sediments deposited during glacial advance were densely compacted by the glacial ice. Glacial till (a dense, unsorted mixture of clay, silt, sand, gravel, and cobbles), fine-grained glacial lake sediments, and glacial outwash (unconsolidated interbedded sand and gravel) were deposited in the valleys as the glacier receded. Thick sequences of glacial sediments are present along the banks and terraces of the Pend Oreille River. Recent alluvium is found overlying bedrock and glacial deposits bordering the river and its tributaries, and is a result of the current erosional and depositional processes associated within the river and its drainages. The alluvial deposits consist of unconsolidated silt, sand, and gravel underlying flood plains and terraces. The thickness of the glacial and alluvial sediments is variable and is based on the bedrock topography.

The three stratigraphic units discussed above form aquifers where they are saturated with ground water. The development and usage of each aquifer unit will be discussed in the following hydrogeologic sections.

GROUND WATER

Regionally extensive aquifers (aquifers extending into two or more watersheds) have not been identified or evaluated in northeastern Washington; however, the metamorphic and igneous basement rocks of the region may be interconnected through faults or fractures.

Within WRIA 62, ground water occurs within the three previously identified stratigraphic units. This section details the ground water occurrences, typical aquifer yields, ground water flow directions and hydraulic characteristics. Table 1 presents a summary of the hydrological units, associated geologic stratigraphic unit, and typical yields for wells in them. Well yields are based on well logs provided by Ecology's Shorelands and Water Resources Program. A generalized geologic map with ground water rights depicted is presented in Map 3, and Figure 4 shows a generalized geologic cross-section typical for the WRIA.

Based on the readily available literature, the majority of ground water is withdrawn from the unconsolidated glacial and alluvial deposits contained within the major river and stream valleys within the watershed. The unconsolidated deposits include coarser-grained layers of sand and gravel within glacial outwash and glacial drift, and alluvial sand and gravel deposits. The thickness of the alluvial and glaciofluvial deposits is dependent on the bedrock topography. In general, deposits are thickest near the major stream courses and thin away from the main valleys. Small quantities of perched or semi-perched ground water may also be available in thinner silt, sand and gravel lenses within the glacial drift. Generally, the glacial outwash and alluvium are highly porous and permeable, and provides the highest yields to wells compared to other geologic formations.

Based on topographic relief of the watershed, the overall direction of movement of ground water within the glacial and alluvial deposits is probably toward the river and tributaries; however, localized flow direction may vary greatly based on geologic and hydrologic conditions. Seasonal fluctuation in ground water levels in the glacial and alluvial deposits is not documented; however, water levels are expected to be higher in the winter and spring following periods of precipitation and snow melt and lower in the summer, fall and winter. The amount of water drained by gravity from the pore space of a saturated aquifer is called its specific yield. The specific yield for the glacial and alluvial aquifer ranges from 5 to 25 percent indicating the porosity and amount of water available for flow ranges from low to moderately high. In the upper 50 feet of the unit, the deposits are coarser-grained and the specific yield is estimated to be 20 percent (PNRBC 1970).

Ground water is also available within the Tiger formation in the southern portion of WRIA 62. Due to weak consolidation and cementation of the sandstone and pebble conglomerate deposits, resulting in relatively high permeability, the Tiger formation also provides an important source of ground water. This formation is located in the valley of the Pend Oreille River between Newport and Tiger. Limited outcrops of the Tiger formation are present along the terraces of the Pend Oreille River; however, it is primarily overlain by glacial and alluvial lake deposits.

Glacial (till and glacial lake deposits) and alluvial (lake) deposits are generally fine-grained and dense and subsequently have a low porosity and permeability. However, thin beds of sand and gravel in the till commonly yield small quantities of perched or semi-perched ground water. The location, extent and gradient of water within any perched zones are site-specific and locally controlled by the specific geologic and hydrologic conditions.

Igneous rocks in the central portion of the watershed and meta-sedimentary rocks in the northern and southern portion of the watershed provide a limited source of ground water. In places where the permeable limestones and dolomite are overlain by impermeable slate and argilite, the slate acts as a caprock and the underlying limestone is a confined aquifer. Where the slate has been removed by erosion and the limestone crops out at the surface, a water table aquifer (unconfined aquifer) occurs (Johnson and Olness, undated).

In the hard, relatively impermeable granites, slates, limestones, dolomite and quartzites, ground water occurrences are often only found in faults, fractures, and weathered zones in the basement rocks where more permeable and porous areas are developed. Faults in the northern portion of the watershed have been mapped (Stoffel et al. 1991) and based on geologic maps of the basement rocks exposed at the surface, the lineation of faulting is from northeast to southwest. However, the nature of ground water flow within these fractures is not documented. In addition, the extent of fracturing or faulting in the igneous rocks in the central and southern basement rocks has not been evaluated.

The metamorphic and igneous basement rocks generally have low porosity and specific yield in unfractured or unweathered areas. Specific yields range from 0 to 4 percent in weathered or highly fractured zones (PNRBC 1970). Generally yields of 1 to 20 gallons per minute are

common in the metamorphic basement rocks (PNRBC 1970) and ground water is primarily available only for domestic uses and limited stock (agricultural) use. Seasonal variations in the bedrock aquifers have not been well documented, but are assumed to be influenced by recharge from precipitation.

Recharge to the aquifer units occurs from direct precipitation where the aquifer outcrops, from stream seepage where the aquifer unit intersects the base of the stream, and from bank storage or flood water infiltration. The rate at which infiltration occurs is based on the type and extent of vegetative cover, physical properties of the surficial and underlying soils, amount of available storage, temperature, rainfall intensity, and water quality.

The alluvial and glacial aquifers outcrop in the stream and river valleys and hence, recharge primarily occurs across the areal extent of the outcrop from direct precipitation and snowmelt in the spring (April, May and June) and from direct precipitation in the early winter (October and November).

The metamorphic and igneous basement rocks outcrop in the mountains where precipitation is greatest and are recharged directly from precipitation in the spring and fall and from snowmelt in the spring. Although total precipitation in the mountainous regions of the watershed is high, much of the precipitation occurs as snow and recharge to the aquifer from infiltration into the faults, fractured zones, and weathered zones within the metamorphic and igneous basement rocks is probably low due to steep slopes, high runoff rates and thin or absent soils. Small amounts of recharge water may also enter the bedrock aquifer from overlying aquifers where the hydraulic gradient is downward. However this source is regulated by the thickness and permeability of intervening strata.

Limited outcrops of the Tiger formation are present along, the terraces of the Pend Oreille River; however, the formation is generally overlain by glacial and alluvial lake deposits. Recharge to the Tiger Formation occurs from direct precipitation and snowmelt in the vicinity of the outcrops, from infiltration from the Pend Oreille River where the Tiger formation intersects the base of the river, and from the underlying basement rocks where the hydraulic gradient is upwards.

Confined and semi-confined aquifers have been identified throughout the watershed. Confined or semi-confined ground water occurrences in the alluvial and glacial aquifers are found where fine-grained layers of glacial clay and silt cap saturated deposits. Confined aquifers exist within the basement rocks where dense slates and competent rock overlies saturated zones with weathering, fracturing, or faulting. In these areas, recharge from direct precipitation, snowmelt, flood infiltration, and bank storage is attenuated due to overlying fine-grained materials. Also, water levels in confined aquifers typically show delayed response or no response to seasonal recharge due to the attenuation in the connection between the surface and ground water.

GROUND WATER AND SURFACE WATER INTERACTION

Recharge to an aquifer from stream seepage will occur when the water level in the stream is higher than underlying ground water levels. The rate of seepage is dependent on the magnitude of the water level difference and the permeability of the stream bed materials. Alluvial aquifers in hydraulic continuity with a river or stream typically experience a high degree of water exchange with the associated surface water. These aquifers discharge to streams during low flow periods and receive recharge from the stream during high flow periods. This is due to the relatively high permeability of the alluvial materials and the close proximity of the aquifer with stream or river. Aquifers that are separated from surface water bodies by depth or distance, are confined and/or are composed of low permeability materials require greater periods of time for water exchange to occur resulting in attenuation or dampening of the seasonal variability associated with surface waters.

Although ground water level fluctuations have not been well documented, the water levels are expected to be highest in the spring following recharge and flood events. Because alluvial and outwash deposits are relatively porous and outcrop in the stream and river valleys, a hydraulic continuity is present between the surface water and ground water. The water level in the Pend Oreille river is relatively constant due to the large area of drainage in Montana, Idaho and Washington and as a result of man-made controls on the river elevation such as dams. The Pend Oreille River because of its large size and volume of flow (most of which originates upstream of Washington State), dominates ground water levels in the narrow alluvial aquifer located within the Pend Oreille River valley.

In the spring and early summer, some of the available water from high flows goes into stream bank storage (PNRBC 1970), contributing baseflow in the river during low flow periods. The water level in the alluvial aquifer within the valleys of the Pend Oreille River and tributaries is sustained by direct recharge from the river and its tributaries during flooding and subsequent recharge to the soils and aquifers underlying the flood plain. The alluvial aquifer is also recharged with surface water that is diverted for irrigation of lowland areas during the late spring and summer.

Where the aquifer materials outcrop at the surface in the lower reaches of the streams and rivers, ground water generally discharges to streams. Streams that drain the mountains generally derive one-fifth to one-third of their average discharge from ground water (PNRBC 1970). The ratio of ground water to surface water generally ranges from a few percent during periods of high flow to 100 percent during periods of low flow (PNRBC 1970).

STATUS OF GROUND WATER RESOURCES

Permitted ground water withdrawal mostly occurs from the glacio-fluvial and alluvial deposits within the Pend Oreille River valley, and to a lesser extent from the underlying Tiger Formation. Limited ground water has been developed in areas underlain by bedrock in the vicinity of Metaline Falls and in the southern portion of the watershed. The location and quantities of ground water rights that are registered with Ecology are presented on Map 3.

Ground water rights were not identified in the glacial outwash deposits in the central portion of the watershed or in the metamorphic basement rocks in the northern portion of the watershed. Ground water resources within these regions have not been fully explored primarily due to the lack of access to these regions or lack of development. Limited quantities, potentially suitable for domestic use, are probably available within the fractured or weathered zones of the meta-sedimentary basement rocks. Ground water is also available within the glacial outwash deposits along many of the tributaries of the Pend Oreille River; however, ground water within these deposits is directly connected to surface water flows.

Ground water level trends have not been documented in the WRIA, therefore, water level increases or decreases over time have not been identified. As previously mentioned, however, in the aquifers associated with the Pend Oreille River, ground water levels are typically maintained by river levels.

To assess future ground water appropriations, the impact of the additional water withdrawal on availability of ground water for senior rights and for maintaining base flows to streams (including existing surface water rights) must be assessed to insure that the senior water rights or other beneficial water uses are not impaired. Additionally, the ground water source must be of sufficient quantity and quality for the intended use.

Ground water would be available for appropriation if a proposed ground water withdrawal (1) does not reduce surrounding water levels excessively such that surrounding wells can still obtain permitted quantities, (2) does not induce streamflow loss from streams, and (3) does not induce excessive streamflow loss from streams such that flows decrease below low flow criteria. Wells located too close to each other or too close to a stream (well interference), can cause excessive water level declines resulting from the cone of depression even though recharge to the aquifer is adequate to maintain year round supplies. In some cases however, ground water withdrawals can exceed recharge rates and cause long-term water level declines as well. Ground water appropriations that result in long-term declines would gradually impact adjacent ground water rights and possibly surface water rights.

In WRIA 62, the densest concentration of wells and highest ground water use is located along the Pend Oreille River within the alluvial aquifer. In these areas risks of excessive ground water withdrawals impacting other water users is low because of the influence of the river. Ground water withdrawals from more localized aquifers or from aquifers in hydraulic continuity with the tributaries to the river have a greater chance of adversely affected senior water rights. Periodic streamflow measurements made in streams by Ecology (Appendix A.3) have shown zero flow or extreme low flows in several tributaries to the Pend Oreille River, located in the Sullivan Lake area and along the reach of the Pend Oreille between Ione and Metaline Falls.

These measurements indicate that there are surface water flow limitations in these streams in the summer months. The cause(s) of the extreme low to zero flows may be due in part to low baseflow yields from the underlying bedrock, but are probably also exacerbated by water use. Increased ground water withdrawal in these stream basins, particularly from shallow wells

directly connected to surface water would likely aggravate or extend the low or zero flow periods resulting in increased downstream impacts to senior water rights and aquatic habitat.

In general, ground water use in WRIA 62 is not excessive and does not appear to be in conflict with surface water rights, upstream flows, or in exceedence of natural recharge. To date, adverse impacts from ground water withdrawals has not been documented in the WRIA; however, there are no on-going ground water level monitoring programs in the watershed, and therefore any potential affect of these withdrawals cannot be assessed. Ground water quality is generally good and suitable for most purposes, although there are documented cases of ground water that are high in certain metals (iron and manganese) and high levels of bacteria resulting from non-point sources (see water quality section).

Based on this limited information, ground water appears, in general, to be available for future appropriation where it can be physically obtained. The exception to this general condition is within tributary stream basins in the Calispell Lake area, Sullivan Lake area, and between Ione and Metaline Falls. In these areas, extreme low or zero flows have been documented and closures for some streams have been recommended. Because of these flow limitations, additional ground water appropriations within these basins will require detailed evaluation with regards to potential impacts to senior water rights and downstream aquatic habitat. In some cases, it is possible that a additional ground water appropriation would have a detrimental impact on beneficial use or senior water rights and therefore, would be denied.

Table 1. Stratigraphy, Lithology and Water-Yield Characteristics for Units in the Pend Oreille Watershed.

Period	Rock Unit	Thickness (feet)	Lithology	Hydrogeologic Characteristics
Quaternary	Non-Glacial Lacustrine (Lake) Deposits	0->50	Clay silt and fine along stream courses.	Generally low permeability - yields to wells generally low
	Outburst Flood Deposits and Recent Alluvium	0->100	Poorly sorted pebbles, cobbles and boulders in a sand and gravel matrix	Variable permeability depending on layering - yields to wells estimated moderate to high
	Glacial Till, Drift and Glacio-lacustrine (Lake) Deposits	0->100	Unsorted pebbles, cobbles, and boulders in a matrix of silt and clay or clay, silt, and fine sand deposited in glacial lakes. Contains occasional strata of poorly sorted to sorted sand and gravel outwash deposits.	Highly variable permeabilities depending on strata - yields to wells estimated low to moderate
Eocene	Conglomerate (Tiger Fm)	0->100	poorly sorted conglomerate in a sandstone matrix	Permeabilities low to moderate depending on degree of cementation and consolidation - yields to wells estimated low to moderate
	Volcanic flows	0->50	andesite and dacite flows	Low permeabilities except in weathered zones between basalt flows where yields to wells can be moderate to high
Cretaceous	Intrusives	Unknown	Granitic rocks	Mostly impermeable but with small, variable yield from fractured and weathered zones
Pre-Tertiary	Basement	Unknown	Metamorphic rocks	Mostly impermeable but with small, variable yield from fractured and weathered zones

WATER USE AND DEMAND

Records for water use in the Pend Oreille River Watershed date back to the late 1800's and early 1900s. Water use is not metered at the present time and therefore, actual water use is not known. Numerous recorded or claimed rights may no longer be in use and it is also possible that illegal water users may be using water for irrigation and other purposes. Additionally, the number and quantity of exempt water uses, including single domestic use (less than 5,000 gallons per day) and some stock water uses are not documented.

Since water law requires Ecology to protect existing rights and claims, it is assumed that all recorded water rights and claims are fully in use today and represent consumptive water use. The location and quantities of ground water and surface water rights and claims that are registered with Ecology are presented on Maps 3 and 4 respectively. Water demand for ground water and surface water use in WRIA 62, the Pend Oreille River Watershed, is summarized from available information from Ecology including:

- Watershed Assessment Water Rights and Claims Database for consumptive uses only (Ecology 1994); and
- Primary Water Rights Report from Water Right Information System (WRIS) (Ecology 1995a).

A summary of claims, water rights and applications is presented in the following paragraphs including:

- number of claims, water rights and applications for ground water and surface water use;
- quantity of use;
- primary uses of ground water and surface water; and
- locations of water rights.

CLAIMS

To document those uses of surface water in existence prior to the adoption of the State Surface Water Code (Chapter 90.03 RCW), which was adopted in 1917, and those uses of ground water in existence prior to the adoption of the State Ground Water Code (Chapter 90.44 RCW), which was adopted in 1945, the Claims Registration Act (Chapter 90.14 RCW) was enacted.

The Claims Registration Act established a period from 1969 to 1974 to register claims of ground water and surface water use. Documentation was submitted to Ecology on either a long form to claim detailed uses for domestic and irrigation uses or on a short form for a single domestic use with up to one-half acre non-commercial lawn and garden. Claims registries (i.e.,

long and short forms) were included in the Watershed Assessment Water Rights and Claims Database (Ecology 1994).

Short claim forms did not specify the quantity of water usage. For WRIA 62, Ecology assigned a quantity for ground water and surface water use for each claim. For ground water claims, quantities, Q_i [gallons per minute (gpm)] and Q_a (acre-feet per year), were assigned by Ecology as follows:

- If irrigated acreage is greater than 0 acres: Q_i = [# of acres claimed] * 9 gpm and Q_a= [# of acres claimed] * 4 acre-feet per year; and
- If irrigated acreage is 0 acres: Q_i = 9 gpm and Q_a = 2.0 acre-feet per year.

For surface water claims, quantities, Q_i [cubic feet per second (cfs)] and Q_a (acre-feet per year), were assigned by Ecology as follows:

- If irrigated acreage is greater than 0 acres: Q_i = [# of acres claimed] * 0.02 cfs and Q_a = [# of acres claimed] * 4 acre-feet per year; and
- If irrigated acreage is 0 acres: Q_i = 0.02 cfs and Q_a = 2.0 acre-feet per year.

A total of 1,053 claims were filed including 542 ground water claims for a total of 3,018 acre-feet per year and 9,045 gpm; and 511 surface water claims for a total of 29,754 acre-feet per year and 155 cfs.

WATER RIGHT PERMITS AND CERTIFICATES

Since the adoption of the state surface water and ground water codes, the only means of acquiring a water right within the state is by making an application for and receiving, a Permit and or subsequent Certificate from Ecology or its predecessors. An applicant must file a Water Right Application with Ecology when a water user or future water user (applicant) expects to:

- use any amount of surface water for any purpose;
- use more than 5,000 gallons per day of ground water (well) for any and all purposes including domestic, commercial, industrial, and/or irrigation; or
- use ground water to irrigate more than one-half acre.

A Water Right Permit is issued to the applicant if Ecology determines that:

- The use will be beneficial;
- The use will be in the public interest;
- The water is available;
- The use will not impair senior water users.

The Water Right Permit allows the applicant to proceed with the development of the water use. Upon approved appropriation, a Certificate documenting the authorized water use is issued.

As shown in Figures 8 and 9, ground water and surface water use has increased steadily throughout the years. A total of 553 permits and certificates were filed with 61 ground water permits/certificates for a total of 3,620 acre-feet per year and 5,828 gpm (13 cfs); and 492 surface water permits/certificates for a total of 180 cfs. The total quantity of surface water allocated per year is not provided for all permits and certificates. However, the reported quantities allocated for surface water are 11,815 acre-feet/year.

The primary uses for the ground water and surface water permits and certificates are illustrated on Figures 10 and 11. The principal ground water use is municipal which consists of 55 percent of ground water allocations. The principal surface water use is irrigation which consists of 81 percent of surface water allocations. The total quantities per use, including the number of rights, are shown in Table 2.

Approximately 25 percent of the ground water rights account for 80 percent of the total allocated ground water quantity (gpm). The largest ground water user is the Town of Ione, which has 2 permits totaling 1,350 gpm (1,342 acre-feet/year). The Town's two permits account for 23 percent of the total allocated instantaneous withdrawal and 37 percent of the total allocated annual ground water permit quantities in the watershed.

Approximately 5 percent of the surface water rights account for 65 percent of the total allocated surface water use quantity (cfs). The largest surface water users are Washington Water Power Company (allocated 20 cfs) and Pend Oreille Mines (allocated 20 cfs). These two users account for 22 percent of the total allocated surface water quantities in the watershed.

APPLICATIONS

Issuance of a permit after an application has been filed may take one to three years or more (Ecology 1995b). The requested quantities shown on the applications and as presented in the WRIS report were used in the preparation of the report.

The 38 applications were divided into 10 ground water applications for 3,912 gpm and 159.64 acre-feet per year; and 28 surface water applications for 12.36 cfs. The total quantity of surface water use per year was not provided. The requests for water by purpose of use can be seen in Figures 6 and 7. The location of applications are shown on Map 5.

Ground water use was requested for domestic multiple, domestic municipal, irrigation, commercial & industrial manufacturing, and domestic single. Domestic multiple and irrigation were the largest ground water uses requested at 51 percent and 32 percent of the total volume, respectively. Surface water use was requested for the following uses:

- wildlife propagation;
- stock watering;
- domestic multiple;
- irrigation;

- fish propagation;
- fire protection;
- commercial & industrial manufacturing; and
- domestic single.

Domestic single and commercial & industrial manufacturing were the largest surface water use requested at 27 percent and 26 percent of the total volume, respectively.

SUMMARY

The total quantity of ground water allocated by both rights and claims is 6,638 acre-feet per year and 14,873 gpm (33.1 cfs). Including applications, the total quantity allocated for possible future use is 6,798 acre-feet per year and 18,785 gpm (41.9 cfs). The total quantity of surface water allocated by both rights and claims is 335 cfs and including applications, total quantity is 348 cfs. The reported quantity of surface water allocated by both rights and claims is 41,568 acre-feet per year. Actual usage may be less or more (i.e., due to unutilized claims/permits or illegal uses) than the quantities stated above.

Table 2. Quantities for Purpose of Use for WRIA 62

Purpose	Total Q_i (cfs)	Total Q_i (gpm)	Total Q_a (acre-feet/year) (a)	Total Irrigation (acres)	Number of Rights
Surface Water Rights					
Domestic Multiple	50,924	22,855	322.34	0	59
Domestic Single	37.6725	16,907	319	1	277
Fire Protection	1.65	741	41.6	0	10
Fish Propagation	1.02	458	36	0	3
Irrigation	80.913	36,314	9,662.63	5,346.5	109
Stock Watering	1.725	774	23	0	23
Commercial & Industrial Manufacturing	0.45	202	3	0	3
Environmental Quality	1.47	660	191	0	1
Mining	2.625	1,178	66	0	4
Domestic Municipal	1.67	749	220	0	2
Recreation & Beautification	0.03	13	920	0	1
Claims (specific use unknown)	155	69,564	29,754	NA	511
TOTAL SURFACE WATER RIGHTS	335.15	150,415	41,568	5,347.5	1,003
Ground Water Rights					
Domestic Multiple	5.90	2,647	1,075.7	0	23
Domestic Single	1.04	468	204	0	26
Irrigation	2.09	939	335.55	106	7
Stock Watering	0.02	10	0.3	0	1
Domestic Municipal	3.93	1,764	2,004	0	4
Claims (specific use unknown)	20.15	9,045	3,018	NA	542
TOTAL GROUND WATER RIGHTS	33.14	14.873	6,638	106	603
Combined Surface and Ground Water Rights					
TOTAL SURFACE AND GROUND WATER RIGHTS	368.29	165,288	48,206	5,453.5	1,606

(a) – only Total of Q_a reported.

MINIMUM FLOWS

Minimum flows or stream closures to water appropriations for WRIA 62 are not established by administrative rule (Washington Administrative Code). However, there are several creeks and streams, including the mainstem of the Pend Oreille River above Box Canyon Dam, which have been recommended for closure or minimum flow requirement based on fish and aquatic habitat considerations (Table 3). According to RCW 75.20.050, these streams can be considered closed to future appropriations by the Department of Ecology based on recommendations from the Department of Fish and Wildlife or other agency in order to protect beneficial use of the resource. At a minimum, Ecology will consider the recommendations before issuing any additional water rights which would affect flow in these streams.

The tributary stream closures occur primarily in the southern portion of the WRIA in the vicinity of Calispell and Marshall Lake, and in several tributaries to the Pend Oreille in the north central portion of the WRIA between Ione and Metaline Falls. The stream closures are the result of fisheries concerns resulting from either water quality issues or low flow issues. Several of the stream closures in the north central region coincide with previously noted zero or extreme low flow (see ground water status section). The recommended instream flow for the mainstem of the Pend Oreille River is 8,500 cfs. This flow is currently met more than 90% of the time. The instream flow value has been set in order to preserve habitat and downstream flows for smolt survival and anadromous fish migration. It is considered to be an interim recommendation that may require further investigation in order to establish more definitive flows, perhaps on a seasonal basis.

The administrative restrictions are established by the following procedure: (1) an application for water use is made, (2) during review of the application, the Washington Department of Fish and Wildlife or other appropriate agency may recommend stream closure to additional appropriation, or a low-flow/seasonal restriction on additional appropriation; (3) if Ecology accepts WDFW recommendation, the application for water use is denied (in the case of a stream closure recommendation) or a permit is issued with low flow provision or cut-off date; (4) if the Ecology decision is not appealed, or if appealed and then affirmed by the Pollution Control Hearings Board (PCHB), then the closure or low flow is adopted administratively. This same provision is placed on every future application made or permit granted unless a future recommendation is made. If the recommendation is a closure, then all future permits are denied and the stream is closed. In the instance of a low flow limitation or cut-off date that may restrict an applicant, the application is returned to the applicant and the applicant is advised of the restrictions. The applicant may choose to accept the restrictions and the application will be processed or the application may be withdrawn.

Table 3. A Summary of Surface Water Limitations for the Pend Oreille River Basin

Stream	Tributary To	*Status*	Documentary Basis	Remarks
Bracket Creek	Pend Oreille River	Low Flow / Closure	Letter, Fisheries: 4/15/52 / Letter, Game: 7/20/64	
Calispell Creek	Pend-Oreille River	Low Flow	Letter, Fisheries: 10/28/52	Based on Fisheries Needs
Davis Creek	Pend Oreille River	Closure	Letters, Fisheries: 7/26/51, 5/9/51, 8/21/51	Based on Fisheries Needs
Diamond Creek	Pend Oreille River	Adjudicated	Pend Oreille Superior Court: 2/9/89	
Reneshaw Creek	Pend Oreille River	Adjudicated	Pend Oreille Superior Court: 2/9/89	
East Fork Small Creek	Small Creek	Low Flow / Closure	Letter, Games: 5/21/58	
Harvey Creek (Sullivan Lake Creek)	Sullivan Lake	Closure	10/18/72	
Indian Creek	Pend Oreille River	Closure	Letter, Game: 11/21/67, 2/1/61, 9/19/45	
Little Calispell Creek	Calispell Creek	Low Flow /Cut-off (7/1 -11/1)		
Little Muddy Creek	Pend Oreille River	Low Flow	Letter, Wildlife: 4/28/88	
Maitlen Creek Marshall Lake & Marshall Creek	Pend Oreille River Pend Oreille River	Closure Adjudication	Letter, Game: 10/18/72 Incomplete	Closure allows Stock & Domestic only
North Fork Sullivan Creek	Sullivan Creek	Low Flow	Letter, Fisheries: 12/12/56	
Pend Oreille River	Columbia River	Low Flow	Letter, Wildlife: 8/13/90	Supporting Resident Gamefish
Diamond Creek	Pend Oreille River	Adjudicated	Pend Oreille Superior Court: 2/9/89	
Skookum Creek Small Creek (Smalle Creek)	Pend Oreille River Calispell Creek	Closure Low Flow	Letter, Game: 8/24/67, 11/25/70 Letter, Game: 2/10/67	Closure allows Stock & Domestic only
South Fork Calispell Creek (Little Calispell Creek)	Calispell Lake	Adjudicated	Pend Oreille Superior Court: 11/28/28	
Ten Mile Creek	North Fork Calispell Creek	Low Flow		
Trimble Creek/Reynolds Creek	Pend Oreille River	Low Flow	Letters, Game: 6/24173, 5/14/73	
Reynolds Creek	Pend Oreille River	Low Flow	Letters, Game: 5/14/73, 5/24/73	
Unnamed Creek	Davis Creek & Lake	Low Flow	Letter, Game: 11/8/68	
Cusick Pumps		High & Low Flows	Letter, Dr. Gates: 6/5/87	1982 Water Regulation Outline
Club Dam		Drawdowns	Letter, Dr. Gates: 6/5/87	1982 Water Regulation Outline
Power Lake		Drawdowns	Letter, Dr. Gates: 6/5/87	1982 Water Regulation Outline

WATERRES.XLS/WRIA 62

WATER QUALITY

This section includes a compilation of historical water quality indicator data for surface water and ground water. These data are obtained from pertinent reports, the EPA STORET data base and the USGS. Researchers at Eastern Washington University (funded by BPA), the University of Idaho (funded by the Pend Oreille Public Utility District), and the Kalispell Indian Tribe have collected water quality data related to fisheries for the Pend Oreille River and tributaries with a focus on the Box Canyon area. A three-year water quality study was conducted in the Clark Fork - Pend Oreille basin including those portions in the states of Washington, Idaho and Montana.

SURFACE WATER QUALITY, INFLUENCES UPSTREAM OF WRIA 62

A relatively small portion of the Pend Oreille River system lies in the state of Washington with most of the drainage basin and therefore the greatest influence on water quality outside of the state. Water and nutrient inputs from Washington account for less than 4 percent of the Pend Oreille River flow and nutrient load (USEPA et al. 1993). The upstream inputs to the Pend Oreille River are largely determined by the activities in Idaho and Montana. The river then flows into Canada.

Pend Oreille Lake is located just upstream of the Washington boarder and is Idaho's largest lake. The greatest share (more than 90 percent) of water entering the lake comes from the Clark Fork River inflow. This contribution accounts for about 85 percent of the total loading of phosphorus (the nutrient that limits algae growth in the lake). Therefore, maintenance of open lake water quality is largely dependent on controlling nutrient loadings from the Clark Fork River (USEPA et al. 1993).

The headwaters of the Clark Fork River are near Butte, Montana. The river has large tributaries such as the Flathead River, Bitterroot River and Blackfoot River. Excessive levels of algae have caused water use impairment in up to 250 miles of the Clark Fork River. About half of the soluble phosphorus comes from wastewater discharges with the other half contributed by non-point sources in tributary watersheds. Three-fourths of the soluble nitrogen comes from tributaries, with the remaining quarter from wastewater discharges. A non-point source stream reach assessment found that of 99 Clark Fork basin streams with suspected problems, 65 percent have an impaired ability to support designated beneficial water uses (USEPA et al. 1993).

SURFACE WATER QUALITY IN WRIA 62

The mainstem Pend Oreille River in the state of Washington is considered a freshwater class A (excellent) waterbody (Chapter 173-201A WAC). This classification is used to provide general guidelines for water use and water quality criteria as described in the Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC). In general class A waters should meet or exceed the requirements for all or substantially all uses. Examples of these uses include all types of water supply (i.e., domestic and cattle watering), successful migration and propagation of fish and wildlife, and recreational activities.

The mainstem Pend Oreille River has water quality that is generally good considering it is largely a reservoir or lake like environment due to the numerous dams on the river. This assessment is based on nitrogen and phosphorus concentrations, chlorophyll a, and Secchi disk transparency. A primary water quality concern on the Pend Oreille River is the proliferation of Eurasian water milfoil (*Myriophyllum spicatum*), an invasive and adaptable plant. The dense growth of milfoil slows water velocities so that nutrients and sediment precipitate out of the water column, thus promoting further plant growth. Water column nutrients do not appear to be a factor in milfoil (and other aquatic plant) proliferation; phosphorus concentrations in the Pend Oreille River are well below the eutrophication threshold guideline of 25 micrograms per liter. However, water quality within the weedbeds was found to be different from that of open water on the Pend Oreille River (USEPA et al. 1993).

Roughly 75 percent of the external nitrogen and phosphorus loading to WRIA 62 comes from the Newport wastewater treatment plant, Calispell Creek, and Trimble Creek. Nitrogen appears to be the limiting nutrient to plant growth during the late winter, while phosphorus may be limiting during the rest of the year (USEPA et al. 1993). Loadings of pollutants from tributary streams is minor. Surveys conducted by Ecology have shown few water quality violations in tributary streams entering the Box Canyon Reservoir, although several streams showed exceedences of fecal coliform. It has been estimated that 87 percent of the fecal coliform loading to the Pend Oreille River in Washington comes from Skookum Creek (Coots and Willms 1991). Fecal coliform loading from Skookum Creek has been attributed to poor livestock management.

There are two permitted point sources (discharges from a specific location or outfall) within the Washington area of the basin. Both are within the Box Canyon Reservoir on the Pend Oreille River and include the Newport Wastewater Treatment Plant and the Ponderay Newsprint Company. Non-point sources (those with no specific discharge point) of pollutants that potentially affect the river are animal keeping practices, crop agriculture, on-site sewage disposal, stormwater and highway runoff, forest practices, land development, landfills, and gravel extraction (USEPA et al. 1993). Timber harvesting and associated increased sediment loading has been identified as a principle threat to further water quality degradation in the river (Skillingstad et al. 1993). Impacts to tributary streams from sedimentation due to clear cutting have been noted in many streams draining to the Box Canyon Reservoir (Geiger et al. 1993); however, the extent of impact cannot be determined because of a lack of baseline data.

The Federal Clean Water Act (Section 303 [d]) and federal regulations (40 CFR Part 130.7) require Washington State to develop a 303 (d) list every two years. The list is compiled by Ecology and submitted to the United States Environmental Protection Agency for approval. The list describes the health of Washington's rivers, coastal waters, estuaries, and lakes. The listing of "troubled waters" is used by the state to set environmental priorities for action and to chart water quality trends. Water bodies must meet two criteria to be placed on the list including 1) water quality does not meet state water quality standards as defined in Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201) and 2) technology-based controls are not sufficient to achieve water quality standards. Waters on the list exceed standards for bacteria, temperature, siltation, oxygen levels, nutrients, and toxic compounds or heavy metals. The list helps Ecology determine if there are human health concerns, dangers to fish and wildlife, and what kinds of uses the water body will support or impair.

