# UPPER·MIDDLE MAINSTEM

## Subbasin Plan

Prepared for the Northwest Power & Conservation Council

# Upper Middle Mainstem Subbasin

5/28/2004

Prepared for the

Northwest Power and Conservation Council

# 1 Introduction

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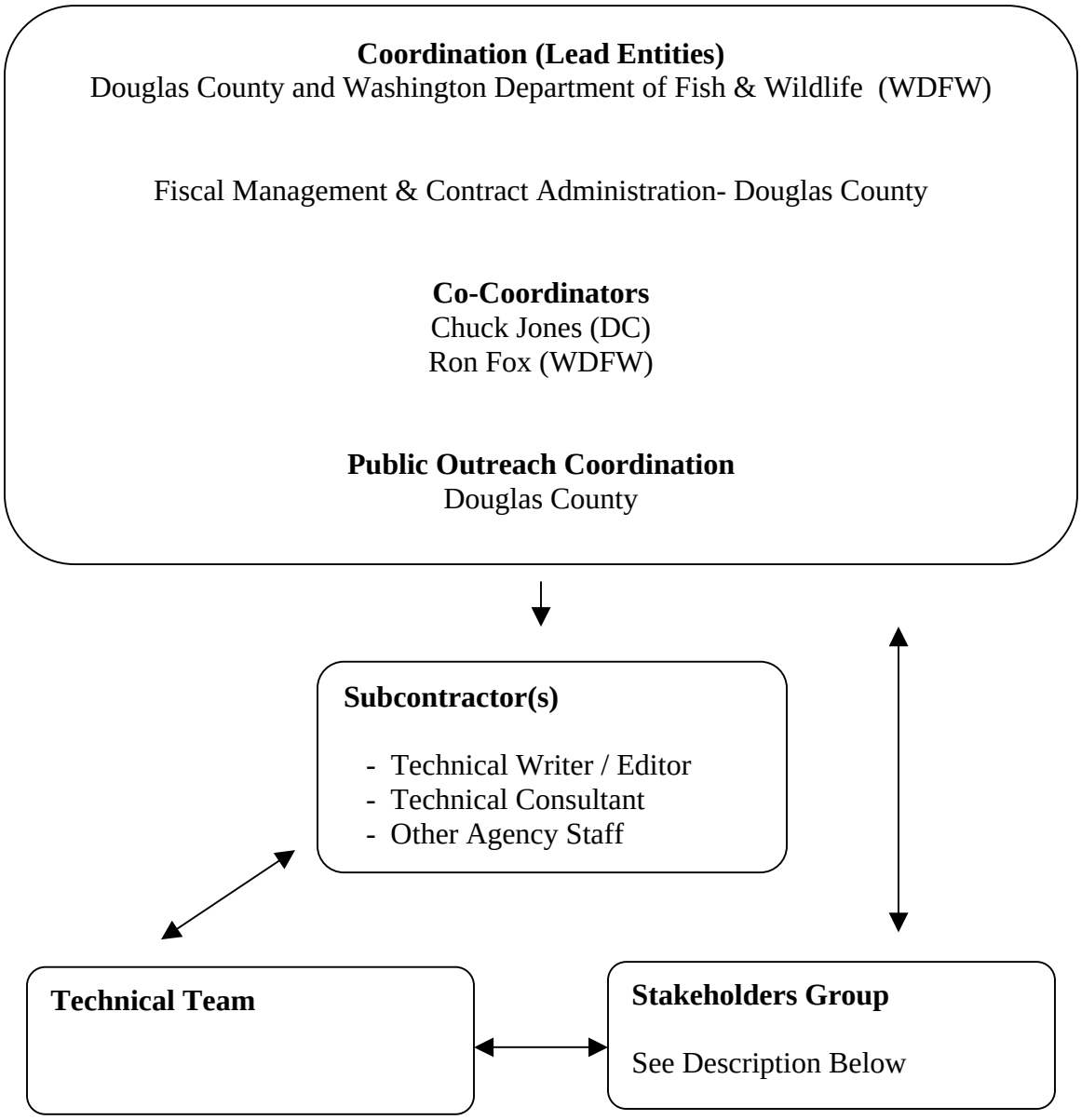
## 1.2 Subbasin Plan Approach and Public Involvement

### 1.2.1 Description of Planning Organization

**Infrastructure and Organization**

Douglas County, in conjunction with Washington Department of Fish and Wildlife (WDFW) developed this subbasin plan for the UMM Subbasin with guidance from the *Technical Guide for Subbasin Planners* (NPPC 2001-20). Fish and wildlife population and habitat management goals and objectives, including harvest, natural and hatchery production were collected and described from numerous resources. Strategies to meet goals for habitat protection and restoration have been prioritized in collaboration with local stakeholders in the planning process. Consistent with subbasin summaries completed for provincial reviews, the geographic scope of the Subbasin Plan includes the Columbia River and tributary drainages, although the Columbia River relies on and refers extensively to existing Habitat Conservation Plans and FERC relicensing documents. Subbasin Planners used the following organizational structure in developing the subbasin plan.

**Upper Middle Mainstem Subbasin Organizational Structure**




**Stakeholders:** The primary stakeholder involvement mechanism is the Watershed Planning Unit because of the participation, representation, and well-attended meetings. Stakeholders include representatives from multiple organizations, primarily through a collaborative effort administered by Foster Creek Conservation District, that represent cities, counties, irrigation districts, state agencies and federal land and resource management agencies

### 1.2.2 Mission Statement

Restore and maintain healthy indigenous fish and wildlife populations and their ecosystems to support sustainable harvest, cultural values, and non-consumptive benefits through a local, state, tribal, and federal partnership. Management decisions will be made in an open and cooperative coordinated process that respect different points of view, and will adhere to varied rights and statutory responsibilities.

### 1.2.3 Approach

Douglas County and the WDFW partnered to coordinate Subbasin Planning for the UMM Subbasin. Douglas County has been primarily responsible for sub-contracting, outreach and public involvement, whereas WDFW focused on technical components. Both entities spent much of their time in coordinating all of these efforts.

The timeline established by the Northwest Power and Conservation Council (NPCC) has necessitated a very compressed process that has allowed little flexibility in stakeholder involvement. The rigorous schedule and limited budget have restricted the time available for outreach. However, Douglas County has devoted resources to public outreach such as using the County website, public meetings, Regional Planning Commission information sessions and use of the Douglas County Watershed Planning Association as the primary stakeholder group. The NPCC's proposed three year rolling review of subbasin plans, will make the plans relevant, enable them to be updated regularly, and to be adapted to new knowledge and information.

#### Outreach

In February 2003 the Coordinators and Foster Creek Conservation District agreed that the Douglas County Watershed Planning Association would work as the primary stakeholder group to reduce duplication and relying on stakeholders to come to multi-purpose meetings. In the fall of 1998, the initiating governments in the Foster Creek and Moses Coulee watershed basins chose to work together to form the Douglas County Watershed Planning Association for WRIA's 44 and 50. These initiating governments include Douglas County, Grant County, Okanogan County, City of East Wenatchee, City of Bridgeport, Bridgeport Irrigation District #1, East Wenatchee Water District, and the Colville Confederated Tribes. The initiating governments created an intergovernmental agreement for the purpose of administering the development of a local watershed plan and to designate Foster Creek Conservation District as lead agency.

The Planning Unit consists of a wide representation of the local community. The group has met monthly since 1999. All members or their alternates are expected to attend. Decisions are made on a consensus basis. Consensus, as agreed upon by the Unit, will allow every member to say, "I can live with the decision and accept it, even though it may or may not be exactly what I want." The commitment is to a collective well-being and not to an individual's needs. Members come with a 'solution-oriented' vision for the health of the community, the water resources which sustain it, and the abundant wildlife present.

#### Fact sheets

Douglas County developed several Fact Sheets to introduce Subbasin Planning to stakeholders and the media and explain opportunities for public involvement. The Fact Sheet included a telephone number and email, postal mail, and web site addresses that individuals could use to obtain more information. Opportunities for public involvement in the UMM Subbasin Planning process are detailed in **Table 1** below.

**Table 1** Public participation in UMM Subbasin planning

| Date | Subject | Where or Who |
|---|---|---|
| Nov. 20, 2002 | Subbasin planning- workplan development | Douglas County Regional Planning Commission (DCRPC) |

| Date | Subject | Where or Who |
|---|---|---|
| Feb. 20, 2003 | Subbasin planning- 101 Workshop | Douglas County Watershed Planning Unit (WPU) |
| Mar. 05, 2003 | Website development | Douglas County Website- Natural Resources Sxn Created w/SBP |
| June 26, 2003 | Subbasin planning update | WPU |
| Sept. 25, 2003 | Subbasin planning update | WPU |
| Oct. 22, 2003 | Subbasin planning basics and update | Joint RPC and City of E. Wenatchee Planning Comm. |
| Nov. 20, 2003 | Subbasin planning update | WPU |
| Dec. 15, 2003 | Display- subbasin planning and regional salmon recovery | Douglas County Public Services Bldg. |
| Jan. 21, 2004 | SBP update on assessment, folders/handouts, focal spp, wildlife | DCRPC |
| Feb. 05, 2004 | SBP update on assessment, folders/handouts, focal spp | WPU, public, advertised |
| Mar. 10, 2004 | Subbasin planning update | Regional Technical Team presentation |
| Mar. 10, 2004 | Subbasin planning update | Bridgeport City Council |
| Mar. 24, 2004 | Subbasin planning update | WPU |
| Mar. 25, 2004 | SBP summarized product and results, folders/handouts, maps | Regional Planning Commission, public, advertised |
| Apr. 14, 2004 | Subbasin planning update | Eastern Washington Planners Forum- Moses Lake |
| Apr. 21, 2004 | SBP summarized product and results, folders/handouts, maps | Regional Planning Commission, public, advertised |
| Apr. 22, 2004 | Subbasin planning update | WPU |
| May 13, 2004 | SBP summarized product and results, folders/handouts, maps | Public, advertised, 100-200 people emailed |
| May 19, 2004 | SBP summarized product and results, foders/handouts, maps | Regional Planning Commission, public, advertised |

(This does not include technical or USCRB related meetings)

## 1.2.4 Acknowledgements

We would like to thank all of those who participated in the development of this report, particularly the following organizations for their commitment during the planning process: North Central Washington Resource Conservation and Development Council for their assistance in the Level 2 contract maintenance, The Upper Columbia Salmon Recovery Board for assisting with direction of the regional planning processes, and The Upper Columbia Regional Technical Team, NOAA Fisheries Technical Review Team, and Washington Department of Fish and Wildlife staff who provided direction and support to those mentioned in the list of participants. We also thank Douglas County Transportation and Land Services staff for GIS and data entry assistance.

