Lessons Learned
Interstate Coordination of Columbia/Snake Mainstem TMDLs

Introduction

The Clean Water Act requires states to identify and list lakes, rivers and streams that do not meet water quality standards. For each of those water bodies, a state is required to establish a Total Maximum Daily Load (TMDL) for each non-attainment pollutant, including non-point source pollutants, at a level necessary to ensure that applicable water quality standards can be obtained. A TMDL is the amount of pollution a waterbody can absorb and still support it's designated uses, such as aquatic life, drinking water, recreational.

In implementing TMDLs, the states are often faced with watersheds that encompass multiple state, federal, tribal, and in some cases, international jurisdictions. Since states and tribes individually determine impaired waters for Section 303(d) listings, there can be inconsistencies crossing state and tribal boundaries on pollution thresholds and priorities. This inconsistency can lead to a watershed being listed as a top priority in one state and a low priority for another state. The management of interstate watersheds will require new tools, guidelines, and commitment for coordinating the development of such corresponding interstate TMDLs.

Under a grant from the Environmental Protection Agency (EPA), the Western Governors' Association (WGA) undertook a pilot program to assist in the development of tools and guidelines for coordinating interstate watersheds. WGA asked member states to nominate impaired interstate watersheds where facilitation from WGA in coordinating development of TMDLs would be beneficial to the respective states and serve as a good model for other interstate TMDLs. Proposals had to be accompanied by a letter from the governor, thus ensuring the state's commitment. Additional desirable criteria included acceptable TMDL time lines, endangered species, and tribal participation. WGA selected the Columbia and Snake River Mainstem for Total Dissolved Gas and Temperature TMDLs.

In April of 2001 WGA started working with the states and EPA to identify WGA's role in the Columbia and Snake River Mainstem TMDLs. Since work had already been initiated on a couple of the TMDLs WGA ended up melding into an existing framework and taking the task of organizing a basin-wide outreach program and assisting in the coordination between the individual states and EPA. This role included organizing meetings, establishing agendas, facilitating issues, developing a public participation plan and outreach materials.

I Basin Description

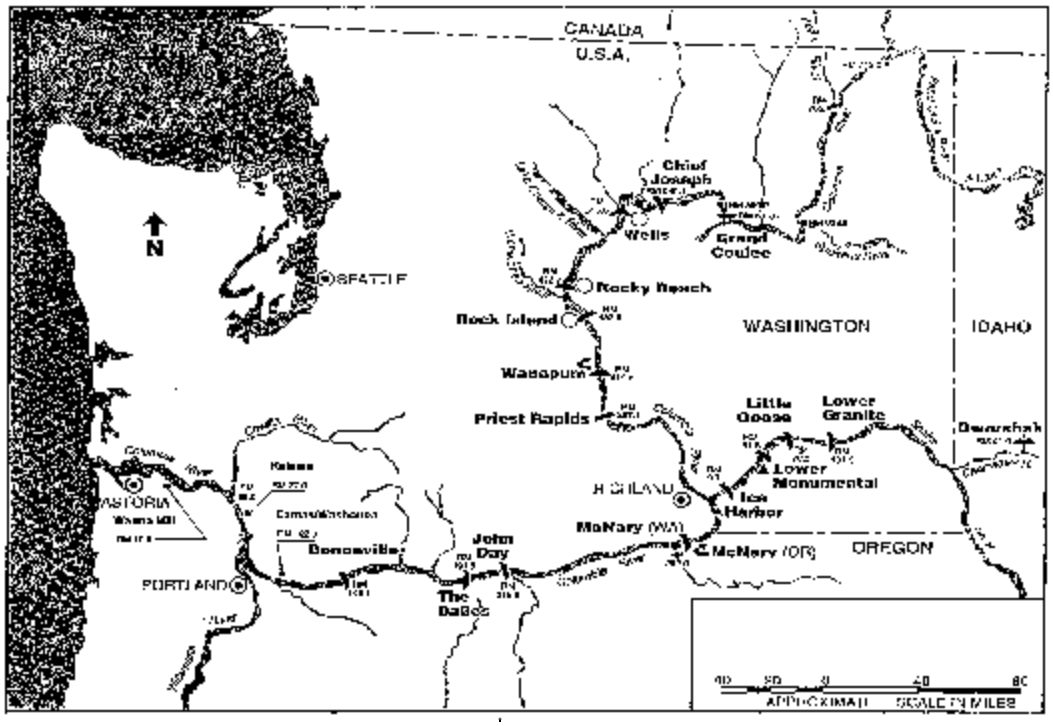

Figure 1-1. The Columbia and Snake Rivers in the study area.

Geography

The Columbia River drains more than 259,000 square miles of southeastern British Columbia in Canada and the states of Idaho, Oregon, Washington, and Wyoming. The Columbia rises in the Rocky Mountain Trench and flows more than 400 miles through the rugged, glaciated mountains of southeastern British Columbia before it reaches the U.S.-Canada border near Castlegar, British Columbia. It enters the United States from the Okanagan Highland Province, a mountainous area of Precambrian-early Paleozoic marine sediments. The Columbia crosses the western margin of the Columbia Basin—a broad, arid plateau formed by Miocene lava flows of the Columbia Basalt—and flows south across the state of Washington. Near Pasco, Washington, and the confluence with the Snake River, the Columbia turns west, forms the border between Oregon and Washington, and flows more than 300 miles through the Cascade Mountain Range to the Pacific Ocean near Astoria, Oregon.

The headwaters of the Snake River are in Jackson Lake in the Teton Mountains of Wyoming at an elevation of 7,000 feet above sea level. The river flows west across the Snake Plain, which is also a broad, arid plateau formed by Miocene lava flows of the Columbia Basalt. At the western edge of Idaho, it turns north and flows through a deeply incised canyon, emerging near Lewiston, Idaho. At Lewiston, the Snake joins the Clearwater River and flows west through the Palouse Country of eastern Washington, joining the Columbia near Pasco, Washington. The major tributaries of the Snake in Idaho within this project area are the Clearwater River and the Salmon River.

The Snake River is the Columbia's largest tributary. Other major tributaries in the project area include the Spokane, Yakima, Deschutes, and Willamette Rivers. The Spokane River begins in Lake Coeur d'Alene in Idaho and flows west through eastern Washington, entering the Columbia in Lake Franklin D. Roosevelt (Lake FDR). The Yakima River begins in the Cascade Mountains and flows east and south to join the Columbia near the Tri-Cities. Both the Deschutes and Willamette rivers have their headwaters in Oregon; the Deschutes rises in central Oregon and flows north across lava flows of the Columbia Basalt, while the Willamette begins in the Cascade Mountains and flows west to the Willamette Valley, then north to join the Columbia near Portland, Oregon.