In 1992, a statewide water quality assessment indicated that the Pend Oreille River was not water quality limited and therefore had no section 303(d) categories, although temperature and pH were exceeding state standards (Ecology 1992). The 303(d) list released for 1994 included the Pend Oreille River and three tributaries in the basin (Map 6). The Pend Oreille River was listed because temperature and pH exceeded standards in the segment from Box Canyon Dam (RM 34.5) to the Idaho border (RM 87.7). Uses that are impaired include salmonid (i.e., salmon and trout) spawning, salmonid and non-salmonid migration, and rearing, harvesting and spawning by non-salmonids. When similar excursions occurred in 1990, Pelletier and Coots (1990) explained that the likely cause of these excursions beyond criteria are due to stratification of water behind impoundments and flow regulation within the Washington area. It is believed that remedies to the problem may not be available.

The three tributaries on the 303(d) list include South Fork Lost Creek (from the confluence with the Pend Oreille River [RM 47.8] to the headwaters), Skookum Creek (from the confluence with the Pend Oreille River [RM 73.2] to the outlet of Half Moon Lake), and Bracket Creek (from the confluence with the Pend Oreille River [RM 77.1] to the headwaters). All three water bodies exceed standards for fecal coliform (Coots and Willms 1991).

Map 6 provides a summary of areas where water quality is known to impose a limit on a fish population's ability to annually perpetuate. In the Pend Oreille watershed, there are no known areas where limiting water quality factors are present throughout the entire year. One percent (15 miles) of the watershed streams are known to be limiting during only part of the year or are only mildly limiting in nature and in 38 percent (492 miles) there are no known limiting factors. Over 60 percent of the watershed streams (930 miles) have no data to make a determination (WARIS 1994).

Surface water source limitations are summarized in Table 3. This is a summary of documented concerns for waterbodies in the basin. When considering water rights decisions, Ecology uses these files to identify potential conflicts and concerns. As seen in this table; the majority of limitations are based on fisheries concerns. There are many tributaries to the Pend Oreille River listed and several tributaries to Calispell Creek. Calispell Creek is also included on the list.

Figures 12 and 13 provide data summaries of water temperatures (1974 through 1984) and oxygen levels (1977 through 1984), respectively, in the Pend Oreille River. These data are the most recent long-term series of data found that can provide seasonal trends. This data is taken from a station near the Canadian border and represents data near the surface of the river. This data provides a general idea of the seasonal variation within the Pend Oreille River for this area:

Temperature fluctuates considerably on an annual basis. The summer temperatures are highest in July through September with temperatures exceeding 22°C (71°F) at times in August. These high summer temperatures near the surface are typical of large and slow moving waterbodies that are most likely thermally stratified (higher temperatures near the surface and cooler temperatures near the bottom). The surface temperatures during the summer are not compatible with cold water species such as trout, although the bottom temperatures are likely acceptable. During the winter months, temperatures are near freezing, especially during the months of December through February. Dissolved oxygen values show an inverse trend to that of

temperature with higher values during the winter months and lower values for the summer months. This is to be expected since cold water is capable of having a higher concentration of oxygen than warmer water.

Trend analysis of historical surface water quality (for select parameters including dissolved oxygen, carbon dioxide, turbidity, pH, alkalinity, hardness, ammonia nitrogen, magnesium chloride, sulfate, sodium, potassium, arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc) in the Box Canyon Reservoir (Pend Oreille River from Box Canyon Dam in Washington to Albeni Falls Dam in Idaho) has shown exceedences of federal and state water quality criteria for dissolved oxygen, pH, ammonia nitrogen, cadmium, chromium and mercury (Skillingstad and Scholz 1993). Since 1979, only dissolved oxygen and ammonia nitrogen have shown exceedences, and the Skillingstad and Scholz study concluded that there is no significant water quality problems in the reach at the present time. These conclusions were also indicated by a study conducted by the University of Idaho (Falter et al. 1991) in the Box Canyon Reservoir.

Water quality in lakes throughout the watershed is generally excellent. Data collected in Sullivan, Bead and Marshall lakes indicate oligotrophic conditions with low nutrients and high dissolved oxygen (Kurt Viel personal communication Department of Fish and Wildlife 1995).

GROUND WATER QUALITY

Ground water quality is generally of good to excellent quality throughout the watershed. Dissolved solids commonly are less than 200 mg/1 in water from the alluvial deposits. The water ranges from soft to hard and hardness generally ranges from 50 to 150 mg/l. Boron and fluoride are low and iron is rarely a problem (PNRBC 1970). The state and county department of health have not documented areas where ground water quality is below drinking water standards, although iron and manganese are above secondary standards in some localized areas (Matsuahma and Justice, personal communication Stevens and Ferry County Departments of Health, 1995).

Most of the water utilized from the metamorphic and igneous basement rocks is obtained from springs or from wells at shallow depths. That water is usually soft to moderately hard and has low concentrations of dissolved solids (PNRBC 1970). Water from deeper wells or from springs with deep sources may be more highly mineralized and high in calcium, magnesium and bicarbonate.

A ground water quality study was performed on the Kalispell Reservation (Gieger et al. 1993). Wells completed on the reservation obtain water from the alluvial aquifer associated with the Pend Oreille River. The study indicated that many wells were high in iron and manganese (which had been noted in periodic well sampling of wells by the Indian Health Service since 1966). Arsenic and cadmium did not show levels above drinking water standards even though previous sampling by the Indian Health Service had shown evidence of high levels of these metals in some wells (Gieger et al. 1993). Wells on the reservation are also affected by bacterial contamination and other non-point source pollution from septic systems and agricultural practices. Based on a limited review of the available information, ground water pollution has not been documented in other areas of the watershed.

FISHERIES AND AQUATIC RESOURCES

This section provides a compilation of fisheries habitat and fish presence information from available databases and communications with entities collecting such information. Researchers at Eastern Washington University (funded by BPA) the University of Idaho (funded by the Pend Oreille Public Utility District) and the Kalispell Indian Tribe have collected fisheries data for the Pend Oreille River and tributaries with a focus on the Box Canyon area. The USFS, Colville District, is presently collecting fisheries information in tributaries to the Pend Oreille on USFS land (Shuhda personal communication, USDA Forest Service 1995). WDFW has a GIS data base (WARIS) that appears preliminary in nature and is still being developed. A three-year water quality study was conducted in the Clark Fork - Pend Oreille basin with limited fisheries information collected. WDNR and USFWS have not conducted fisheries work in the basin.

The Pend Oreille River in the state of Washington has been changed extensively by dams. Historically it consisted of typical riverine (lotic) habitat and at present most of the habitat is reservoir or lake-like (lentic). There are no anadromous fish found in the basin due to conditions created by dams and other man-induced activities. Anadromous species are those that ascend rivers from the ocean to spawn, with some species rearing 1 to 3 years, and then returning to the ocean where they grow to adults. Historically, anadromous fish species of salmon and steelhead utilized this portion of the basin for migration, spawning, and rearing. Salmon were restricted to the lower 20 miles of the river although were reported to be abundant until declining after 1878. Steelhead were also abundant at the mouth of the river. Some fish were present until Grand Coulee Dam was built in 1939 (Bennett and Falter 1985, NWPPC 1986).

Table 4 provides a list of species known to inhabit the Pend Oreille watershed. Also included in the table are the linear miles of stream and percentage of stream miles where they are documented as being present (WARIS 1994). This table is provided to give the reader a general idea of the fisheries resources that exist in the basin. For example, approximately 61 percent of the watershed streams either have a "no fisheries data designation" or "no fish species are present". The WARIS data base does not distinguish between the two designations.

The two most common sport fish in the basin (lakes, rivers, and tributaries) at present are Eastern brook trout and resident rainbow trout. There also appears to be significant populations of brown trout, westslope cutthroat trout, largescale suckers, mountain whitefish, brown bullhead, large mouth bass, walleye, and yellow perch (WARIS 1994). Lakes in the basin may also support Kokanie trout, northern squawfish, rainbow trout and burbett. Marshall Lake is stocked with westslope cutthroat.

Inundation caused by dams created habitat for warm and cool water species and favorable conditions for aquatic vegetation. A two year study in the Box Canyon Reservoir by Bennett and Liter (1991) list additional species of fish to those in Table 4. These include black crappie (*Pomoxis nigromae ulatus*), black bullhead (*Ictalurus melas*), goldfish (*Carassius auratus*), longnose sucker (*Catostomus catostomus*), peamouth (*Mylocheilus caurinus*), tench (*Tinca tinca*), and bull trout (*Salvelinus malma*).

Table 4. Fish species list and relative distribution data within the Pend Oreille Watershed (WARTS 1994).

Common Name	Species Name	Miles	Total Percent of Miles
	No species associated with these segments.	940	61
Resident Rainbow Trout	*Salmo gairdneri*	537	35%
Eastern Brook Trout	*Salvelinus fontinalis*	483	31%
Sculpin (General)	*Cottidae spp.*	296	19%
Brown Trout	*Salmo trutta*	176	11%
Largescale Sucker	*Catostomus macrocheilus*	113	7%
Mountain Whitefish	*Prosopium williamsoni*	111	7%
Westslope Cutthroat Trout	*Salmo clarki*	107	7%
Northern Squawfish	*Ptychocheilus oregonensis*	83	5%
Largemouth Bass	*Micropterus salmoides*	78	5%
Brown Bullhead	*Ictalurus nebulosus*	76	5%
Yellow Perch	*Perca flavescens*	76	5%
Walleye	*Stizostedion vitreum vitreum*	73	5%
Pumpkinseed	*Lepomis gibbosus*	72	5%
Kokanee Salmon	*Oncorhynchus nerka*	7	< 1%
Lake Whitefish	*Coregonus clupeaformis*	3	< 1%
Redside Shiner	*Richardsonius balteatus*	1	< 1%

Twenty one species were collected in the Box Canyon Reservoir (Ashe and Scholz, 1992). Yellow perch, pumpkinseed, and largemouth bass were game species highest in relative abundance. Northern squawfish, tench, and largemouth sucker were the most abundant non-game species. Sampling of Powder Lake in 1989 and 1990 resulted in only brown bullhead, rainbow trout and brook trout being captured.

Five tributaries to the Pend Oreille River have documented bull trout populations (WARIS 1995). Bull trout are considered a sensitive species in the state of Washington and are a candidate for threatened and endangered status. If they are listed under the Endangered Species Act, this would have significant effects on water withdrawals from any area known to provide habitat. Approximately 6 percent (95 miles) of the watershed streams are inhabited by a species of concern (most likely bull trout and westslope cutthroat trout). Thirty-five percent (532 miles) have no known species of concern and 59 percent (900 miles) has no data to make the determination (WARIS 1994). There is presently a lawsuit pending that involves the preservation of bull trout habitat on 28 USFS forests located in Oregon, Washington, Montana, Nevada, and Idaho, including the subject watershed. There are presently negotiations going on with regard to instream flow and regulation of that flow by a proposed dam in the watershed. There are no bull trout documented in lakes within the watershed.

Approximately 2 percent (34 miles) of the watershed streams provide known key reaches (areas) of spawning habitat which are critical to perpetuation of a fish population. About 37 percent (570 miles) are considered as not having critical spawning habitat or the absence of spawning habitat. Sixty percent (926 miles) have no data to make a determination on critical spawning habitat.

As a substitute for losses of anadromous fish in the Pend Oreille River since the construction of Grand Coulee Dam, the U.S. Department of Energy and Bonneville Power Division of Fish and Wildlife has recommended specific improvements for fishery enhancement in the Box Canyon Reach (Ashe and Scholz 1992). The recommendations were developed to meet two objectives:

- Restore tributary populations of native cutthroat and bull trout which were historically present in the Box Canyon Reach of the River;
- Enhance the largemouth bass population to provide a quality sport and subsistence fish in the reservoir.

STATUS OF STREAMFLOW

Streamflow conditions and status in the Pend Oreille River is largely independent of the status of tributary streams whose basins are wholly contained or head within WRIA 62. Key management issues facing the Pend Oreille River, due to its large watershed covering three states, are regional in extent. The primary concerns in the River relate to water quality degradation and preservation of aquatic habitat. These issues are currently being addressed regionally by the Tri-State Implementation Council (located at 206 North 4th Ave. in Sandpoint Idaho) on water quality management for the entire Clark Fork - Pend Oreille watershed.

All surface water withdrawals within WRIA 62 directly affect flow in the Pend Oreille River because the river receives all of the runoff from within the watershed. Similarly, ground water withdrawals also affect flow in the river; however, these effects are seasonally attenuated in many cases due to the longer residence time of water in the aquifer. The total water withdrawals in the WRIA, as indicated by claims and permitted water rights, is approximately 368 cfs (48,207 acre-feet per year).

Statistical trend analysis of streamflow in the Pend Oreille River, Clark Fork River and Outlet Creek (Appendix A.4) indicate slight declines in streamflow over the period of record in the Pend Oreille at Box Canyon Dam and in Outlet Creek. The statistics indicate slight increases in flow in the Pend Oreille at the International Boundary, at Newport and for the Clark Fork River. These trends seem to indicate that water declines are occurring in Washington State within the Pend Oreille River and its tributaries. However, trend analysis of streamflow for years comparable to the other stations (since the 1940's) for the Clark Fork and the Pend Oreille at Newport since the 1940's shows slight declines similar to the other stations, indicating that there has been a general slight decline in flow in the more recent years. Inspection of the hydrographs (Figures 3 and 4) indicates that the declines are most pronounced recently, following a general increase (1980s to present). This follows the observed trends in precipitation at Newport and Northport.

Comparative trend analysis was also performed between flows at Newport and at the International Boundary in order to assess possible increased declines within Washington as compared to upstream. Streamflow records for both stations were made comparable by eliminating flow years that were not included in either of the records, yielding an annual flow record for each station with identical years of data. Trend analysis was performed for the period of record at each station, as well as on the normalized flow (divided by the mean) values to provide direct comparison of slopes and intercept of the trend lines. The results showed nearly identical trends at both stations (Appendix A.4).

The same procedure was completed for flows at both stations after 1970 in order to assess more recent trends. Figures 9 and 10 indicate that the majority of surface water rights on the river were obtained before 1970; however, the majority of ground water rights were obtained after 1970. The post 1970 comparative trend analysis again shows nearly identical trends; however, this time there was a slight decline in flows observed at both stations with flows declining a little more at the Newport station compared to the International Boundary. These comparisons indicate that

there has not been a detectable decline in streamflows due to water withdrawals or other natural process unique to the Pend Oreille River in Washington State.

The long term average annual flow of the Pend Oreille River at the International Boundary, which represents flow out of the watershed, is 27,040 cfs (19.58 million acre-feet per year) and the average long term annual flow into the watershed as gaged at Newport is 25,740 cfs (18.64 million acre-feet per year). The difference between inflow and outflow is 1,300 cfs (0.94 million acre-feet per year). Within the last 20 years, the difference between the flow at the International Boundary and Newport has been somewhat larger (probably in response to greater than average precipitation in recent years), showing a difference of 1,449 cfs (1.05 million acre-feet per year).

Streamflow trends in the Pend Oreille River are dependent on upstream conditions, both natural and those affected by human use. The largest water use in the Pend Oreille basin is for irrigation. The U.S. Geological Survey estimates indicate that greater than 400,000 acres of land are irrigated upstream of the Pend Oreille gage at the International Boundary between Washington and British Columbia (USGS, 1991). Based on WRIA 62 groundwater and surface water permits and certificates, 5,347 acres of land are irrigated in WRIA 62 which is approximately 45 percent of the total water use in the WRIA. Assuming 45 percent of ground water and surface water claims are also used for irrigation (purpose of use is not detailed for claims), an additional 11,353 acres are irrigated for a total of 16,700 irrigated acres in WRIA 62. Thus it is apparent that the majority of water use from the Pend Oreille River occurs upstream of the WRIA 62. Because of this, trends in water declines are similar between the Clark Fork - Pend Oreille Rivers upstream of Newport Washington and the Pend Oreille River at the International Boundary.

These comparisons indicate that annualized water withdrawals (66 cfs) from the WRIA are approximately 5 percent of the gain in flow (1,300 cfs) within the WRIA from runoff, and instantaneous withdrawals would be as high as 28 percent (368 cfs) of the gain in flow. Additionally, the total withdrawals are very small relative to average flow volume in the river, indicating that the lost volume due to the withdrawals would not be measurable in the river. During seasonal low flow periods, which typically fall to as low as 6,000 to 7,000 cfs most years (lower flows result from regulation of flows by the dams, and would not be impacted by withdrawals as these would be regulated as well), the total instantaneous withdrawal would be approximately 6 percent of the instream flow, and during extreme low flows on the order of 2,500 cfs (100-year daily low flow, USGS 1984) would be as much as 15 percent of the instream flow. The instream low flows documented above include all component inflows and withdrawals and therefore would only be impacted if withdrawals were reduced (thereby increasing flow) or by additional appropriations. Applications for new water rights in the basin total 21 cfs, and if approved would reduce instream flows by less than 1% even during extreme low flow events.

As noted above, flows in the Pend Oreille River as measured at the Box Canyon Dam and at the International Boundary occasionally fall to very low values as the result of flow regulation by the dams, and are not associated with consumptive use or climatic conditions. Low flows in the Pend Oreille River typically occur in the late summer, fall and winter but occasionally occur in the spring as a result of regulation by the dams. This is in contrast to low flows in Outlet Creek (contained within WRIA 62) where low flows typically occur mid to late spring. This

indicates that low flows in the Pend Oreille River are not associated with low flow and peak summer water use in WRIA 62. During periods when flows are low, water withdrawals and instream flows for aquatic habitat could be interrupted. Minimum flow requirements for the Pend Oreille in conjunction with regulation of discharge from the dams would be necessary to provide assurance that flow needs are met throughout the year. This would be especially critical if bull trout is listed as an endangered species.

Management issues facing tributary streams to the Pend Oreille River within the WRIA are more critical. Documented reduction in water quality and fish habitat in several streams have resulted in recommendations for instream flow requirements and stream closures to additional appropriations. There is wide variation in low flows within diverse drainages within the WRIA (LaFrance 1975). The 2-year 7-day low flow (7Q2), which represents the low flow occurring over a consecutive seven day period on average every 2 years (i.e., the 50 percent probability) has been estimated to vary from approximately 0.5 cfs per square mile of drainage area to as low as 0.02 cfs per square mile of drainage. The basins with the lowest low flows tend to be those which have little storage and ground water baseflow or are affected by diversions (LaFrance 1975).

Periodic flow measurements conducted by Ecology in recent years (since 1985) has shown little or no flow in some stream reaches during the summer and fall that would be expected to be flowing year round. These reaches occur primarily in the north central part of the WRIA along the reach of the Pend Oreille River between Ione and Metaline Falls, and in the vicinity of Sullivan Lake. Additionally, low flow stream closures have been recommended by the Department of Fish and Wildlife (Fish and Game) in the Calispell Lake and Marshall Lake areas, although these areas do not appear to experience the degree of low flows observed in the north central area. The extreme low flow conditions may result from naturally low baseflows due to geologic conditions (formations with little ground water), but may also be exacerbated by consumptive water withdrawals. This may be especially true in the Calispell, Skookum and Marshall Creek area, which experience the largest withdrawals in the WRIA.

The low flow data and stream closures indicate that there are flow limitations in many tributary streams to the Pend Oreille River. These limitations may be due in part to natural causes but may also be due in part to increased consumptive water uses in the stream basins. Irrespective of the causes, the flow limitations require that future appropriations be considered carefully in these tributary stream basins in order to prevent additional impacts to senior water users and other beneficial downstream water uses.

Due to the large instream flows in the Pend Oreille River compared to water use (and applications) in the WRIA, it is apparent that under current conditions there is adequate water for additional appropriation. This is because instream flow demand by senior water rights is far exceeded by the average annual flow in the river. However, preservation of flow to British Columbia must be considered in the equation. Currently there are no international treaties guarantying specific flows to Canada; however, water resource issues in Canada could spark the need for such an agreement in the future. Additionally, instream flow requirements in the river have not been set by rule, although a recommended level of 8,500 cfs for the Pend Oreille near

lone has been recommended by the Washington State Department of Fish and Wildlife to preserve habitat for resident fish, downstream smolt survival and fish migration (Washington Department of Wildlife 1990).

The recommended flow of 8,500 cfs is not met approximately 10 percent of the time during the months of August through September, 5 percent of the time during April and July, and 1 percent of the time the remainder of the year (USGS 1984). Annually, the minimum instream flows are not met approximately 5 percent of the time with 95 percent of the range falling between 61 days and 0 days per year (Appendix A.2). Thus streamflow would be unavailable for additional appropriation upstream of Ione during the periods that the flow level is not met. The degree to which the recommended flow could be met by regulation of the dams is not certain; however, manipulation of reservoir storage behind the dams both upstream and downstream of Ione would be capable of insuring adequate flows for instream habitat.

Water availability for streams tributary to the Pend Oreille can be assessed in a general way considering the overall gain in flow to the Pend Oreille within the WRIA. Based on long term flow records for Outlet Creek and flow gains between the Pend Oreille River at Newport and at the International Boundary, average annual discharge from tributary basins would be approximately 1.3 to 1.4 cfs/mile^2 of basin area. However, in reaches where extreme low flows or zero flows occur seasonally, there would be no availability during the low flow periods. Since long term streamflow and recent continuous flow data is generally unavailable for tributary streams in the WRIA, with the exception of Outlet Creek, specific information regarding low flow occurrence and duration, and areal extent of low flows cannot be accurately determined.

Because of the lack of streamflow data, the seasonal availability of water from the tributaries is difficult to assess and specific instream flows are difficult to define. Without adequate streamflow data, informed and supportable water availability and instream flow management assessments cannot be made. This results in an inability to develop adequate decisions regarding future water allocations because potential impacts of the withdrawal on senior water users and other beneficial uses are ill defined.

Currently, extreme low flows and zero flows in tributaries to the Pend Oreille River limit the amount of water available during low flow periods, and therefore impact the Pend Oreille River downstream. If ground water rights were issued to replace surface water that is naturally limited by climatic factors and from over appropriation, low flow impacts would likely persist over longer periods of time, as surface water runoff becomes ground water recharge rather than becoming streamflow. Increased ground water use in the Pend Oreille River valley, within the narrow alluvial aquifer associated with the river, would also contribute directly to increasing declines in streamflow.

DISCUSSION AND CONCLUSIONS

During average and high flow conditions, there appears to be ample water within the Pend Oreille River to preserve senior water rights and beneficial uses, and still allow for additional appropriation. Flows in the Pend Oreille River are largely independent of water use and hydrologic conditions in the WRIA, because most of its total contributing watershed is upstream of Washington State in Idaho and Montana. In addition, flows in the river are largely controlled by the series of dams located on the mainstem of the river in Montana, Idaho, Washington and Canada. However, during low flow periods, especially during summer low flows which coincide with increased water use and instream flow needs for fish, tributaries to the Pend Oreille River are critical and may not be able to sustain significant amounts of additional appropriations, either surface water or ground water.

Because of the effect of the Pend Oreille River, risks of excessive ground water withdrawals from the alluvial aquifer located along the river impacting other water users is low. Ground water withdrawals from more localized aquifers or from aquifers in hydraulic continuity with the tributaries to the river have a greater chance of adversely affected senior water rights. There is limited streamflow and ground water information, thus, the natural variability in water availability and potential impacts from water use cannot be fully assessed in these tributary drainages. Currently, water use in tributary drainages is limited; however, in many cases water availability is limited as well, evidenced by extreme low flows and recommendations for minimum streamflow requirements and/or stream closures in several streams. In the flow limited tributaries, future surface and ground water appropriations must consider the potential impact on downstream senior water rights and other beneficial uses, particularly maintenance of fisheries and aquatic habitat.

The recommendations for minimum streamflow requirements in tributary streams is based primarily on water quality and fishery concerns. These same concerns apply to the Pend Oreille River, which also has recommended instream flow levels in order to maintain habitat for resident fish. Because flows in the river are regulated by dams and because most of the Pend Oreille basin is upstream of WRIA 62, management of aquatic habitat, fisheries, water quality and flow in the Pend Oreille River will require cooperative efforts between State Agencies in Washington, Idaho and Montana, civilian groups, Indian Tribes and dam operators.

Currently, permitted water rights for both surface and ground water do not appear to be excessive and damaging to senior water rights or flows within the Pend Oreille River. However, due to the lack of streamflow and ground water data for the tributary drainages draining to the Pend Oreille River, the availability and interaction of natural hydrologic and climatic conditions in the WRIA and human induced variability has not been adequately assessed.

The Pend Oreille River and its tributaries in the WRIA, provide habitat for bull trout, a fish species which may soon be listed as endangered. If this species is listed, instream flow requirements, water quality and habitat conditions will become much more critical for the tributary streams which flow into the Pend Oreille River.

The major conclusions regarding the state or "health" of water resources in the Pend Oreille watershed include:

- Flows in the Pend Oreille River are largely independent of water use and hydrologic conditions in the WRIA, because most of its total contributing watershed is upstream of Washington State in Idaho and Montana. In addition, flows in the river are largely controlled by the series of dams located on the mainstem of the river in Montana, Idaho, Washington and Canada.

- During low flow periods, especially during summer low flows which coincide with increased water use and instream flow needs for fish, the Pend Oreille River and its tributaries may not be able to sustain significant amounts of additional appropriations, either surface water or ground water. This is especially evident in the Calispell Lake area, Sullivan Lake area, and between Ione and Metaline Falls where extreme low or zero flows have been documented within tributary stream basins and closures for some streams have been recommended. Hence, ground water and surface water appropriation within these basins will require detailed evaluation with regards to potential impacts to senior water rights and downstream aquatic habitat.

- During average and high flow conditions, there appears to be ample water within the Pend Oreille River to preserve senior water rights and beneficial uses, and still allow for additional appropriation.

- Currently, permitted water rights for both surface and ground water do not appear to be excessive and damaging to senior water rights or flows within the Pend Oreille River. However, the availability and interaction of natural hydrologic and climatic conditions in the WRIA and human induced variability has not been adequately assessed due to the lack of streamflow and ground water data for the tributary drainages draining to the Pend Oreille River.

- Because of the effect of the Pend Oreille River, risks of excessive ground water withdrawals from the alluvial aquifer located along the river impacting other water users is low. Ground water withdrawals from more localized aquifers or from aquifers in hydraulic continuity with the tributaries to the river have a greater chance of adversely affected senior water rights.

- All surface water withdrawals within WRIA 62 directly affect flow in the Pend Oreille River because the river receives all of the runoff from within the watershed. Similarly, ground water withdrawals also affect flow in the river; however, these effects are seasonally attenuated in many cases due to the longer residence time of water in the aquifer.

- Currently, water use in tributary drainages is limited; however, in many cases water availability is limited as well, evidenced by extreme low flows and recommendations for minimum streamflow requirements and/or stream closures in several streams. In

the flow limited tributaries, future surface and ground water appropriations must consider the potential impact on downstream senior water rights and other beneficial uses, particularly maintenance of fisheries and aquatic habitat.

- Flows in the river are regulated by dams and because most of the Pend Oreille basin is upstream of WRIA 62, management of aquatic habitat, fisheries, water quality and flow in the Pend Oreille River will require cooperative efforts between State Agencies in Washington, Idaho and Montana, civilian groups, Indian Tribes and dam operators.

- The Pend Oreille River and its tributaries in the WRIA, provide habitat for bull trout, a fish species which may soon be listed as endangered. If this species is listed, instream flow requirements, water quality and habitat conditions will become much more critical for the tributary streams which flow into the Pend Oreille River.

RECOMMENDATIONS

Managing water resources in WRIA 62, and specifically evaluation of ground and surface water rights. applications in the watershed, require consideration and assessment of water quantity, quality and use. The key water management issues include:

- Evaluation of instream flows for habitat preservation in the Pend Oreille River and its tributaries.

- Development of minimum flow requirements for the Pend Oreille to provide assurance that flow needs are met throughout the year. This is especially critical if bull trout is listed as an endangered species.

- Development of dam and reservoir operation strategies and coordinated efforts to meet instream flows in the Pend Oreille River.

- Cooperation between Agencies in Washington, Montana and Idaho through the Tri-State Pend Oreille River Water Quality Management Project, Tribal Nations and dam operators to preserve water quality and develop habitat management strategies for the Pend Oreille River.

- Determination of causes and implications of extreme low flows and zero flows during summer/fall months in selected tributary streams in the Metaline Falls area and southern portion of the watershed.

Resolution and understanding of these issues will enable better management decisions designed to preserve senior water rights, aquatic habitat, water quality, and allow for additional water development in the WRIA. However, lack of information concerning streamflows and ground water conditions in the watershed limit the ability to address these issues. In addition, cooperation and sharing of information is essential to effective management of the Pend Oreille River. Specific recommendations to provide adequate information and strategies to address water management issues include:

- Re-establish select streamflow monitoring locations within the existing Ecology network for tributary streams in the WRIA as permanent gaging stations.

- Develop ground water level and water quality monitoring network for tributary streams in the WRIA.

- Work with the Tri-state Pend Oreille River Council, other Agencies, Tribes and dam operators to continue monitoring and develop an appropriate strategy for managing flow in the Pend Oreille River and meet resource management objectives.

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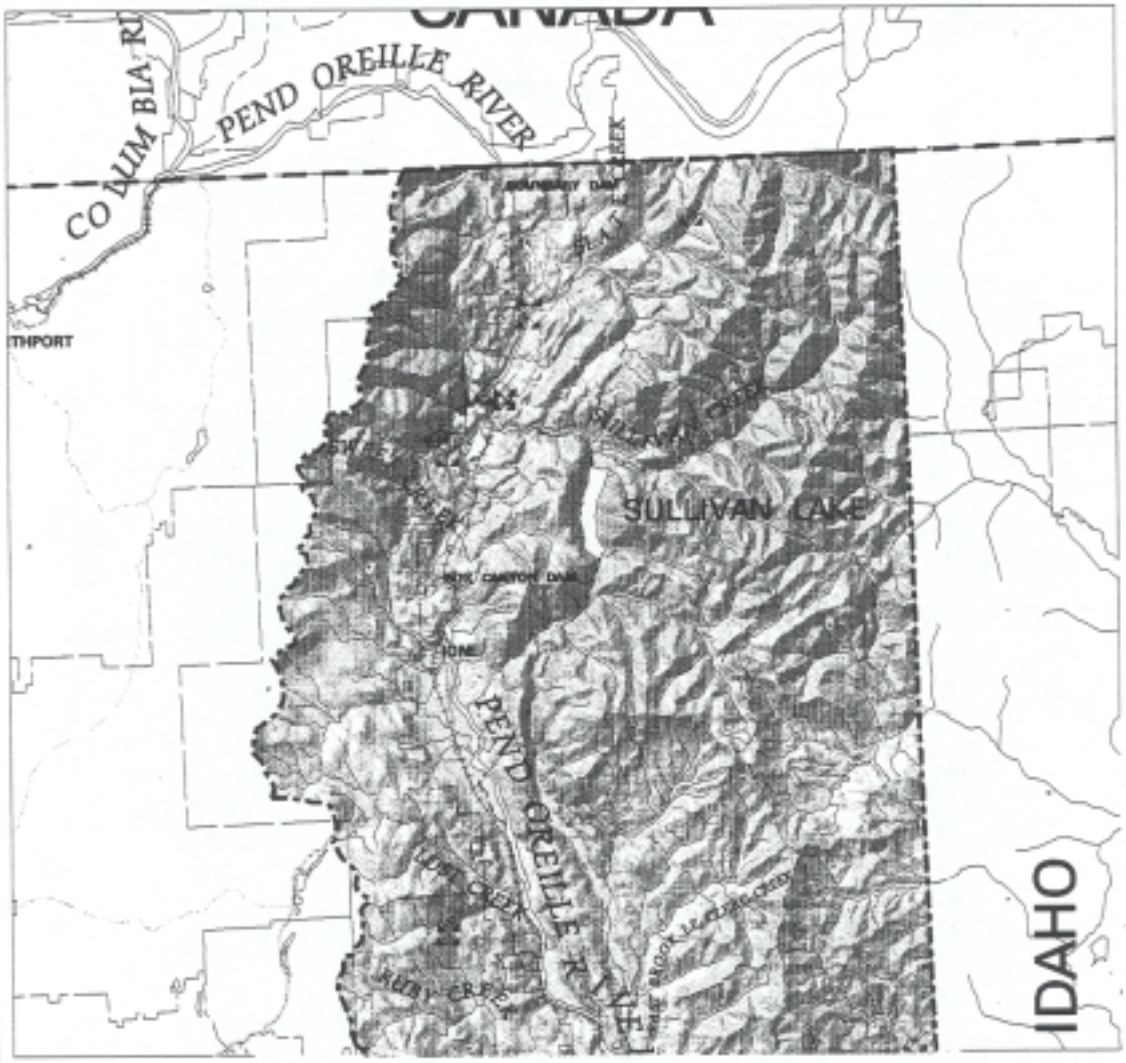
Washington Administrative Code (WAC) Chapter 173-500 Water Resources Management Program.

Washington Department of Wildlife, August 10, 1990. Letter to Mr. Ted Olson, Department of Ecology, Eastern Region Water Resources from Hal Beecher, Instream Flow Biologist.

Watts, Donald. Stevens County GMA Planner. Colville, Washington. Personal Communications; December 20, 1994, January 10, 1995.