# Upper Middle Mainstem

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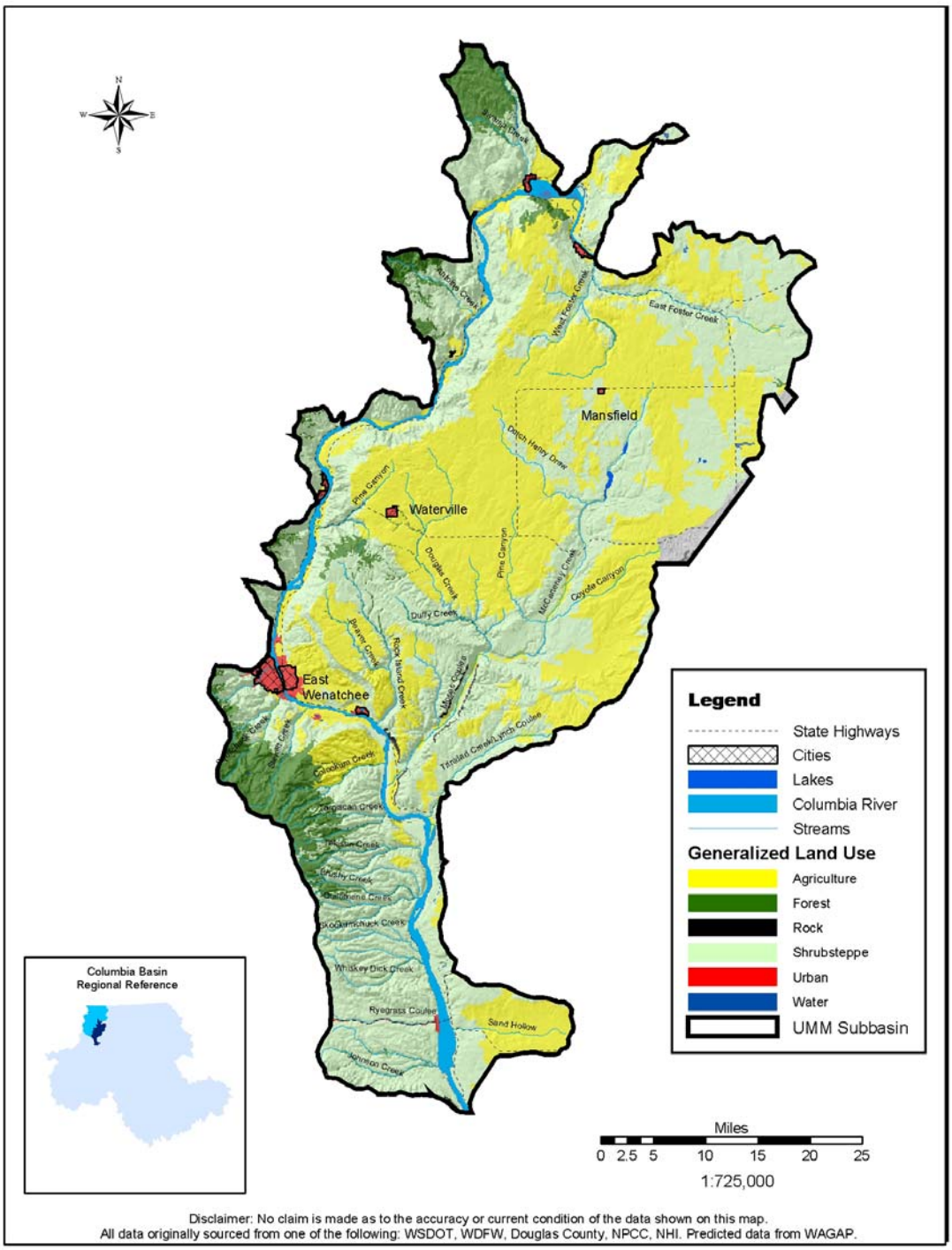
# 2 Executive Summary

## 2.1.1 Purpose and Scope

In October of 2000, the Northwest Power Planning Council adopted a revised Fish and Wildlife Program (Program) for the Columbia River Basin. The new program is intended to be more comprehensive than, but complimentary to, regional efforts related to the Endangered Species Act, state-sponsored recovery, watershed planning, and coordination efforts, and tribal recovery initiatives. The revised Program calls for an ecosystem-based approach for planning and implementing fish and wildlife recovery. The focus of the planning effort is to fulfill the obligations within the Northwest Power Act and not intended to supercede other similar efforts, such as the Mid Columbia Habitat Conservation Plan or Federal Energy Regulatory Commission relicensing efforts, but possibly to enhance and/or incorporate those efforts to better plan for fish and wildlife resources.

The Program divides the Columbia Basin into ecological provinces that are further divided into individual subbasins. At the heart of the Program are subbasin plans, consisting of a comprehensive description of the basins general ecology including the identification of specific fish and wildlife needs. The Upper Middle Mainstem Subbasin (Figure 1) Plan is one of six subbasin plans being generated in the CCP. The Okanogan, Wenatchee, Lake Chelan, Entiat, and Methow Subbasins comprise the remainder of this CCP. Future action strategies and project funding are to be based upon these identified needs.

The *UMM Subbasin Summary* (Peven 2002) presented a compilation of known and existing data on anadromous and resident fish, wildlife, and their habitats. The report also provides data and context, land use, human population patterns, and overall resource management issues. The UMM Subbasin Plan draws from the important information assembled in the Subbasin Summary (updated where appropriate), and draws from a significant body of information to facilitate coordinated planning. The Subbasin Plan addresses the limiting factors for fish and wildlife populations & habitats, however the needs of area residents and their critical role in ecosystem stewardship have been expressly considered as part of overall ecosystem recovery and its benefits.




(DCTLS 2004)

**Figure 1** UMM Subbasin location, topography, land use, demographics, and hydrology

## 2.1.2 Subbasin Goal - Vision Statement

The Vision Statement for the Upper Middle Mainstem Subbasin is largely based on the Douglas County Watershed Planning Association Goal Statements for water resources. They are based on a sustainable future for the landscape, the economy, and the people within the Subbasin.

Our vision for the landscape is to balance habitat conservation with human uses to ensure the long-term health of plant, fish, wildlife and human communities.

Our vision for the economy is based on efficient management and use of natural resources including reliable water supplies, fish and wildlife populations, and aquatic and terrestrial habitats.

Our vision for the people is to manage natural resources to promote social and economic well-being and to improve or maintain our quality of life. We will work together to foster increased understanding of the importance of natural resource conservation.

**Biological Objectives**

Biological objectives describe physical and biological changes within the subbasin needed to achieve the vision and address factors affecting focal habitats. Biological objectives for all Ecoregion subbasins are habitat based and describe priority areas and environmental conditions needed to achieve functional focal habitat types. Where possible, biological objectives are empirically measurable and based on an explicit scientific rationale (the working hypothesis). Biological objectives are:

- Consistent with subbasin-level visions and strategies
- Developed from a group of potential objectives based on the subbasin assessment and resulting working hypotheses
- Realistic and attainable within the subbasin
- Consistent with legal rights and obligations of fish and wildlife agencies and tribes with jurisdiction over fish and wildlife in the subbasin, and agreed upon by co-managers in the subbasin
- Complementary to programs of tribal, state and federal land or water quality management agencies in the subbasin
- Quantitative and have measurable outcomes where practical

### 2.1.3 Major Findings and Conclusions

The analysis and synthesis of information in this subbasin plan is summarized as follows:

- Columbia River water is managed at a much larger scale than the subbasin or province, and within the subbasin and province most of the fisheries management is guided through existing legal agreements (HCP, FERC, ESA etc.).
- Small tributaries in the UMM Subbasin are generally thought to be in better shape than initially thought, although certain areas need significant improvements to be functional or accessible to anadromous and resident fish. In addition, data is severely lacking in many of the tributaries and is needed to develop better strategies for fish or wildlife in those areas.
- Shrubsteppe and herbaceous wetlands are the two dominant habitat types within the UMM and this subbasin contains some of the most important shrubsteppe habitat in the state for several species. WDFW, BLM, and The Nature Conservancy are the largest landowners that

specifically manage for natural resources in the subbasin. Also, there are substantial conservation programs (e.g. CRP etc.) designed to assist private landowners in managing their lands to conserve natural resources.

# 3 Subbasin Overview

The Subbasin Overview has four main sections. The first section, Subbasin in Regional Context, describes the UMM Subbasin and its place within the CCP and the greater Columbia River Basin as defined by the Northwest Power and Conservation Council (NPCC). The second and third sections, CCP and Subbasin Description, summarize the geological, climatic, biological, hydrological, and anthropogenic characteristics of the CCP and UMM Subbasin, respectively. The fourth, the Guiding Principles, articulates and merges biological and management assumptions to provide a framework for developing the UMM Subbasin Plan.