Climate

The climate of most of the Columbia River drainage is primarily of continental character, with cold winters and hot, dry summers. Precipitation varies widely, depending primarily on topographic influences. The interior Columbia Basin and Snake Plain generally receive less than 15 inches of precipitation annually, while annual precipitation can exceed 100 inches per year in some of the mountainous regions of Canada.

Air temperature also varies considerably, depending on location. Summertime temperatures in the Columbia Basin and Snake Plain exceed 100 ºF (37.8 ºC) for extended periods. Temperatures at higher elevations remain cooler. Winters are cold throughout the basin and heavy snow falls in the mountains. The snowbank accumulates throughout the winter months as a result of frequent passage of storm systems from the Pacific Ocean. Some of the snowbank is incorporated into the extensive system of glaciers in the basin; however, between the months of March and June, depending on elevation, much of the snowbank begins to melt. The resulting hydrograph is typical of a snowmelt regime, high spring runoff peaking in early to mid summer.

West of the Cascade Mountains, which includes the lower 150 miles of the Columbia River and all of the Willamette River, the climate has a more maritime character. Winter air temperatures at lower elevations are seldom below freezing, and summer air temperatures are seldom above 100 ºF (37.8 ºC) for long periods. Average annual precipitation west of the Cascades is more than 40 inches in most areas. Precipitation recorded at coastal stations is typically higher. Below about 5,000 feet, most of the precipitation falls as rain, with 70 percent or more falling between October and March.

II Problem Description

The decline of fish runs in the Columbia River Basin have resulted from 150 years of development, including hydropower development, hatchery production, fish harvest, water quality degradation and habitat loss across the basin. As a result, twelve stocks of fish in the Columbia River basin that are directly and/or indirectly impacted by the Columbia and Snake River dams are now listed as threatened or endangered under the Endangered Species Act (ESA). There are current exceedances of Clean Water Act (CWA) water quality standards, including Total Dissolved Gas (TDG) and temperature, that impact beneficial uses especially support for fish and other aquatic life, in the Columbia and Snake River mainstem. The state and tribal water quality standards for the Columbia River are based on

supporting the biological requirements for fish migration and spawning.

Hydropower Development

The hydroelectric dams on the Columbia and Snake Rivers produce an average of 18,500 megawatts of electricity annually and are the foundation of the Northwest's power supply. There are thirty four dams on the Columbia and Snake River, fourteen are federal multi-purpose projects which serve as the Federal Columbia River Power System (FCRPS). These projects also provide navigation, irrigation, flood control and recreation. The Bonneville Power Administration markets and distributes power to public and private utilities generated at the federal dams on the Columbia River and its tributaries. The U.S. entered into the Columbia River Treaty with Canada in 1964 to provide for the building of four storage reservoirs (three in Canada, and one in the U.S.) These reservoirs represent almost half of the water storage on the Columbia River system used for flood control and power generation.

The Columbia River and its tributaries have been developed to a high degree. The only segment of the Columbia River above Bonneville Dam that remains unimpounded is the Hanford Reach between Priest Rapids Dam (Columbia River Mile 397.1) and the confluence with the Snake River (Columbia River Mile 324.3). The 11 main stem hydroelectric projects in the United States (Table 1-1), from Grand Coulee Dam to Bonneville Dam, develop approximately 1,240 feet of the 1,290 feet of hydraulic head available in this segment of the Columbia River main stem. Hydroelectric and flow control projects on the main stem of the Columbia River and its tributaries in Canada have resulted in significant control of flow in the Upper Columbia and Kootenai River Basins. The Snake River is also nearly fully developed, with 19 dams on the main stem, four of them in the TMDL project area.

Table 1-1. Hydroelectric projects on the main stem Columbia and Snake Rivers included in the scope of the analysis

Project	River Mile	Start of Operation	Generating Capacity (megawatts)	Storage Capacity (1000s acre-feet)
Columbia River				
Grand Coulee	596.6	1942	6,494	8,290
Chief Joseph	545.1	1961	2,069	588
Wells	515.8	1967	774	281
Rocky Reach	473.7	1961	1,347	440
Rock Island	453.4	1933	622	132
Wanapum	415.8	1963	1,038	710
Priest Rapids	397.1	1961	907	231
McNary	292.0	1957	980	1,295
John Day	215.6	1971	2,160	2,294
The Dalles	191.5	1960	1,780	311
Bonneville	146.1	1938	1,050	761
Snake River				
Lower Granite	107.5	1975	810	474
Little Goose	70.3	1970	810	541

Lower Monumental	41.6	1969	810	351
Ice Harbor	9.7	1962	603	400

These dams and reservoirs serve many purposes, including irrigation, navigation, flood control, municipal and industrial water supply, recreation, and hydroelectric power generation. There are approximately 7 million acres of irrigated farmlands in the Columbia River Basin, including 3.3 million acres in Idaho, 0.4 million acres in Montana, 1.9 million acres in Washington, and 1.3 million acres in Oregon (Bonneville Power Administration et al., 1994). The system has the capacity for generating more than 20,000 megawatts of hydroelectric energy, and slack-water navigation now extends more than 460 river miles from the mouth at Astoria, Oregon, to Lewiston, Idaho.

In the United States, federal agencies, private power companies, and public utility districts own the dams in the Columbia River Basin. The Columbia Treaty between the United States and Canada governs transboundary issues related to the operation of dams and reservoirs on the Columbia River system in Canada.

Endangered Species

Two hundred distinct anadromous salmon stocks returned several million adult salmon and steelhead to the Columbia River prior to development of the basin. All five native eastern Pacific salmon species historically returned to the Columbia River, but today (with some exceptions) most chum, pink and wild coho stocks are extinct and the other species are at risk of extinction. In fact, 69 of the 200 stocks have been identified as extinct and 75 others are at risk of extinction in various parts of the basin. Historical estimates of average salmon runs in the portion of the Columbia Basin upstream of Bonneville Dam exceeded 5 to 11 million fish, but, as of 1995, average returns above Bonneville Dam were fewer than 500,000 fish and 80% of those were from hatcheries. The Independent Scientific Group concluded that the development of the Columbia River for hydropower, irrigation, navigation and other purposes has led to a reduction in both the quantity and quality of salmon habitat, and most critical, a disruption in the continuum of that habitat.

Table 1-2 lists the 12 stocks (or species under the ESA) listed by NMFS under the ESA and present within the TMDL project area.