MAPS



BASE MAP

LEGEND

- Water Bodies
- Springs (GNIS)
- Mine (GNIS)
- Roads (DLG)
- Study Area Boundary (WRIA's)
- Streams & Rivers (WARIS, 1993)
- Railroads (DLG)

NORTH PEND OREILLE (WRIA 62)

MAP 1a

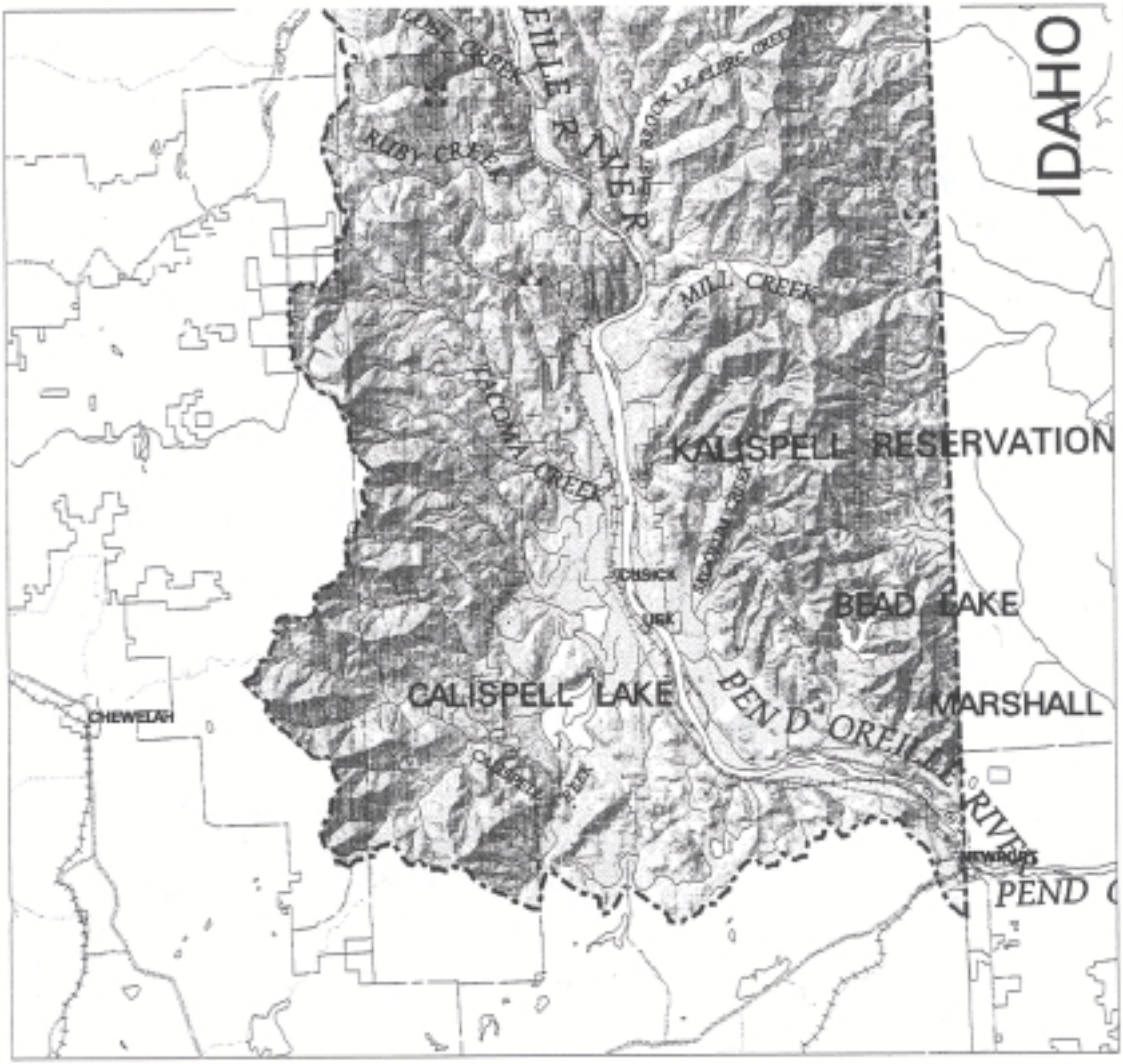
Washington Department of Ecology

Watershed Assessment

5 0 5 10 15

miles

May 04, 1999



BASE MAP

LEGEND

- Water Bodies
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- Roads (DLG)
- Study Area Boundary (WRIA's)
- Streams & Rivers (WARIS, 1993)
- Railroads (DLG)

SOUTH PEND OREILLE (WRIA 62)

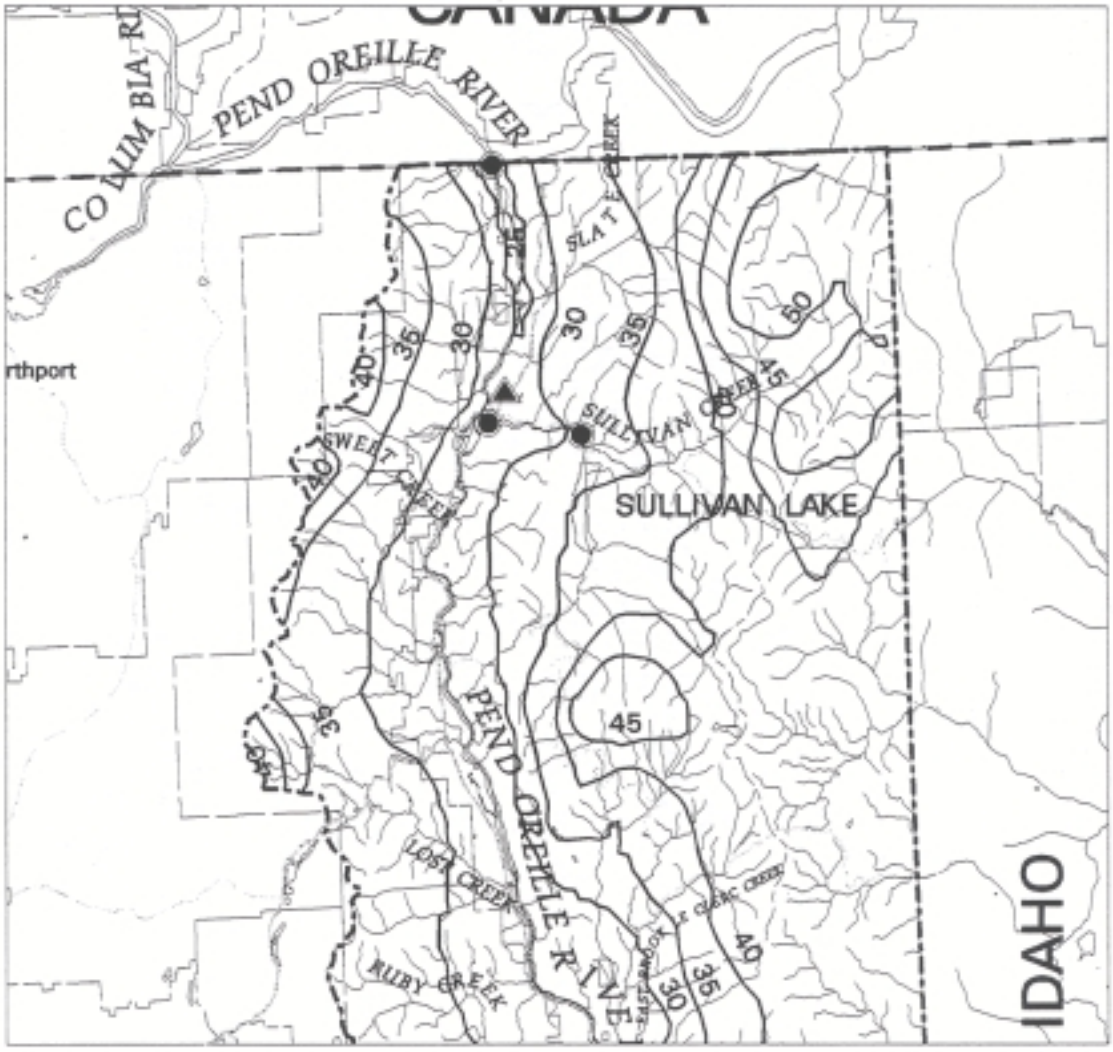
MAP 1b

Washington Department of Ecology

Watershed Assessment

5 0 5 10 15

miles



ANNUAL PRECIPITATION

LEGEND

- Stream Gauge (USGS) (D = Discontinued)
- Climate Station (NOAA)
- 5 Inch Precipitation Isohyets

NORTH PEND OREILLE (WRIA 62)

MAP 2a

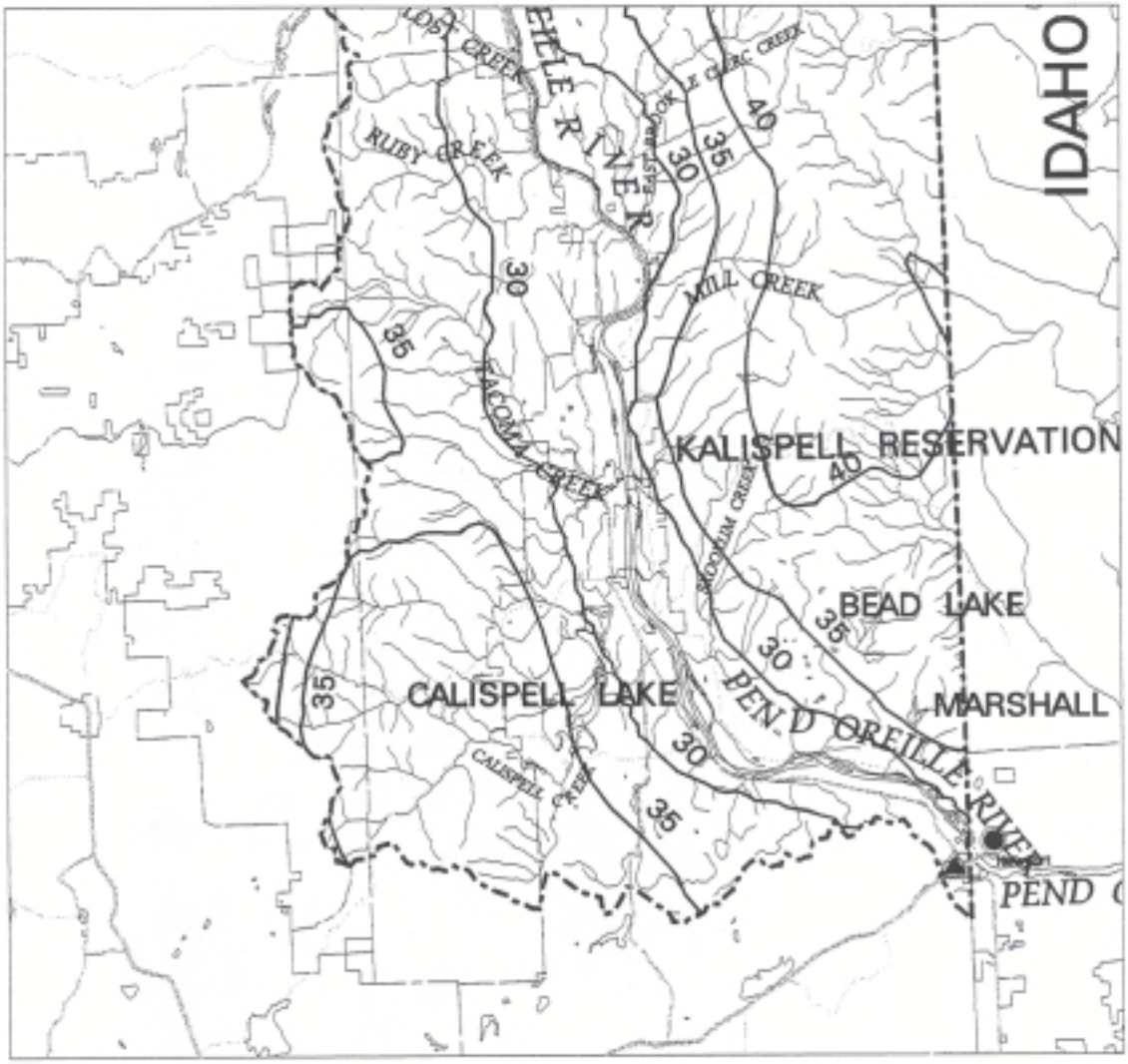
Washington Department of Ecology

Watershed Assessment

5 0 5 10 15

miles

May 04, 1998



ANNUAL PRECIPITATION

LEGEND

- Stream Gauge (USGS) (D = Discontinued)
- Climate Station (NOAA)
- 5 Inch Precipitation Isohyets

SOUTH PEND OREILLE (WRIA 62)

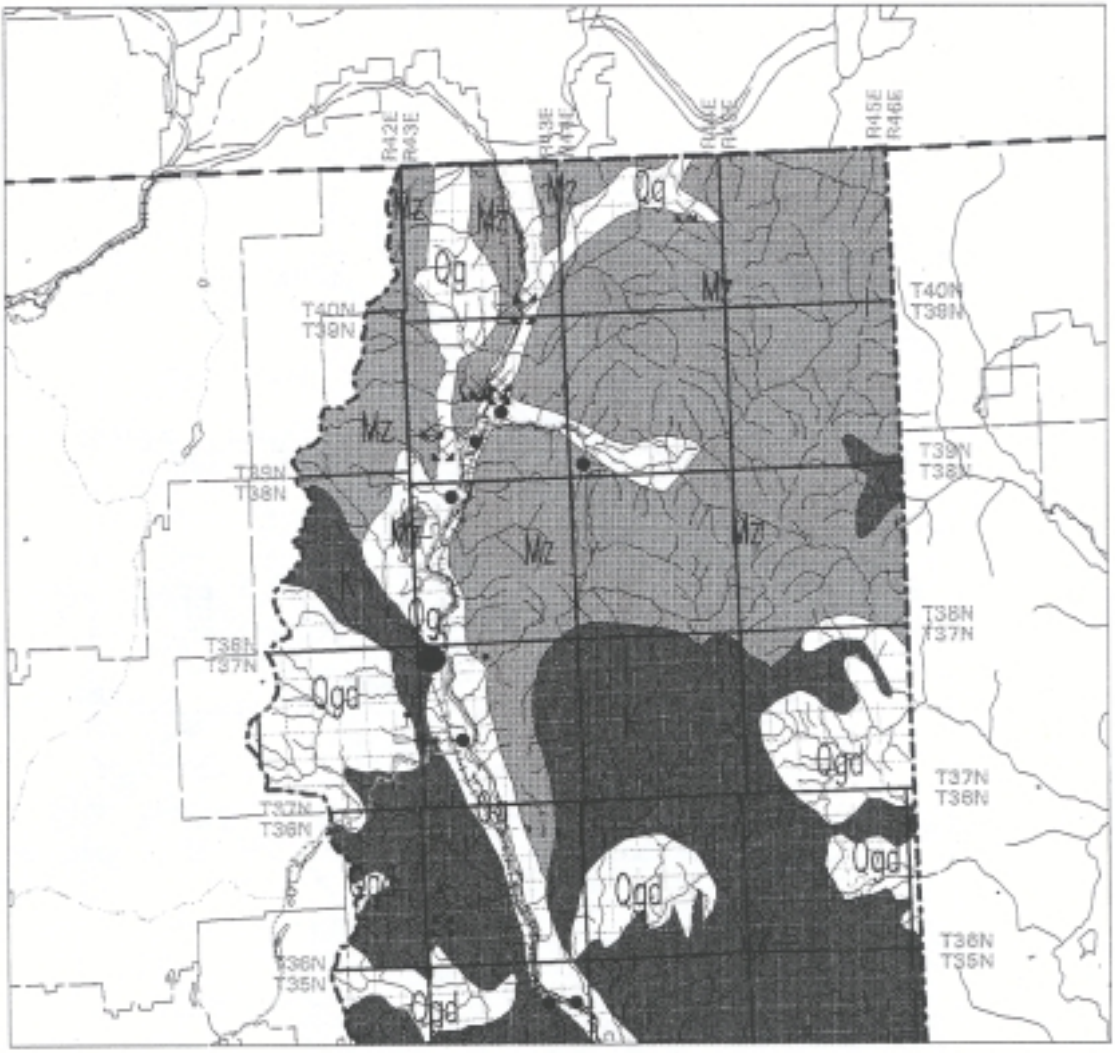
MAP 2b

Washington Department of Ecology

Watershed Assessment

5 0 5 10 15

miles



GROUND WATER USE AND GENERALIZED GEOLOGY

LEGEND

- 1,000-10,000 Acre-Feet/Year
- 100-1,000 Acre-Feet/Year
- 5-100 Acre-Feet/Year
- < 5 Acre-Feet/Year

A ——— A'
Geologic cross-section location

Generalized Geologic Features
From Staffel et. al (1991)

- Qfg — Outburst flood deposits; poorly sorted sand, and cobbles.
- Qgo/ Qg — Glacial drift; Glacial till and lake deposits. Primarily fine grained deposits with occasional lenses of sand and gravel.
- Tog — Alluvial and glacial deposits underlain by Tiger formation. Includes sandstones & pebble conglomerate underlain by volcanic flows.
- Igneous granitic rocks overlain by alluvial deposits and glacial drift in river and stream valleys.
- Mz — Metamorphic and sedimentary bedrock includes quartzite, carbonates, conglomerates, limestone, and slate.

Physiographic Provinces

From Fenneman, 1931

NORTH PEND OREILLE (WRIA 62)

MAP 3a

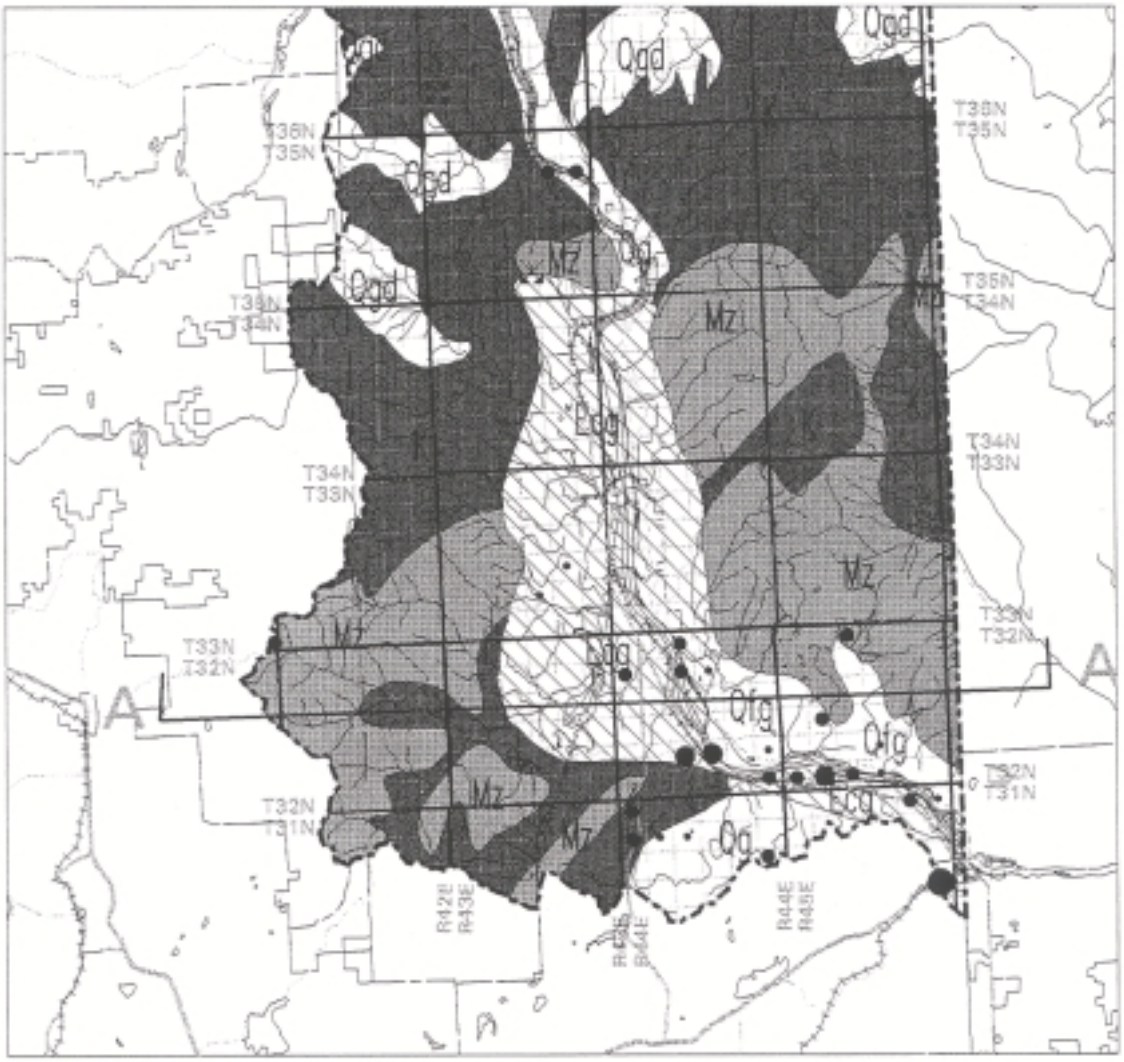
Washington Department of Ecology

Watershed Assessment

5 0 5 10 15

miles

May 05, 1995



GROUND WATER USE AND GENERALIZED GEOLOGY

LEGEND

- 1,000-10,000 Acre-Feet/Year
- 100-1,000 Acre-Feet/Year
- 5-100 Acre-Feet/Year
- < 5 Acre-Feet/Year

A — A' Geologic cross-section location

Generalized Geologic Features
From Staffel et. al (1981)

- Qfg — Outburst flood deposits; poorly sorted sand, and cobbles.
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Physiographic Provinces

From Fenneman, 1931

SOUTH PEND OREILLE (WRIA 62)

MAP 3b

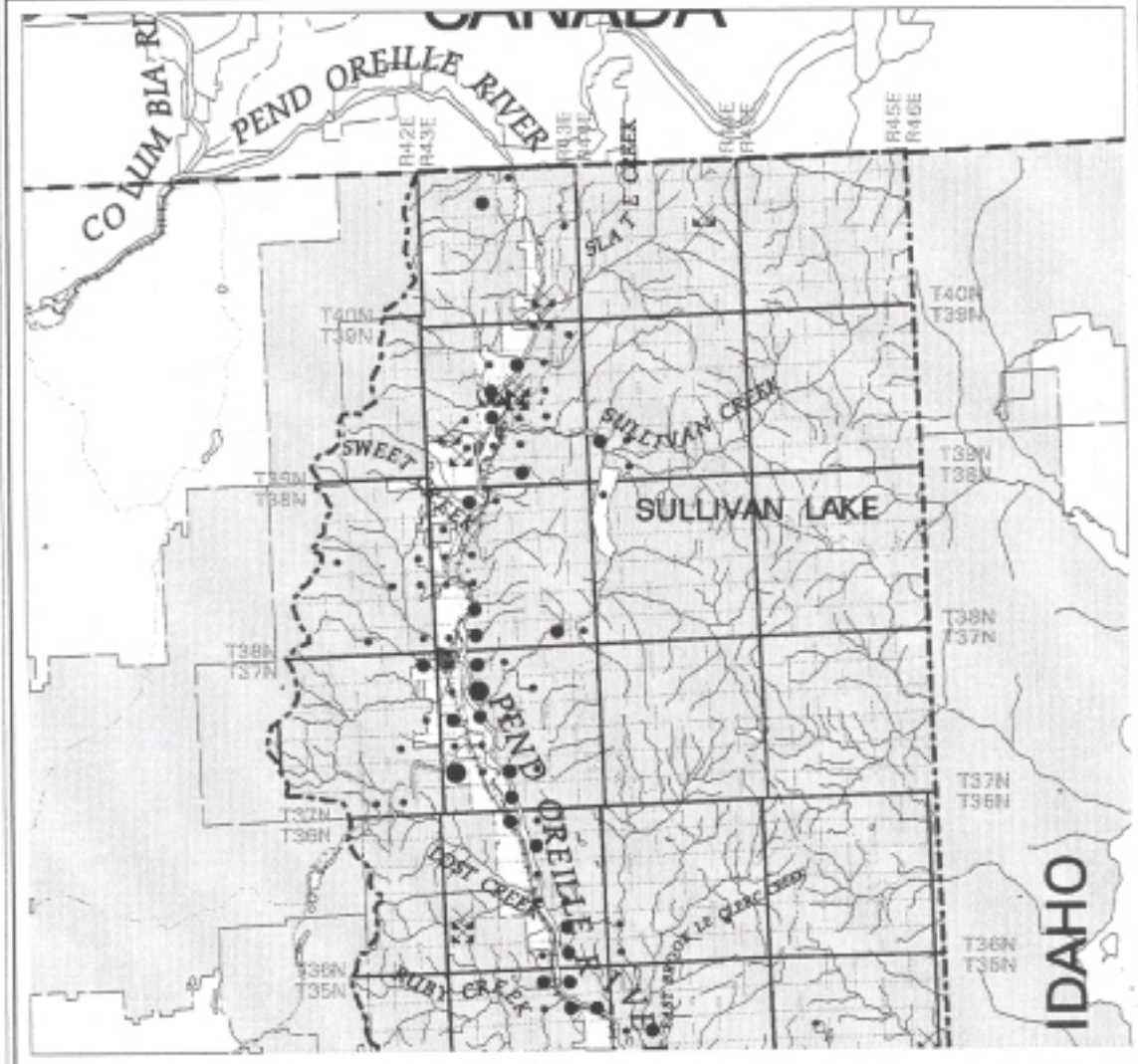
Washington Department of Ecology

Watershed Assessment

5 0 5 10 15

miles

May 05, 1999



SURFACE WATER USE

LEGEND

- 1,000-10,000 Acre-Feet/Year
- 100-1,000 Acre-Feet/Year
- 5-100 Acre-Feet/Year
- < 5 Acre-Feet/Year

- Developed Areas (100k USGS Quad)
- National Forest/ Misc. Public Land (100k USGS Quad)
- Indian Reservation (100k USGS Quad)
- Study Area Boundary (WRIA's)
- Township Boundaries

NORTH PEND OREILLE (WRIA 62)

MAP 4a

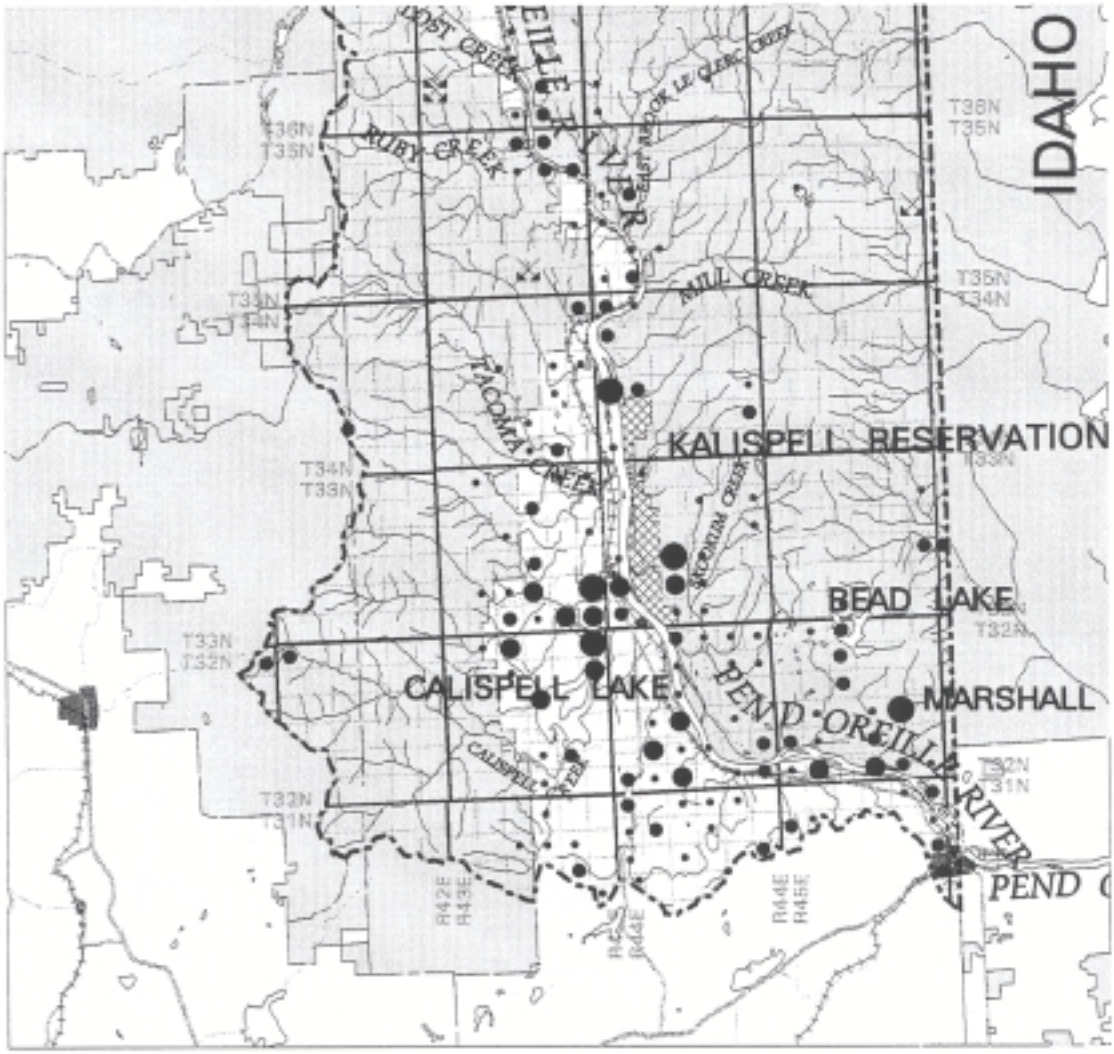
Washington Department of Ecology

Watershed Assessment

5 0 5 10 15

miles

May 04, 1995



SURFACE WATER USE

LEGEND

- 1,000-10,000 Acre-Feet/Year
- 100-1,000 Acre-Feet/Year
- 5-100 Acre-Feet/Year
- < 5 Acre-Feet/Year

- Developed Areas (100k USGS Quad)
- National Forest/ Misc. Public Land (100k USGS Quad)
- Indian Reservation (100k USGS Quad)
- Study Area Boundary (WRIA's)
- Township Boundaries

SOUTH PEND OREILLE (WRIA 62)

MAP 4b

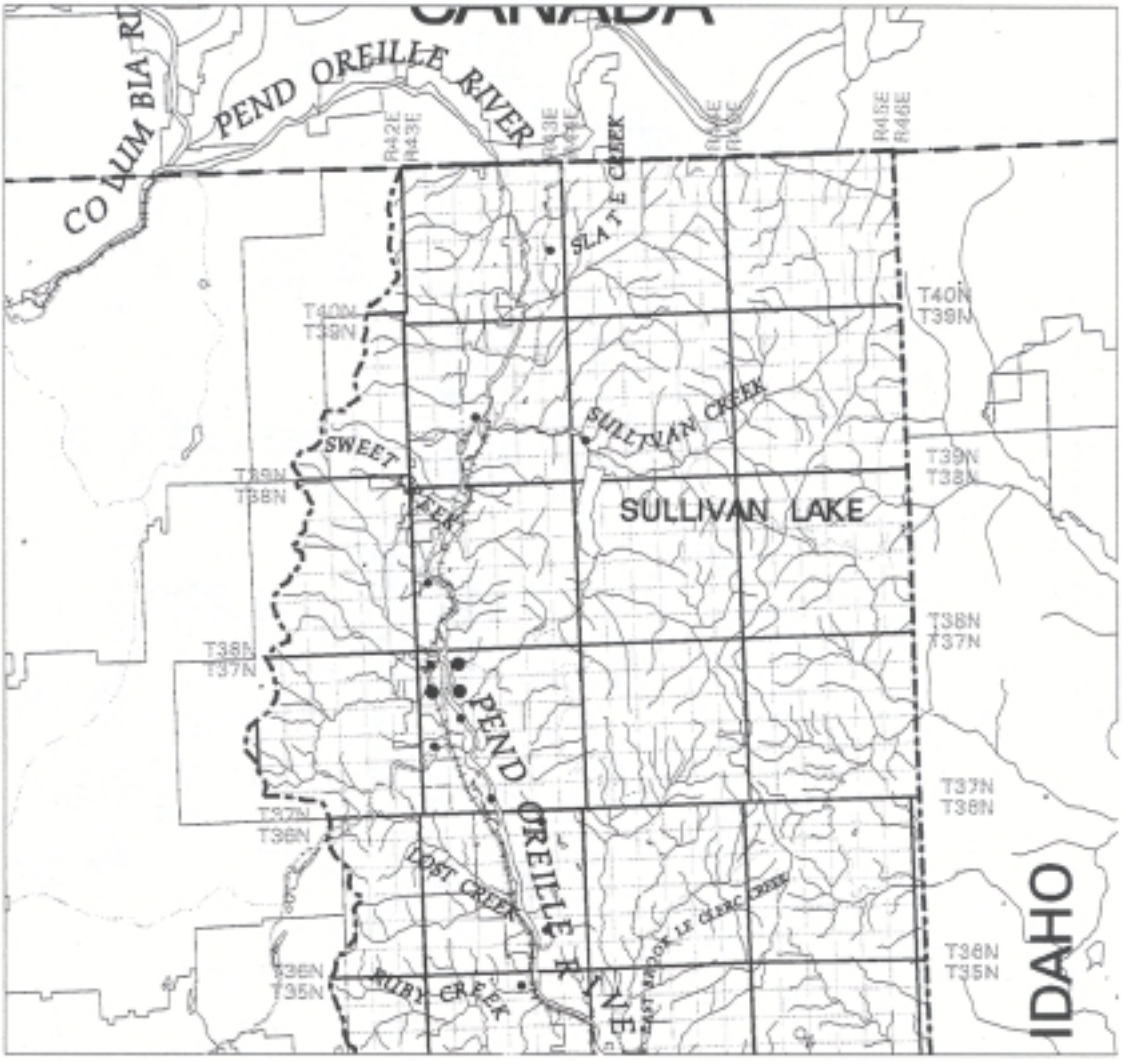
Washington Department of Ecology

Watershed Assessment

5 0 5 10 15

miles

May 04, 1995



LOCATION OF WATER USE APPLICATIONS

LEGEND

Number of Applications per Section (Groundwater and Surfacewater)

- 1
- 2
- 3 or more

Study Area Boundary (WRIA)

Township Boundaries

NORTH PEND OREILLE (WRIA 62)