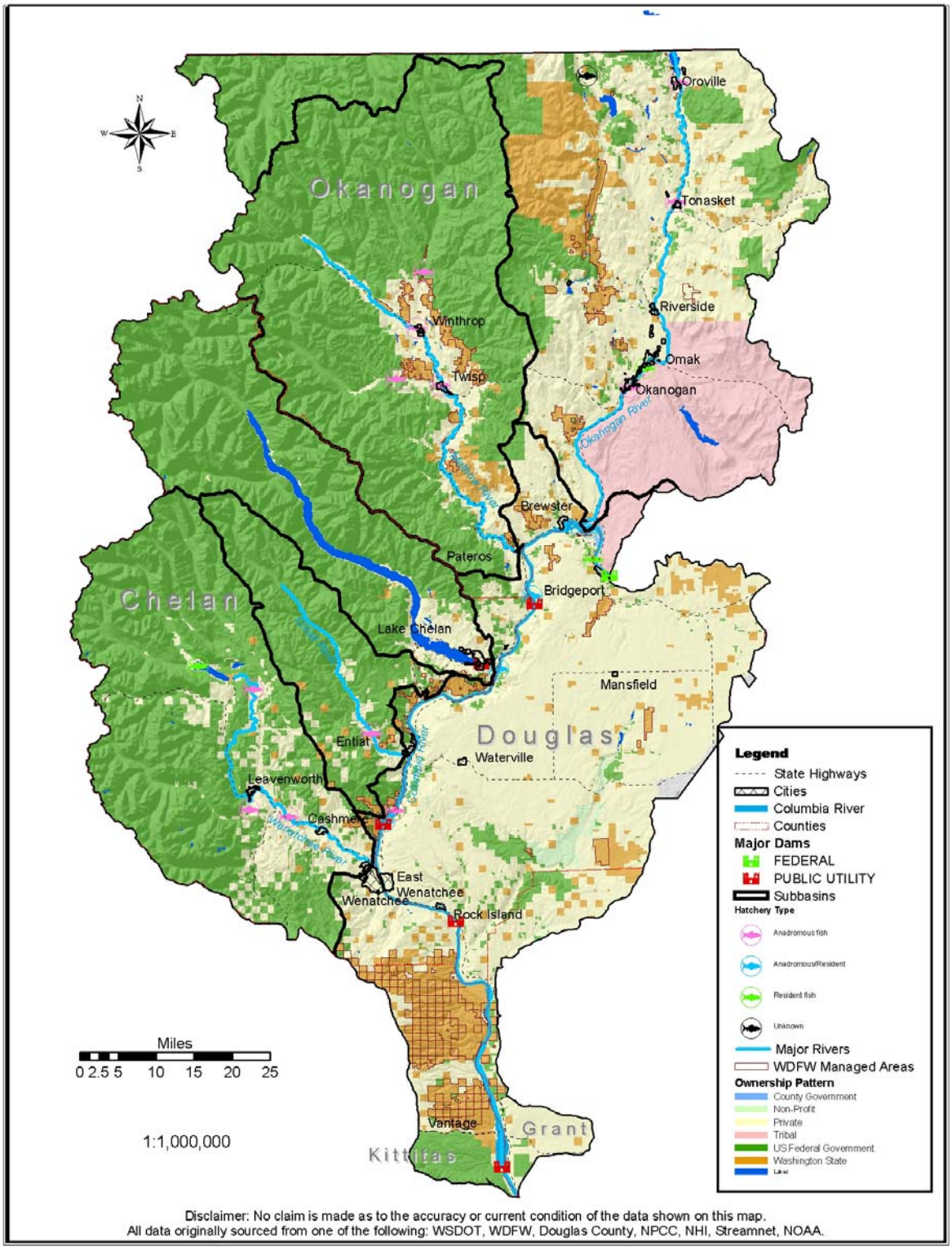
### 3.1.1 Subbasin in Regional Context

For planning purposes, the NPCC divided the Columbia River Basin south of the Canadian border and its more than 60 subbasins into 11 CCPs. NPCC is responsible for implementing the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L. 96-501) and the Fish and Wildlife Program mandated by the Act.

The 11 Provinces, beginning at the mouth of the Columbia River and moving inland, are: Columbia Estuary; Lower Columbia; Columbia Gorge; Columbia Plateau; Columbia Cascade; Inter-Mountain; Mountain Columbia; Blue Mountain; Mountain Snake; Middle Snake; Upper Snake. These 11 Provinces include the entire Columbia River Basin in the United States, and together cover approximately 25,000 sq. mi. in Washington, Oregon, Idaho, and Montana.

Each of the 11 Provinces will develop its own vision, biological objectives, and strategies consistent with those adopted at the subbasin level. NPCC's intent is to adopt these elements into the 2000 Fish and Wildlife Program during later rulemaking. The biological objectives at the CCP scale will then guide development of the program at the subbasin scale.

The Provincess are made up of adjoining groups of ecologically related subbasins, each Province distinguished by similar geology, hydrology, and climate. Because physical patterns relate to biological population patterns, fish and wildife populations within a Province are also likely to share life history and other characteristics (NPCC 2000). The UMM Subbasin is in the CCP (Figure 2).




(DCTLS 2004)

**Figure 2** Overview of the UMM Subbasin within the CCP, WA.

### 3.1.2 Columbia Cascade Province

The Columbia Cascade Province (CCP) is the fourth smallest of the ecological Provinces and covers an area of approximately 9,407 sq. mi (Figure 2). It is defined as the Columbia River and all tributaries from Chief Joseph Dam to Wanapum Dam. This area includes much of north-central Washington. The CCP is divided into six subbasins: Lake Chelan, Okanogan, Methow, Entiat, Wenatchee, and Upper Middle Mainstem (CBFWA 2003).

The Cascade Mountains form the western border of the CCP, and the U.S. / Canada border forms the northern edge. The northeastern corner of the CCP passes through the Okanogan National Forest and the Colville Indian Reservation, while the southeastern boundary is bordered by Banks Lake, Lake Lenore State Wildlife Area, and the towns of Ephrata and Quincy. Wanapum Dam lies at the southern tip of the CCP.

The CCP overlies two significantly different physiographic regions and topography varies widely (10,000 ft. at Glacier Peak to 600 ft. at the Columbia River). The Cascade Mountains, to the north and west, consists primarily of metamorphosed sedimentary, volcanic and granitic rock, while the Columbia Plateau, to the east and south, features vast thick layers of basaltic bedrock. The hydrology of the CCP is complex; surface water includes numerous small tributaries draining to the Columbia River, while underlying the region is the Columbia Plateau Regional Aquifer System.

Temperatures and precipitation within the UMM Subbasin also vary significantly, usually depending on elevation, with cooler and wetter climates in the mountainous areas in the western and northern sections of the CCP, and arid to semi-arid climates in the eastern and southern portions of the CCP.

Vegetation communities follow elevation and moisture gradients. At the highest elevations subalpine and alpine meadow grasses and forb species occur and give way to subalpine fir communities below the Cascade Crest. At mid-elevations a transition from Douglas fir communities to the dominant ponderosa pine forests occurs on moisture and elevation gradients. At the lowest elevations, an arid continental climate occurs and shrubsteppe and steppe plant communities (shrubs, perennial bunch grasses, lichens, and mosses) dominate the landscape. High water table or seasonal flooding conditions found adjacent to lakes, streams and rivers support development of deciduous riparian communities.

Federal lands, including the Okanogan and Wenatchee National Forests make up most of the Western section and small portions of the northeastern section of the CCP. The western one-third (341,051 acres) of the Colville Indian Reservation is also located within the CCP (southeast portion of the Okanogan subbasin) and much of remaining CCP lands are in private ownership. The western portion of the CCP is predominantely coniferous forest, while the eastern portion is comprised primarily of agricultural lands, shrubsteppe and steppe habitat.

The CCP is an important agricultural and grazing area and also encompasses several urban areas. Orchards and small areas of irrigated cropland are found along the Columbia River corridor between Chief Joseph and Rock Island dams. Most of the eastern UMM Subbasin is a plateau where dryland farming and rangelands are the dominant agricultural practices. Much of the Grant County portion of the UMM Subbasin is part of the Columbia Reclamation Irrigation Project and has extensive irrigated agriculture. Significant urban centers within the CCP include Wenatchee,

East Wenatchee, Entiat, Chelan, Pateros, Brewster, Winthrop, Leavenworth, Cashmere, Waterville, Bridgeport, and Okanogan/Omak, Washington. The Greater Wenatchee Area is the largest urban center with a total population of 48,952 (East Wenatchee urban areas, U.S. Census 2000). The western one-third (341,051 acres) of the Colville Indian Reservation is also located within the CCP.