Table 1-2 : The 12 species of Columbia Basin Salmonids listed under the Endangered Species Act and located in waters within the TMDL project area.

Listed Species	**Date Listed/Federal Register Notice**	**Date Critical Habitat Designated/ FR Notice**
Snake River Spring/Summer Chinook (*Oncorhynchus tshawytscha*)	04/22/92 [58 FR 14653]	12/28/93 [64 FR 57399] 10/2593 [64 FR 57399]
Snake River Fall Chinook (*O. tshawytscha*)	04/22/92 [57 FR 14653]	12/28/93 [58 FR 68543]
Upper Columbia River Spring Chinook (*O. tshawytscha*)	03/24/99 [64 FR 14308]	02/16/00 [65 FR 7764]
Upper Willamette River Chinook (*O. tshawytscha*)	03/24/99 [64 FR 14308]	02/16/00 [65 FR 7764]
Lower Columbia River Chinook (*O. tshawytscha*)	03/24/99 [64 FR 14308]	02/16/00 [65 FR 7764]
Snake River Steelhead (*O. mykiss*)	08/18/97 [62 FR 43937]	02/16/00 [65 FR 7764]
Upper Columbia River Steelhead (*O. mykiss*)	08/18/97 [62 FR 43937]	02/16/00 [65 FR 7764]
Middle Columbia River Steelhead (*O. mykiss*)	03/25/99 [64 FR 14517]	02/16/00 [65 FR 7764]
Upper Willamette River Steelhead (*O. mykiss*)	03/25/99 [64 FR 14517]	02/16/00 [65 FR 7764]
Lower Columbia River Steelhead (*O. mykiss*)	03/19/98 [63 FR 13347]	02/16/00 [65 FR 7764]
Columbia River chum (*O. keta*)	03/25/99 [64 FR 14508]	02/16/00 [65 FR 7764]
Snake River sockeye (*O. nerka*)	11/20/91 [56 FR 58619]	12/28/93 [58 FR 68543]

In 2000, the National Marine Fisheries Service (NMFS) issued a Biological Opinion on the Endangered Species Act listings of Columbia and Snake River salmon. The Biological Opinion identified reasonable and prudent alternatives for the "federal action agencies" (U.S. Army Corps of Engineers (Corps), Bureau of Reclamation and Bonneville Power Administration) to avoid jeopardy from the FCRPS on endangered and threatened species and identified an aggressive restoration strategy in lieu of near-term dam breaching. Dam breaching may be revisited as a result of fish recovery performance measure attainment. The background for restoration actions is complex and contentious involving four states, thirteen tribes and Canada, on issues such as governance, energy deregulation, tribal harvest, hatcheries, habitat, and hydropower. At the same time, the U.S. Fish and Wildlife Service also issued a Biological Opinion on impacts to ESA listed resident fish from the FCRPS.

Water Quality Standards

Water Quality Standards (WQS) for lakes, streams, rivers, wetlands and other surface waters are established by States and certain Indian tribes under the federal Clean Water Act (CWA). Water Quality Standards define the water quality goals of a water body by designating the use or uses to be made of the water, by setting criteria necessary to protect the uses and by preventing degradation of water quality through antidegradation provisions. They play an important role in protecting the quality of the waters of the United States by establishing the target water quality for waste water discharges, watershed management plans and TMDLs. Three states and one Indian tribe have WQS standards promulgated pursuant to section 303(c) of the CWA that apply to the Columbia and Snake Rivers: Idaho, Oregon, Washington and the Confederated Tribes of the Colville Reservation. Another Indian tribe, the Spokane Tribe of Indians has WQS for the Columbia River that have been adopted by the tribe but not yet approved by EPA. The WQS for each state and tribe for the portions of the Columbia and Snake Rivers subject to this TMDL are summarized below:

Idaho

Temperature

The WQS for Idaho are established in the Idaho Administrative Code, IDAPA 16.01.02, "Water Quality Standards and Wastewater Treatment Requirements." Section 130.02 establishes the designated aquatic life uses of the Snake River between the Salmon River and the Washington Border as cold water. Section 100.01.a defines cold water as "water quality appropriate for the protection and maintenance of a viable aquatic life community for cold water species." Section 250.02.b establishes the water quality criteria for temperature for the cold water aquatic life use designation as "Water temperature of twenty-two (22) ^{o}C or less with a maximum daily average of no greater than nineteen (19) ^{o}C."

Section 070.06 discusses natural background conditions: "Where natural background conditions from natural surface or groundwater sources exceed any applicable water quality criteria as determined by the Department, that background level shall become the applicable site-specific water quality criteria. Natural background means any physical, chemical, biological, or radiological condition existing in a water body due only to non-human sources. Natural background shall be established according to protocols established or approved by the Department consistent with 40 CFR 131.11. The Department may require additional or continuing monitoring of natural conditions."

Total Dissolved Gas

Idaho Administrative Code, IDAPA 58.01.02 "Water Quality Standards and Wastewater Treatment Requirements." Section 250.01 establishes the designated aquatic life uses on total dissolved gas as "The total concentration of dissolved gas not exceeding one hundred and ten (110%) if saturation at atmospheric pressure at the point of sample collection."

Oregon

Temperature

The WQS for temperature in Oregon are established in the Oregon Administrative Rules, OAR 340-040-0001 to OAR 340-040-0210, "State-Wide Water Quality Management Plan; Beneficial Uses, Policies, Standards, and Treatment Criteria for Oregon."

The Snake River in Oregon from the OR/WA Border at river mile 176 to the Salmon River at river mile 188 is included in this TMDL. The beneficial uses most sensitive to temperature in that reach are "Anadromous Fish Passage", "Salmonid Fish Rearing" and "Salmonid Fish Spawning". The temperature criteria applicable to this reach are:"

Unless specifically allowed under a Department-approved surface water temperature management plan as required under OAR 340-41-026(3)(a)(D), no measurable surface water temperature increase resulting from anthropogenic activities is allowed:

> (i) in a basin for which salmonid rearing is a designated beneficial use, and in which surface water temperatures exceed 64.0 ^{o}F (17.8 ^{o}C);
>
> (ii) In waters and periods of the year determined by the Department to support native salmonid spawning, egg incubation, and fry emergence from the egg and from the gravels in a basin which exceeds 55 ^{o}F (12.8 ^{o}C)."

The period of the year designated by the Oregon Department of Environmental Quality for the protection of salmonid spawning, egg incubation, and fry emergence in this area is October 1 through June 30.