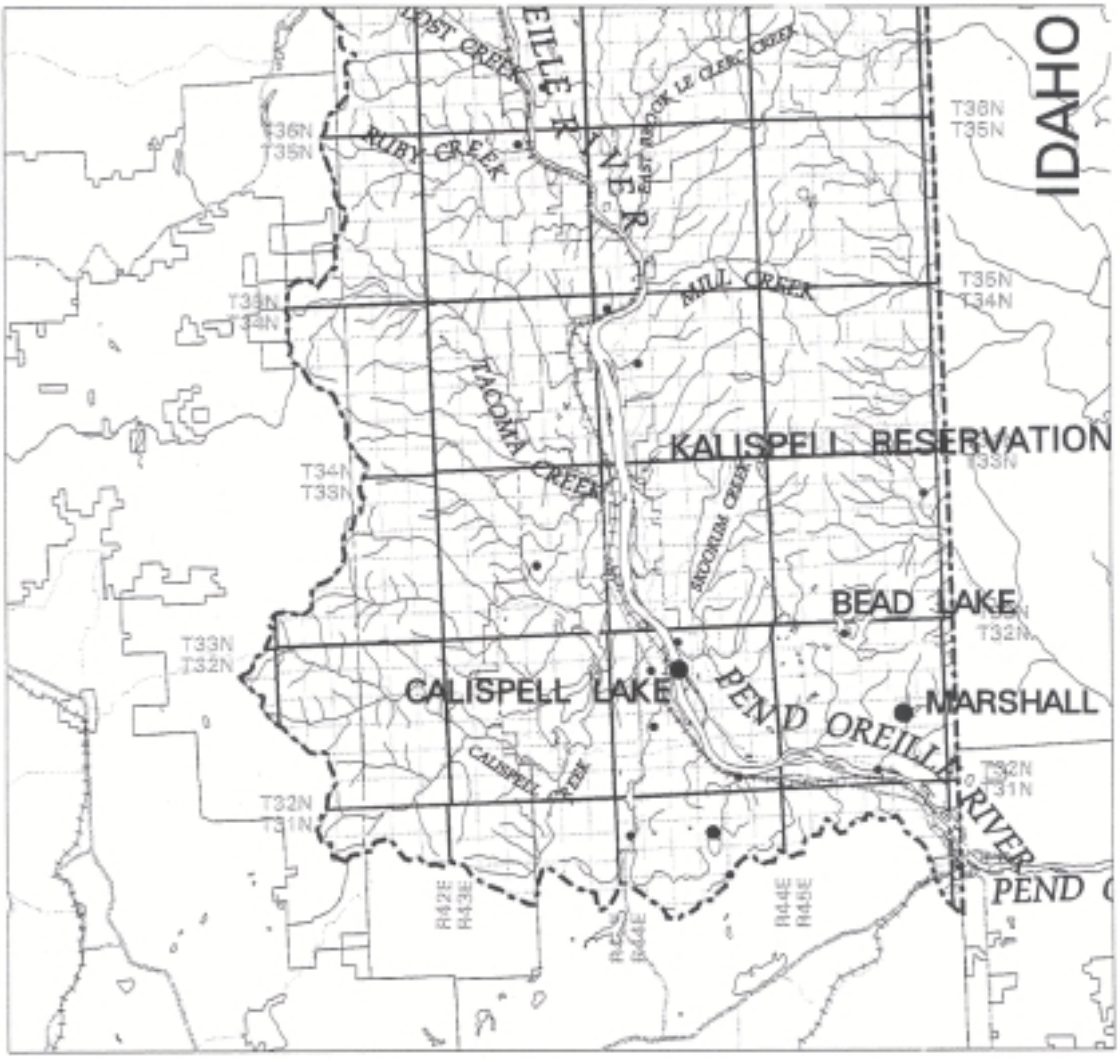
MAP 5a

Washington Department of Ecology

Watershed Assessment

5 0 5 10 15

miles



LOCATION OF WATER USE APPLICATIONS

LEGEND

Number of Applications per Section (Groundwater and Surfacewater)

- 1
- 2
- 3 or more

Study Area Boundary (WRIA)

Township Boundaries

SOUTH PEND OREILLE (WRIA 62)

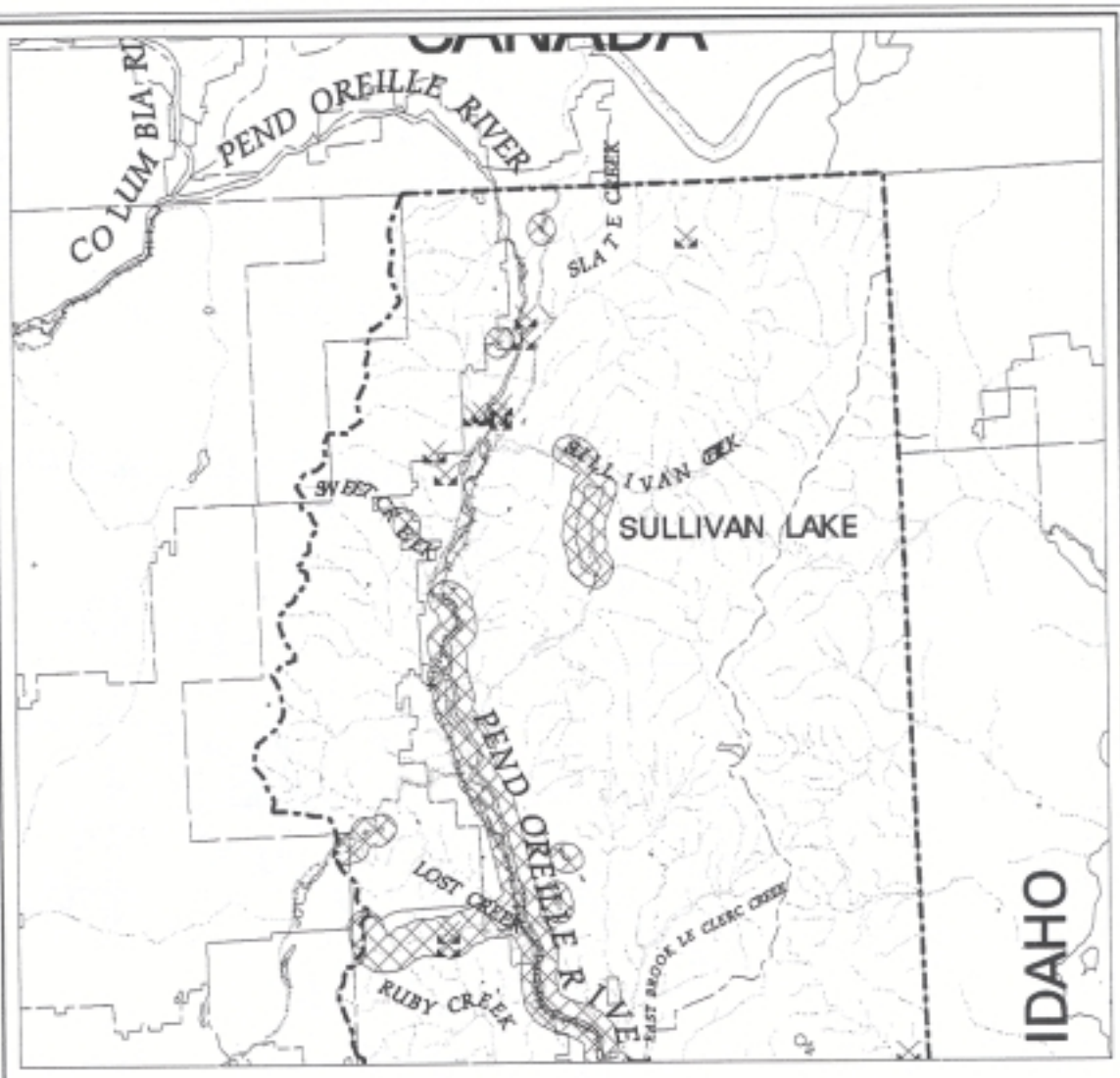
MAP 5b

Washington Department of Ecology

Watershed Assessment

5 0 5 10 15

miles



WATER QUALITY MAP

LEGEND

- 303(d) Water Bodies (WDOE)
- Springs (GNIS)
- Mines (GNIS)
- No Known Water Quality Limiting Factors to Fish Populations or No Data Available (WDFW, 1995)
- Water Quality Limiting Factors Not Annual in Occurrence or Only Mildly Limiting to Fish Populations (WDFW, 1995)
- Water Quality Limiting Factors Present and Annually Impact Fish Populations (WDFW, 1995)
- Study Area Boundary (WRIA)
- Roads (DLG)
- Railroads (DLG)

NORTH PEND OREILLE (WRIA 62)

MAP 6a

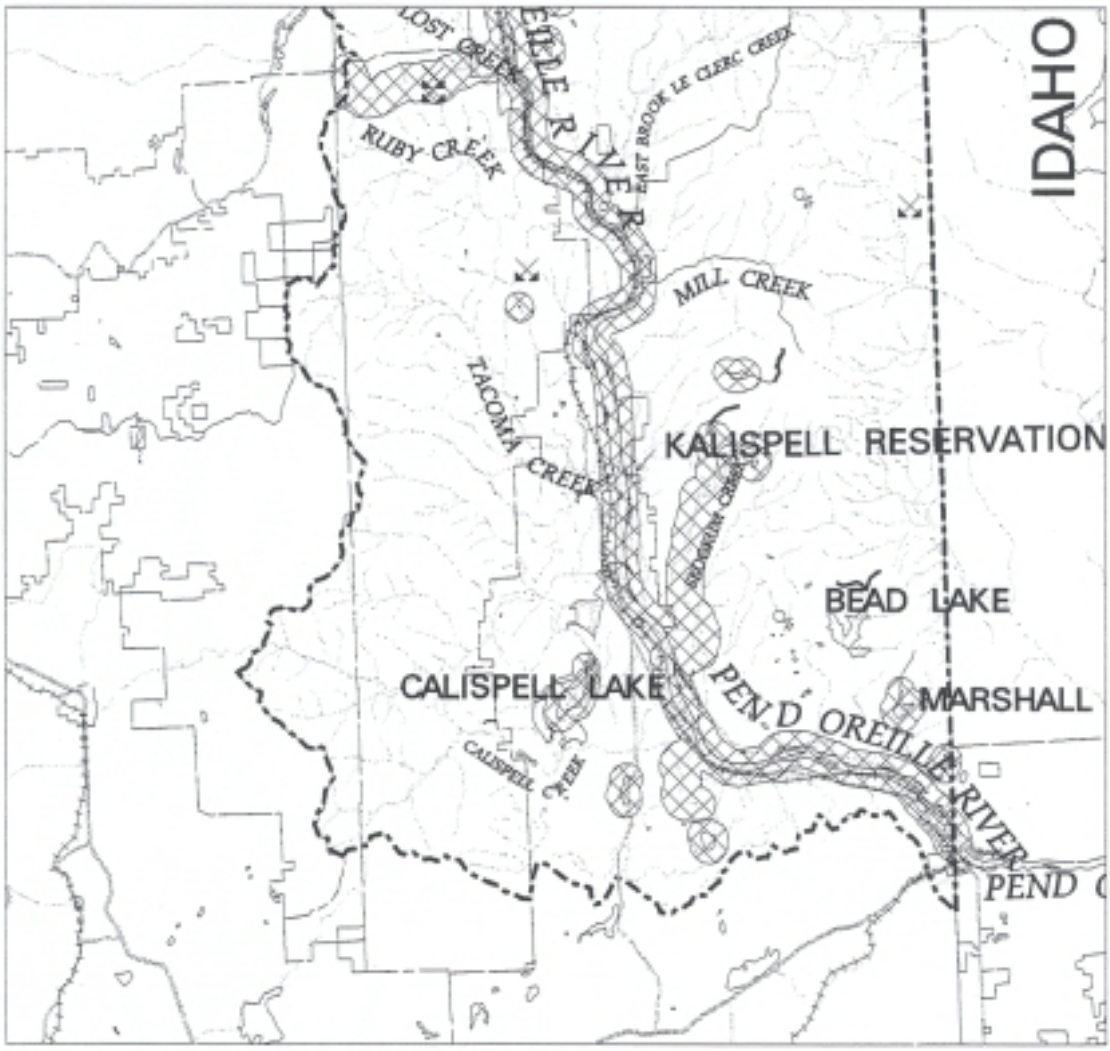
Washington Department of Ecology

Watershed Assessment

5 0 5 10 15

miles

May 04, 1995



WATER QUALITY MAP

LEGEND

303d Water Bodies (WDOE)

Springs (DNR)

Mines (DNR)

No Known Water Quality Limiting Factors to Fish Populations or No Data Available (WDFW, 1990)

Water Quality Limiting Factors Not Annual in Occurrence or Only Mildly Limiting to Fish Populations (WDFW, 1990)

Water Quality Limiting Factors Present and Annually Impact Fish Populations (WDFW, 1990)

Study Area Boundary (WRIA)

Roads (DLG)

Railroads (DLG)

SOUTH PEND OREILLE (WRIA 62)

MAP 6b

Washington Department of Ecology

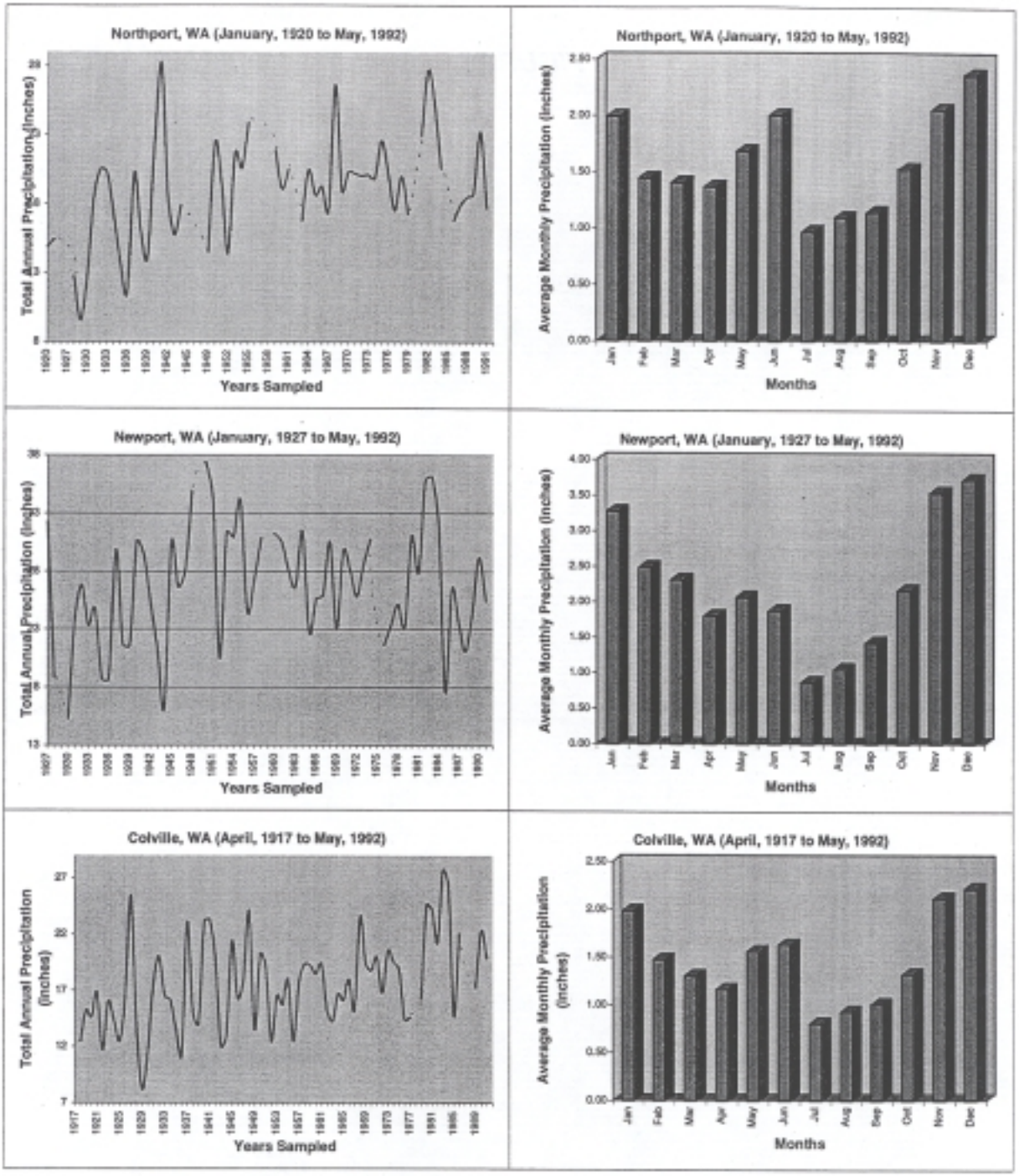
Watershed Assessment

5 0 5 10 15

miles

May 04, 1995

FIGURES



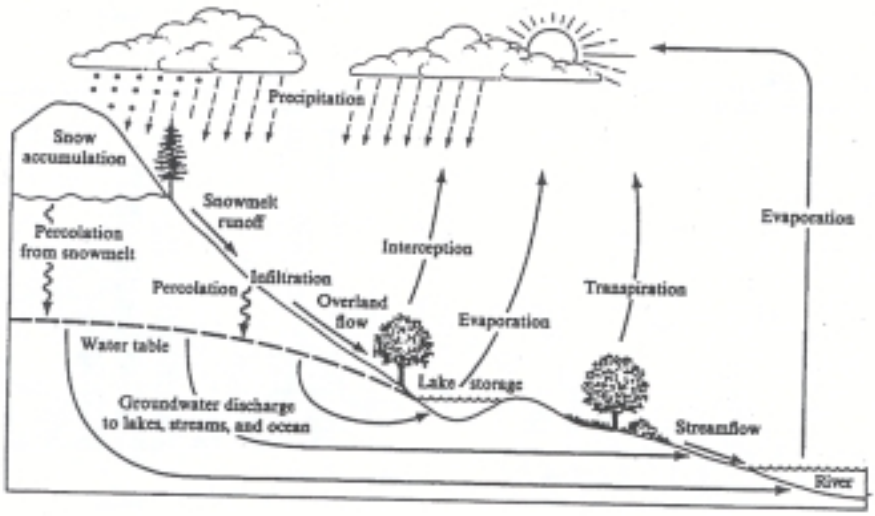
TOTAL ANNUAL PRECIPITATION (--- data not collected for that year) **AVERAGE MONTHLY PRECIPITATION**

Figure 1. Total Annual and Average Monthly Precipitation at Three Stations Located in the Pend Oreille Watershed.

DAMES & MOORE

FINAL.XLS/Pend Oreille
2/16/96 - 10:31 AM

07927_07.CDR

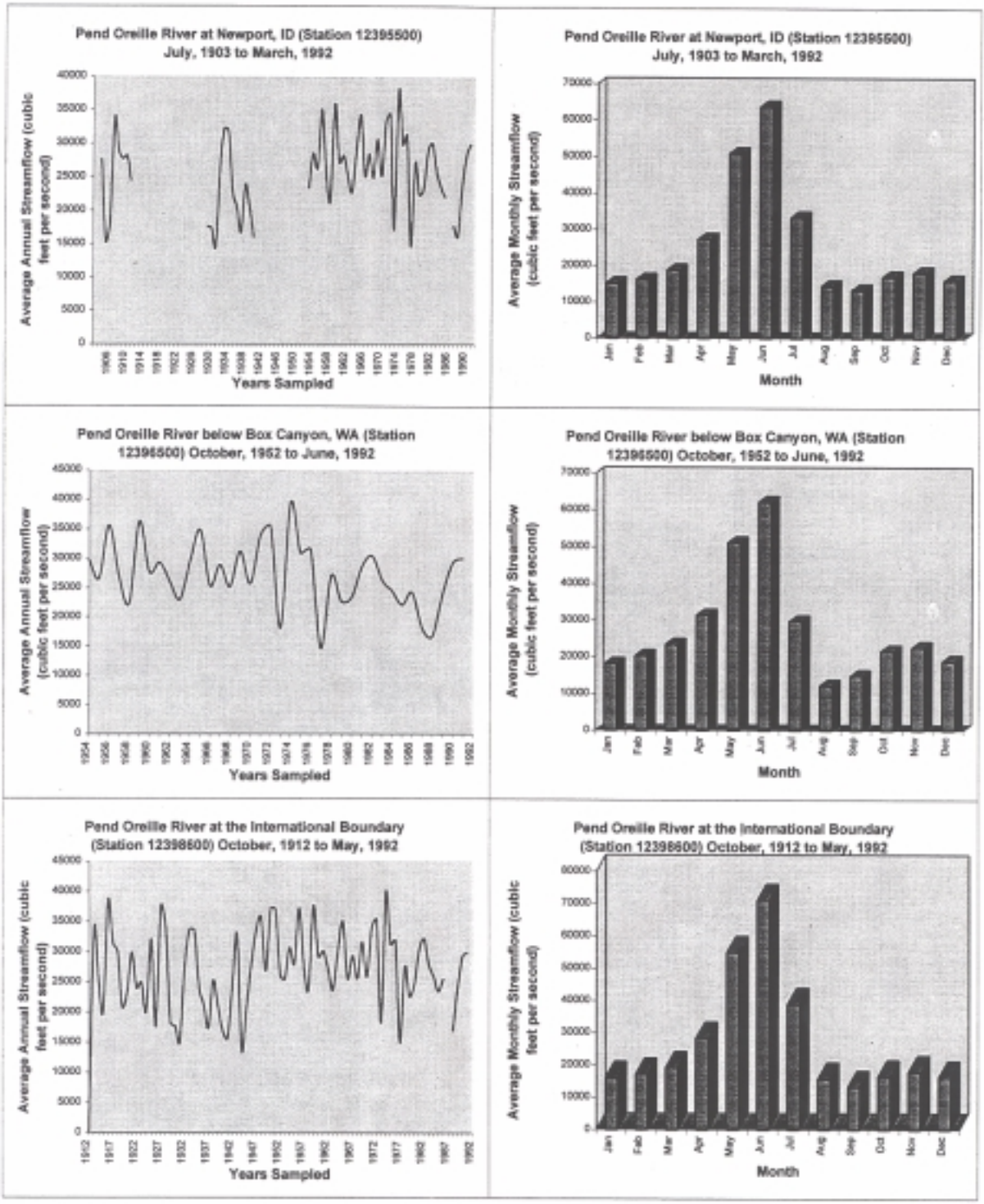


SCHEMATIC DIAGRAM OF HYDROLOGIC CYCLE

Job No. 07927-007-005

DAMES & MOORE

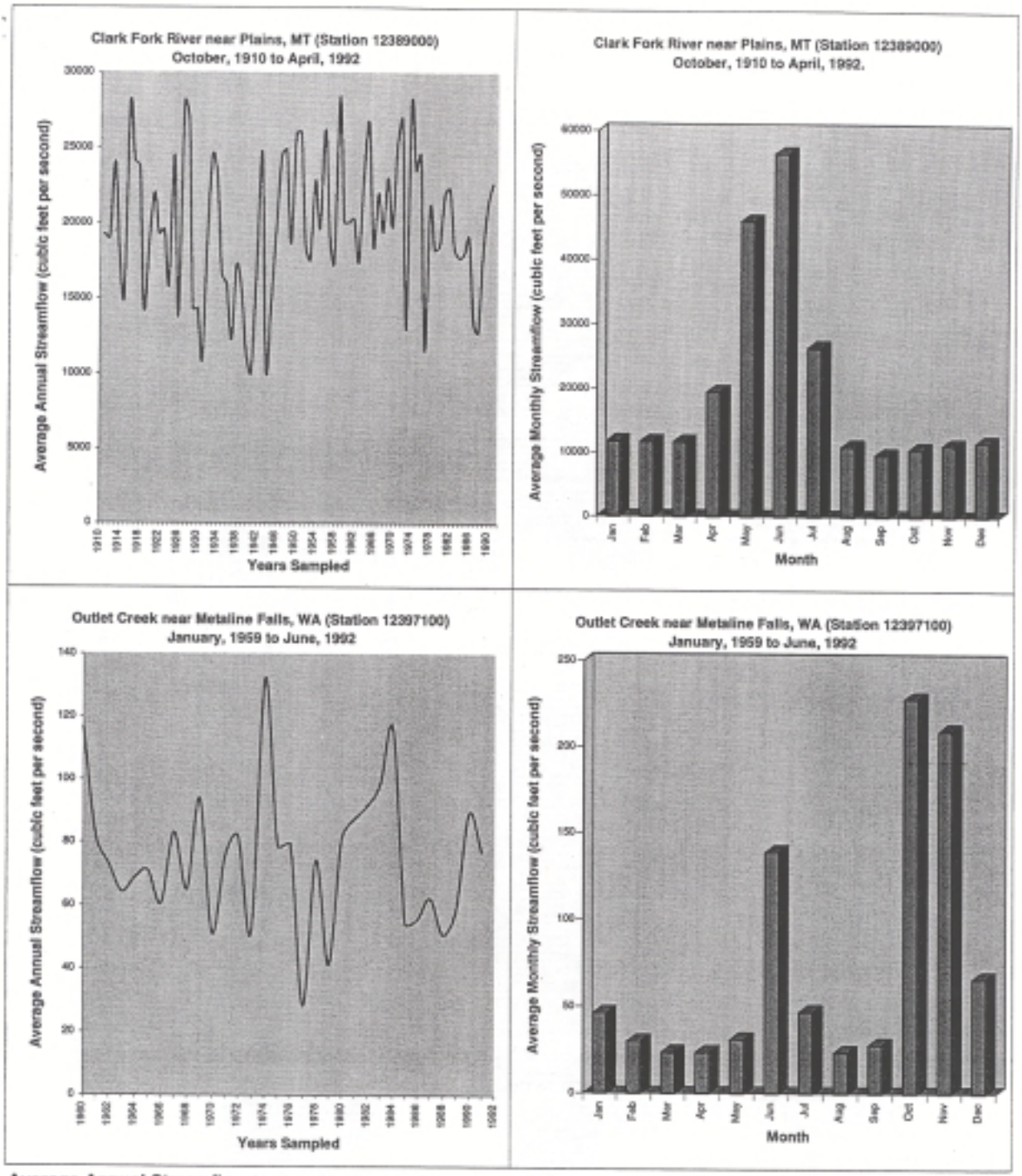
FIGURE 2



Average Annual Streamflow (— data not collected for that year)

Average Monthly Streamflow

Figure 3. Average Annual and Average Monthly Streamflow at Five Stations Located in the Pend Oreille Watershed.



Average Annual Streamflow (--- data not collected for that year)

Average Monthly Streamflow

Figure 3. Continued.

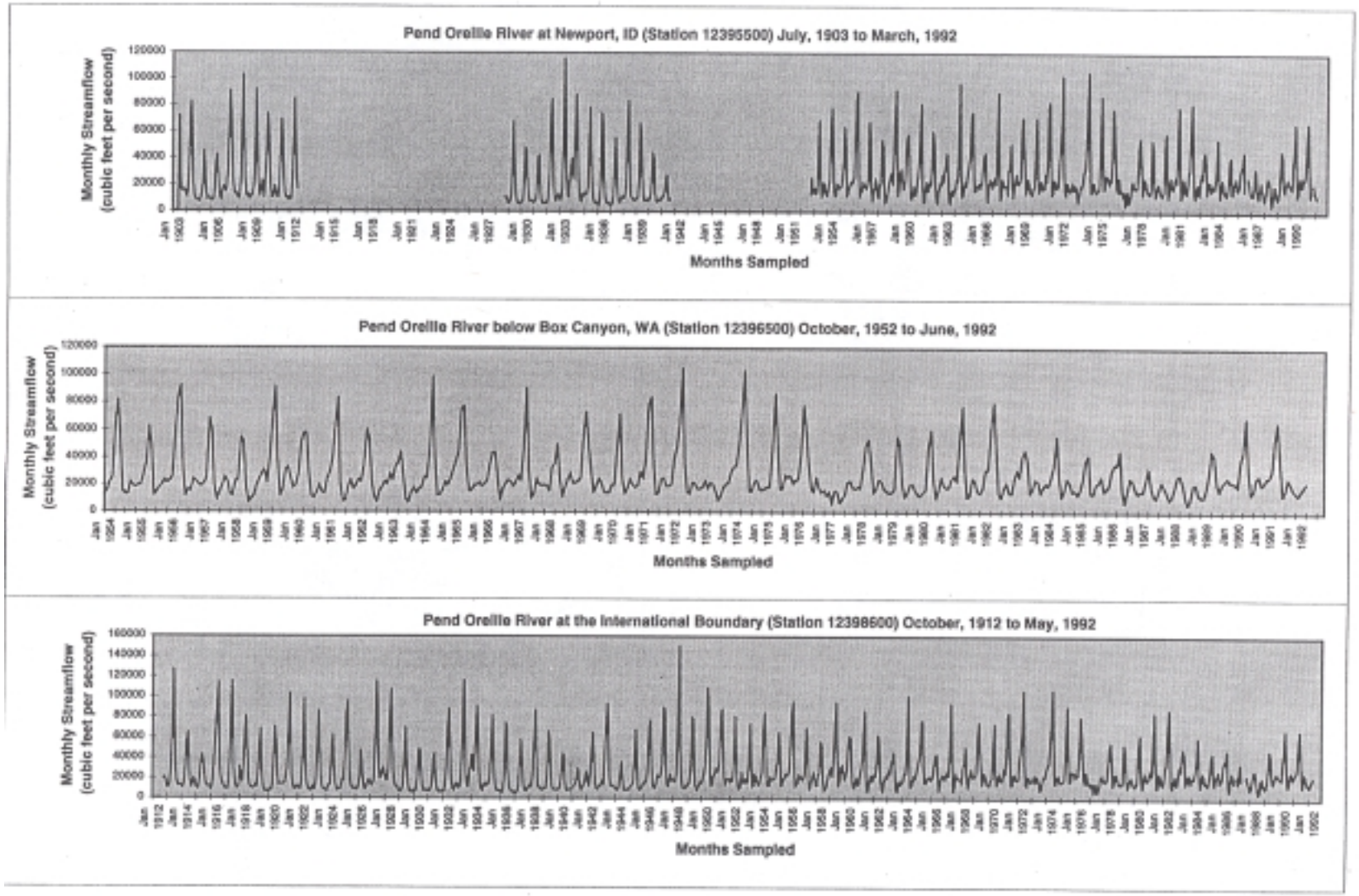


Figure 4. Streamflow, by Month, at Five Stations Located in the Pend Oreille River Watershed.

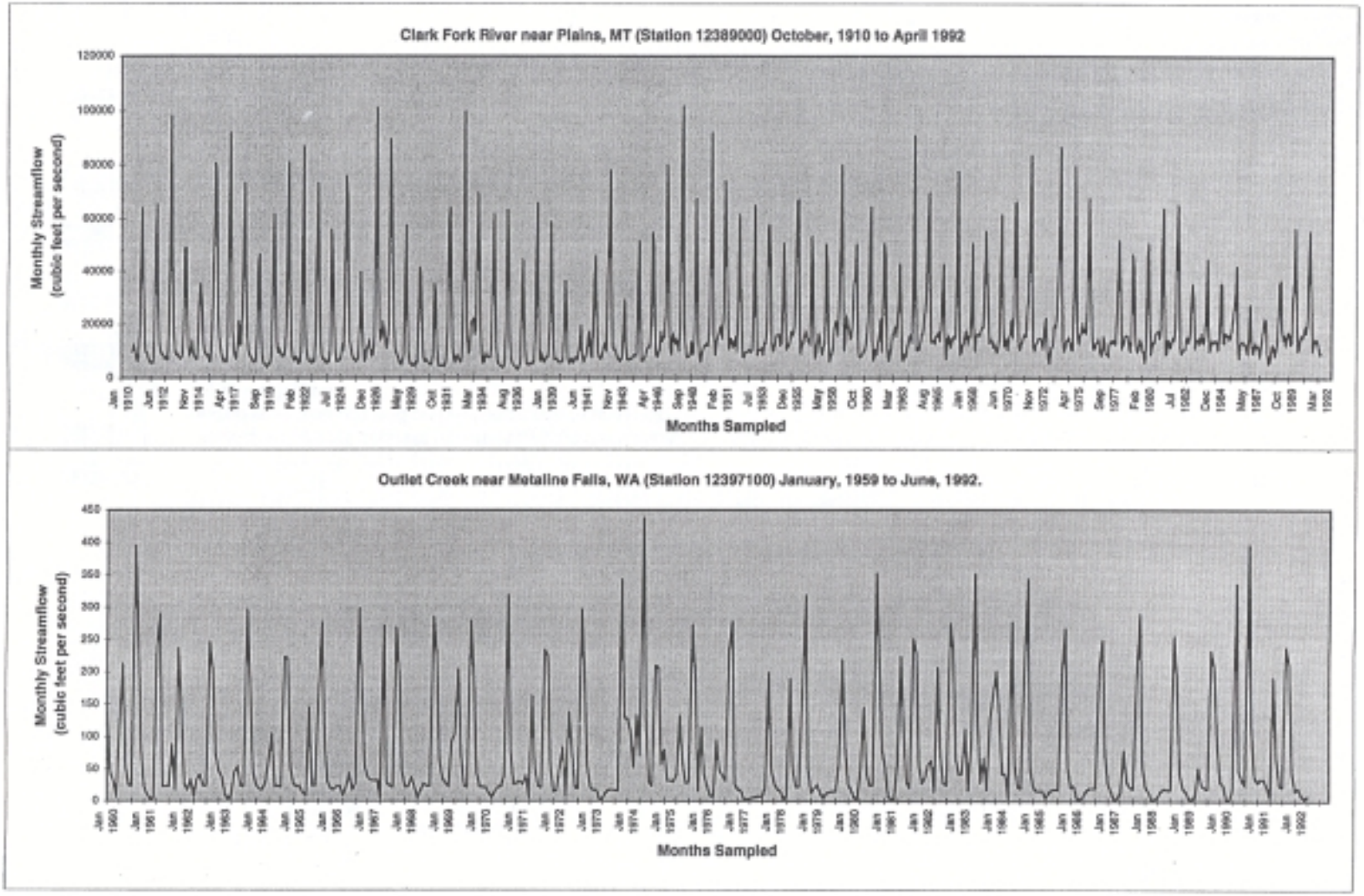
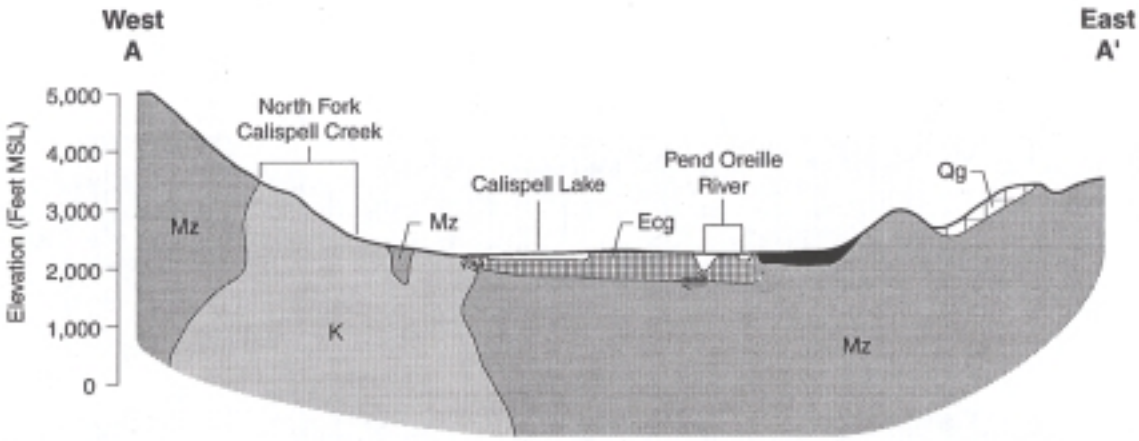


Figure 4. Continued.