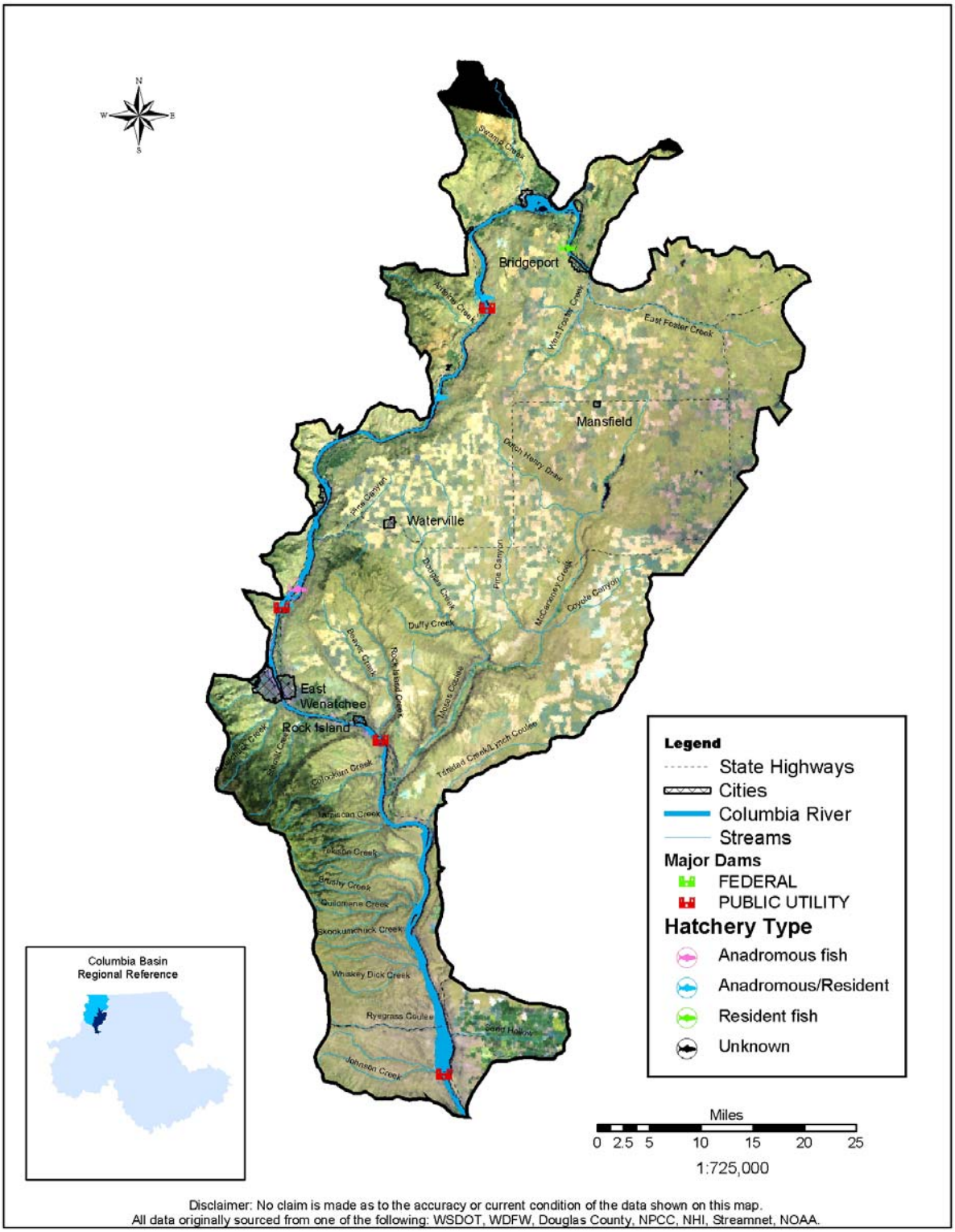
The CCP is also a significant source of hydroelectric power. Five major Columbia River dams are located within the CCP: Chief Joseph, Wells, Rocky Reach, Rock Island, and Wanapum dams. Five more dams lie downstream on the Columbia River: Priest Rapids, McNary, John Day, The Dalles, and Bonneville dams. All hydro-projects listed, with the exception of Chief Joseph Dam, have fish passage facilities and also provide downstream passage for juvenile salmonids (through collection facilities or fish spill). These dams provide an economical power supply and numerous recreational and economic benefits.

## 3.2 Subbasin Description

The majority of the UMM Subbasin (Figure 3) is in Douglas County with lesser amounts in Okanogan, Chelan, Kittitas, and Grant Counties. The UMM Subbasin comprises 17.5 percent of the CCP (Figure 3 Upper Middle Mainstem Subbasin, WA.

**Table 2**), and consists of 1,607,740 acres (2,512 $mi^2$). The UMM Subbasin extends from Chief Joseph Dam (Rkm 877, Rm 545.1) to Wanapum Dam (Rkm 669, Rm 415.8) and contains Wells, Rocky Reach, Rock Island and Wanapum dams and reservoirs.

Below Chief Joseph Dam, the Columbia River flows in a westerly direction and turns south at the eastern edge of the Cascade Mountains. Several minor tributaries and drainages join this stretch of the Columbia and are included within the UMM Subbasin. These include: Foster, Rock Island, and Moses Coulee creeks in Douglas County; Squilchuck, Stemilt, and Colockum creeks in Chelan County; Trinidad Creek and Sand Hollow Wasteway in Grant County; and Tarpiscan, Tekison, Brushy, Quilomene, Whiskey Dick, and Johnson creeks in Kittitas County. Jameson and Grimes Lakes are also included in this subbasin. The two largest watersheds located within the UMM Subbasin are Foster Creek (WRIA 50) and Moses Coulee (WRIA 44).




(DCTLS 2004)

**Figure 3** Upper Middle Mainstem Subbasin, WA.

**Table 2** Subbasin size relative to the CCP and WA. State (IBIS 2003)

| Subbasin | Size | | Percent of CCP | Percent of State |
|---|---|---|---|---|
| | Acres | $Mi^2$ | | |
| Enitat | 298,363 | 466 | 3.2 | .7 |
| Lake Chelan | 599,925 | 937 | 6.5 | 1.4 |
| Wenatchee | 851,894 | 1,333 | 9.3 | 2.0 |
| Methow | 1,167,795 | 1,825 | 12.7 | 2.8 |
| Okanogan | 1,490,079 | 2,328 | 16.2 | 3.5 |
| Upper Middle Mainstem | 1,607,740 | 2,512 | 17.5 | 3.8 |
| Crab | 3,159,052 | 4,936 | 34.4 | 7.4 |
| Total (CCP) | 9,174,848 | 14,337 | 100 | 21.6 |

## 3.2.1 Topographic/Physio-geographic Environment

### Geology

Three physiographic Provinces influence the geology of the UMM Subbasin: the Columbia Mountain/Highlands to the north, the North Cascade Range to the west and the Columbia Basalt Plain to the east and south. The Columbia River flows over mainly Paleozoic metamorphic and intrusive rocks north of Rock Island Dam, while south of the dam the river passes through the Columbia basalt group (BPA et al. 1994).

Bordered by the North Cascade Range, the topography on the west side of the Columbia River is generally steep with slopes greater than 60 percent. Elevations change quickly from 4,200 feet at Burch Mountain to 700 feet at Rocky Reach Dam. Most tributary streams on the western edge of the UMM Subbasin flow from west to east into the Columbia River and are high gradient streams capable of transporting large volumes of water and sediment during the spring runoff period. Large alluvial fans are common in the areas where the major tributaries meet the Columbia River.

On the east side of the Columbia River, elevations also rise quickly from 700 feet to 4,100 feet at Badger Mountain. Most of the eastern UMM Subbasin is best described as a plateau where slopes are not as steep and the landscape has the appearance of rolling hills rather than mountains. Major landforms within the eastern portion of the UMM Subbasin include Dyer Hill, Waterville Plateau, Moses Coulee, and the Badger Mountain area.

A wide variety of soils occur in the UMM Subbasin. Soils range from light-colored, with thin A horizons poor in organic matter and calcium accumulations high in the profile to thick, very dark-brown to black A horizons rich in organic matter in which calcium carbonate accumulations may be deep in the profile or absent. Soils with high accumulations of salt and large amounts of exchangeable sodium are also present (MCMCP 1995).

### Climate and Weather

Located in the rain shadow of the Cascade Mountain Range, the UMM Subbasin is classified as arid to semiarid with low levels of annual precipitation, cold winters and hot, dry summers.

Precipitation can vary widely in relation to topographic features but in general much of the subbasin receives less than 15 inches of annual precipitation and most of that precipitation falls in winter. Nearby, the upper Cascade Mountains sometimes receive more than 100 inches of snowfall per year. Cool winter temperatures maintain most of this snowpack as natural storage until spring when its runoff adds to flows in the Columbia River. Snowpack accumulation is dependent on storm systems moving inland to central Washington from the Pacific Ocean during the winter months (Peven 2002).

Air temperatures vary widely depending on topography and location within the subbasin. Summertime air temperatures generally exceed 100 ºF for one to several days each year. Winter temperatures can also drop below 0 ºF, but in general they are in the 20 to 40 ºF range. Along the Columbia River, winter and spring air temperatures remain very stable. The growing season ranges from 170 days (May-September) at Bridgeport and East Wenatchee to 135 days on the eastern plateau (Peven 2002).

### Vegetation

Vegetation in the UMM Subbasin consists mainly of steppe and shrub-steppe vegetation (Table 3). Forest vegetation is generally confined to mountain slopes with sufficient precipitation (MCMCP 1995). Present vegetative communities vary widely from historic conditions because much of the UMM Subbasin is cultivated or grazed by livestock.