The numeric temperature criteria are measured as the seven-day moving average of the daily maximum temperatures. If there is insufficient data to establish a seven-day average of maximum temperatures, the numeric criterion is applied as an instantaneous maximum. A measurable surface water increase is defined as 0.25 ^{o}F. Anthropogenic is defined to mean that which results from human activity.

The segment of the Columbia River which serves as the OR/WA border is included in this TMDL and subject to OR WQS. It stretches from the mouth of the river at river mile 0 to river mile 309. The temperature sensitive beneficial uses vary from segment to segment along that reach as shown in Table 3-1.

Table 3-1: Oregon designated uses along the Columbia River

Basin/Columbia River Miles	**Anadromous Fish Passage**	**Salmonid Fish Rearing**	**Salmonid Fish Spawning**	**Shad and Sturgeon Spawning/Rearing**
Lower Columbia / 0-86	X	X	X	
Willamette / 86-120	X	X	X	
Sandy / 120-147	X	X		
Hood / 147-203	X	X	X	X
Deschutes /203-218	X	X		
John Day / 218-247	X	X	X	
Umatilla / 247-309	X	Trout	Trout	

The temperature criterion applicable to the Columbia River in Oregon is:

> "Unless specifically allowed under a Department-approved surface water temperature management plan as required under OAR 340-41-026(3)(a)(D), no measurable surface water temperature increase resulting from anthropogenic activities is allowed in the Columbia River or its associated sloughs and channels from the mouth to river mile 309 when surface water temperatures exceed 68.0 ºF (20.0 ºC)."

Total Dissolved Gas

A. The concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not exceed 110 percent of saturation, except when stream flow exceeds the ten-year, seven-day (7Q10) average flood. However, for Hatchery receiving waters and waters of less than two feet in depth, the concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not

exceed 105 percent of saturation;

B. The Commission may modify the total dissolved gas criteria in the Columbia River for the purpose of allowing increased spill for salmonid migration. The Commission must find that:

1. Failure to act would result in greater harm to salmonid stock survival through in-river migration than would occur by increased spill;

2. The modified total dissolved gas criteria associated with the increased spill provides a reasonable balance of the risk of impairment due to elevated total dissolved gas to both resident biological communities and other migrating fish and to migrating adult and juvenile salmonids when compared to other options for in-river migration of salmon;

3. Adequate data will exist to determine compliance with the standards; and

4. Biological monitoring is occurring to document that the migratory salmonid and resident biological communities are being protected.

C. The Commission will give public notice and notify all known interested parties and will make provisions for opportunity to be heard and comment on the evidence presented by others, except that the Director may modify the total dissolved gas criteria for emergencies for a period not exceeding 48 hours;

D. The Commission may, at its discretion, consider alternative modes of migration.

Washington

Temperature

The WQS for Washington are established in the Washington Administrative Code, Chapter 173-201A WAC, "Water Quality Standards for Surface Waters of the State of Washington." Waters of the state are categorized in the Water Quality Standards into classes based on the character of the uses of each water body. The designated uses of the Columbia and Snakes rivers most sensitive to temperature are salmonid migration, rearing, spawning and harvesting; and other fish migration, rearing, spawning and harvesting. The most protected class on the Columbia Snake is "AA" or 'extraordinary' and this

applies only to Lake Roosevelt. The rest of the river is grouped into class "A" or 'excellent'. Under each of these classes, the temperature standard is applicable at any time of day or night. It applies toward fish protection in all portions of the rivers, including fish passage facilities and fish ladders within the dam structures.

Each class of water is assigned a maximum temperature. For class "AA" waters it is 16 °C. For class "A" waters it is 18 °C. However, for the Columbia River below Priest Rapids dam and for the entire Snake River, a special condition applies which is two degrees higher, 20 °C.

"Natural Conditions" for temperature means water temperatures as they are best assessed to have existed before any human-caused pollution or alterations. If the Snake or Columbia Rivers are found to have a natural condition higher than the standard, no additional temperature pollution can be added that will result in raising the temperature more than 0.3 °C. This would be measured as the cumulative impact of all dischargers as measured by the far-field TMDL model.

Incremental temperature increases are allowed when existing temperatures are below the standard as long as the standard maximum temperature is not exceeded. This is different for different parts of the river. Some of these increases are expressed as formulas. Generally, they are more restrictive for the upper portions of the rivers. The temperature criteria and incremental temperature increases applicable to the Snake and Columbia Rivers in Washington are summarized in Table 1-3.

Table 1-3: **Washington Water Quality Criteria along the Columbia River**

Water Body	***Criteria***
Columbia Main Stem from the coast to the Oregon/Washington Border	"Temperature shall not exceed 20 °C (68 F) due to human activities. When natural conditions exceed 20 °C (68 F) no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 °C (0.5 F) nor shall such temperature increases, at any time exceed 0.3 °C (0.5 F) due to a single source or 1.1 °C (2.0 F) due to all such activities combined."
Columbia Main Stem Priest Rapids Dam to OR/WA Border	"Temperature shall not exceed 20 °C (68 F) due to human activities. When natural conditions exceed 20 °C (68 F) no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 °C (0.5 F) nor shall such temperature increases, at any time exceed t=34/(T+9)."

Columbia Main Stem Priest Rapids to Grand Coulee	"Temperature shall not exceed 18 °C (64.4 F) due to human activities. When natural conditions exceed 18 °C (64.4 F) no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 °C (0.5 F). Incremental temperature increases resulting from point source activities shall not, at any time, exceed t=28/(T+7). Incremental increases resulting from nonpoint source activities shall not exceed 2.8 °C (5.4 F)."
Columbia Main Stem Above Grand Coulee	"Temperature shall not exceed 16 °C (60.8 F) due to human activities. When natural conditions exceed 16 °C (60.8 F) no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 °C (0.5 F). Incremental temperature increases resulting from point source activities shall not, at any time, exceed t=23/(T+5). Incremental increases resulting from nonpoint source activities shall not exceed 2.8 °C (5.4 F)."
Snake Main Stem from the Washington/Oregon Border to the Clearwater River.	"Temperature shall not exceed 20 °C (68 F) due to human activities. When natural conditions exceed 20 °C (68 F) no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 °C (0.5 F) nor shall such temperature increases, at any time exceed 0.3 °C (0.5 F) due to a single source or 1.1 °C (2.0 F) due to all such activities combined."
Snake Main Stem from the Clearwater River to the Columbia River.	"Temperature shall not exceed 20 °C (68 F) due to human activities. When natural conditions exceed 20 °C (68 F) no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 °C (0.5 F) nor shall such temperature increases, at any time exceed t=34/(T+9)."

t = the maximum permissible temperature increase measured at a mixing zone boundary

T = the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

Total Dissolved Gas

Washington's Water Quality Standards (Chapter 173-201A WAC) classify the reaches of the Columbia River covered by this TMDL as Class A. The following standards specifically apply:

(A) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(B) The water quality criteria herein established for total dissolved gas shall not apply when the stream flow exceeds the seven-day, ten-year (7Q10) frequency of flood.