07927_06.CDR



LEGEND

	Ecg	Alluvial and glacial deposits underlain by Tiger Formation, includes sandstones and pebble conglomerate underlain by volcanic flows
	K	Igneous granite rocks overlain by alluvial deposits and glacial drift in river and stream valleys
	Mz	Metamorphic and sedimentary bedrock, includes quartzite, carbonates, conglomerates, limestone, and slate
	Qfg	Outburst flood deposits, poorly sorted sand, gravel, and cobbles
	Qg	Glacial till, lake deposits, primarily fine-grained deposits with occasional lines of sand and gravel

0 4 8

Horizontal Scale in Miles

PEND OREILLE WATERSHED
GENERALIZED GEOLOGIC CROSS-SECTION

Job No. 07927-010-005

DAMES & MOORE

Watershed Assessment
Washington Department of Ecology
FIGURE 5

Figure 6. WRIA 62 - Pend Oreille River Watershed

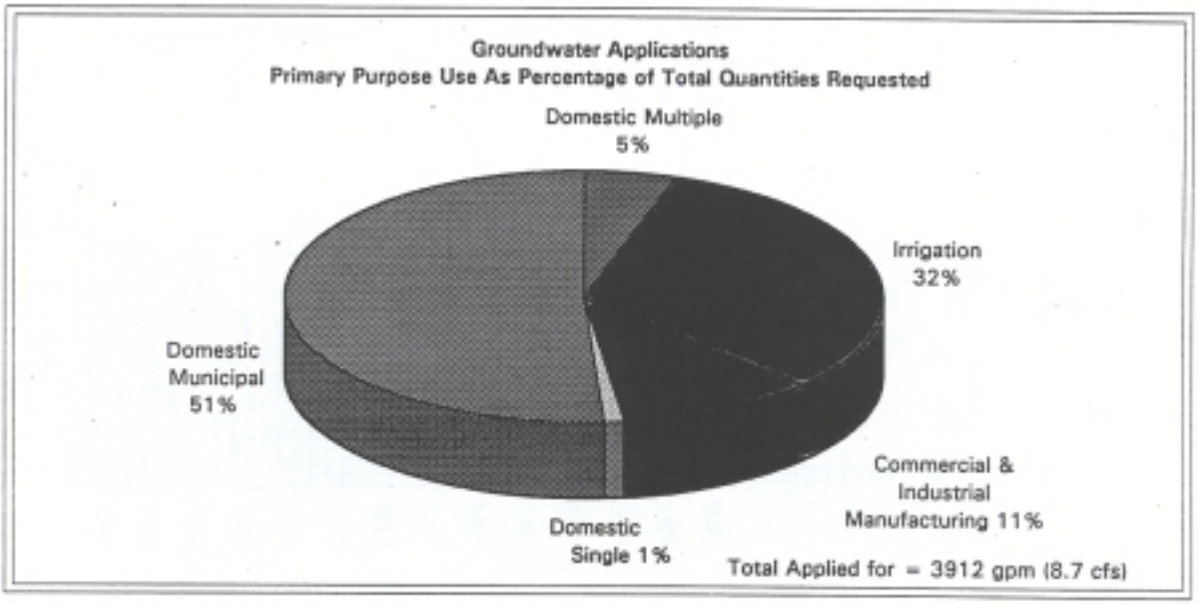


Figure 7. WRIA 62 - Pend Oreille River Watershed

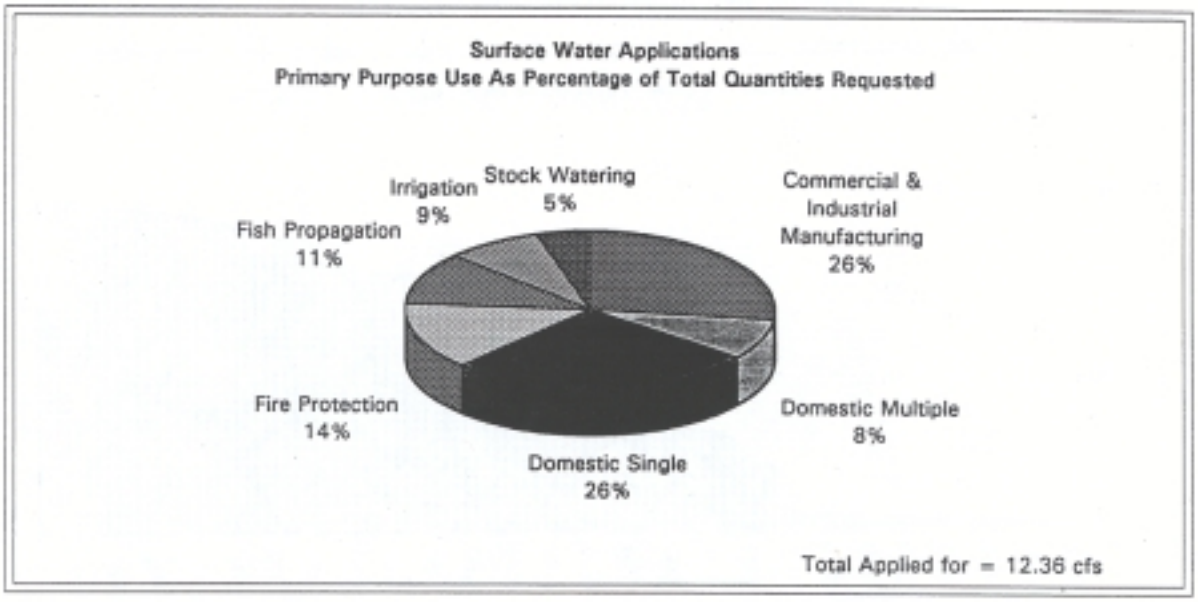


Figure 8. WRIA 62 - Pend Oreille River Watershed.

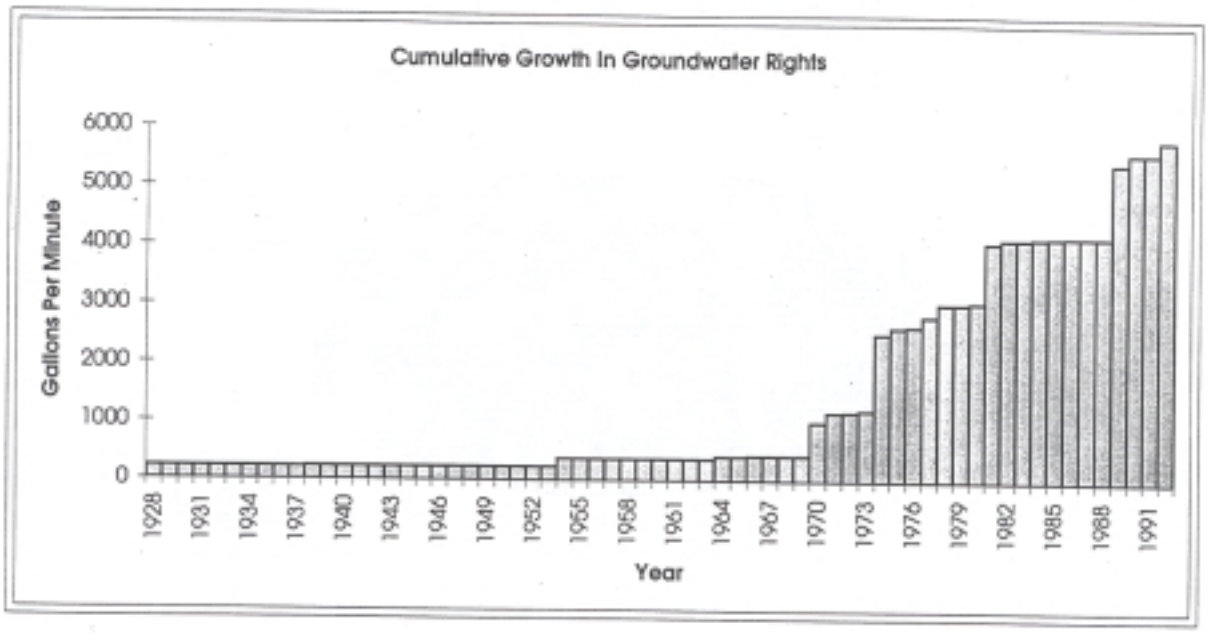


Figure 9. WRIA 62 - Pend Oreille River Watershed.

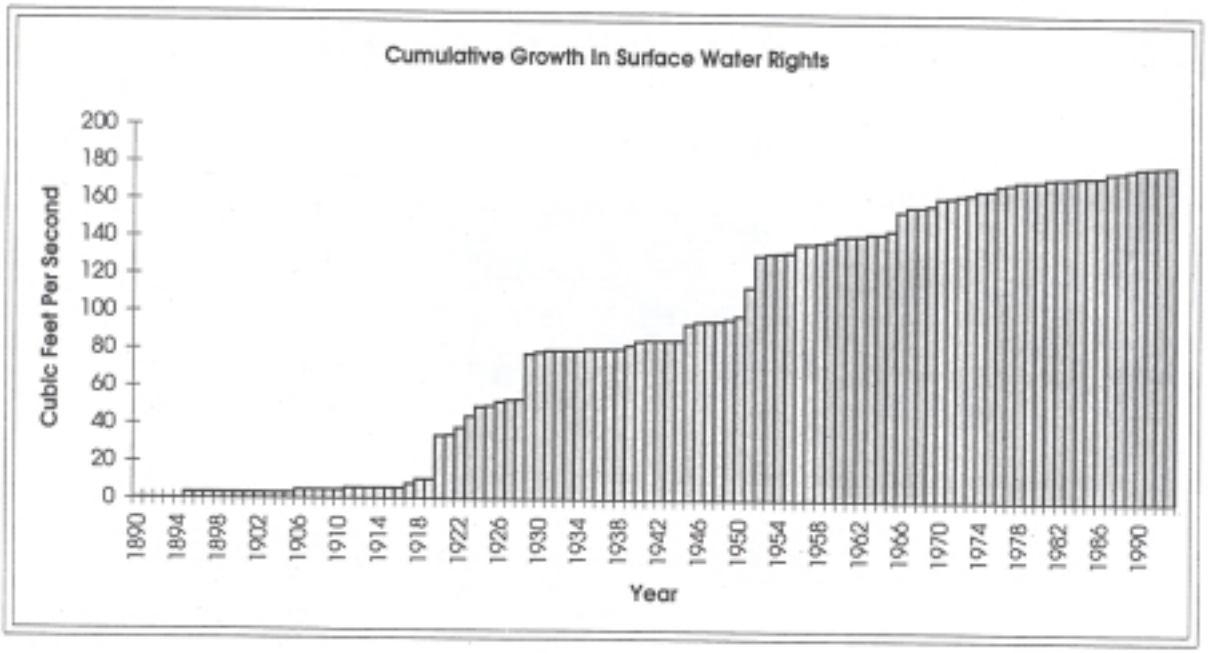


Figure 10. WRIA 62 - Pend Oreille River Watershed.

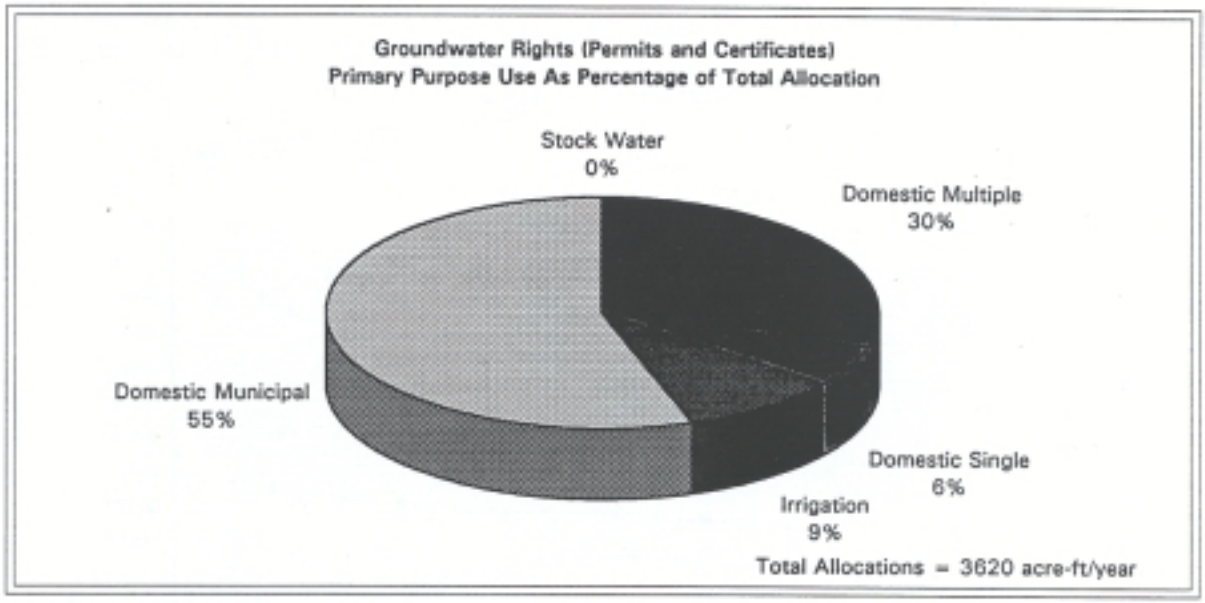


Figure 11. WRIA 62 - Pend Oreille River Watershed.

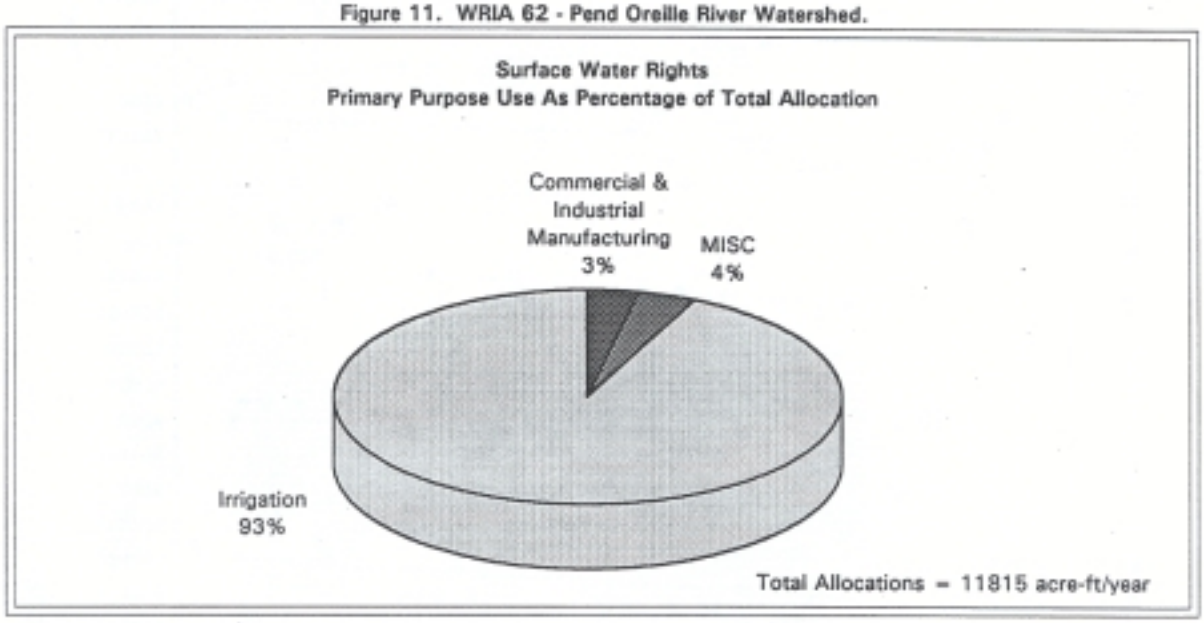
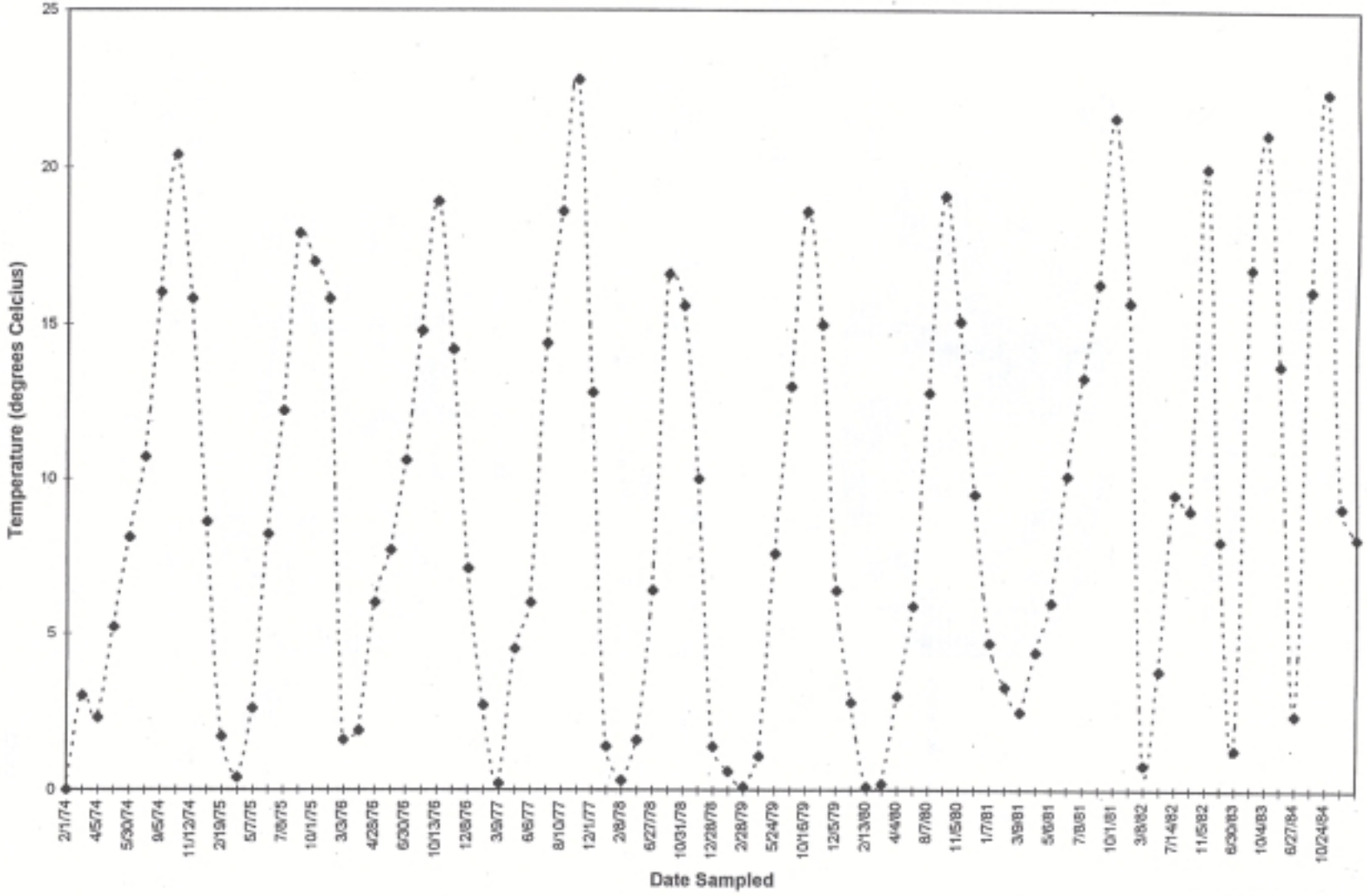


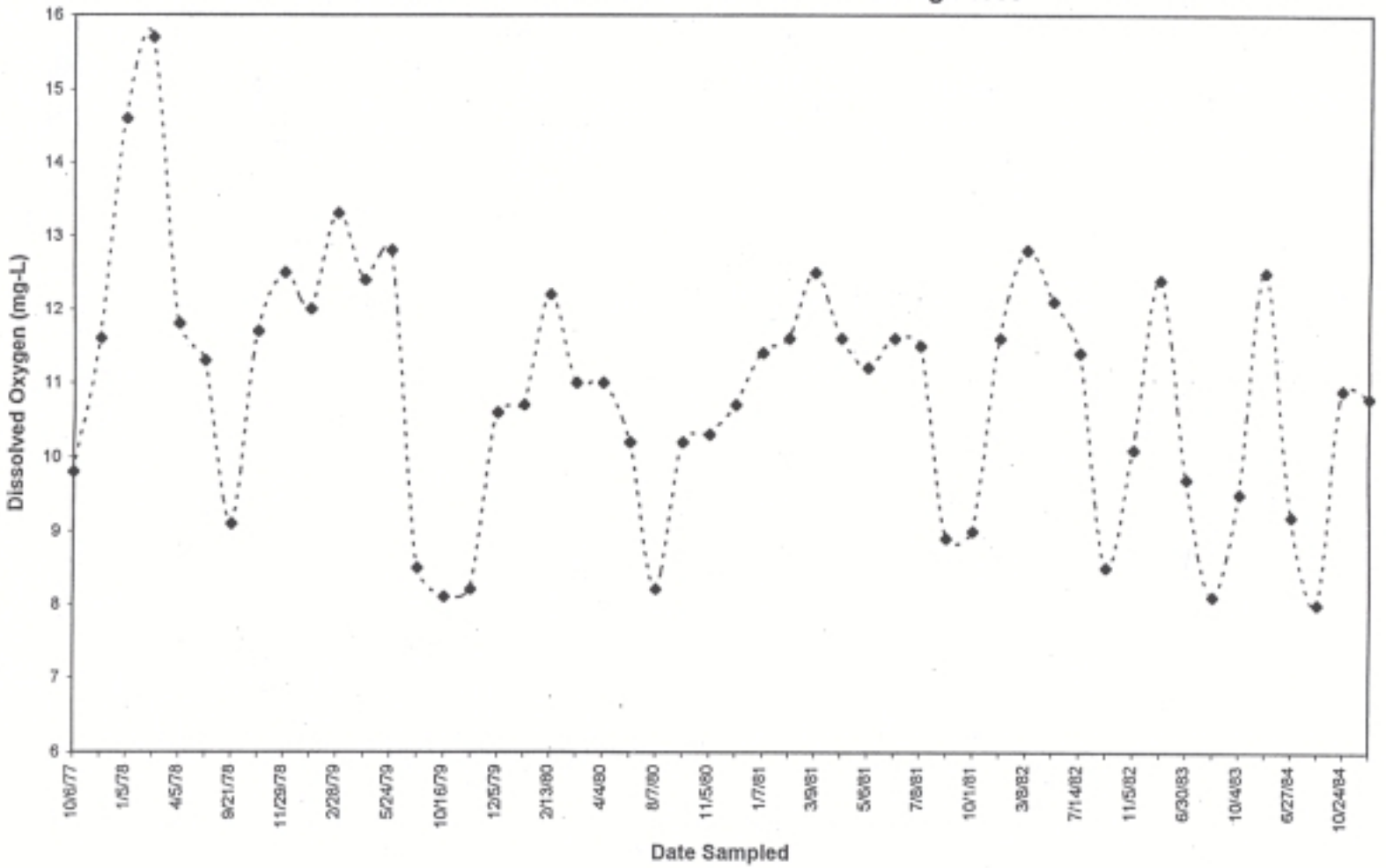
Figure 12. Pend Oreille River Temperature Values (°C) at a Station at the International Border for the Years 1974 through 1985.



DAMES & MOORE

PEND.XLS/Temp Chart F
2/17/95 - 9:54 AM

Figure 13. Pend Oreille River Dissolved Oxygen Values (Milligram per Liter) at a Station at the International Border for the Years 1977 Through 1985



DAMES & MOORE

PEND.XLS/DO (mg-L) Chart F
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Appendix A.1 Department of Ecology Regional Precipitation Analysis (Barker 1995)

LONG TERM PRECIPITATION TRENDS

Introduction

Precipitation data from gages located throughout the state were used to examine long term trends and identify extended periods of above or below average precipitation. This analysis will put the more recent weather patterns that we have experienced into a long-term perspective. Such a perspective is necessary when considering the issuance of additional water rights because periods of extended drought identified in the historical record can be expected to occur again in the future.

Precipitation Stations

Precipitation stations located at 16 sites throughout the state were used for the analysis (Figure 1). The criteria used to select a particular station was that the record should be relatively long (80 or more years), have few periods of missing data, and be geographically disperse from the other stations. Periods of missing data were filled in using nearby stations if available, or at-station monthly mean values if a secondary station was not available. Table 1 shows the stations used in the analysis. Stations 1 through 8 are in western Washington, stations 9 through 16 are in eastern Washington.

Table 1
Long Term Precipitation Stations Used in Analysis

Name	County	Period of Record	Mean Annual Precipitation (inches)
1. Port Angeles	Clallam	1878-1992	25.5
2. Olympia	Thurston	1878-1992	51.6
3. Vancouver	Clark	1899-1992	38.7
4. Sedro Woolley	Skagit	1897-1992	45.9
5. Cedar Lake	King	1903-1992	102.7
6. Seattle	King	1878-1992	35.5
7. Aberdeen	Grays Harbor	1891-1992	82.5
8. Centralia	Lewis	1892-1992	45.6
9. Lake Kachess	Kittitas	1909-1974	51.4
10. Wenatchee	Chelan	1913-1992	8.8
11. Yakima	Yakima	1910-1992	7.6
12. Omak	Okanogan	1909-1989	11.6
13. Odessa	Lincoln	1903-1992	10.0
14. Colville	Stevens	1898-1986	17.5
15. Spokane	Spokane	1881-1992	16.3
16. Walla Walla	Walla Walla	1873-1992	16.7

Results

The deviation of the annual precipitation total from the mean for each station is shown in Figures 2A-2H and 3A-3H. The trend line on each graph is a moving average of the previous 10 years.

For presentation purposes, the gages were grouped into two broad categories; those located west of the cascade divide and those located east of the divide. The data for each station was normalized by dividing the annual deviation from the mean by the at-site mean annual precipitation. The normalized data for each group was then averaged to obtain a trend line for each region (Figures 4 and 5).

In western Washington, high variability can be seen throughout the period of record. Since the mid-1950's, the precipitation has been typically above the long-term mean. Extended periods of below average precipitation occurred in the 1920's and 1930's and again in the late 1940's.

In eastern Washington, precipitation was generally above the long-term average since the 1940's except for a period in the mid 1970's. An extended period of below average precipitation occurred in the 1920's through about 1940.

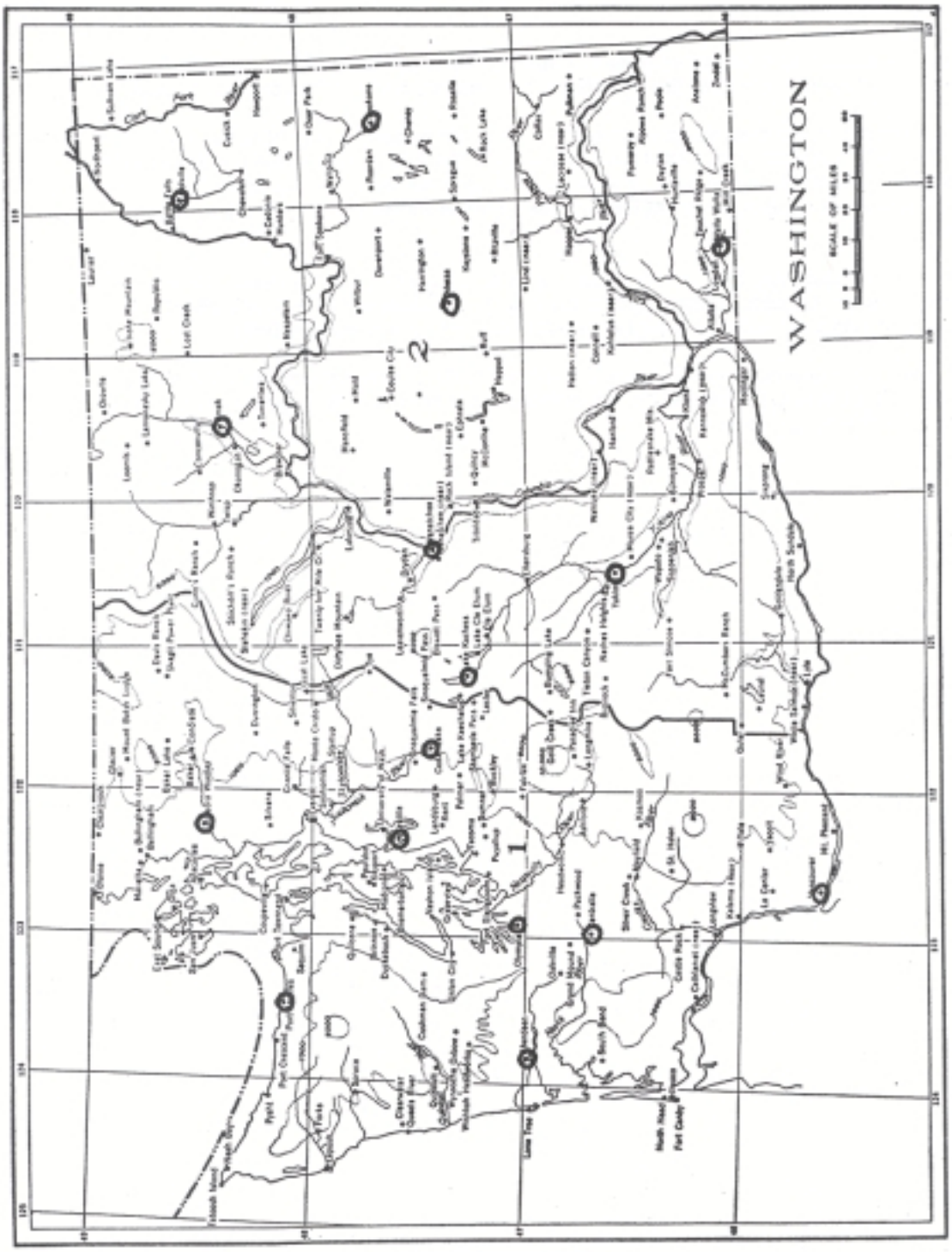


Figure 1. Station Locations

For sale by the Superintendent of Documents, Washington, D. C. - - Price 10 cents

Figure 2A

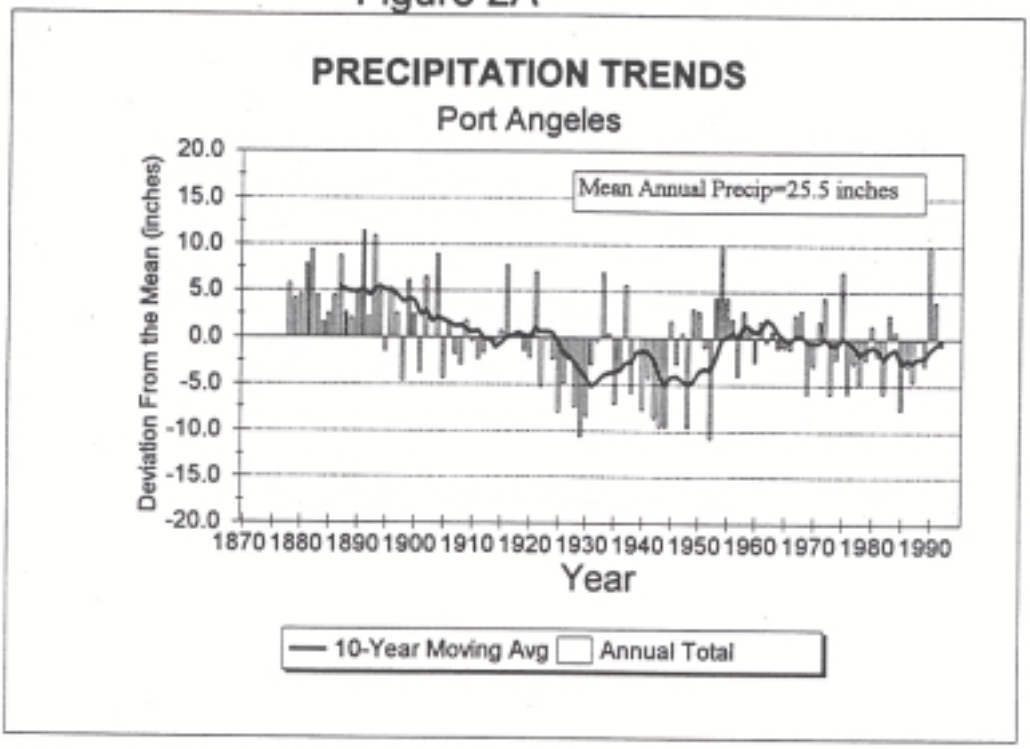
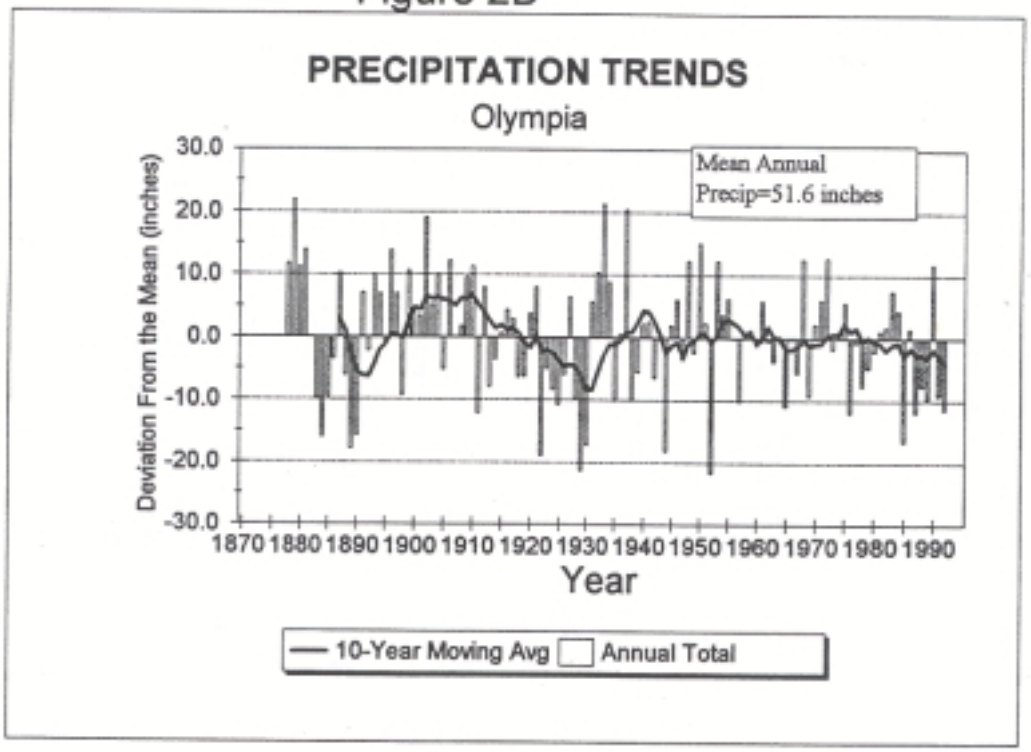