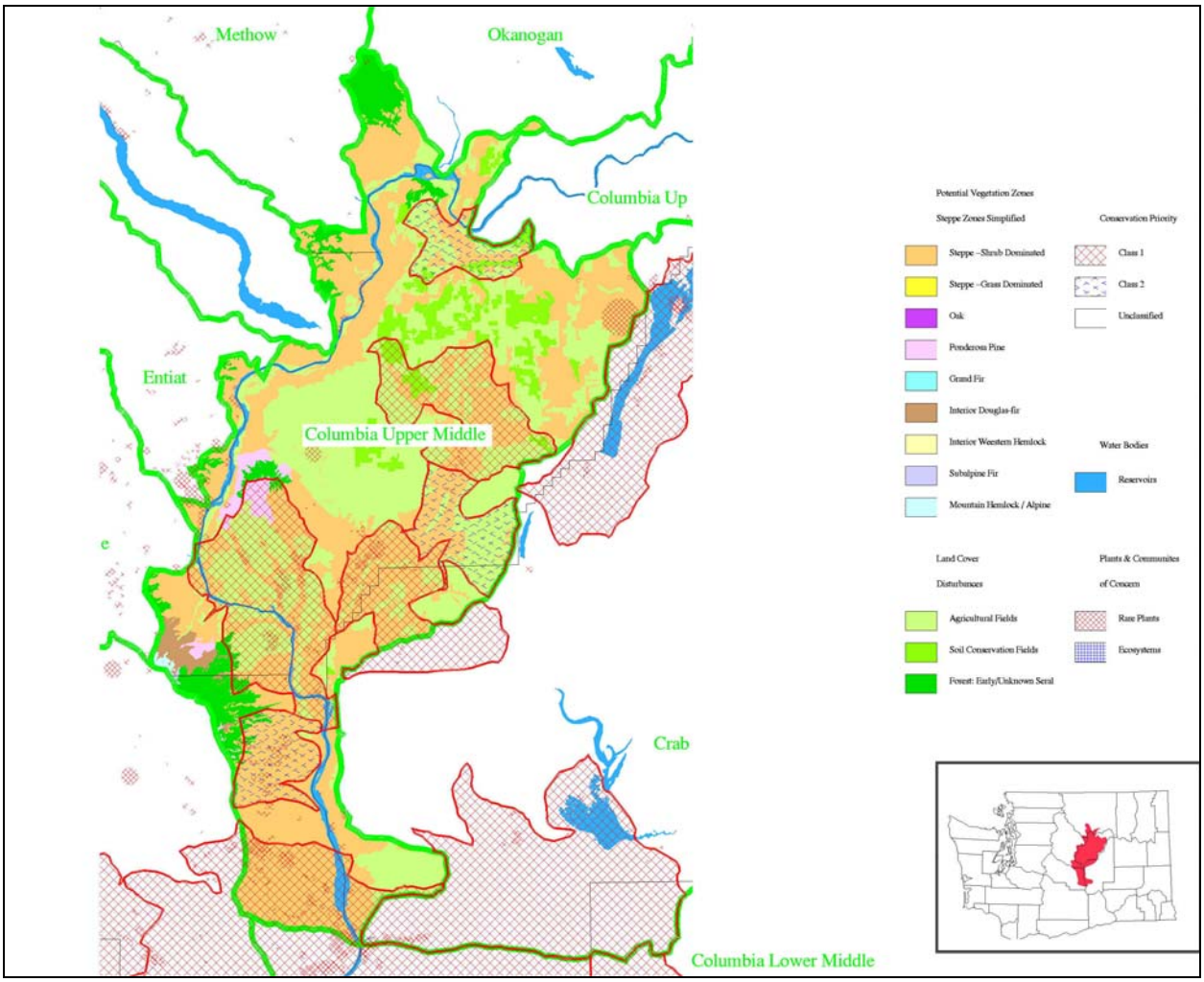
**Table 3** Land types and acreage in the UMM Subbasin, WA.

| Basic Land Type | Acres | Percent |
|---|---|---|
| Agriculture | 744,828 | 12.4 |
| Forest | 3,477,765 | 57.8 |
| Rock | 2,766 | 0.0 |
| Shrub/Steppe | 1,667,509 | 27.7 |
| Urban | 31,227 | 0.5 |
| Water | 90,742 | 1.5 |
| TOTAL | 6,014,837 | |

*Washington GAP Analysis Data- total difference because of data alignment with Canadian Border in GIS.

#### *Rare Plant Communities*

The UMM Subbasin contains 91 rare plant communities (Table 1, Appendix A). Approximately 30 percent of the rare plant communities are associated with shrubsteppe habitat, 20 percent with riparian or wetland habitats, and 50 percent with upland forest habitat. Rare/high-quality plant occurrences and communities are illustrated in (Figure 4).

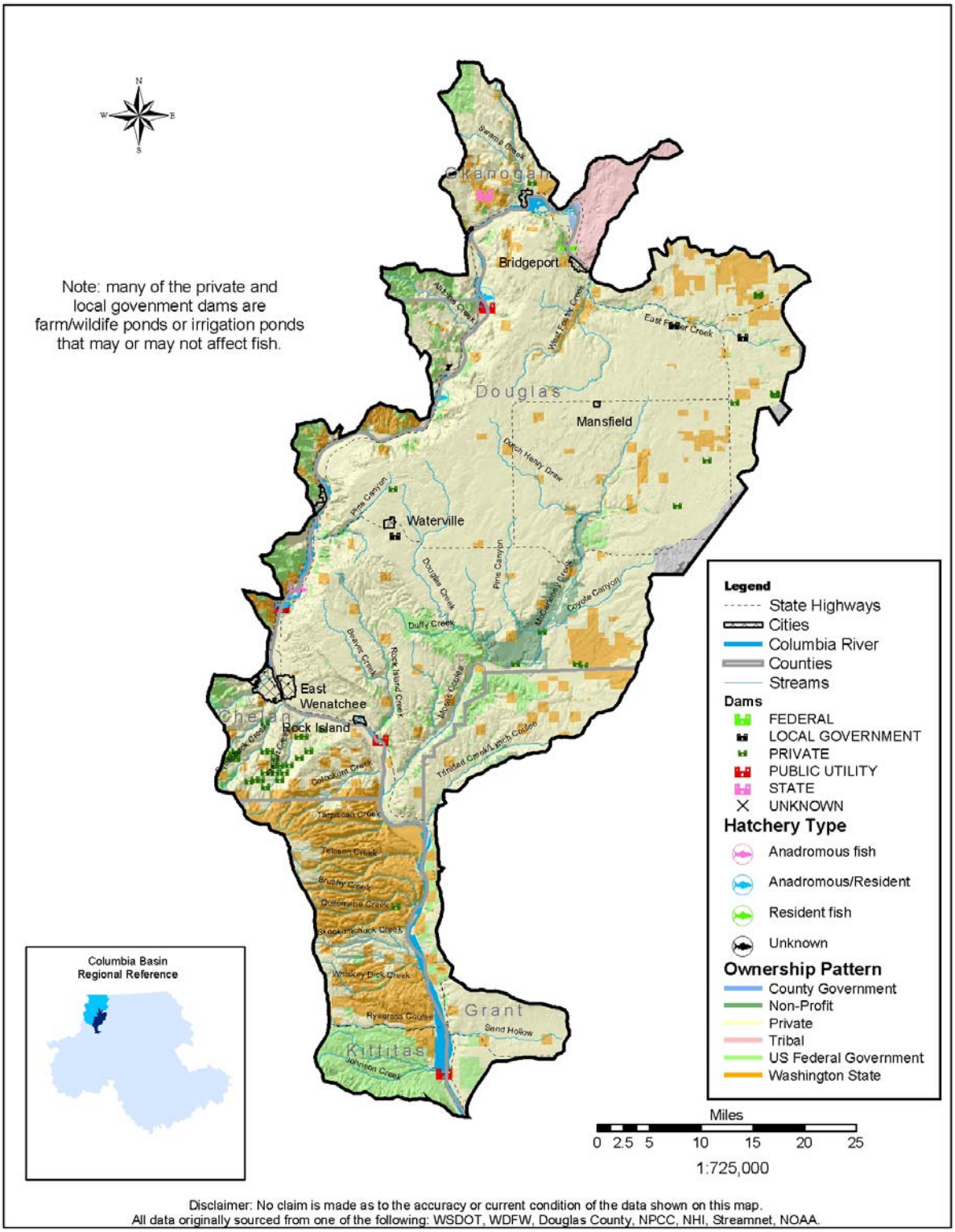



(Cassidy 1997, WNHP 2003)

**Figure 4** Rare plant occurrence and high quality plant communitities in the UMM Subbasin, WA

### 3.2.2 Jurisdictions and Land Ownership

Approximately 27 % of the UMM Subbasin is in federal, state, tribal, and local government ownership, while the remaining 73 % is privately owned or owned by non-government organizations (NGOs) (Figure 5 and Table 4). Privately held lands in the Subbasin comprise 12 % of the entire CCP (Table 5).




(DCTLS 2004)

**Figure 5** Land ownership in the UMM Subbasin, WA.

**Table 4** Land ownership in the UMM Subbasin, WA. (based on parcel level data from Chelan, Douglas, Grant, and Okanogan counties and WDFW data for Kittitas County)

| Owner | Acres | Percent |
|---|---|---|
| County Government (partial) | 1,216 | 0.02 |
| Private | 2,189,878 | 35.1 |
| Tribal | 341,051 | 5.5 |
| US Federal Government | 3,011,173 | 48.3 |
| Washington State | 694,273 | 11.1 |
| TOTAL | 6,237,591 | |