(C) The total dissolved gas criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with a department approved gas abatement plan. This gas abatement plan must be accompanied by fisheries management and physical and biological monitoring plans. The elevated total dissolved gas levels are intended to allow increased fish passage without causing more harm to fish populations than caused by turbine fish passage. The specific allowances for total dissolved gas exceedances are listed as special conditions for sections of the Snake and Columbia rivers in WAC 173-201A-130 and as shown in the following exemption:

Special fish passage exemption for sections of the Snake and Columbia rivers: When spilling water at dams is necessary to aid fish passage, total dissolved gas must not exceed an average of on hundred fifteen percent as measured at Camas/Washougal below Bonneville dam or as measured in the forebays of the next downstream dams. Total dissolved gas must also not exceed an average of one hundred twenty percent as measured in the tailraces of each dam. These averages are based on the twelve highest hourly readings in any one day of total dissolved gas. In addition, there is a maximum total dissolved gas one hour average of one hundred twenty-five percent, relative to atmospheric pressure, during spillage for fish passage. These special conditions for total dissolved gas in the Snake and Columbia rivers are viewed as temporary and are to be reviewed by the year 2003.

Confederated Tribes of the Colville Reservation

Temperature

The WQS for the Confederated Tribes of the Colville Reservation were promulgated by EPA at 40 CFR 131.135. These standards apply to the Columbia River from the northern boundary of the reservation downstream to Wells Dam. The Columbia River is designated as "Class I (Extraordinary)" from the Northern Border of the Reservation to Chief Joseph Dam and "Class II (Excellent)" from Chief Joseph Dam to Wells Dam. The designated uses most sensitive to temperature are "Fish and shellfish: Salmonid migration, rearing, spawning and harvesting: other fish migration, rearing, spawning and harvesting." The temperature criterion for Class I waters is:

"(D) Temperature - shall not exceed 16.0 ^{o}C due to human activities. Temperature increases shall not, at any time, exceed t=23/(T+5).

(1) When natural conditions exceed 16.0 ^{o}C, no temperature increase will be allowed which

will raise the receiving water by greater than 0.3 °C.

(2) For purposes hereof, "t" represents the permissive temperature change across the dilution zone: and "T" represents the highest existing temperature in this water classification outside of any dilution zone.

(3) Provided that temperature increase resulting from nonpoint source activities shall not exceed 2.8 °C, and the maximum water temperature shall not exceed 16.3 °C."

The temperature criterion for Class II waters is:

"Temperature - shall not exceed 18.0 °C due to human activities. Temperature increases shall not, at any time, exceed t=28/(T+7).

(1) When natural conditions exceed 18.0 °C, no temperature increase will be allowed which will raise the receiving water by greater than 0.3 °C.

(2) For purposes hereof, "t" represents the permissive temperature change across the dilution zone: and "T" represents the highest existing temperature in this water classification outside of any dilution zone.

(3) Provided that temperature increase resulting from nonpoint source activities shall not exceed 2.8 °C, and the maximum water temperature shall not exceed 18.3 °C."

Total Dissolved Gas

Total dissolved gas - shall not exceed 110 percent of saturation at any point of sample collection.

Water Quality Limited Waters

Under Section 303(d) of the Clean Water Act, states must identify waters for which effluent limitations, as required by Section 301, are not sufficient to implement established water quality standards. EPA, Oregon and Washington have identified portions of the main stem of the Columbia River from the International Border (Columbia River Mile 745.0) to the mouth at Astoria, Oregon, and the Snake River from its confluence with the Salmon River at river mile 188 to its confluence with the Columbia River as water quality limited for temperature pursuant to Section 303(d) of the Clean Water Act. This designation arises from an analysis of data (Smith, 2001; Washington DOE, 1998; Oregon DEQ, 1998) showing these waters do not meet water quality standards during all or part of the year. Table 1-4 lists the reaches of the Columbia and Snake Rivers in the study area that have been included by EPA and the States on the 303(d) list for temperature and require a TMDL for temperature. Table 1-5 lists the reaches of the Columbia and Snake Rivers in the study area that have been included by EPA and the States on the 303(d) list for total dissolved gas and require a TMDL for TDG.

Table 1-4. Segments of the Columbia and Snake Rivers listed for Temperature in the Study Area

State	Water Body Name	River Mile	Parameter	Action Needed
ID*	Snake River	139.1 -188.0	Temperature	TMDL
OR	Snake River	176.1-188.0	Temperature	TMDL
OR	Columbia River	0.0 – 309.3	Temperature	TMDL
WA	Columbia River	21 listings	Temperature	TMDL
WA	Snake River	8 listings	Temperature	TMDL

* Listed by EPA 2001

Table 1-5. Segments of the Columbia and Snake Rivers listed for Total Dissolved Gas in the Study Area

State	Water Body Name	River Mile	Parameter	Action Needed
OR	Columbia River	0.0 - 309.3	TDG	TMDL
WA	Columbia River	41 listings	TDG	TMDL
WA	Snake River	10 listings	TDG	TMDL

III TMDL Objectives

A Total Maximum Daily Load (TMDL) is a technical analysis resulting in a document that quantifies the amount of a given pollutant (load) that can be released into a given waterbody each day while still maintaining water quality standards. A TMDL also allocates responsibilities to "contributors" for reductions in the pollutant load that are necessary to achieve water quality standards. TMDLs are often referred to as Water Quality Improvement Plans or Water Quality Cleanup Plans.

TMDLs are required when waterbodies are identified as impaired waters not meeting state or tribal water quality standards under Section 303 (d) of the Clean Water Act. The TMDLs being done for the Columbia/Snake Mainstem will determine the sources of temperature and total dissolved gas causing or contributing to water quality impairment, and allocate responsibility for TDG and temperature reductions to achieve water quality standards.

The objective of this effort is to identify the sources of total dissolved gas and temperature loadings and to allocate those loadings based on numeric water quality criteria in order to meet water quality standards. Water quality monitoring have found that temperature and total dissolved gas levels in the Columbia River exceed established standards for the Colville Confederated Tribes, Spokane Tribe of Indians, and states of Idaho, Oregon and Washington.