Figure 2B



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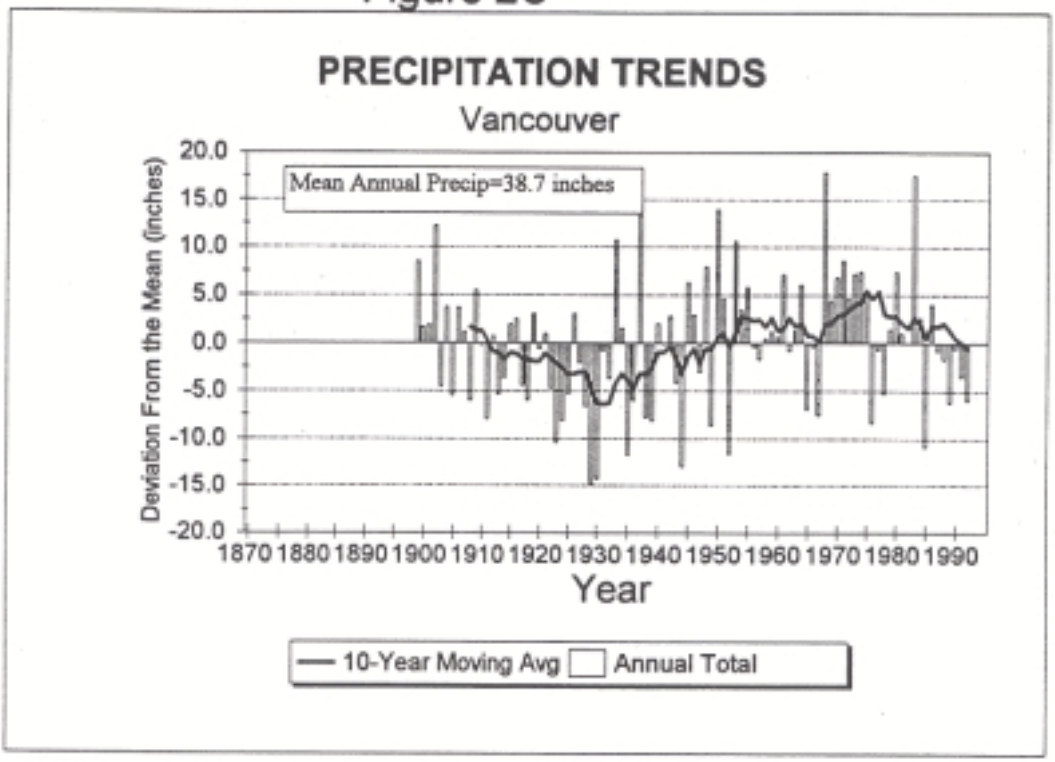

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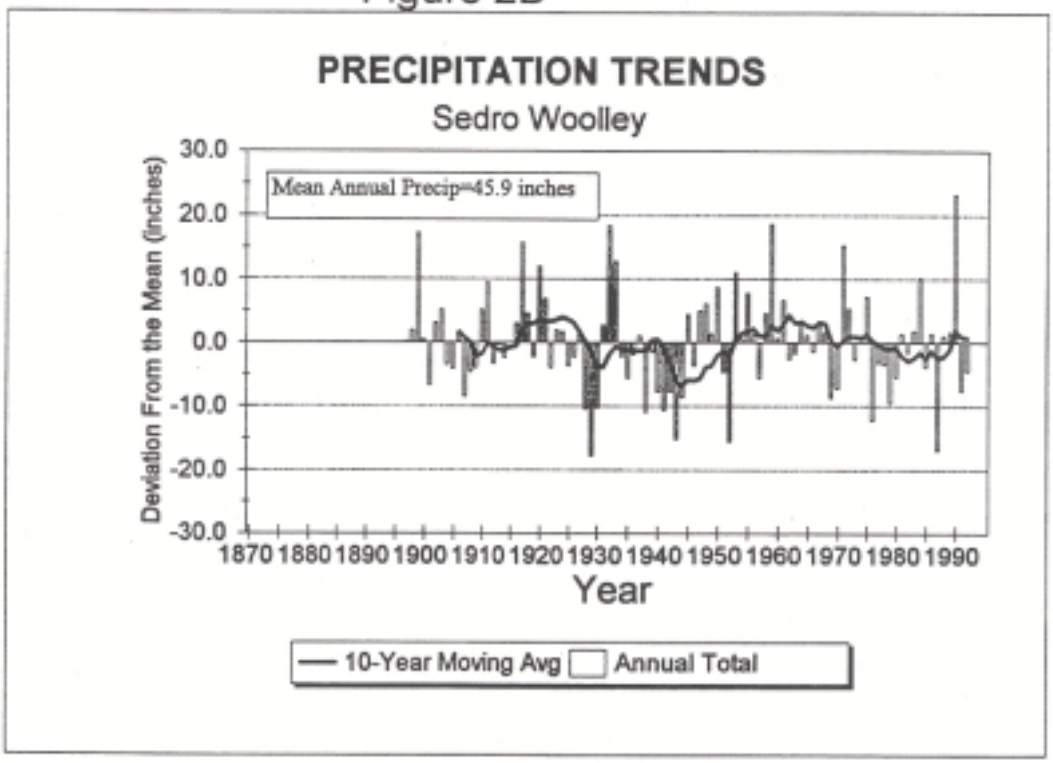


Figure 2E

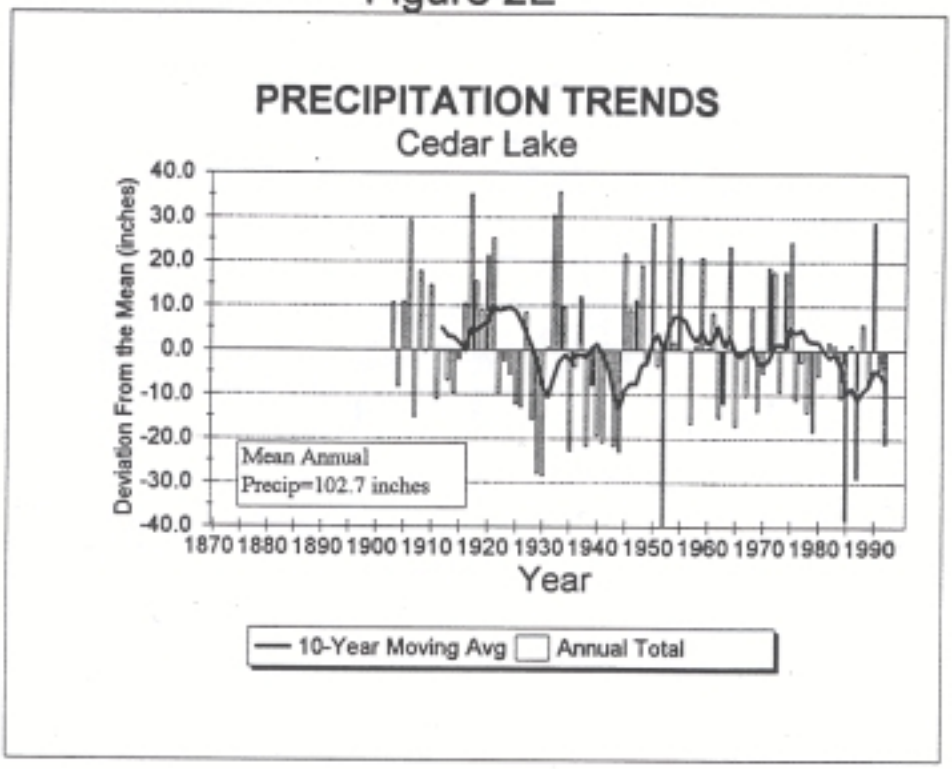


Figure 2F

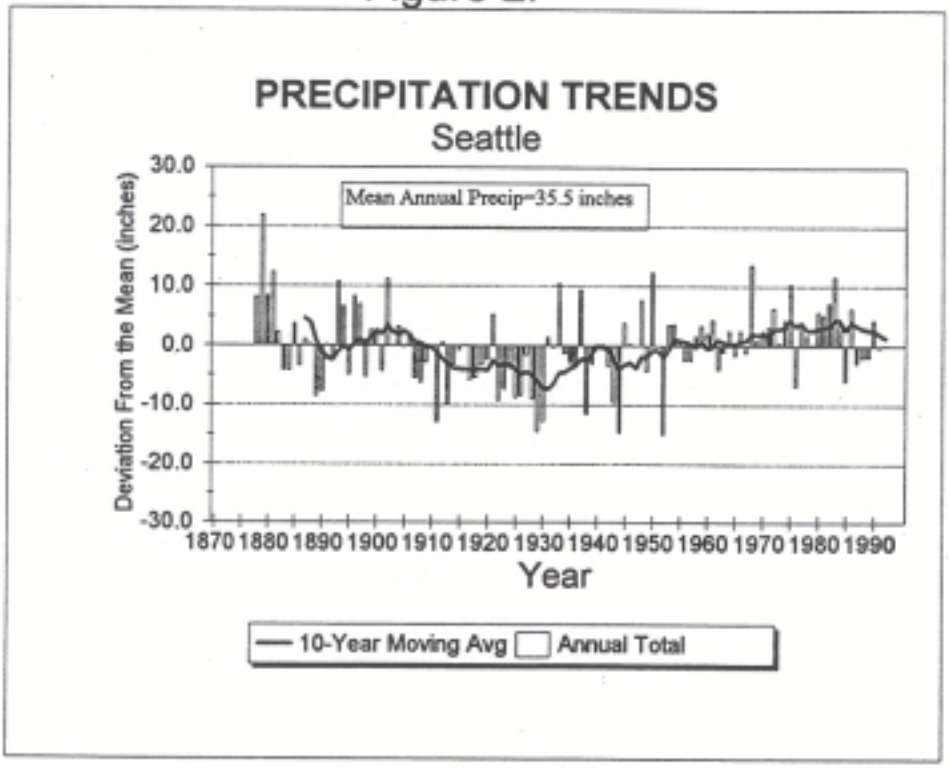


Figure 2G

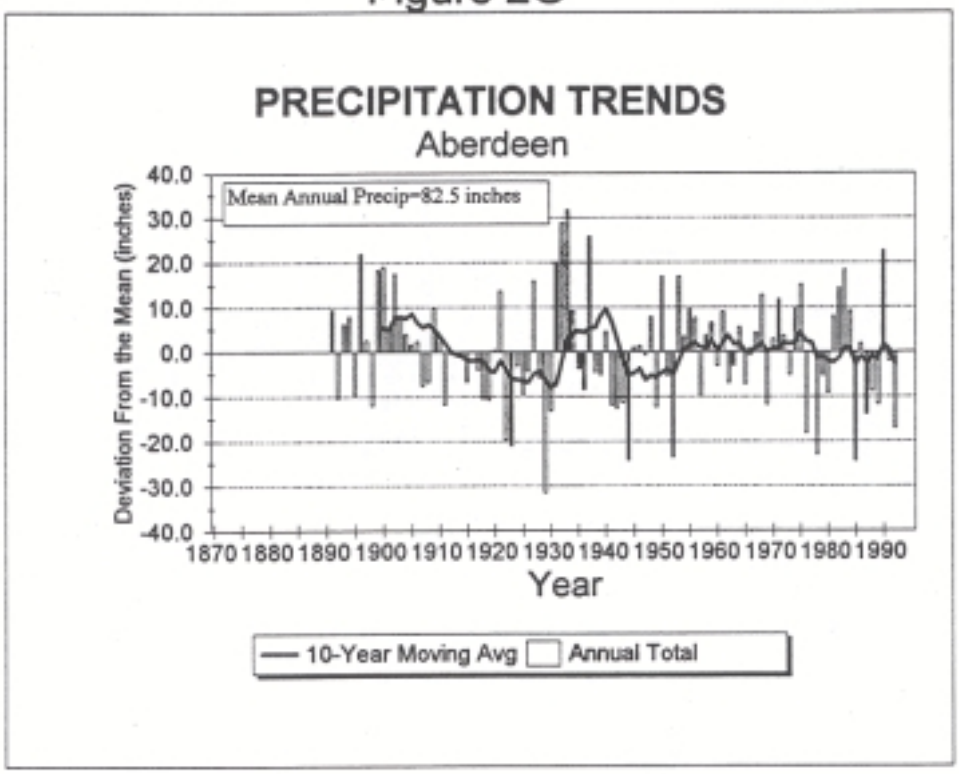


Figure 2H

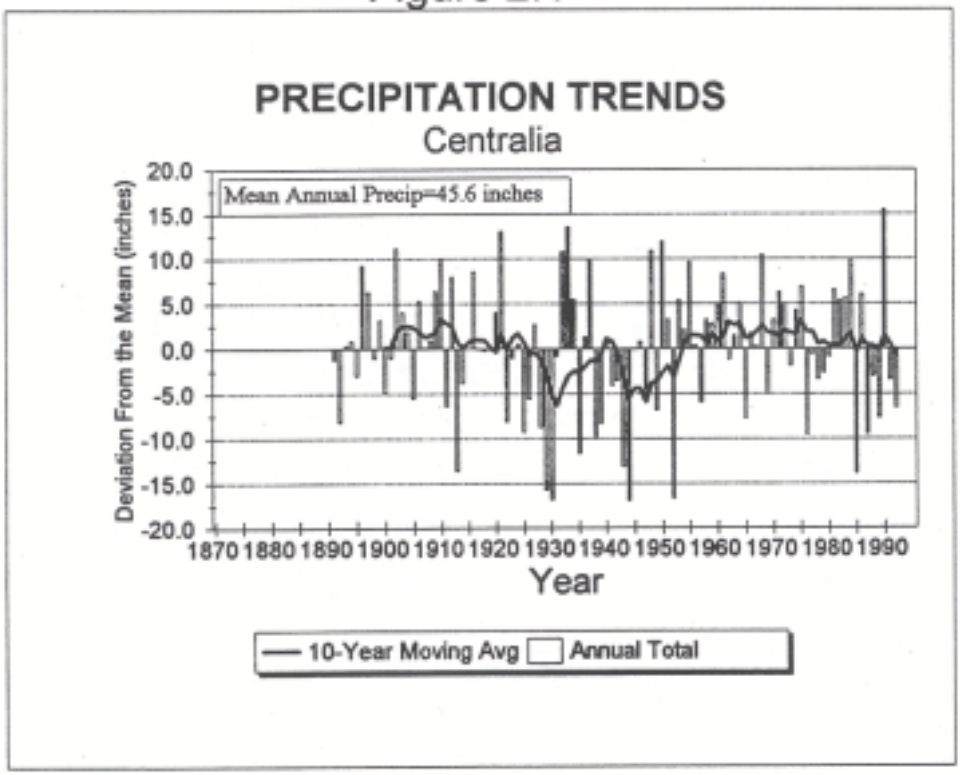


Figure 3A

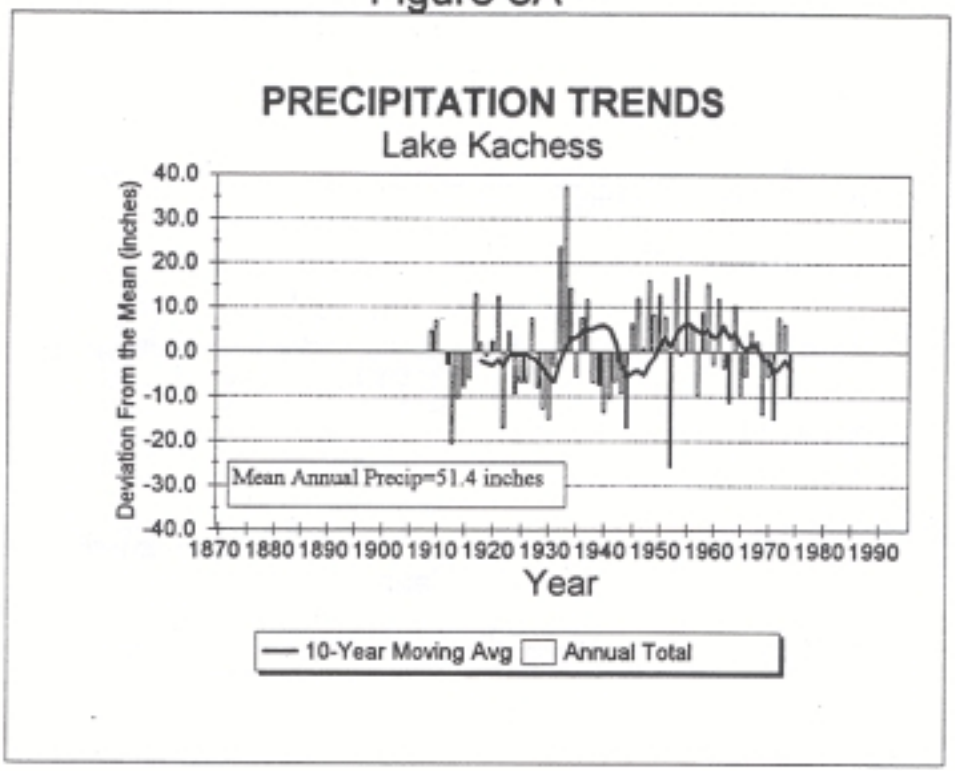


Figure 3B

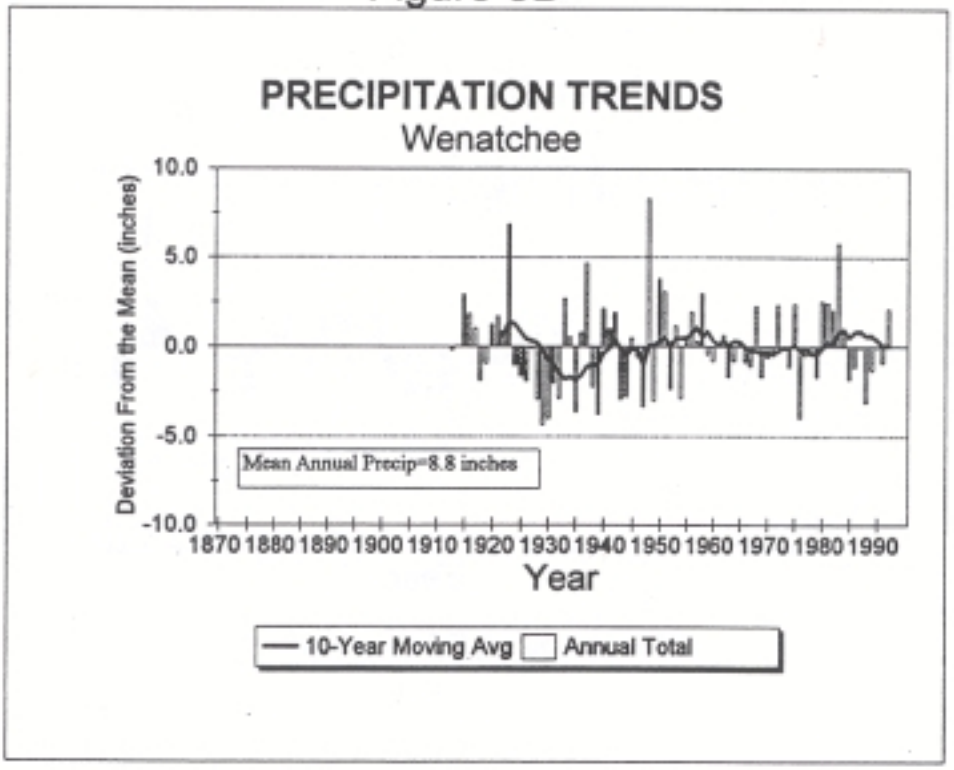


Figure 3C

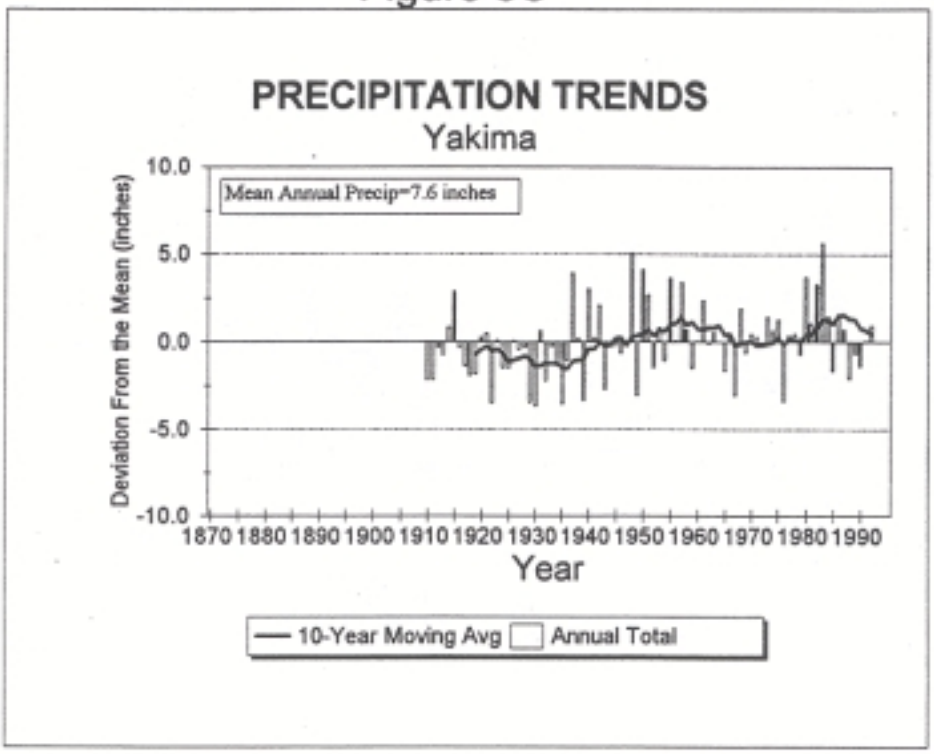


Figure 3D

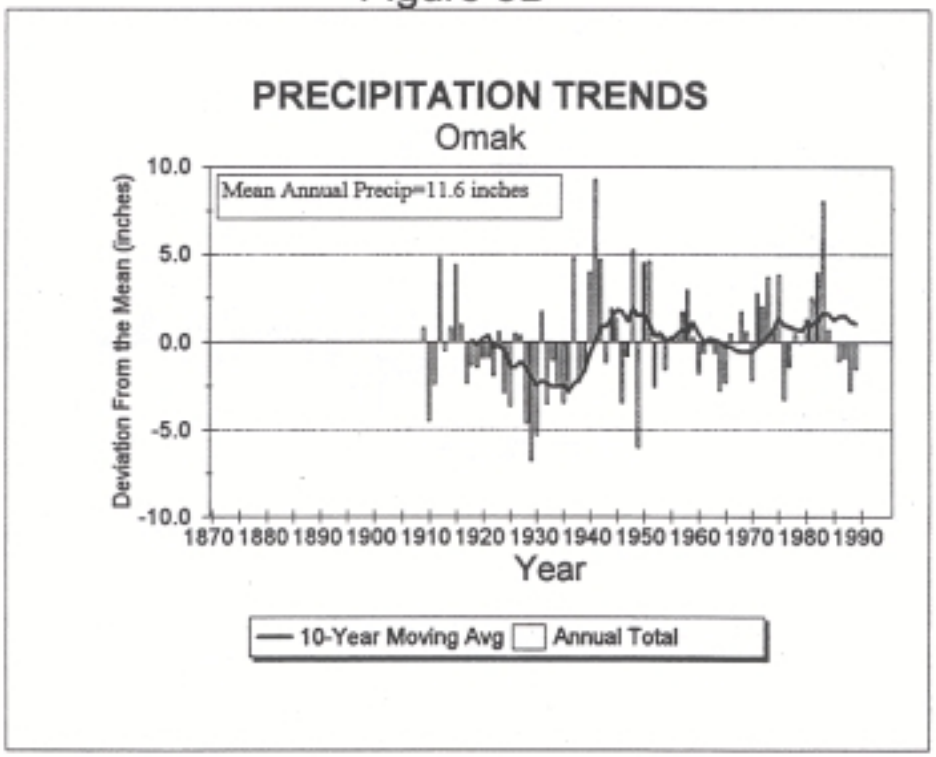


Figure 3E

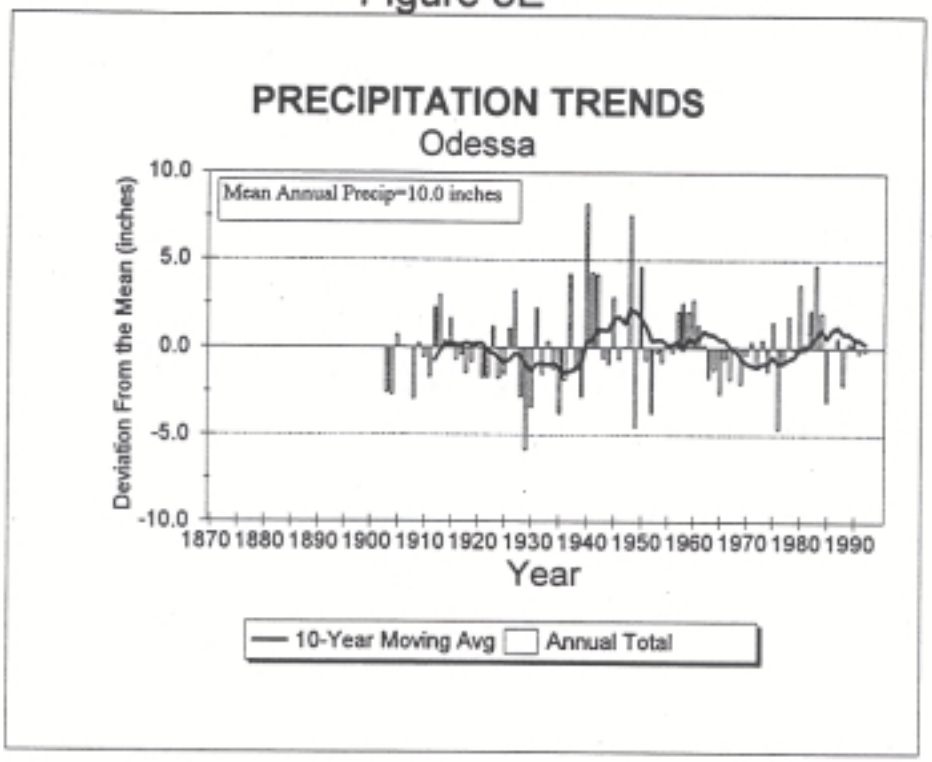


Figure 3F

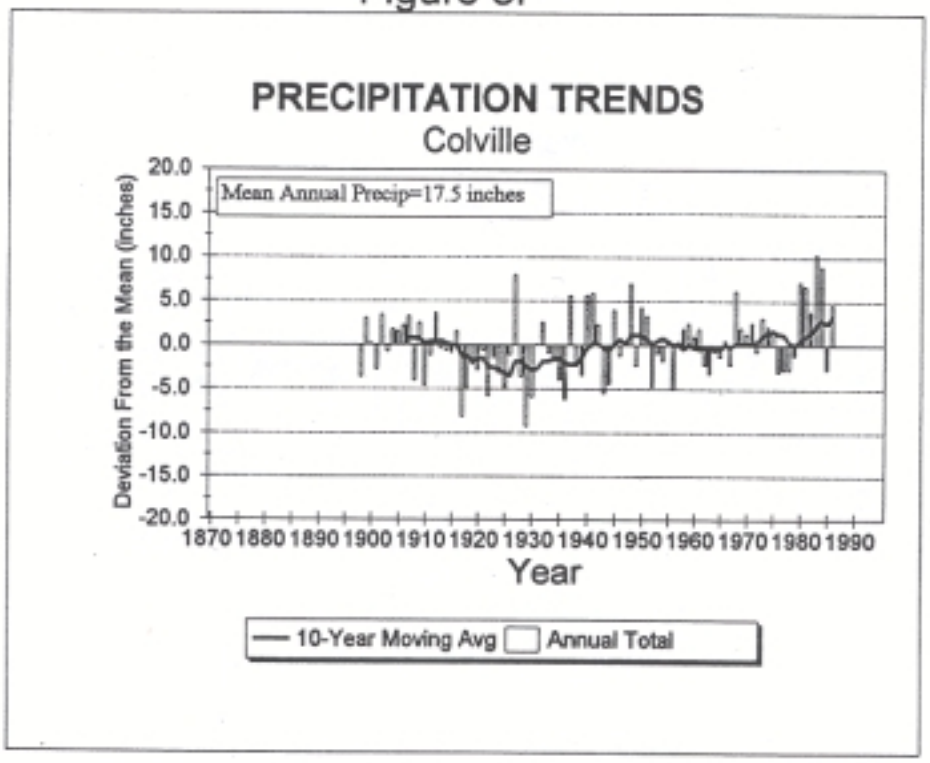


Figure 3G

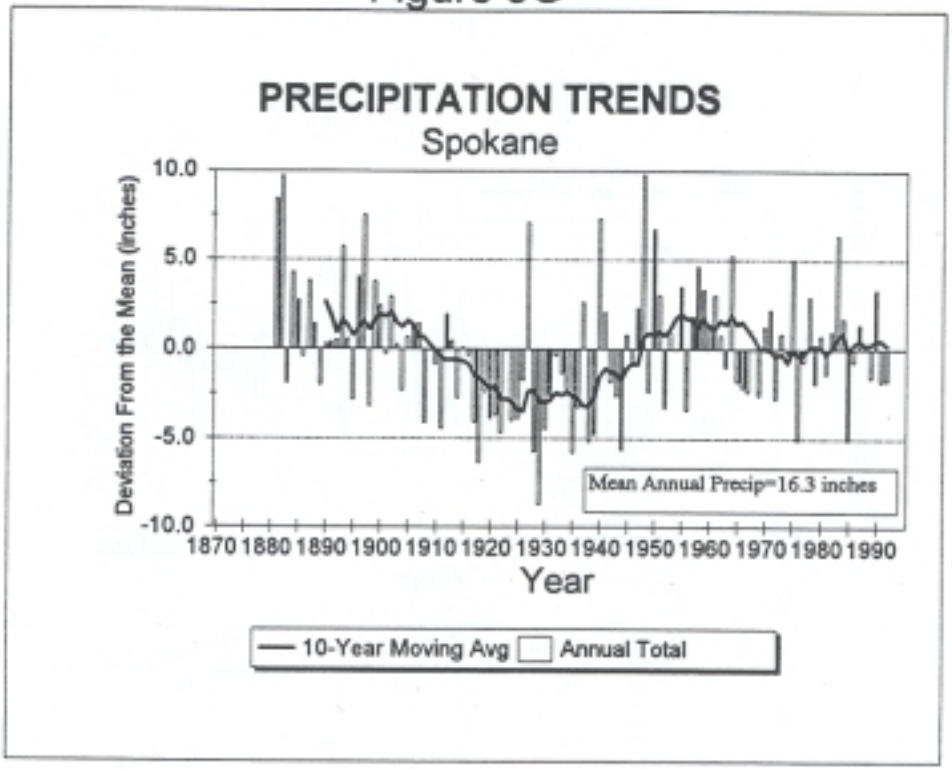


Figure 3H

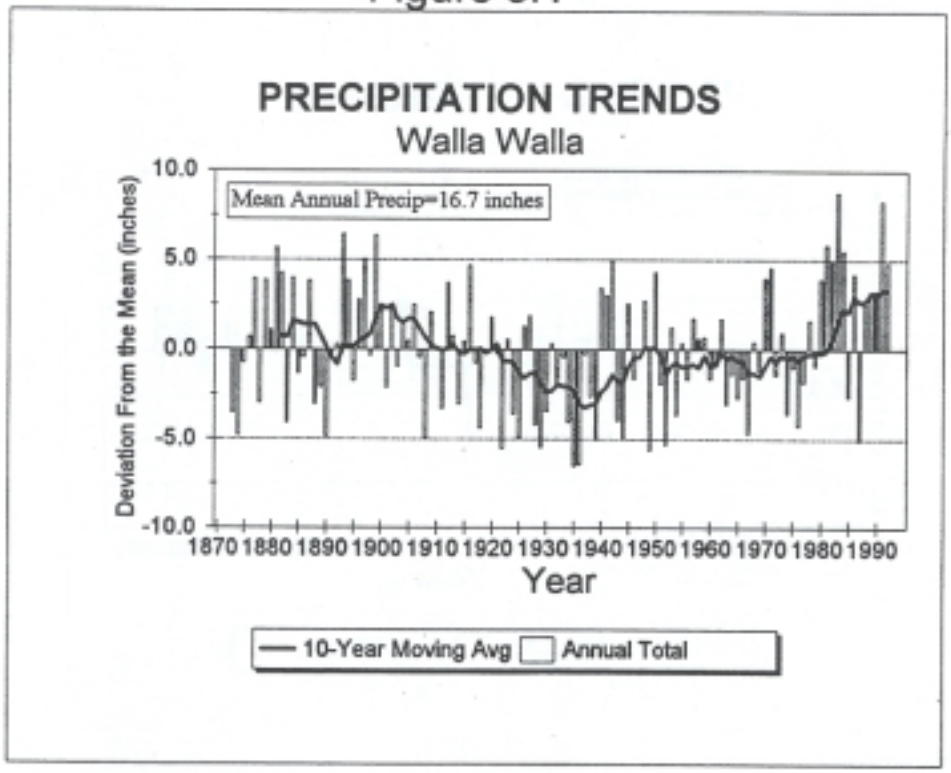


Figure 4

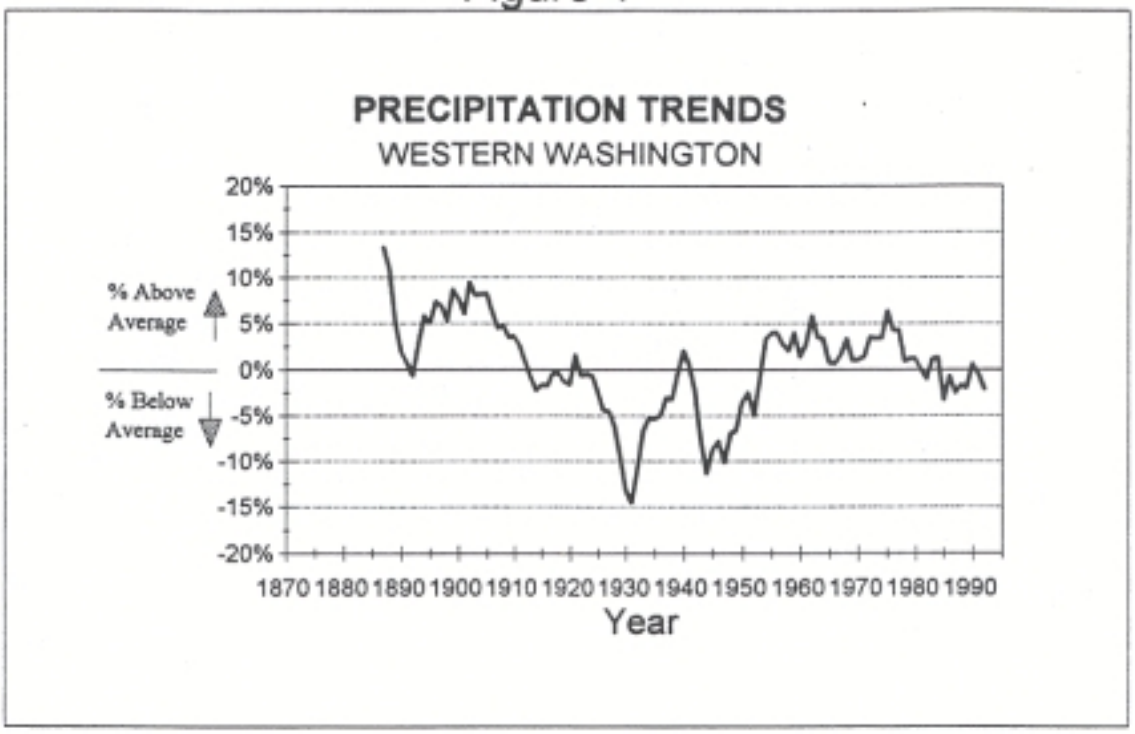
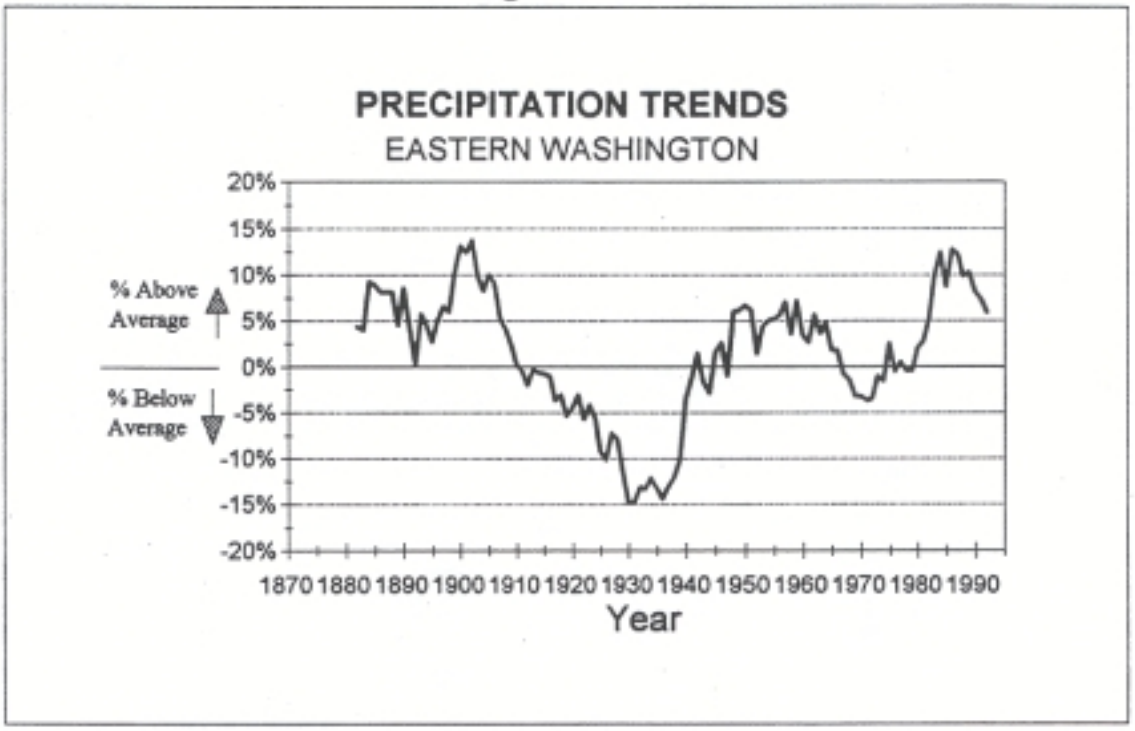