**Table 5** Land Ownership of the CCP, WA. (IBIS 2003)

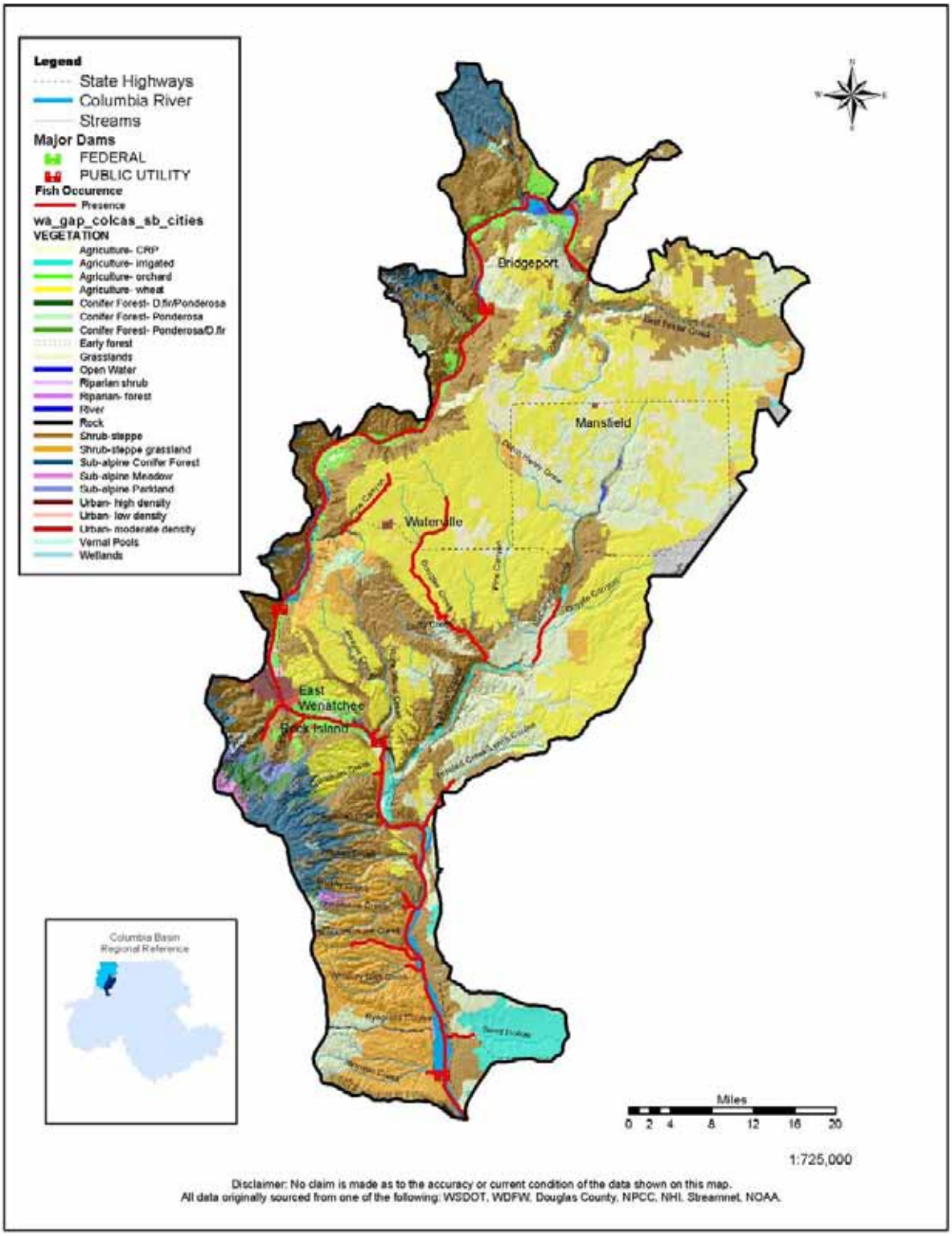
| Subbasin | Federal Lands (acres) | Tribal Lands (acres) | State Lands (acres) | Local Gov't Lands (acres) | Private Lands (acres) | Water (acres) | Total (Subbasin) (acres) |
|---|---|---|---|---|---|---|---|
| Entiat | 247,064 | 0 | 13,629 | 0 | 37,670 | 0 | 298,363 |
| Lake Chelan | 517,883 | 0 | 3,549 | 0 | 78,493 | 0 | 599,925 |
| Wenatchee | 682,295 | 0 | 11,836 | 0 | 159,182 | 0 | 853,313 |
| Methow | 985,234 | 0 | 55,836 | 0 | 126,724 | 0 | 1,167,794 |
| Okanogan | 400,496 | 311,826 | 261,598 | 0 | 516,159 | 0 | 1,490,079 |
| Upper Middle Mainstem | 124,492 | 29,507 | 284,996 | 1,216 | 1,167,528 | 0 | 1,607,739 |
| Crab | 303,136 | 0 | 13,629 | 25 | 2,681,363 | 16,100 | 3,014,253 |
| Total (CCP) | 3,260,600 | 341,333 | 645,073 | 1,241 | 4,767,1197,119 | 16,100 | 47,675,461,466 |

Please note that the IBIS ownership data is not up to date. Municipal owned land is significant in some areas and is not reflected.

### 3.2.3 Land Use and Demographics

Major land uses in the Subbasin include agriculture, livestock grazing, and suburban development (Figure 6). As the human population in UMM Subbasin counties grows (Figure 6 Land use and potential vegetation zones in the UMM Subbasin, WA.

Table 6), pressure on natural resources intensifies. For more information about the effects on wildlife habitat from changes in land use from circa 1850 to today, see section 3.2 (Ashley and Stovall, unpub. rpt., 2004). Two cities with populations over 10,000 residents and numerous small towns are distributed throughout the Subbasin.




(DCTLS 2004)

**Figure 6** Land use and potential vegetation zones in the UMM Subbasin, WA.

**Table 6** Population of UMM Subbasin counties, 1990-2020

| County | 1990 | 2000 | 2010 Proj. | 2020 Proj. | % Increase 1990-2020 | Area (sq. mi.) | 2000 People/ sq. mi. | 2020 People/ sq. mi. |
|---|---|---|---|---|---|---|---|---|
| Douglas | 26,205 | 32,603 | 39,196 | 44,920 | 71.4 | 1,821 | 17.9 | 24.7 |
| Chelan | 52,250 | 66,616 | 75,993 | 85,864 | 64.3 | 2,921 | 22.8 | 29.4 |
| Grant | 54,758 | 74,698 | 88,331 | 95,715 | 74.7 | 2,681 | 27.9 | 35.7 |
| Kittitas | 26,725 | 33,362 | 36,742 | 41,776 | 56.3 | 2,297 | 14.5 | 18.2 |
| Okanogan | 33,350 | 39,564 | 44,061 | 47,920 | 43.6 | 5,317 | 7.4 | 9.0 |

U.S. Census Bureau, 1990 and 2000, Projected from Washington State Office of Financial Management website.

### Urban and Rural Development

The population of Douglas County (**Table 6**) increased by 24% between 1990 and 2000 (26,205 to 32,603 people) and is expected to increase by 71.4% above 1990 figures by 2020 (26,205 to 49,920 people). This represents an increase from 14.3 people/sq. mi. in 1990 to 24.4 people/sq. mi. in 2020. Two cities within the UMM Subbasin have populations over 10,000 residents and numerous small towns are distributed throughout the Subbasin. The other counties are experiencing similar trends in population growth.

Suburban development, agriculture, and rangelands are significant land uses with the UMM Subbasin. Although urban areas comprise only 0.5 % of the UMM Subbasin, much of the urban and rural development has taken place at lower elevations along the Columbia River shoreline, between Wanapum and Chief Joseph dams, and has had significant impacts on fish and wildife habitat. As the human population continues to grow, urban sprawl and rural development will place increasing pressure on natural resources.

### Agriculture

Historically, the majority of the UMM Subbasin was shrub-steppe habitat (Daubenmire 1970). Today, agricultural lands cover large portions of the UMM Subbasin. Orchards dominate the Columbia River corridor between Chief Joseph and Rock Island dams, and dryland farming and ranching are the dominant agricultural practices on the eastern plateau. Small areas of irrigated cropland are also present on the eastern side of the UMM in Moses Coulee and the Grant County portion of the subbasin.

### Federal Land Management

The USFS manages land in the Entiat Ranger District, on the Wenatchee portion of the Wenatchee National Forest. The land is managed according to the Wenatchee National Forest Land and Resource Management Plan (the Forest Plan) (USDA 1990), as amended by the Northwest Forest Plan (USFS and BLM 1994a). The Forest Plan divides the land into management areas, each with a management prescription based on unique habitat conditions. The majority of National Forest land in the UMM Subbasin is managed for multiple uses,

including deer and elk winter range, timber production, livestock grazing, recreation, and research.

The BLM manages 81,161 acres in the UMM Subbasin. Most of the BLM lands within the subbasin are shrubsteppe habitat. The Spokane Resource Management Plan provides the general management direction for BLM administered lands within the subbasin as required by the Federal Land Policy and Management Act of 1976. Under this act the BLM is required to manage public lands to protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use. The BLM is required by the CWA to ensure that activities on administered lands comply with requirements concerning the discharge or run-off of pollutants.

### State Land Management

Two primary agencies manage land within the UMM Subbasin- WDFW and the DNR. The WDFW administers seven wildlife areas totaling 176,436 acres. This land includes owned land, and land administered through agreements with other local, state, and federal landowners. Land owned by DNR east of the Columbia River is primarily shrubsteppe used for grazing or dryland wheat cultivation. West of the Columbia River, DNR holdings are primarily managed for timber production and grazing. The primary management focus of DNR lands is to support public schools and universities by selling products like timber, grazing leases, and wheat.

### Water development

#### *Hydropower System*

Five Columbia River dams are located within the UMM Subbasin: Chief Joseph, Wells, Rocky Reach, Rock Island, and Wanapum dams. All Columbia River dams, with the exception of Chief Joseph Dam, have upstream fish passage facilities and also provide downstream passage for juvenile salmonids through collection facilities or fish spill. These dams provide an economical power supply and numerous recreational and economic benefits.

#### *Irrigation*

There are four irrigation districts (Wenatchee Heights Irrigation District, Stemilt Irrigation District, the Lower Stemilt Irrigation District, and the Kennedy-Lockwood Irrigation District) and numerous private diversions operating in the Stemilt watershed (Andonaegui 2001). Other irrigation districts within the UMM Subbasin include the Palisades, (water pumped from an unconsolidated aquifer in Moses Coulee and from Douglas Creek), Bridgeport, Greater Wenatchee, and East Wenatchee. The latter three pump water from the Columbia and/or Wenatchee Rivers.

Irrigation projects have both positive and negative impacts on the small tributaries in the UMM Subbasin. Irrigation return flow from the Columbia Reclamation Irrigation Project provides increased summer flow in the Sand Hollow channel, and Trinidad Creek receives some small amounts from the same project. Sand Canyon Creek receives increased summer flow from the Wenatchee Reclamation District. An irrigation diversion structure located approximately 1.0

mile up Colockum Creek may block fish passage at low flows (B. Steele, pers. comm., 2001 in Andonaegui 2001). Two irrigation diversions are located on Douglas Creek approximately 0.25 miles from where the creek enters Moses Coulee. An irrigation dam is located on top of a natural falls at RM 1.03 on Foster Creek. It is 18 inches taller than the original falls that precluded all fish passage past this point.