The complexity of the governance system is profound, involving federal agencies, state agencies, Tribes, private entities, and Public Utility Districts (PUDs). No single agency or tribe can assert it's jurisdiction and achieve a successful outcome. For example, total dissolved gas travels across international borders, through tribal and state jurisdictions, and is increased by passage over federal, PUD, and private dams. Its one commonality is that it is harmful to fish and aquatic life at certain percentages of saturation. Temperature exceedances are perhaps even more complex with respect to assessing causes and solutions. The secondary objective of this effort is to coordinate and consolidate temperature and TDG TDMLs across jurisdictional boundaries.

The Columbia and Snake Mainstem under this effort in many respects are unique since the majority of temperature and total dissolved gas loading are a direct result from hydroelectric facilities in the watershed. This resulted in the majority of the load allocations associated with the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation , and the local public utility districts and private dam owners. This effort was also unique since the states of Oregon and Washington have asked EPA to issue TMDL's for Temperature while retaining the right to issue TMDLs for Total Dissolved Gas. EPA will be issuing temperature and total dissolved gas TMDLs for tribal areas.

IV Process

TMDL Coordination Process

An inter-agency steering committee consisting of staff from the Idaho Department of Environmental Quality, the Oregon Department of Environmental Quality, the Washington Department of Ecology and the EPA was established to coordinate temperature and total dissolved gas TMDLs. A number of Columbia Basin Tribes also participate on the committee. Each agency was responsible for developing or co-developing a TMDL including EPA which was the lead for temperature.

The committee serves multiple functions including monitoring progress, developing roles, responsibilities and establishing time lines. The committee served as a sounding board for issues, coordinating outreach and discussing technical concerns. The group on several occasions held technical sessions to develop joint methods, approaches and build consensus.

An Outreach Team was established as part of the steering committee that included the basin states, EPA, tribes and the Western Governor's Association (WGA). WGA facilitated this team which developed and coordinated outreach activities. This included scheduling public workshops, developing outreach materials and measuring the success of our outreach program..

Inter-agency steering committee contacts:

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Memorandum of Agreement

One of the first tasks undertaken by the inter-agency steering committee was to develop a Memorandum of Agreement (MOA). The purpose of the MOA was to document a mutual understanding on the approach and roles among Idaho Department Environmental Quality, Washington Department of Ecology, Oregon Department Environmental Quality, EPA Region X, and the Columbia basin tribes to complete a total dissolved gas and temperature TMDL for the mainstem Columbia and Snake Rivers. Expected roles of non-signatory agencies were also included.

The MOA defined the geographic scope of the TMDLs including the relationship of tributaries and upstream TMDLs to the mainstem effort. Natural conditions prior to development were identified as base conditions and present water quality conditions were measured. Current water quality conditions were compared to existing state water quality standards to determine compliance or estimate pollutant reductions to meet compliance goals. Since water quality standards reflect changes from natural conditions these estimates were critical.

The MOA signatories recognized a high degree of uncertainty in the Basin. When the TMDLs were completed the signatories did not know the outcome of decisions regarding breaching of dams, outcomes of litigation or adjudications; flows that may be required to be adjusted, future appropriations, and other uncertainties. Yet decisions regarding these TMDLs could not wait for these outcomes thus the TMDLs moved forward while acknowledging incomplete information and uncertainty.

Final products and overall TMDL vision were established in the MOA as follows:

- An equitable allocation of pollutant reductions that accurately reflects relative contribution, and favors no one state, tribe, or dam operator.
- A TMDL that informs decision-makers as to the real causes of the water quality standards violations and the resultant loadings and feasible reductions and that has public participation.
- A TMDL that recognizes and complements the other work in habitat and hydropower.
- A TMDL that is approvable, withstands appeal, and meets the requirements of the Clean Water Act and state TMDL legal settlements and decisions.
- A TMDL that includes an implementation plan.
- A TMDL that has the support of the participants (i.e., no surprises).
- A TMDL that promotes real improvements in water quality and fish habitat and meets water quality standards.
- A cooperative venture which recognizes the expertise, jurisdiction, authorities, and efforts of all participants.

Monthly Coordination Meetings

The steering committee met monthly and meeting locations were rotated between state and federal offices. The purpose of these coordination meetings were to jointly plan TMDL activities, update study progress, discuss issues, concerns, technical problems and plan public involvement. Meetings were extremely beneficial for building consensus, learning from others, and developing a common message.

Jointly developed agendas were distributed in advance and meetings were open to the public. Meeting notes were developed and widely distributed. Since travel budgets were restricted call-in lines were made available to ensure maximum participation.

Non-Biased Facilitation

The Columbia Basin TMDLs have been extremely challenging as water quality problems intertwine with endangered species and energy concerns. Steering committee participants are key players on other issues as well, and this breadth of experience has been beneficial in looking for watershed solutions. However, many steering committee members have been on opposite sides of past issues and this quelled openness in the early phases. Non-biased facilitation assisted in removing many of these past barriers.

The steering committee hired non-biased facilitation for the public workshops and most steering committee meetings. Third party facilitation relieved committee members from this task, provided an open forum where ideas could be discussed without domination of any one group and allowed a concentrated effort on TMDL issues.

Group Work Environment

Roles and responsibilities were outlined in the Memorandum of Agreement so each TMDL had a designated leader or co-leader. The framework of our MOA required all steering committee members to assist and participate in the development of all TMDLs. TMDL development benefitted from internal review and comment between the various agencies. This created a scientifically sound product ready for public discussion.

Public Involvement

The steering committee agreed that public education and involvement is critical to the development and implementation of a water quality improvement plan that successfully reach the water quality goals for the Columbia/Snake Mainstem TMDLs. The public can and should participate in many phases of the process such as identification of pollution sources, developing, assessing and choosing water quality improvement strategies, reviewing and commenting on documents.

Large watersheds offer a unique challenge to meeting the communication needs of interstate TMDLs with often limited outreach resources. Each individual TMDL effort developed an outreach or public involvement plan that was integrated into a basin-wide outreach plan. The objectives of our public involvement plan:

- Create an open and visible decision-making process to which the public has numerous opportunities for access and input.

- Provide a mechanism by which the public is informed and has an understanding of the process, issues, and shares possible solutions from perspectives of various interests.

- Incorporate public comments throughout the decision-making process.

- Respond to comments submitted during the formal comment period.

Communication Techniques

Some of the communication techniques employed to engage the public in the process of developing TMDLs for the Columbia/Snake River Mainstem TMDLs include:

1) A website (www.epa.gov/r10earth/columbiamainstemtmdl.htm) to provide timely information on work efforts. The web page includes links to related documents, maps, etc. as well as to tribes, states, agencies, etc.