Figure 5



Appendix A.2 Precipitation and Streamflow Trend Analysis Results and Summary of Compliance with Instream Flow Requirements

Appendix A.2

This appendix presents data sheets for the statistical analyses performed on the annual precipitation data and annual streamflow data for the period of record at each station. The data sheets show the data used and the resultant best fit equation in the form:

$$y = mx + b$$

where y = predicted annual precipitation or streamflow
m = slope of trend line (positive is increasing over time and negative is decreasing overtime)
x = sequential time (as the predictor variable)
b = the predicted y value at zero time (start of the record)

The years of no record were deleted from the data sets before analysis. Also, analysis was conducted after normalizing on the mean value for each record. The normalized record allows comparison of the trend slope between stations without adjusting for absolute values of the data for each station. Trend comparisons between stations were conducted using the normalized data sets over identical years of record.

Also presented is a tabulation of the number of days that recommended instream flow of 8,500 cfs for the Pend Oreille River at Box Canyon Dam are not met each year for the period of record.

Appendix A.2
Precipitation and Streamflow Trend Analysis Results
Pend Oreille Watershed – WRIA 62

Analysis	Regression Equation	Normalized Regression Equation
Precipitation Analysis		
Linear Regression of Annual Precipitation Totals at Newport	precip = 25.3 – 0.0479 int	norm precip = 0.945 + 0.00179 int
Linear Regression of Annual Precipitation Totals at Northport	precip = 16.1 + 0.101 int	norm precip = 0.849 + 0.00531
Linear Regression of Annual Precipitation Totals at Colville	precip = 14.6 + 0.0847 int	norm precip = 0.827 + 0.00480 int
Streamflow Analysis		
Regression of Normalized Equivalent Flow Data Set Pend Oreille River at Newport	flow = 23799 + 76.3 int	norm flow = 0.926 + 0.000297 int
Regression of Normalized Equivalent Flow Data Set Pend Oreille River at International Boundary	flow = 25059 + 72.9 int	norm flow = 0.932 + 0.00271 int
Regression of Normalized Equivalent Flow Data Set from 1970 Pend Oreille River at Newport	flow = 29065 – 263 int	norm flow = 1.11 – 0.0100 int
Regression of Normalized Equivalent Flow Data Set from 1970 Pend Oreille River at International Boundary	flow = 30086 – 260 int	norm flow = 1.10 – 0.00949 int
Linear Regression of Annual Average Flow at the Clark Fork River Near Plains (period of record)	flow = 19427 + 9.1 int	norm flow = 0.981 + 0.00046 int
Linear Regression of Annual Average Flow of the Pend Oreille River at Newport (period of record)	flow – 24430 + 37.9 int	norm flow = 0.956 + 0.00148 int
Linear Regression of Annual Average Flows of Outlet Creek near Metaline Falls (period of record)	flow = 78.8 – 0.244 int	norm flow = 1.05 – 0.00326 int
Linear Regression of Annual Average Flow of the Pend Oreille River at Box Canyon Dam (period of record)	flow = 30365 – 158 int	norm flow = 1.11 – 0.00577 int
Linear Regression of Annual Average Flow of the Pend Oreille River at International Boundary (period of record)	flow = 29891 – 156 int	norm flow = 1.08 – 0.00565 int
Regression of Normalized Equivalent Flow at the Clark Fork River Near Plains	flow = 20627 – 24.5 int	norm flow = 1.03 – 0.00122 int
Regression of Normalized Equivalent Flow at the Pend Oreille River at Newport	flow = 26752 – 26.4 int	norm flow = 1.02 – 0.00101 int

Key to Variables

precip = Annual total precipitation for the period of record
flow = Annual average flow for the period of record
int = integer representing year number in numerical order from the start of the record (i.e. for period of record 1929 to 1993, the integers are 1-65)
norm precip = precipitation values are divided by the mean value for the entire record allowing direct comparison between dimensionless data sets.
norm flow = flow values are divided by the mean value for the entire record allowing direct comparison between dimensionless data sets

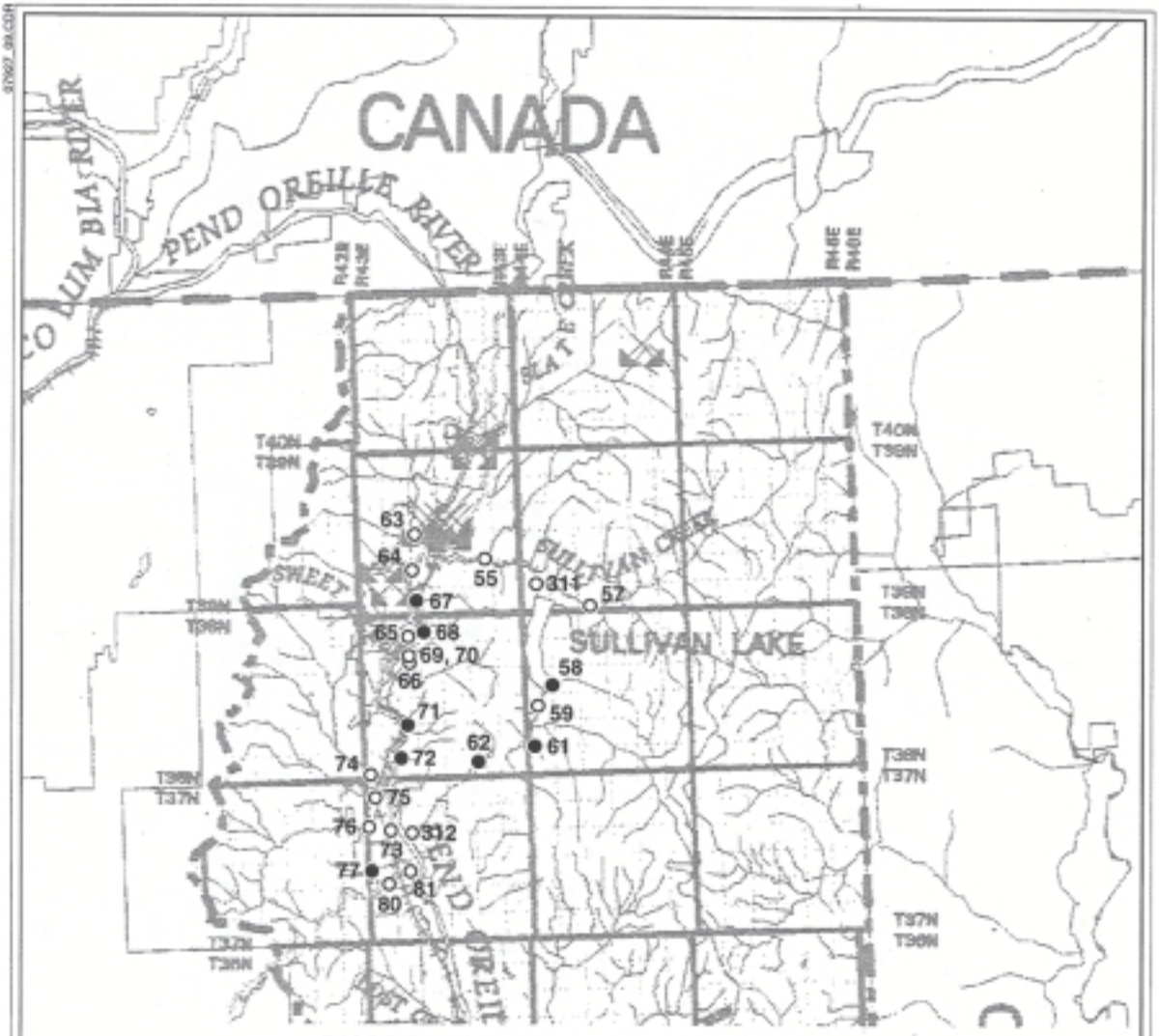
Streamflow – Pend Oreille River at Box Canyon
Total Number of Days Flows are below Instream Flow Requirements

Year	Jan	Feb	Mar	Spr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1952	---	---	---	---	---	---	---	---	---	12	0	0	12
1953	0	0	0	0	0	0	0	5	9	0	0	0	14
1954	0	0	0	0	0	0	0	0	3	0	0	0	3
1955	0	0	0	0	0	0	0	7	1	0	0	0	8
1956	0	0	0	0	0	0	0	1	3	0	0	0	4
1957	0	0	0	0	0	0	1	15	9	0	0	0	25
1958	3	1	0	0	0	0	2	27	8	6	0	0	47
1959	0	0	0	0	0	0	0	2	1	0	0	0	3
1960	0	0	0	0	0	0	0	8	8	0	0	2	18
1961	0	0	0	0	0	0	0	19	21	0	0	0	40
1962	0	0	0	0	0	0	0	9	22	0	0	0	31
1963	0	0	0	0	0	0	0	12	27	4	0	0	43
1964	0	0	0	0	0	0	0	5	1	0	0	0	6
1965	0	0	0	0	0	0	0	3	1	0	0	0	4
1966	0	0	0	0	0	0	0	16	0	0	0	0	16
1967	0	1	0	1	0	0	0	16	10	0	0	0	28
1968	0	0	0	0	0	0	0	10	1	0	0	0	11
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	1	0	0	0	0	1	0	0	0	0	0	2
1971	0	0	0	0	0	0	0	2	0	0	0	0	2
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	12	3	0	0	0	15
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	2	0	0	0	0	0	0	0	0	0	0	0	2
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	9	0	25	6	2	22	9	4	0	0	0	77
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	6	0	0	0	0	6
1980	1	3	0	0	0	0	0	6	0	0	0	4	14
1981	6	0	0	0	0	0	0	6	0	0	0	0	20
1982	3	3	0	0	0	0	0	0	9	0	0	2	17
1983	11	0	0	0	0	0	0	0	0	0	0	4	15
1984	5	0	0	0	0	0	2	0	0	0	0	0	7
1985	0	1	0	0	0	0	0	2	0	5	0	0	8
1986	0	0	0	0	0	0	0	26	2	0	0	0	28
1987	1	1	5	0	0	0	2	0	0	0	0	2	11
1988	9	10	0	0	0	0	2	26	6	0	0	2	55
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	2	0	0	0	0	0	0	0	0	0	0	0	2
1991	0	0	0	0	0	0	0	1	0	0	0	0	1
1992	3	3	0	0	0	0	---	---	---	31	31	31	99

Appendix A.3 Department of Ecology Discrete Stream Flow Measurements and Location of Monitoring Points

Appendix A.3

This appendix presents Ecology's discrete stream flow measurements at 48 sites within WRIA 60. These discrete measurements were generally collected monthly between May and September in between 1986 through 1990. A map indication station locations is also provided in this appendix.



DISCRETE STREAM GAGING LOCATIONS
DEPARTMENT OF ECOLOGY

LEGEND

- ○ Approximate location and station number
- ● Extreme low or zero flow measured where solid

See database for stream flow measurements

NORTH HALF OF PEND OREILLE (WRIA 62)

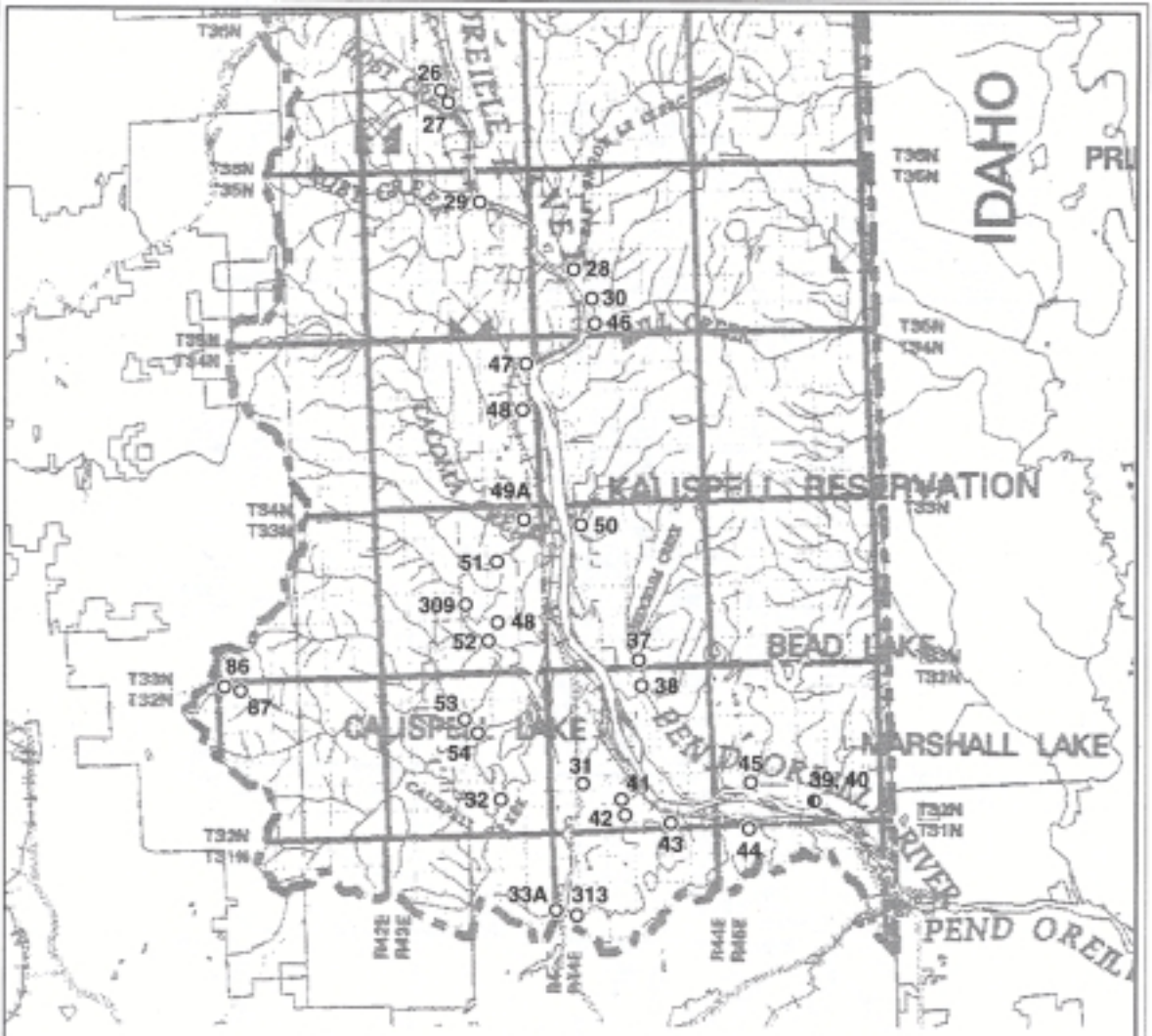
Washington Department of Ecology

0 5 10

Scale in Miles

APPENDIX A.3

Watershed Assessment



DISCRETE STREAM GAGING LOCATIONS
DEPARTMENT OF ECOLOGY

LEGEND

- ○ Approximate location and station number
- ● Extreme low or zero flow measured where solid

See database for stream flow measurements

SOUTH HALF OF
PEND OREILLE (WRIA 62)

Washington Department of Ecology

0 5 10

Scale in Miles

APPENDIX A.3

Watershed Assessment

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	8/7/85	1.9900	no meas. 8.6-9.0 backwater
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	7/8/86	3.8900	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	10/18/86	2.8100	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	5/24/87	9.9900	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	6/17/88	7.5900	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	7/14/88	3.6000	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	8/22/88	1.4700	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	9/13/88	1.4200	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	6/15/89	0.0000n	Too fast
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	7/24/89	2.4800	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	8/15/89	3.0100	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	9/14/89	2.1100	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	5/18/90	39.1000	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	6/13/90	88.6000	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	7/25/90	9.2900	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	8/15/90	4.5200	
00026	62	PO	Lost Creek	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	10/6/90	2.8500	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	8/7/85	0.4600	no meas. 1.0-2.5,7.6-9.8
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	7/8/86	1.2800	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	10/18/86	0.6400	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	5/24/87	6.2300	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	6/17/88	3.5800	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	7/14/88	1.4100	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	8/22/88	0.6800	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	9/13/88	0.5900	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	5/15/89	20.9000	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	6/15/89	4.8600	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	7/24/89	0.6000	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	8/15/89	0.8100	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	9/14/89	0.4900	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	5/18/90	18.6000	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	6/13/90	38.3000	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	7/25/90	3.3200	
00027	62	PO	Lost Creek (S.Fork)	Pend Oreille River	36	43	22	NW	NW	@ highway	Ruby	10/6/90	0.4500	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	8/9/85	33.0000	no meas. 1.0-4.0,24.0-28.0
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	5/24/87	102.0000	
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	7/16/87	35.6000	
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	6/17/88	64.5000	
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	7/14/88	33.2000	
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	8/23/88	24.7000	
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	9/14/88	20.1000	
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	6/19/89	62.3000	
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	7/24/89	29.8000	
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	8/14/89	30.5000	
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	9/14/89	28.5000	
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	6/13/90		Too swift to measure
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	8/15/90	47.3000	
00028	62	PO	LeClerc Creek	Pend Oreille River	35	44	20	SW	NW	@ highway	Ruby	10/4/90	40.3000	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	8/7/85	4.3300	no meas. 7.5-8.4 backwater
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	4/8/86	6.8500	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	10/18/86	3.3100	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	5/24/87	11.4000	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	6/17/88	13.2000	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	7/14/88	7.0800	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	8/22/88	2.3900	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	9/13/88	2.3200	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	5/15/89	53.7000	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	6/15/89	17.1000	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	7/24/89	3.6000	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	8/15/89	4.5000	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	9/14/89	2.9100	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	5/18/90	36.7000	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	6/13/90	81.9000	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	7/25/90	19.9000	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	8/15/90	6.3800	
00029	62	PO	Ruby Creek	Pend Oreille River	35	43	11	NW	NW	@ highway	Ruby	10/6/90	4.3500	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	8/8/85	2.4800	no meas. 1.0-2.3 backwater

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	5/24/87	4.5400	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	7/16/87	3.6900	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	7/14/88	4.6500	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	5/19/89	15.8000	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	6/19/89	7.2000	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	7/24/89	2.7200	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	8/14/89	2.1100	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	9/14/89	1.9600	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	6/13/90	32.5000	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	7/25/90	8.3500	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	8/15/90	4/0100	
00030	62	PO	Middle Creek	Pend Oreille River	35	44	28	NW	SW	@ highway	Ruby	10/4/90	2.6900	
00031	62	PO	Davis Creek	Pend Oreille River	32	44	29	SW	NW	north of road	Sacheen Lake	5/19/89	19.2000	
00031	62	PO	Davis Creek	Pend Oreille River	32	44	29	SW	NW	north of road	Sacheen Lake	6/26/89	9.1700	
00031	62	PO	Davis Creek	Pend Oreille River	32	44	29	SW	NW	north of road	Sacheen Lake	8/17/89	6.3700	
00031	62	PO	Davis Creek	Pend Oreille River	32	44	29	SW	NW	north of road	Sacheen Lake	6/20/90	37.0000	
00031	62	PO	Davis Creek	Pend Oreille River	32	44	29	SW	NW	north of road	Sacheen Lake	7/12/90	9.1800	
00031	62	PO	Davis Creek	Pend Oreille River	32	44	29	SW	NW	north of road	Sacheen Lake	8/9/90	12.1000	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	7/9/85	6.0200	no meas. bet/n 6.4-7.7 backwat
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	7/17/86	15.8000	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	8/11/86	6.9400	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	9/17/86	3.2300	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	7/20/87	18.8000	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	7/15/88	34.4000	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	8/24/88	4.6800	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	9/13/88	16.9000	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	11/22/88	24.4000	Many days rain prior to meas.
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	6/15/89	39.0000	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	7/25/89	23.0000	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	8/17/89	6.0600	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	9/22/89	17.1200	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	5/19/90	184.0000	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	6/20/90	120.0000	
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE	SW	@ road near GS gage	Sacheen Lake	7/12/90	52.5000	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTERSE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00032	62	PO	Calispell Creek	Pend Oreille River	32	43	26	NE SW	@ road near GS gage	Sacheen Lake	9/21/90	37.2000	
00033A	62	PO	Deer Creek	Davis Lake	31	43	13	NE SE	@ road	Sacheen Lake	6/20/90	8.1000	
00033A	62	PO	Deer Creek	Davis Lake	31	43	13	NE SE	@ road	Sacheen Lake	7/12/90	1.5100	
00033A	62	PO	Deer Creek	Davis Lake	31	43	13	NE SE	@ road	Sacheen Lake	8/9/90	0.7100	
00033A	62	PO	Deer Creek	Davis Lake	31	43	13	NE SE	@ road	Sacheen Lake	9/6/90	0.8300	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	7/16/86	14.7000	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	8/11/86	9.6500	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	9/28/86	7.8200	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	6/29/87	11.3000	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	6/20/88	14.4000	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	7/14/88	9.1400	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	8/23/88	5.8300	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	9/15/88	6.1300	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	6/19/89	20.7000	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	7/17/89	17.2000	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	8/17/89	9.5800	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	6/13/90		Too swift to measure
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	7/30/90	20.3000	
00037	62	PO	Skookum Creek (N. Fork)	Skookum Creek	33	44	34	S2 SW	@ road	Skookum Cr.	8/20/90	14.7000	
00038	62	PO	Skookum Creek	Pend Oreille River	32	44	03	SE SW	@ highway	Skookum Cr.	8/11/86	11.5000	
00038	62	PO	Skookum Creek	Pend Oreille River	32	44	03	SE SW	@ highway	Skookum Cr.	6/29/87	19.2000	
00038	62	PO	Skookum Creek	Pend Oreille River	32	44	03	SE SW	@ highway	Skookum Cr.	6/13/88	13.4000	

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Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00038	62	PO	Skookum Creek	Pend Oreille River	32	44	03	SE	SW	@ highway	Skookum Cr.	6/20/88		Too deep for meas.@ P.O.M.
00038	62	PO	Skookum Creek	Pend Oreille River	32	44	03	SE	SW	@ highway	Skookum Cr.	8/23/88	7.2100	
00038	62	PO	Skookum Creek	Pend Oreille River	32	44	03	SE	SW	@ highway	Skookum Cr.	9/15/88	6.9500	
00038	62	PO	Skookum Creek	Pend Oreille River	32	44	03	SE	SW	@ highway	Skookum Cr.	6/19/89	0.0000	Too fast
00038	62	PO	Skookum Creek	Pend Oreille River	32	44	03	SE	SW	@ highway	Skookum Cr.	7/17/89	0.0000	Too fast
00038	62	PO	Skookum Creek	Pend Oreille River	32	44	03	SE	SW	@ highway	Skookum Cr.	6/13/90		Too deep to measure
00038	62	PO	Skookum Creek	Pend Oreille River	32	44	03	SE	SW	@ highway	Skookum Cr.	7/30/90	32.9000	
00038	62	PO	Skookum Creek	Pend Oreille River	32	44	03	SE	SW	@ highway	Skookum Cr.	8/20/90	29.5000	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	8/16/85	0.8900	Bucket
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	9/11/85	1.3300	Bucket
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	7/16/86	0.0200	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	8/14/86	0.0200	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	9/28/86	0.5900	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	4/9/87	0.8300	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	6/18/87	0.3300	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	10/3/87	0.7600	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	6/20/88	0.8100	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	7/13/88	1.2600	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	8/23/88	0.7300	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	9/15/88	0.6700	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	6/19/89	0.6900	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	7/17/89	0.6900	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	8/14/89	0.6300	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	5/18/90	1.2900	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	6/20/90	0.7100	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	7/23/90	2.9400	
00039	62	PO	Marshall Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	8/16/90	3.3300	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	7/16/86	0.0900	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	8/14/86	0.2000	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	9/28/86	11.3000	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	4/9/87	0.3300	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	6/18/87	0.6900	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	10/3/87	0.6700	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	6/20/88	0.3200	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport	7/13/88	0.3000	

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Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport.	8/23/88	0.2400	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport.	9/15/88	0.2700	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport.	5/19/89	0.7500	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport.	6/19/89	0.3460	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport.	5/18/90	0.7300	
00040	62	PO	Unnamed Creek	Pend Oreille River	32	45	34	NE		@ highway	Newport.	6/20/90	0.5000	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	6/18/87	0.4900	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	10/3/87	0.4100	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	7/14/88	0.3200	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	8/24/88	0.1700	Heavy veg.@ LEW & REW
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	9/15/88	0.2900	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	5/19/89	1.2100	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	6/26/89	0.3800	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	7/31/89	0.3100	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	8/16/89	0.5700	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	9/22/89	0.2680	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	5/19/90	2.3300	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	6/20/90	1.5900	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	7/12/90	0.6100	
00041	62	PO	Bracket Creek	Pend Oreille River	32	44	28	SW	SE	@ road (north side)	Diamond Lake	10/12/90	0.4300	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	8/11/85	0.4400	none
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	7/17/86	0.3500	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	8/13/86	0.2700	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	4/9/87	0.7100	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	6/18/87	0.4800	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	10/3/87	0.3300	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	7/14/88	0.3400	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	8/24/88	0.2700	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	9/15/88	0.3000	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	5/19/89	1.5200	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	6/26/89	0.3900	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	7/31/89	0.4000	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	8/16/89	0.3800	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	9/22/89	0.2500	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	5/19/90	1.2400	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	6/20/90	1.0000	

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Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	7/12/90	0.5000	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	8/9/90	0.4200	
00042	62	PO	Bracket Creek	Pend Oreille River	32	44	33	NW	SE	@ road	Diamond Lake	10/12/90	0.5700	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	8/11/85	0.3200	Bucket
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	10/15/85	0.3600	Bucket
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	7/17/86	0.8400	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	8/13/86	0.1600	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	4/9/87	2.1200	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	6/18/87	0.6900	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	10/3/87	0.1800	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	7/14/88	0.3300	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	8/24/88	0.1000	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	9/15/88	0.0900	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	5/19/89	3.7600	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	6/26/89	0.9300	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	7/31/89	0.2000	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	8/16/89	0.2800	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	9/22/89	0.5600	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	5/19/90	4.4800	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	6/20/90	2.0200	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	7/12/90	1.5700	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	8/16/90	0.8300	
00043	62	PO	Kent Creek	Pend Oreille River	32	44	35	SW	SW	@ road	Diamond Lake	10/12/90	0.5800	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	8/11/85	0.3100	Bucket
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	7/17/86	0.2500	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	8/13/86	0.3700	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	4/9/87	3.2000	Heavy Veg.@ LEW & REW
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	6/18/87	0.5700	Heavy Veg.@ LEW & REW
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	10/3/87	0.3000	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	7/14/88	0.3800	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	8/24/88	0.1700	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	9/15/88	0.1300	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	11/22/88	3.6600	Many days rain Prior to meas.
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	5/19/89	2.0200	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	6/26/89	0.4600	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	7/31/89	0.2300	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	8/16/89	0.3300	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	9/22/89	0.3200	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	5/19/90	4.0400	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	6/20/90	2.8900	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	7/12/90	0.8800	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	8/16/90	0.7400	
00044	62	PO	McCloud Creek	Pend Oreille River	31	45	06	NW	NW	next to road	Diamond Lake	10/12/90	0.4500	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	4/9/87	8.6800	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	6/18/87	3.6700	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	10/3/87	3.2100	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	6/20/88	3.8800	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	7/13/88	3.5200	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	8/23/88	2.6200	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	9/15/88	2.4400	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	5/19/89	5.7000	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	6/19/89	4.0500	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	7/17/89	3.6600	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	8/14/89	3.3300	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	5/18/90	5.6600	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	6/13/90	12.3000	
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	7/23/90	6.3900	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00045	62	PO	Indian Creek	Pend Oreille River	32	45	29	NW		North of highway @ house	Diamond Lake	8/16/90	7.3400	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	8/27/87	5.3800	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	6/20/88	12.8000	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	7/14/88	8.2400	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	8/23/88	3.9200	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	9/14/88	2.4300	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	5/27/89	30.3000	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	6/19/89	13.9000	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	7/24/89	6.8700	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	8/14/89	6.1900	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	9/14/89	4.7500	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	6/13/90		Too swift to measure
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	7/25/90	15.0000	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	8/15/90	10.5000	
00046	62	PO	Mill Creek	Pend Oreille River	35	44	33	SW		off highway	Jared	10/4/90	5.1100	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	7/16/86	0.6000	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	8/15/86	0.6100	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	10/3/86	0.6400	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	8/27/87	0.4600	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	7/15/88	0.5610	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	8/22/88	0.2330	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	9/13/88	0.3900	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	5/15/89	1.0100	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	6/15/89	1.1800	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	7/24/89	1.4000	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	8/15/89	1.2700	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	9/23/89	0.8000	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	5/18/90	1.3000	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	6/13/90	1.6500	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	7/25/90	2.5500	
00047	62	PO	Gardiner Creek	Pend Oreille River	34	43	12	NE	NW	@ highway	Jared	8/15/90	1.9500	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	8/16/85	0.3500	no meas. bet/n 1.0-1.9,5.5-6.4
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	10/14/85	0.8400	no meas. bet/n 3.1-4.3,8.2-8.8