Much of the Grant County portion of the UMM Subbasin is part of the Columbia Reclamation Irrigation Project and has extensive irrigated agriculture. This water originates in the Columbia River above Grand Coulee Dam and is transferred through the Banks Lake Equalization Project created by Dry Falls Dam.

#### Transportation

Along with hydropower and other human developments in the subbasin came the building of numerous roads and railways. Many culverts within the transportation network are barriers to fish migration and result in reduced habitat availability. Washington State Department of Transportation and FWS combined efforts to inventory state highway barriers which are now linked to the 303d Water Quality lists (Category 2). Watershed planning units have additionally sponsored, or been a part of, local inventories, such as Harza's report in Chelan County, and also assisted or lead the Limiting Factors Analysis by the Washington State Conservation Commission staff.

### 3.2.4 Hydrologic Conditions

#### Hydrography

The UMM Subbasin encompasses an estimated 1.6 million acres. The Columbia River travels about 130 miles through the subbasin. From river mile 545.1 near Chief Joseph Dam, the Columbia River flows in a westerly direction past the small communities of Bridgeport and Brewster, WA. At the eastern edge of the Cascade Mountains, the river turns and flows south to its southern boundary at river mile 415.8 by Wanapum Dam near Vantage, WA (Peven 2002).

Minor streams and Columbia River tributaries in the UMM Subbasin include: Foster, Rock Island, McCarteney and Douglas creeks (latter two drain into Moses Coulee) in Douglas County; Squilchuck, Stemilt, and Colockum creeks in Chelan County; Sand Hollow Wasteway and Trinidad Creek in Grant County; and Tekison, Brushy, Quilomene, Whiskey Dick, Tarpiscan, and Johnson creeks in Kittitas County. Jameson and Grimes Lakes are also found within this subbasin (Douglas County). Grand Coulee Equalization Reservoir (Banks Lake) and the Sun lakes border the UMM Subbasin on the east, but are not included within the boundary. The two largest watersheds located within the subbasin are the Foster Watershed Resource Inventory Area (WRIA) 50 and Moses Coulee WRIA 44. Several major tributaries ―the Okanogan, Methow, Chelan, Entiat, and Wenatchee rivers—also join this reach of the Columbia River, but are not included in the UMM Subbasin (Peven 2002).

#### Hydrology

Hydrology in the UMM Subbasin primarily reflects a snowmelt system. Generally, snow accumulates in the surrounding mountain areas from November to March, then melts and produces peak runoff during May and June. During late summer and fall, instream flows in tributary streams often decline substantially and remain relatively low through April. Heavy

rainfall in late fall or early winter can also lead to increased runoff and in the past, these rain-on-snow events in the eastern Cascades have caused some of the most significant flooding events in the subbasin (Peven 2002).

Average flow contributions from the four largest tributaries in the CCP (Okanogan, Methow, Entiat, and Wenatchee Rivers) provide 7,860 cfs to the Columbia River, while the upriver contribution from the Columbia Basin above Chief Joseph is 188,000 cfs, and the Canadian portion provides 99,200 cfs of average flow (EPA 2001).

Within the UMM Subbasin, Wanapum, Rock Island, Rocky Reach, and Wells dams impound the Columbia River. Instream flows within the UMM Subbasin are considered "run-of-river" with little storage capacity present in the reservoirs above the four hydroelectric projects. Rock Island was the first hydroelectric project to span the Columbia River and was completed in 1933. Wells Dam, which began operating in 1967, is the most recent hydroelectric project completed on the Columbia River in the subbasin (Peven 2002).

Hydroelectric operations at Grand Coulee Dam greatly influence river flows for downstream hydroelectric operations (Peven 2002). Changes in storage reservoir operations for fish passage flow augmentation, flood control and power production have resulted in reduced flows from January through April and increased flow from May through August.

**Water quality**

The Columbia River has been classified by Ecology as "Class A" water. On a scale ranging from Class AA (extraordinary) to Class C (fair), Class A waters are rated as excellent. State and federal regulations require that Class A waters meet or exceed certain requirements for all uses (Peven 2002).

While water quality in the UMM Subbasin is good compared to other rivers in the United States, there is still cause for concern. Primary concerns include levels of dissolved gases, changes in stream temperatures, turbidity levels and exposure to environmental contaminates above biological thresholds for fish species utilizing the river. These concerns are generally related to hydropower production, past mining practices (Canada and Spokane River are or have been major sources above the UMM Subbasin planning area), and agriculture. The hydroelectric projects on the Columbia River in the UMM Subbasin are "run-of-river" with reservoirs that have little storage capacity. Water velocities are generally fast enough to prevent the formation of a thermocline and the associated depletion of oxygen in deeper waters. Water quality parameters affected by hydropower production, include TDG, water temperature, dissolved oxygen, turbidity, suspended sediments and nutrients. The status of each of these parameters in the UMM Subbasin is summarized below (Peven 2002).

The federal Clean Water Act, adopted in 1972, requires that all states restore their waters to be "fishable and swimmable." The Clean Water Act established a process to identify and clean up polluted waters. Every two years, all states are required to prepare a list of waterbodies that do not meet water quality standards. This list is called the 303(d) list because the process is described in Section 303(d) of the Clean Water Act. The 2002-2004 Washington Department of Ecology Proposed Assessment (303d list review) shows several waterbodies have impaired water quality. A summary of some waterbodies in the UMM Subbasin is listed in Table 7 for Category 5 (requires a TMDL) and Category 2, waters of concern. For details please refer to the WDOE

website: http://www.ecy.wa.gov/. Not listed is Foster Creek, which, according to Foster Creek Conservation District data 2000-2003, has peak summer temperatures that exceed the standard (FCCD, unpublished monitoring data, 2003).

**Table 7** Water quality parameters for some waterbodies in the UMM Subbasin, WA.

| Water body | Parameter | WRIA (40,41,44,50) | Category |
|---|---|---|---|
| Columbia River | Temperature | 40, 41, 44, 50 | 5 |
| | Total Dissolved Gas | 40, 41, 44, 50 | 5 |
| | Temperature | 50 | 2 |
| | Total Dissolved Gas | 44, 50 | 2 |
| | pH | 40, 41 | 2 |
| | Dissolved Oxygen | 41 | 2 |
| | 3,3-Dichlorobenzidine | 40 | 2 |
| | Benzo(a)pyrene | 40 | 2 |
| | Heptachlor | 40 | 2 |
| | Mercury | 40 | 2 |
| Grimes Lake | Total Phosphorus | 44 | 2 |
| Jameson Lake | Total Phosphorus | 44 | 2 |
| Black Lake | Total Phosphorus | 40 | 2 |
| Sand Hollow Wasteway | pH | 41 | 5 |
| | Temperature | 41 | 5 |

(WDOE 2004)

Grant County PUD (2003a) measured physical parameters to describe Columbia River water quality attributes as a portion of their relicensing application. This provides a way to compare and track seasonal and historical trends in water quality status. These parameters also form the basis for comparison with water quality standards. Key physical parameters include temperature, TDG concentrations, DO concentrations, acidity (pH), and turbidity. Other physical parameters commonly collected from reservoirs are conductivity, alkalinity, and light attenuation measurements. More detailed information on these parameters is provided in Normandeau et al. (2000) and Juul (2003).

Grant PUD performed detailed comparisons of available water quality data with criteria for state standards. Juul (2003) compared TDG, pH and turbidity to binomial distribution exceedence limits described in Ecology Policy 1-11. This comparison showed that TDG failed to meet the binomial distribution limits, but pH and turbidity were well within the binomial distribution limits for all data analyzed. However, as noted earlier, one must understand that MCCC representatives attempt to maximize spill levels and manage for compliance with the 120% tailrace criteria while tending to de-emphasize the 115% forebay criteria.

Ecology uses different comparison methods for fecal coliform bacteria, but all samples were well below the standard. In addition, nearly all DO measurements were above 8 mg/L with only two

historical measurements of 7.6 mg/L and 7.5 mg/L taken in 1969 and 1987, respectively. The remaining 457 measurements were all above 8.0 mg/L (Normandeau Associates 2003).

Comparisons of temperature data to standards are much more complex, because the standards contain both special conditions and exceptions for situations where natural conditions already exceed the standard. The 20°C special condition below Priest Rapids Dam allowed for straightforward comparisons. From 1999 through 2001, over 22,000 hourly temperature measurements below Priest Rapids Dam contained not one hourly measurement greater than 20°C; showing remarkable compliance with the special condition standard. During warmer weather in 1995 and 1998, 12-13% of hourly measurements were in excess of 20°C, with maximum measurements being about 1°C above the 20°C special condition (Normandeau Associates 2003). However, naturally warm water conditions are not considered violations of water quality standards.

Comparisons to the 18°C are not as simple because the policy guidance and temperature standard considers natural conditions. To estimate natural conditions, Juul (2003) used historical data from Rock Island Dam during the 1933-41 time period when it was the only Columbia River dam and its very limited storage and low height would have minimal effects on temperature. Review of this data showed that high percentages of temperature readings were greater than 18°C with some July through September periods showing nearly 100% of temperature measurements greater than the present-day standard. While large percentages of available data (Normandeau Associates 2003) are greater than the 18°C criteria, because of the natural conditions, these values are not considered violations of water quality standards.

**Water uses**

Flows in the Columbia River are regulated and managed to provide for hydropower production, flood control, fish passage, irrigation, and other uses. Instream flows for the Columbia River were first established in 1980 under the Instream Resources Protection Program (codified in Chapter 173-563 WAC). From 1980 to 1997, any water rights issued were made subject to interruption should Columbia River Instream Flows not be met. In response to the federal protection of salmonids in the Columbia and Snake River Systems through Endangered Species Act listings in December of 1991, in the spring of 1992 Ecology issued an order placing a moratorium on further allocation of water from the Columbia River. Legislative action in 1997 eliminated Columbia River instream flows and moratorium for all future water resource decisions. However, streamflow monitoring continues for the management of hundreds of water use authorizations with priority dates between 1980 and 1997. In water year 2001, enforcement and other management actions were taken by Ecology as, for the first time, instream flows were not met. Monitoring and management of streamflow will continue as these water rights will continue to be subject to the 1980 instream flows (Peven 2002).