2) Formal and Informal Public Meetings (described below)- variety of meetings to engage the public in the process and decision making.

3) Fact Sheets (described below) that will serve two primary purposes: 1) to inform and educate the public and keep the public updated on TMDL progress and 2) provide the schedule of public involvement opportunities.

4) News releases, articles and display ads in key local newspapers announcing public involvement opportunities.

5) Mailings/notification to tribes and key stakeholders including interest groups, general public, local, state and federal agencies, watershed groups, trade organizations, etc.

6) State sponsored watershed coordination groups.

1) Presentations and discussion with individuals and groups as requested.

Formal and Informal Public meetings

Our public meetings followed key steps in the TMDL process. Meetings were intended to share information with, and receive input from participants. The TMDL steering committee consolidated meetings on total dissolved gas and temperature. Saving monetary resources by sharing meetings allowed the steering committee to increase the number of public meetings for an individual TMDL. Thus allowing more communities and individuals to be reached.

In developing the Columbia Basin Mainstem TMDL's we employed various types of public meetings.

Types of public meetings

Public Informational Workshops: Periodic presentation of proposals, updates on progress, providing requested information, taking informal comments.

Listening posts, poster sessions, open house: Informal sharing information on proposals, no presentation, set up for public interaction and discussion with agency staff and other participants, take informal comments.

Presentations at other organizations' meetings: Informal presentation of proposals, updates on progress, providing requested information, taking informal comments, at established meetings of interested groups.

Informational Meetings: by request from public and interest groups

Formal Public Hearings: Formal, with a brief information presentation and Q & A, followed by a formal hearing to receive oral and written comments on the draft TMDL.

Fact Sheets

Fact sheets provided information to the public about the Columbia/Snake River Temperature and TDG TMDLs. Fact sheets were developed by individual state, and federal agencies, and cooperatively by the states, federal, and tribal members. Fact sheets from individual agencies covered specific material for an individual locality or jurisdiction. For example, states developed fact sheets covering state water quality standards.

Cooperatively developed fact sheets were developed to cover material that transects jurisdictional boundaries. The Columbia/Snake River fact sheet on process and schedules is an example of multiple jurisdictional fact sheets that tie individual river reach TMDLs into a comprehensive plan. This was extremely important since the Total Dissolved Gas TMDLs were completed in three river reaches; the Lower Columbia, Lower Snake, and Mid-Columbia. Each river reach had different jurisdictional involvement, time lines and stakeholders but were related to adjacent TMDL efforts.

Fact sheets provided clear and concise information to the public, but also improved communication and understanding within the steering committee. The development of fact sheets while tedious was extremely beneficial in moving state, federal, and tribal agencies forward with an agreed upon message. Thus improving public image and demonstrating unity toward solutions.

Website

One of the most cost effective tools employed in our joint TMDL process was the Internet. The Environmental Protection Agency, working through the steering committee, developed a website for the Columbia basin TMDLs. Information posted on the website included background material, work plans, outreach plans, fact sheets, meeting and workshop information. Additional links were provided to participating state, federal, and tribal websites where further material was located.

The website is extremely useful for informing individuals both inside and outside the process about the current status and findings. The address of the Columbia/Snake River Mainstems TMDLs:

http://www.epa.gov/r10earth/columbiamainstemtmdl.htm

Watershed Coordination Groups

The Columbia basin states normally organize watershed coordination groups to provide advice on allocations, waste load allocation and convey information to various stakeholder groups. These coordination groups are generally open to anyone with an interest but an effort is made by the states to have all stakeholder groups represented. These local watershed representatives provide great energy and creativity in resolving water quality problems.

The use of watershed coordination groups, although extremely beneficial, will only be used for the Mid-Columbia total dissolved gas TMDL. Early in our study process federal attorneys advised the steering committee that TMDL's that were issued by EPA would fall under Federal Advisory Committee Act (FACA). This law places restrictions to the use of watershed coordination groups which would offset benefits of this approach.

Documentation

Documentation of the TMDL process and making records available is extremely important. Each entity maintained records for studies which they lead or co-lead. In addition a joint TMDL website was used to post meeting notes, agendas, fact sheets and technical documents. The web has been an effective tool for the dissemination of information.

Funding

Funding mechanisms for interstate TMDLs are extremely complex. On the Columbia mainstem TMDLs the states provided funding for their participation and EPA provided funding for tribal and EPA staff participation.

Similar to most water quality efforts financial resources were not adequate to meet all the needs. Our study coordinated agency resources and combined meetings to reduce travel costs. Additional resources were also provided by basin stakeholders which provided meeting facilities and logistical support.

V Lessons Learned

Many of the lessons learned in developing Columbia Basin interstate TMDLs are obvious but extremely important. Involving all parties in a collaborative process from the beginning is critical for not only

developing TMDLs, but establishing the framework for implementing water quality improvements and minimizing or eliminating potential legal action.

TMDLs like most natural resource investigations are extremely complex. The scientific foundation while sound is inherently difficult as budget and time limitations can impact overall quality. Major natural and manmade point source pollution sources are easily identifiable, but more diffuse non-point source pollution are problematic. Unfortunately, many of the pollutants addressed in TMDLs such as temperature in the Columbia basin are mostly produced by non-point sources.

Data Quality

There are many difficulties associated with all TMDLs and the quality or lack of data is foremost at creating uncertainty, error and tension. Take the Columbia River temperature as an example, scientists agree that basin dams are contributing additional heat loads to the river through increased water surface area and thus additional solar gain. Unfortunately temperature records prior to completion of the first dam are limited and of unknown quality. Temperature records after construction while more complete still have quality concerns. This study relied on existing sources of data that were not collected for modeling purposes, no original data were collected. This compounded data quality challenges. Adding additional uncertainty are impacts of changes in watershed conditions that occurred prior to dam construction and have accelerated with post dam development. Urbanization, grazing, logging, irrigated agriculture all contribute additional heat loads and factors such as climate variation and global warming may also contribute but difficult to quantify.

Watershed Basis

Interstate TMDLs with multiple state and international boundary issues need to be evaluated as a watershed unit and the preferred order would start at the headwaters and work down through the basin. Dividing larger watersheds such as the Columbia into sub-basins is acceptable to keep individual TMDL investigations at a manageable size. In the Columbia basin we recognized the advantages of starting at the headwaters but dire endangered species needs and legal obligations dictated the need for immediate action in the lower basin. Starting TMDLs in the lower basin created difficulties in identifying upstream tributary site potential ("natural conditions") and potential pollutant reductions which had an impact on waste load allocations downstream. This difficulty may result in revising lower basin TMDLs once the upper basin or tributary TMDLs are complete.