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	7/16/86	0.9100	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	8/15/86	0.1700	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	8/27/87	0.4100	2in.PVC pipe in stream
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	7/15/88	0.5740	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	8/22/88	0.1700	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	9/13/88	0.2070	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	6/15/89	2.1300	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	7/24/89	0.3300	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	8/15/89	0.5200	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	9/23/89	0.4000	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	5/18/90	10.2000	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	6/13/90	22.5000	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	7/25/90	3.9800	
00048	62	PO	Cusick Creek	Pend Oreille River	34	43	13	SW		@ highway	Cusick	10/6/90	0.9700	
00049A	62	PO	Tacoma Creek	Pend Oreille River	33	43	01	SE	NW	access road	Jared	6/13/90	meas.	Flooded/No
00049A	62	PO	Tacoma Creek	Pend Oreille River	33	43	01	SE	NW	access road	Jared	7/26/90		Flooded/No meas.
00049A	62	PO	Tacoma Creek	Pend Oreille River	33	43	01	SE	NW	access road	Jared	8/20/90	33.4000	
00049A	62	PO	Tacoma Creek	Pend Oreille River	33	43	01	SE	NW	access road	Jared	10/6/90	17.5000	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	8/27/87	5.2300	Meas. taken above confluence.
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	6/20/88	8.2000	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	7/14/88	7.7500	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	8/23/88	5.1500	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	9/14/88	5.5800	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	5/19/89	31.2000	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	6/19/89	18.5000	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	7/24/89	9.9600	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	8/14/89	7.9900	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	9/14/89	6.4800	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	4/28/90	31.8000	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	6/13/90		Too swift to measure
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	7/30/90	16.9000	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	8/20/90	12.2000	
00050	62	PO	Cee Cee Ah Creek	Pend Oreille River	33	44	05	SW	SE	@ highway	Jared	10/4/90	6.9400	
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	7/9/85	0.3600	no meas.3.7-4.4 backwater
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	9/11/85	0.5200	none
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	7/16/86	0.3100	
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	9/28/86	0.9800	
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	6/29/87	0.6200	
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	10/3/87	0.7100	
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	5/15/89	2.0800	
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	6/15/89	0.5700	
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	7/31/89	0.2600	
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	8/17/89	1.0400	
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	6/13/90	6.0200	
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	7/26/90	2.7100	
00051	62	PO	Trimble Creek	Pend Oreille River	33	43	14	NE	NW	@ road	Cusick	8/20/90	0.9900	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	7/9/85	8.1900	no meas. 12,4-15.4 backwater
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	9/11/85	5.0700	no meas. 11.2-13.6 backwater
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	7/17/86	8.4200	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	8/18/86	4.3500	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	6/29/87	7.5200	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	10/3/87	4.0800	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	7/15/88	7.7900	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	8/22/88	4.0000	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	9/13/88	3.6800	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	5/15/89	53.2000	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	6/15/89	18.8000	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	7/31/89	5.9900	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	8/17/89	7.6900	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	9/23/89	5.1600	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	6/13/90	73.5000	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	7/26/90	22.7000	
00052	62	PO	Small Creek	Calispell Creek	33	43	27	SE	SE	@ road	Cusick	8/20/90	10.7000	
00053	62	PO	Winchester Creek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	7/9/85	6.5400	no meas. 7.6-9.1 backwater

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	9/11/85	4.8400	no meas. 7.3-8.5 backwater
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	7/17/86	4.7200	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	8/18/86	2.7500	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	6/29/87	5.8900	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	10/3/87	2.9300	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	7/15/88	8.6200	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	8/24/88	2.9700	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	9/13/88	2.6200	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	11/22/88	6.8900	Many days rain prior to meas.
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	5/15/89	24.0000	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	6/15/89	11.4000	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	7/31/89	4.0100	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	8/17/89	5.4800	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	9/23/89	3.4500	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	5/18/90	39.5000	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	6/13/90	38.5000	
00053	62	PO	WinchesterCreek	Calispell Creek	32	43	15	NE	NW	@ road	Cusick	8/20/90	6.5600	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	7/9/85	0.7600	Bucket
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	9/11/85	0.7100	Bucket
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	7/17/86	0.7700	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	8/18/86	0.5200	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	6/29/87		Flow too low to measure.
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	10/3/87	0.3500	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	8/24/88	0.3200	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	9/13/88	0.3600	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	5/15/89	2.0900	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	6/15/89	0.9400	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	7/31/89	0.7000	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	8/17/89	0.5850	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	5/18/90	7.0700	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	6/13/90	4.4500	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	7/26/90	2.8100	
00054	62	PO	Dorchester Creek	Calispell Creek	32	43	15	SW	NW	@ road	Cusick	8/20/90	1.0100	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00055	62	PO	Sulllivan (N.Fork)	Sullivan Creek	39	43	23	SE	SE	@ road	Metaline Fls	9/9/87	0.7500	
00055	62	PO	Sulllivan (N.Fork)	Sullivan Creek	39	43	23	SE	SE	@ road	Metaline Fls	6/16/88	18.9000	boulders @ REW
00055	62	PO	Sulllivan (N.Fork)	Sullivan Creek	39	43	23	SE	SE	@ road	Metaline Fls	8/15/88	1.2200	
00055	62	PO	Sulllivan (N.Fork)	Sullivan Creek	39	43	23	SE	SE	@ road	Metaline Fls	9/13/88	0.7800	
00055	62	PO	Sulllivan (N.Fork)	Sullivan Creek	39	43	23	SE	SE	@ road	Metaline Fls	7/14/89	3.2800	
00055	62	PO	Sulllivan (N.Fork)	Sullivan Creek	39	43	23	SE	SE	@ road	Metaline Fls	9/23/89	0.8100	
00055	62	PO	Sulllivan (N.Fork)	Sullivan Creek	39	43	23	SE	SE	@ road	Metaline Fls	7/31/90	7.1300	
00055	62	PO	Sulllivan (N.Fork)	Sullivan Creek	39	43	23	SE	SE	@ road	Metaline Fls	8/22/90	3.8100	
00057	62	PO	Sullivan Creek	Pend Oreille River	39	44	30	SW	SE	@ road	Metaline Fls	9/9/87	29.8000	
00057	62	PO	Sullivan Creek	Pend Oreille River	39	44	30	SW	SE	@ road	Metaline Fls	6/16/88	170.0000	
00057	62	PO	Sullivan Creek	Pend Oreille River	39	44	30	SW	SE	@ road	Metaline Fls	8/15/88	30.9000	
00057	62	PO	Sullivan Creek	Pend Oreille River	39	44	30	SW	SE	@ road	Metaline Fls	9/13/88	24.8000	
00057	62	PO	Sullivan Creek	Pend Oreille River	39	44	30	SW	SE	@ road	Metaline Fls	7/14/89	62.0400	
00057	62	PO	Sullivan Creek	Pend Oreille River	39	44	30	SW	SE	@ road	Metaline Fls	9/23/89	31.1000	
00057	62	PO	Sullivan Creek	Pend Oreille River	39	44	30	SW	SE	@ road	Metaline Fls	8/1/90	68.0000	
00057	62	PO	Sullivan Creek	Pend Oreille River	39	44	30	SW	SE	@ road	Metaline Fls	8/22/90	49.9000	
00057	62	PO	Sullivan Creek	Pend Oreille River	39	44	30	SW	SE	@ road	Metaline Fls	9/22/90	28.8000	
00058	62	PO	Noisy Creek	Sullivan Lake	38	44	18	SE		@ campground	Metaline Fls	6/1/86	12.0000	
00058	62	PO	Noisy Creek	Sullivan Lake	38	44	18	SE		@ campground	Metaline Fls	10/18/86	0.0000	
00058	62	PO	Noisy Creek	Sullivan Lake	38	44	18	SE		@ campground	Metaline Fls	6/23/87	2.3300	
00058	62	PO	Noisy Creek	Sullivan Lake	38	44	18	SE		@ campground	Metaline Fls	9/9/87	0.0000	
00058	62	PO	Noisy Creek	Sullivan Lake	38	44	18	SE		@ campground	Metaline Fls	6/16/88	4.0000	
00058	62	PO	Noisy Creek	Sullivan Lake	38	44	18	SE		@ campground	Metaline Fls	9/13/88	0.0000	
00058	62	PO	Noisy Creek	Sullivan Lake	38	44	18	SE		@ campground	Metaline Fls	7/13/89	0.9500	
00058	62	PO	Noisy Creek	Sullivan Lake	38	44	18	SE		@ campground	Metaline Fls	9/23/89	0.0000	
00058	62	PO	Noisy Creek	Sullivan Lake	38	44	18	SE		@ campground	Metaline Fls	7/30/90	1.9500	
00058	62	PO	Noisy Creek	Sullivan Lake	38	44	18	SE		@ campground	Metaline Fls	8/22/90	0.1680	
00058	62	PO	Noisy Creek	Sullivan Lake	38	44	18	SE		@ campground	Metaline Fls	9/22/90	0.0000	DRY
00059	62	PO	Harvey Creek	Sullivan Lake	38	44	19	NE	SW	near road	Metaline Fls	6/25/86	25.0000	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00059	62	PO	Harvey Creek	Sullivan Lake	38	44	19	NE	SW	near road	Metaline Fls	10/18/86	8.6900	
00059	62	PO	Harvey Creek	Sullivan Lake	38	44	19	NE	SW	near road	Metaline Fls	6/23/87	51.5000	
00059	62	PO	Harvey Creek	Sullivan Lake	38	44	19	NE	SW	near road	Metaline Fls	6/16/88	88.4000	
00059	62	PO	Harvey Creek	Sullivan Lake	38	44	19	NE	SW	near road	Metaline Fls	8/2/88	9.6100	
00059	62	PO	Harvey Creek	Sullivan Lake	38	44	19	NE	SW	near road	Metaline Fls	9/13/88	0.6500	
00059	62	PO	Harvey Creek	Sullivan Lake	38	44	19	NE	SW	near road	Metaline Fls	7/13/89	19.6000	
00059	62	PO	Harvey Creek	Sullivan Lake	38	44	19	NE	SW	near road	Metaline Fls	9/23/89	4.5400	
00059	62	PO	Harvey Creek	Sullivan Lake	38	44	19	NE	SW	near road	Metaline Fls	7/30/90	22.7000	
00059	62	PO	Harvey Creek	Sullivan Lake	38	44	19	NE	SW	near road	Metaline Fls	8/22/90	14.7000	
00059	62	PO	Harvey Creek	Sullivan Lake	38	44	19	NE	SW	near road	Metaline Fls	9/22/90	6.1200	
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls			
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls	5/16/86	12.1000	none
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls	6/23/87	3.4000	
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls	9/9/87	0.0000	
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls	6/17/88	6.2600	
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls	8/2/88	0.0000	
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls	9/13/88	0.0000	
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls	7/13/89	0.5700	
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls	9/23/89	0.0000	
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls	7/31/90	0.4850	
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls	8/22/90	0.0000	DRY
00061	62	PO	Paupac Creek	Harvey Creek	38	44	30	SW	NW	@ road	Metaline Fls	9/22/90	0.0000	DRY
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	9/25/85	0.000	“Dry”
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	6/23/87	0.0000	
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	7/20/87	3.8800	
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	9/9/87	0.0000	
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	6/17/88	0.0000	
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	7/15/88	3.1700	
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	8/2/88	0.0000	Pumping running upstream @
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	8/24/88	2.2000	house
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	9/13/88	2.6500	
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	7/13/89	0.0000	
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	9/23/89	0.0000	
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	6/19/90	7.7100	
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	7/31/90	0.8100	
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW	NW	access road	Ione	8/22/90	0.5500	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTERSE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00062	62	PO	Maitlen Creek	Pend Oreille River	38	43	35	SW NW	access road	Ione	9/22/90	0.3100	
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	8/14/85	7.1300	no meas. 1.8-2.3,12.8-13.2
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	9/25/85	4.8500	no meas. 12.2-13.0 backwater
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	6/25/86	15.2000	none
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	8/25/86	3.2300	
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	10/19/86	4.1700	
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	6/23/87	17.9000	
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	6/14/88	34.7000	
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	8/1/88	5.5100	
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	9/13/88	3.3800	
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	7/13/89	14.0000	
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	9/23/89	4.1900	
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	6/18/90		Too swift to measure
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	7/31/90	14.9000	
00063	62	PO	Flume Creek	Pend Oreille River	39	43	16	SW SW	@ road	Metaline	8/23/90	9.3400	
00064	62	PO	Linton Creek	Pend Oreille River	39	43	29	SE NE	@ park	Metaline	6/23/87	1.1700	
00064	62	PO	Linton Creek	Pend Oreille River	39	43	29	SE NE	@ park	Metaline	6/14/88	1.8800	
00064	62	PO	Linton Creek	Pend Oreille River	39	43	29	SE NE	@ park	Metaline	8/1/88	1.8400	
00064	62	PO	Linton Creek	Pend Oreille River	39	43	29	SE NE	@ park	Metaline	9/13/88	0.8200	
00064	62	PO	Linton Creek	Pend Oreille River	39	43	29	SE NE	@ park	Metaline	7/13/89	2.4300	
00064	62	PO	Linton Creek	Pend Oreille River	39	43	29	SE NE	@ park	Metaline	9/23/89	2.6800	
00064	62	PO	Linton Creek	Pend Oreille River	39	43	29	SE NE	@ park	Metaline	6/18/90	5.3100	
00064	62	PO	Linton Creek	Pend Oreille River	39	43	29	SE NE	@ park	Metaline	7/31/90	1.9800	
00064	62	PO	Linton Creek	Pend Oreille River	39	43	29	SE NE	@ park	Metaline	8/22/90	1.9900	
00065	62	PO	Lunch Creek	Pend Oreille River	38	43	05	NW SE	@ highway	Metaline	6/23/87	9/8100	
00065	62	PO	Lunch Creek	Pend Oreille River	38	43	05	NW SE	@ highway	Metaline	6/14/88	21.5000	
00065	62	PO	Lunch Creek	Pend Oreille River	38	43	05	NW SE	@ highway	Metaline	8/1/88	4.3100	
00065	62	PO	Lunch Creek	Pend Oreille River	38	43	05	NW SE	@ highway	Metaline	9/13/88	2.7300	
00065	62	PO	Lunch Creek	Pend Oreille River	38	43	05	NW SE	@ highway	Metaline	7/13/89	7.6200	
00065	62	PO	Lunch Creek	Pend Oreille River	38	43	05	NW SE	@ highway	Metaline	9/23/89	3.3900	
00065	62	PO	Lunch Creek	Pend Oreille River	38	43	05	NW SE	@ highway	Metaline	6/18/90		Too swift to measure
00065	62	PO	Lunch Creek	Pend Oreille River	38	43	05	NW SE	@ highway	Metaline	7/31/90	7.8200	
00065	62	PO	Lunch Creek	Pend Oreille River	38	43	05	NW SE	@ highway	Metaline	8/23/90	5.7000	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00066	62	PO	Lost Creek	Pend Oreille River	38	43	08	NW	SW	@ highway	Metaline	6/10/86	0.3000	none
00066	62	PO	Lost Creek	Pend Oreille River	38	43	08	NW	SW	@ highway	Metaline	8/25/86	0.1000	
00066	62	PO	Lost Creek	Pend Oreille River	38	43	08	NW	SW	@ highway	Metaline	6/23/87	0.2700	
00066	62	PO	Lost Creek	Pend Oreille River	38	43	08	NW	SW	@ highway	Metaline	6/14/88	0.4800	
00066	62	PO	Lost Creek	Pend Oreille River	38	43	08	NW	SW	@ highway	Metaline	8/9/88	0.1200	
00066	62	PO	Lost Creek	Pend Oreille River	38	43	08	NW	SW	@ highway	Metaline	9/13/88	0.0900	
00066	62	PO	Lost Creek	Pend Oreille River	38	43	08	NW	SW	@ highway	Metaline	7/13/89	0.2900	
00066	62	PO	Lost Creek	Pend Oreille River	38	43	08	NW	SW	@ highway	Metaline	9/23/89	0.1500	
00066	62	PO	Lost Creek	Pend Oreille River	38	43	08	NW	SW	@ highway	Metaline	6/18/90	2.3900	
00066	62	PO	Lost Creek	Pend Oreille River	38	43	08	NW	SW	@ highway	Metaline	7/31/90	0.4600	
00066	62	PO	Lost Creek	Pend Oreille River	38	43	08	NW	SW	@ highway	Metaline	8/23/90	0.4100	
00067	62	PO	Pocahontas Creek	Pend Oreille River	39	43	33	SW	NW	@ cemetary road	Mateline	9/9/87	0.0000	
00067	62	PO	Pocahontas Creek	Pend Oreille River	39	43	33	SW	NW	@ cemetary road	Mateline	6/14/88	1.3300	
00067	62	PO	Pocahontas Creek	Pend Oreille River	39	43	33	SW	NW	@ cemetary road	Mateline	8/1/88	0.4300	
00067	62	PO	Pocahontas Creek	Pend Oreille River	39	43	33	SW	NW	@ cemetary road	Mateline	9/13/88	0.0000	
00067	62	PO	Pocahontas Creek	Pend Oreille River	39	43	33	SW	NW	@ cemetary road	Mateline	7/13/89	0.2800	
00067	62	PO	Pocahontas Creek	Pend Oreille River	39	43	33	SW	NW	@ cemetary road	Mateline	9/23/89	0.0000	
00067	62	PO	Pocahontas Creek	Pend Oreille River	39	43	33	SW	NW	@ cemetary road	Mateline	8/1/90	0.6700	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	8/13/85	0.0200	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	9/26/85	0.0000	trickle, standing water
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	6/1/86	0.5900	none
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	8/25/86	0.0000	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	10/3/86	0.0000	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	6/29/87	0.0800	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	9/9/87	0.0000	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	11/4/87	0.0000	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	6/14/88	0.5400	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	8/2/88	0.0080	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	9/13/88	0.0000	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	7/13/89	0.1300	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	9/23/89	0.0000	
00068	62	PO	Wolfe Creek	Pend Oreille River	38	43	04	NW		near road	Metaline	8/1/90	0.3400	
00069	62	PO	Unnamed Creek	Sand Creek	38	43	08	SE	NE	@ road	Metaline	8/13/85	0.1300	Bucket
00069	62	PO	Unnamed Creek	Sand Creek	38	43	08	SE	NE	@ road	Metaline	6/1/86	0.5600	none
00069	62	PO	Unnamed Creek	Sand Creek	38	43	08	SE	NE	@ road	Metaline	8/25/86	0.0600	
00069	62	PO	Unnamed Creek	Sand Creek	38	43	08	SE	NE	@ road	Metaline	6/29/87	0.0900	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00069	62	PO	Unnamed Creek	Sand Creek	38	43	08	SE	NE	@ road	Metaline	9/9/87	0.0340	
00069	62	PO	Unnamed Creek	Sand Creek	38	43	08	SE	NE	@ road	Metaline	6/14/88	0.3800	
00069	62	PO	Unnamed Creek	Sand Creek	38	43	08	SE	NE	@ road	Metaline	8/2/88	0.1610	
00069	62	PO	Unnamed Creek	Sand Creek	38	43	08	SE	NE	@ road	Metaline	9/13/88	0.0700	
00069	62	PO	Unnamed Creek	Sand Creek	38	43	08	SE	NE	@ road	Metaline	7/13/89	0.0700	
00069	62	PO	Unnamed Creek	Sand Creek	38	43	08	SE	NE	@ road	Metaline	9/23/89	0.0520	
00069	62	PO	Unnamed Creek	Sand Creek	38	43	08	SE	NE	@ road	Metaline	8/1/90	1.6900	
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	8/13/85	0.5300	Bucket
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	9/26/85	0.2700	Bucket
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	6/1/86	6.4500	none
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	8/25/86	0.2700	
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	6/29//87	1.3400	
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	9/9/87	0.1800	
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	11/4/87	0.2000	
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	6/14/88	5.1200	
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	8/2/88	0.7800	
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	9/13/88	0.0900	
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	7/13/89	1.4400	
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	9/23/89	0.3800	
00070	62	PO	Sand Creek	Pend Oreille River	38	43	08	SE	NE	@ road	Metaline	8/1/90	0.3250	
00071	62	PO	Mickey Creek	Pend Oreille River	38	43	29	NW	NE	@ road	Metaline	6/1/86	2.5000	none
00071	62	PO	Mickey Creek	Pend Oreille River	38	43	29	NW	NE	@ road	Metaline	8/25/86	0.0000	
00071	62	PO	Mickey Creek	Pend Oreille River	38	43	29	NW	NE	@ road	Metaline	6/29/87	0.1000	
00071	62	PO	Mickey Creek	Pend Oreille River	38	43	29	NW	NE	@ road	Metaline	6/14/88	1.1000	
00071	62	PO	Mickey Creek	Pend Oreille River	38	43	29	NW	NE	@ road	Metaline	8/2/88	0.1200	
00071	62	PO	Mickey Creek	Pend Oreille River	38	43	29	NW	NE	@ road	Metaline	9/13/88	0.0000	
00071	62	PO	Mickey Creek	Pend Oreille River	38	43	29	NW	NE	@ road	Metaline	7/13/89	0.2700	
00071	62	PO	Mickey Creek	Pend Oreille River	38	43	29	NW	NE	@ road	Metaline	9/23/89	0.0000	
00071	62	PO	Mickey Creek	Pend Oreille River	38	43	29	NW	NE	@ road	Metaline	7/31/90	0.1580	
00071	62	PO	Mickey Creek	Pend Oreille River	38	43	29	NW	NE	@ road	Metaline	8/22/90	0.1000	
00071	62	PO	Mickey Creek	Pend Oreille River	38	43	29	NW	NE	@ road	Metaline	9/22/90	0.0000	DRY
00072	62	PO	Exposure Creek	Pend Oreille River	38	43	32	NW		@ road to campground	Metaline	6/29/87	0.0400	
00072	62	PO	Exposure Creek	Pend Oreille River	38	43	32	NW		@ road to campground	Metaline	9/9/87	0.0000	
00072	62	PO	Exposure Creek	Pend Oreille River	38	43	32	NW		@ road to campground	Metaline	6/14/88	0.1000	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00072	62	PO	Exposure Creek	Pend Oreille River	38	43	32	NW		@ road to campground	Metaline	8/2/88	0.0030	
00072	62	PO	Exposure Creek	Pend Oreille River	38	43	32	NW		@ road to campground	Metaline	9/13/88	0.0000	
00072	62	PO	Exposure Creek	Pend Oreille River	38	43	32	NW		@ road to campground	Metaline	7/13/89	0.0500	
00072	62	PO	Exposure Creek	Pend Oreille River	38	43	32	NW		@ road to campground	Metaline	9/23/89	0.0000	
00072	62	PO	Exposure Creek	Pend Oreille River	38	43	32	NW		@ road to campground	Metaline	7/31/90	0.1170	
00072	62	PO	Exposure Creek	Pend Oreille River	38	43	32	NW		@ road to campground	Metaline	8/22/90	0.0700	
00072	62	PO	Exposure Creek	Pend Oreille River	38	43	32	NW		@ road to campground	Metaline	9/22/90	0.0000	DRY
00073	62	PO	Maitlen Creek	Pend Oreille River	37	43	08	SW	SW	@ road	Ione	5/31/86	29800	none
00073	62	PO	Maitlen Creek	Pend Oreille River	37	43	08	SW	SW	@ road	Ione	8/6/86	1.3500	
00073	62	PO	Maitlen Creek	Pend Oreille River	37	43	08	SW	SW	@ road	Ione	10/26/86	0.6800	
00073	62	PO	Maitlen Creek	Pend Oreille River	37	43	08	SW	SW	@ road	Ione	7/28/88	0.7200	
00073	62	PO	Maitlen Creek	Pend Oreille River	37	43	08	SW	SW	@ road	Ione	8/22/88	0.6900	
00073	62	PO	Maitlen Creek	Pend Oreille River	37	43	08	SW	SW	@ road	Ione	9/14/88	0.4200	new dam diverts water to field
00073	62	PO	Maitlen Creek	Pend Oreille River	37	43	08	SW	SW	@ road	Ione	7/14/89	2.1100	
00073	62	PO	Maitlen Creek	Pend Oreille River	37	43	08	SW	SW	@ road	Ione	6/1990	10.1000	
00073	62	PO	Maitlen Creek	Pend Oreille River	37	43	08	SW	SW	@ road	Ione	7/30/90	4.3200	
00073	62	PO	Maitlen Creek	Pend Oreille River	37	43	08	SW	SW	@ road	Ione	8/22/90	2.9800	
00073	62	PO	Maitlen Creek	Pend Oreille River	37	43	08	SW	SW	@ road	Ione	9/22/90	2.2900	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	8/13/85	4.5400	none
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	6/25/86	8.2000	none
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	7/8/86	7.1600	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	8/6/86	3.8200	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	9/2/86	2.8100	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	6/23/87	12.7000	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	9/3/87	4.0700	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	7/28/88	3.9400	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	8/22/88	3.0200	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	9/14/88	1.9100	

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Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	7/14/89	5.8900	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	9/23/89	3.3200	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	6/18/90	84.6000	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	7/30/90	12.9000	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	8/22/90	12.1000	
00074	62	PO	Cedar Creek	Pend Oreille River	38	43	31	SW	SW	@ bridge	Ione	9/22/90	4.2100	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	8/13/85	1.1600	none
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	9/26/85	1.0700	Bucket
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	5/31/86	11.6000	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	8/6/86	0.7900	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	10/26/86	0.9500	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	6/23/87	3.7800	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	9/3/87	1.0700	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	6/28/88	0.8700	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	8/22/88	0.5500	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	9/14/88	0.3400	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	7/14/89	1.9800	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	9/23/89	0.6200	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	5/28/90	37.0000	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	6/18/90	50.6000	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	7/30/90	4.7300	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	8/21/90	6.4200	
00075	62	PO	Little Muddy Creek	Pend Oreille River	37	43	06	SW		@ road	Ione	9/22/90	1.0800	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	8/13/85	1.1300	no meas. 1.4-3.3,6.7-8.1
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	9/26/85	1.0000	no meas. 7.5-8.7 backwater
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	5/31/86	7.5800	none
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	8/6/86	1.0200	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	10/26/86	1.2200	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	6/23/87	4.3400	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	9/3/87	1.0900	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	7/28/88	0.8400	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	8/22/88	0.5800	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	9/14/88	0.4300	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	7/14/89	2.2000	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	9/23/89	0.8700	

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Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTER	SE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	5/28/90	31.0000	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	6/18/90	43.6000	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	7/30/90	5.5400	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	8/21/90	7.6600	
00076	62	PO	Big Muddy Creek	Pend Oreille River	37	43	07	SW	SW	@ road	Ione	9/22/90	1.5800	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	8/13/85	0.1600	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	9/26/85	0.1500	none
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	5/31/86	0.2900	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	7/8/86	0.1600	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	8/6/86	0.1400	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	8/25/86	0.1000	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	10/26/86	0.1800	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	6/29/87	0.4100	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	7/28/88	0.0550	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	8/22/88	0.0570	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	9/14/88	0.0380	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	7/15/89	0.4800	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	9/23/89	0.0990	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	12/21/89	0.1100	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	5/28/90	3.2600	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	6/18/90	5.7700	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	7/30/90	1.1000	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	8/21/90	0.8890	
00077	62	PO	Diamond Creek	Renshaw Creek	37	43	19	N2	NW	@ Stone's house	Ione	9/22/90	0.5400	
00080	62	PO	Renshaw Creek	Pend Oreille River	37	43	19	S2	S2	@ highway	Ione	6/29/87	0.2700	
00080	62	PO	Renshaw Creek	Pend Oreille River	37	43	19	S2	S2	@ highway	Ione	9/3/87	0.4300	
00080	62	PO	Renshaw Creek	Pend Oreille River	37	43	19	S2	S2	@ highway	Ione	7/28/88	0.4400	
00080	62	PO	Renshaw Creek	Pend Oreille River	37	43	19	S2	S2	@ highway	Ione	8/22/88	0.3400	
00080	62	PO	Renshaw Creek	Pend Oreille River	37	43	19	S2	S2	@ highway	Ione	9/14/88	0.3000	
00080	62	PO	Renshaw Creek	Pend Oreille River	37	43	19	S2	S2	@ highway	Ione	7/15/89	0.7500	
00080	62	PO	Renshaw Creek	Pend Oreille River	37	43	19	S2	S2	@ highway	Ione	5/28/90	5.7600	
00080	62	PO	Renshaw Creek	Pend Oreille River	37	43	19	S2	S2	@ highway	Ione	6/18/90	7.0000	
00080	62	PO	Renshaw Creek	Pend Oreille River	37	43	19	S2	S2	@ highway	Ione	7/30/90	1.9200	
00080	62	PO	Renshaw Creek	Pend Oreille River	37	43	19	S2	S2	@ highway	Ione	8/21/90	1.8100	
00080	62	PO	Renshaw Creek	Pend Oreille River	37	43	19	S2	S2	@ highway	Ione	9/22/90	0.8400	
00081	62	PO	Diamond Creek	Renshaw Creek	37	43	20	NW	NW	@ highway	Ione	7/28/88	0.0000	
00081	62	PO	Diamond Creek	Renshaw Creek	37	43	20	NW	NW	@ highway	Ione	8/22/88	0.0000	

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Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTERSE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00081	62	PO	Diamond Creek	Renshaw Creek	37	43	20	NW NW	@ highway	Ione	7/15/89	0.0000	
00081	62	PO	Diamond Creek	Renshaw Creek	37	43	20	NW NW	@ highway	Ione	5/28/90	1.1100	
00081	62	PO	Diamond Creek	Renshaw Creek	37	43	20	NW NW	@ highway	Ione	6/18/90	3.2000	
00081	62	PO	Diamond Creek	Renshaw Creek	37	43	20	NW NW	@ highway	Ione	7/30/90	0.1580	
00081	62	PO	Diamond Creek	Renshaw Creek	37	43	20	NW NW	@ highway	Ione	8/21/90	0.2440	
00081	62	PO	Diamond Creek	Renshaw Creek	37	43	20	NW NW	@ highway	Ione	9/22/90	0.0000	DRY
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	7/18/84	1.4700	no meas. 0.6-1.2,6.6-8.3
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	8/2/84	1.0000	no meas. 0.6-2.1,5.4-7.7
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	9/12/84	0.5000	Bucket
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	6/18/85	1.6000	Bucket
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	7/10/85	0.3600	Bucket
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	8/1/85	0.4000	Bucket
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	6/16/86	1.4700	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	7/23/86	0.5500	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	8/19/86	0.1600	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	3/20/87	0.8800	About 2.5' of snow on ground.
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	8/6/87	0.2500	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	9/10/87	0.1900	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	6/5/88	2.1400	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	7/6/88	0.9100	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	8/18/88	0.2700	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	9/1/88	0.3100	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	5/26/89	1.7000	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	6/3/89	1.4700	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	7/6/89	0.7300	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	8/1/89	0.4100	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	9/6/89	0.2700	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	6/12/90	3.1800	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	7/11/90	0.9300	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	8/1/90	0.5900	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	9/4/90	0.4100	
00086	62	ST	Little Calispell Creek	Ten Mile Creek	32	42	06	NW	@ dirt road	Goddards Pk.	10/13/90	0.2600	

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Point Number	WRIA	County	Source	Tributary	TO	RA	Location SEC	QUARTERSE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	7/3/84	2.6700	no meas. 5.0-5.5
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	8/7/84	1.0000	no meas. 0.3-0.9,2.7-3.2
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	9/12/84	0.6500	no meas. 0.6-1.0,3.1-4.8
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	6/18/85	1.3700	no meas. 1.0-1.5,7.0-7.7
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	7/10/85	0.7800	no meas. 6.7-8.0 backwater
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	8/1/85	0.5900	no meas. 1.0-1.9,6.7-8.1
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	6/16/86	1.6000	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	7/23/86	0.4000	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	8/19/86	0.2700	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	3/20/87	2.2700	2.5'of snow on ground
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	9/10/87	0.5800	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	6/5/88	3.7800	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	7/6/88	1.6000	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	8/18/88	0.7100	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	9/1/88	0.4800	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	10/7/88	0.4800	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	5/26/89	3.4300	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	6/3/89	3.5000	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	7/6/89	1.0900	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	8/1/89	0.7700	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	9/6/89	0.7800	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	6/12/90	8.4700	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	7/11/90	1.5100	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	8/1/90	0.8900	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	9/4/90	0.6500	
00087	62	ST	Ten Mile Creek	Calispell Creek (N.Fork)	32	42	06	W2	@ dirt road	Goddards Pk.	10/13/90	0.4060	
00309	62	PO	Small Creek (Ditch)	None	33	43	22	SW NW	@ flume from creek	Cusick	7/30/90	0.1850	
00309	62	PO	Small Creek (Ditch)	None	33	43	22	SW NW	@ flume from creek	Cusick	8/20/90	0.3710	
00309A	62	PO	Small Creek (Ditch)	None	33	43	22	SE SE	@ road	Cusick	7/30/90	0.2280	
00311	62	PO	Outlet Creek	Sullivan Creek	39	44	30	SW SE	near gage	Metaline Fls	7/31/90	42.0000	

Database of Ecology Stream Measurements
Pend Oreille Watershed (WRIA 62)

Point Number	WRIA	County	Source	Tributary	Location TO	RA	SEC	QUARTERSE	Point of Measurement	USGS Map	Date	Flow (cfs)	Flow Remarks
00311	62	PO	Outlet Creek	Sullivan Creek	39	44	30	SW SE	near gage	Metaline Fls	8/22/90	24.2000	
00311	62	PO	Outlet Creek	Sullivan Creek	39	44	30	SW SE	near gage	Metaline Fls	9/22/90	20.3000	
00312	62	PO	Unnamed Creek	Pend Oreille River	37	43	17	NW NE	@ road	Ione	5/28/90	0.7500	
00312	62	PO	Unnamed Creek	Pend Oreille River	37	43	17	NW NE	@ road	Ione	6/19/90	4.1300	
00312	62	PO	Unnamed Creek	Pend Oreille River	37	43	17	NW NE	@ road	Ione	7/30/90	0.6650	
00312	62	PO	Unnamed Creek	Pend Oreille River	37	43	17	NW NE	@ road	Ione	8/22/90	0.7430	
00312	62	PO	Unnamed Creek	Pend Oreille River	37	43	17	NW NE	@ road	Ione	9/22/90	0.5680	
00312	62	PO	Unnamed Creek	Deer Creek	31	44	19	SE NE	@ road	Sacheen Lake	6/20/90	2.8000	
00313	62	PO	Unnamed Creek	Deer Creek	31	44	19	SE NE	@ road	Sacheen Lake	7/12/90	2.0500	
00313	62	PO	Unnamed Creek	Deer Creek	31	44	19	SE NE	@ road	Sacheen Lake	8/9/90	2.2000	
00313	62	PO	Unnamed Creek	Deer Creek	31	44	19	SE NE	@ road	Sacheen Lake	9/6/90	2.0600	