## 3.3 Guiding Principles

The Guiding Principles are sets of statements to clarify the scope, analysis, and limitations of this document. In addition, there are two visions: one is that of the NPCC and the other was developed through local planning processes and adapted for this Subbasin Plan. The Guiding Principles are divided into three major parts: Vision, planning assumptions, and foundation principles.

### 3.3.1 Vision

As quoted from NPCC's Columbia Basin Fish and Wildlife Program (2000), the overall vision for the NPCC Fish and Wildlife program is:

> The vision for this program is a Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, mitigating across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem and providing the benefits from fish and wildlife valued by the people of the region. This ecosystem provides abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest and the conditions that allow for the recovery of the fish and wildlife affected by the operation of the hydrosystem and listed under the Endangered Species Act.
>
> Wherever feasible, this program will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin. In those places where this is not feasible, other methods that are compatible with naturally reproducing fish and wildlife populations will be used. Where impacts have irrevocably changed the ecosystem, the program will protect and enhance the habitat and species assemblages compatible with the altered ecosystem. Actions taken under this program must be cost-effective and consistent with an adequate, efficient, economical and reliable electrical power supply.

Consistent with the 2000 Columbia Basin Fish and Wildlife Program's vision, yet tailored specifically to the geographic region of the UMM Subbasin and its citizenry. The Vision Statement for the subbasin is largely based on the Douglas County Watershed Planning Association Goal Statements for water resources. They are based on a sustainable future for the landscape, the economy, and the people within the UMM Subbasin.

Our vision for the landscape is to balance habitat conservation with human uses to ensure the long-term health of plant, fish, wildlife and human communities.

Our vision for the economy is based on efficient management and use of natural resources including reliable water supplies, fish and wildlife populations, and aquatic and terrestrial habitats.

Our vision for the people is to manage natural resources to promote social and economic well-being and to improve or maintain our quality of life. We will work together to foster increased understanding of the importance of natural resource conservation.

The vision and subbasin plan is the outcome of an open process and is intended to provide a framework under which future projects can be developed and implemented. Actions taken in the subbasin should be consistent with the UMM Subbasin Plan (Subbasin Plan) the NPCC Columbia Basin Fish and Wildlife Program, the CWA, and the ESA.

### 3.3.2 Planning Assumptions

As a part of this vision, the Subbasin Plan adopts the following policy judgments and planning assumptions:

- The ultimate success of the projects, processes, and programs used to implement the Subbasin Plan will require a cooperative and collaborative approach that balances federal and state mandates to protect fish and wildlife with economies, customs, cultures, subsistence, and recreational opportunities within the basin.
- The Subbasin Plan is not a land use management plan and contains no regulatory authority.
- *No single activity is sufficient to recover and rebuild fish and wildlife species in the UMM Subbasin or in the Columbia River Basin. Successful protection, mitigation, and recovery efforts must involve a broad range of strategies for habitat protection and improvement, as well as improvements to the operations of the hydrosystem, effective and equitable harvest management, and the continued incorporation of artificial production.
- *The BPA should make available sufficient funds to implement projects developed within the framework provided by this plan in a timely fashion.
- *This is a habitat-based program, for rebuilding healthy, naturally producing fish and wildlife populations by protecting, mitigating, and restoring habitats. Artificial production and other non-natural interventions should be consistent with the central effort to protect and restore habitat and avoid adverse impacts on native fish and wildlife species.
- *It is important to consider out-of-basin effects on fish and wildlife populations.
- *There is an obligation to provide fish and wildlife mitigation where habitat has been permanently lost because of hydroelectric development. Artificial production of fish may be used to replace capacity, bolster productivity, and alleviate harvest pressure on weak, naturally spawning resident and anadromous fish populations. Restoration of anadromous fish into areas blocked by dams should be actively pursued where feasible.
- *Management actions, including artificial production, must have an experimental, adaptive management design. This design will allow managers to evaluate benefits of management actions and address scientific uncertainties.
- *Salmon harvest can provide significant cultural, recreational, and economic benefits to the region. Harvest rates should be based on population-specific adult escapement objectives designed to protect and recover naturally spawning populations.
- *Achieving the vision requires that habitat management, artificial production, harvest, and hydrosystem operation are coordinated at the subbasin, CCP, and basin levels, including actions not funded by this program.
- Implementation of subbasin plans should include participation stakeholders at the subbasin and regional level.

* Adapted from and consistent with the NPCC's 2000 Columbia Basin NPCC Fish and Wildlife Program.

These specific planning assumptions are to be incorporated into projects developed within the framework provided by this Subbasin Plan. Actions taken in the UMM Subbasin should be consistent with these planning assumptions.

### 3.3.3 Foundation Principles

These foundation principles reflect the natural and cultural systems in the UMM Subbasin and are based on the following items:

- Economies, customs, cultures, subsistence and recreational opportunities within the basin
- Regulation of land use
- Out of basin effects
- Long term sustainability
- Fish and wildlife habitat
- Connectivity

**Foundation Principle 1: Economies, customs, cultures, subsistence and recreational opportunities within the basin**

The people of the UMM Subbasin are diverse and independent. They value a wide range of customs and cultures. Actions, strategies, programs, and projects for fish and wildlife and their habitats will be more successful if developed in context with the basin's economic needs and opportunities, and with an understanding of the impacts on the human environment in the basin

***Supporting Principles:***

- Activities associated with the Subbasin Plan, undertaken to protect and/or restore fish and wildlife, have the potential to improve opportunities for cultural and recreational uses and thus, social and economic well-being of the communities. Strategies and projects should be reviewed and evaluated based on the potential for such positive impacts, and methods developed to measure and monitor the success of such efforts.
- Costs and benefits of implementing Subbasin Plan actions should be weighed. Alternatives that achieve the greatest benefits at the least costs are preferred.
- Subbasin Plan actions are undertaken with the understanding that fish and wildlife resources and their habitat are a cultural heritage common to the people of the UMM Subbasin, and such actions play a key role in the long-term sustainability of the environment. Projects implemented based on the Subbasin Plan will be consistent with federal tribal trust responsibilities.
- Recreational opportunities are provided for diverse user groups, consistent with conservation and enhancement of subbasin resources.
- Programs and projects are monitored and evaluated for effectiveness and may be altered as necessary to achieve the intended results.

**Foundation Principle 2: Regulation of land use**

Protection and/or restoration strategies that affect land use will require action (both for the adoption and implementation) by local, state, federal and/or tribal governments, and close, coordinated relationships among these groups.

***Supporting Principles:***

- No existing water right is affected by actions derived from the Subbasin Plan without the consent of the holder of that right.
- The processes of subbasin plan preparation, implementation (including project development and planning), and amendment are open, voluntary, and collaborative.
- Subbasin Plan actions acknowledge the statutory authority of local, state, federal, and tribal governments and existing plans, programs, and processes.
- Future land use planning and activities that involve potential impacts on fish and wildlife and their habitats should be fully discussed with agencies and tribes with management authority prior to implementation.

**Foundation Principle 3: Out of basin effects**

The Columbia River Basin is characterized by natural environmental variability and established human urban and rural activities. Restoration and management of fish and wildlife and their habitats in the UMM Subbasin must consider effects within the entire Columbia River Basin ecosystem.

***Supporting Principles:***

- Strategies for recovery or maintenance of self-sustaining populations need to be evaluated within the context of the entire life history of the populations, not just within the life history stages within the UMM Subbasin.
- Important environmental attributes that determine the distribution and productivity of fish and wildlife populations have been influenced by natural and anthropogenic activities in and outside the subbasin.

**Foundation Principle 4: Long-term sustainability**

Fish and wildlife adapt to their habitat through life history characteristics, genetic diversity, and metapopulation organization. They adapt to spatial and temporal environmental variations through diversity and population structure. Diversity promotes production and long-term persistence at the species level.

***Supporting Principles***

- In addition to fish and wildlife populations that support the custom, culture, subsistence and recreational opportunities in the subbasin, indigenous fish and wildlife species should be enhanced and restored to be self-sustaining.
- Selection of a broad range of fish and wildlife focal species provides a basis for developing holistic management strategies.

- Biological inter- and intra-specific interactions shape fish and wildlife populations. Restoration of individual populations may not be possible without restoring other fish and wildlife populations with which they co-evolved.
- Most native fish and wildlife populations are linked across large areas and do not consider political borders. An important component for recovery of depressed populations is to maintain or re-create large-scale spatial diversity.
- Populations with the least amount of change from their historic spatial diversity are the easiest to protect and maintain.
- Small populations are at greater risk of extinction than large populations, primarily because they are more vulnerable to environmental changes and catastrophic events.

**Foundation Principle 5: Fish and wildlife habitat**

Fish and wildlife productivity requires a network of interconnected habitats that are created, altered, or maintained by both natural and human processes in terrestrial, freshwater, estuary, and ocean areas.

***Supporting Principles:***

- The habitat in the UMM Subbasin should be capable of supporting self-sustaining, harvestable, and diverse populations of fish and wildlife.
- The UMM Subbasin is a dynamic system that will continue to change through natural events and human activities.

**Foundation Principle 6: Biological Interactions and Connectivity**

Ecosystem attributes affect population, abundance, and diversity of the biotic community. Connectivity among ecosystem attributes is required for assemblages of species that share requirements for similar ecosystem habitat attributes.

***Supporting Principles:***

- Fish and wildlife are dependent upon properly functioning environments, and the processes that sustain them, to maintain sustainable, harvestable, and diverse populations.
- Native fish and wildlife populations have been negatively impacted by changes to the physical characteristics and connectivity of their habitats within the UMM Subbasin. It is critical to reconnect the native ranges of fish and wildlife species.