Define TMDL Limits

TMDL studies at the onset need to acknowledge existing water rights in the basin and this is especially important with interstate TMDLs. Water rights and interstate compacts provide safeguards to ensure that individuals and states receive their legal water allocations which directly impacts economic vitality. Providing assurances early in the TMDL process that these rights are secure will eliminate a contentious issue that easily could overshadow the process.

Leadership and Coordination

It takes initiative and wherewithal to coordinate activities between agencies, host meetings and follow-up with meeting notes and documentation, and take on critical issues. The Columbia basin TMDLs were fortunate to have EPA taking a leadership role. Locally, state or federally funded watershed coordinators or facilitators could also fill this role. However, to be effective the coordinator would need to remain credible by being completely non-biased and trustworthy, be located in or near the study area and have adequate time and resources to remain fully engaged. Organizations such as the Western Governors' Association, Western States Water Council, and other similar organizations can also provide leadership and decision support on local, regional and national issues that arise during the process.

Public Decision-Making

In an atmosphere of data uncertainty estimates for individual source reductions without the participation of all parties creates the perception of inequality. Employing participatory decision-making with meaningful participation by affected and interested parties is critical in making progress. Developing solutions in this environment provides public support and framework for future implementation measures.

Communication

Communication is critical to effectively develop interstate TMDLs. Lessons learned included the need to establish a framework to encourage efficient flow of information, feelings, values and ideas between the various study participants. The steering committee worked to create an open environment in order to develop professional relationships and build trust both between regulatory agencies and affected parties. It is key to establish a tone of professionalism and civility that also is safe for frank expression of opinions. The ideal outcome is that team participants share mutual respect and open minds to different ideas. Relationships remain congenial even when opinions differ.

Organizational Framework

The first step is to develop a team that represents both management and technical members from the basin states, EPA, and tribes. Regular meetings are critical in providing an open environment for communication and building professional relationships outside one's jurisdiction. In the Columbia basin we found that monthly coordination meetings were extremely effective. Generally, regular face-to-face meetings should occur the majority of the time with social time included in the schedule.

Defining roles and responsibilities between the primary jurisdictions is mandatory for developing a well-coordinated interstate TMDL. The Columbia basin Memorandum of Agreement (MOA) was developed to establish a framework that allowed all parties to move forward. The document defined the environment including agreements on methods and responsibilities. This allowed each entity to assess staff resources and other resource needs to meet known products and schedules. Since the Columbia basin MOA was not finalized until midway through the process several issues were either left unresolved or work was delayed pending final agreement. Delays of this nature would have continued without the MOA in place.

Establish Interstate Priorities

Large agencies and organizations are largely driven by internal priorities, budget and staff resources. Interstate TMDLs place an additional burden on these entities to coordinate priorities and workloads outside their organization. For example, on the total dissolved gas TMDL Oregon Department of Environmental Quality had a court negotiated deadline to finish the Lower Columbia TMDL by December 2001. Since the TMDL covered the reach of the Columbia River that bordered Washington a joint effort between the states was a logical goal. Initial discussions between the states seemed far apart with Oregon rapidly moving forward and Washington Department of Ecology lacking staff and resources to undertake the effort. However both agencies demonstrated flexibility and adaptability in Oregon's willingness to delay and share existing work and Washington's willingness to establish new priorities and bring resources into a joint effort. Without a willingness to be flexible and adaptable differences would have occurred between the TMDL efforts which may have resulted in separate and conflicting implementation strategies. Key to success was a commitment by all parties to fund mutual goals and seek agreement on final products.

Build Public Support

Public support and acceptance of water quality problems and solutions provides the initial framework for water quality improvements. The development of a coordinated outreach plan is an essential step in building support in large interstate basins where local and regional concerns need to be recognized. The collaborative process must include individuals and not just primary stakeholders. The difficulty in large basins is effectively reaching out with limited resources and time. The other aspect of outreach is public

perception of the process. Coordinated outreach - tribes and multiple state and federal agencies appear together with joint material, have joint meetings and have similar messages - builds public confidence in the final product. This will provide support for implementing water quality improvements.

Workshops

Public workshops were conducted at key points during the TMDL process with varying degrees of success. The size of the Columbia basin added to the challenges of public involvement since it was impossible to reach all communities at each phase. Due to limited resources workshops were conducted at two communities during each study phase. Communities were selected based on goals for key points in the process and input from state and local governmental officials. Every effort was made to locate meetings to engage all stakeholder groups at least once. Different workshop layout and design strategies were incorporated to improve public workshops. Meetings were also held both during the day and evening to increase public participation. Several of the following factors contributed to the success of the Columbia Basin workshops:

(A) Time of Day - Workshops held during the day tended to be more successful since participants were less tired, more focused, and more time could be dedicated to agenda items. The main purpose for conducting evening meetings was to increase participation which was only minimally successful.

(B) Agenda - Agenda's were developed and distributed to all identified stakeholders in advance. Meeting objectives were identified on the agenda and presentations and background material were posted on the Internet before the meeting.

(C) Public Workshop Design - Workshops were intentionally designed to give the tribes, states, and EPA specific presentations at each meeting. This presented a positive image that we are all working together to resolve these problems and ensured that each entity remained engaged. Providing opportunities for follow up questions, recording questions, and professional third party facilitation also contributed to successful workshops. Meetings were located at major stakeholder facilities such as public utilities, port authorities, and tribal facilities where possible to increase participation.

(D) Location - The Columbia basin is very large and diverse. In an effort to reach out to stakeholders two meetings were held at each TMDL phase and locations were moved throughout the basin. This allowed for at least one meeting near all major stakeholders since each TMDL had several meetings over the course of the study.

(E) Background Materials - Fact sheets and other background material were available at all public workshops and all material contained contact and website information. Since participants usually distributed this material to other coworkers this was an effective tool for disseminating information. In addition, since meetings were rotated to different communities throughout the process fact sheets were particularly effective at providing an overview of TMDL process and summarizing past activities.

VI Conclusions

Large interstate TMDLs while difficult can move forward efficiently. Participating jurisdictions must clearly define roles and responsibilities early in the process and commit funding and resources to meet jointly developed time lines. Participating jurisdictions need to commit to an adaptative management style that embraces a participatory decision-making process. The coordinating committee needs to facilitate meaningful participation by affected and interested parties. Communication is key to this collaborative process and adequate resources need to be dedicated to communication at all levels. Conflicts need to be addressed without delay and the use of a non-biased facilitator is essential.