White River Spring Chinook Habitat Guidance

A Water Quality Management Approach for the Upper White River: *Version 1.0*

By: Upper White River Chinook TMDL Framework Team

July 7, 1998
Publication No. 98-10

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Prepared by:

Washington State Department of Ecology
Water Quality Program

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PREFACE

The natural beauty of Washington State is treasured by many people. Much of this beauty also comprises habitat for native salmon: glacially coated mountains, diverse rivers, lakes, Puget Sound, and the nearby Pacific Ocean. In addition to their habitat native salmon are, by themselves, a symbol of Washington State. Extinction of numerous salmon populations has occurred, and many entities are now working on critical coordination and implementation efforts to reverse the decline of native fish populations.

White River spring chinook is one population of native salmon that has teetered on the brink of extinction. A multi-entity group has developed this guidance document which addresses water quality related habitat needs of White River spring chinook salmon. The document focuses on upstream historical spawning reaches of the White River Basin in western Washington. In addition to this effort, another group is implementing a rebuilding plan for these fish.

The guidance provides a bridge between existing watershed management approaches (the President's Northwest Forest Plan and the Washington State Forest Practices Act watershed analysis) and the federal Clean Water Act (CWA). Where water quality or fish habitat is impaired the CWA requires that specific measures be taken to address the impairments. These can be either through a "Total Maximum Daily Load" (TMDL), or through adequate "Other Pollution Controls" (OPCs). The group that developed this document is recommending the use of OPCs based on forest watershed analyses for upper White River chinook habitat and stream temperature.

This edition of the White River Spring Chinook Habitat Guidance is Version 1.0. Guidance for CWA Section 303(d) has been in flux, EPA is developing proposed revisions to the CWA Section 303(d) implementing regulations, and the state forest practices regulations are undergoing proposed revisions to address water quality and other related concerns. Readers and users of this document are encouraged to contact either Ecology's TMDL coordinator (360-407-6000) or Ecology, SWRO water quality staff (360-407-6300) to discuss existence of any new information.

Implementation of this guidance document will provide support to salmon resources mandated by the CWA and will provide stability under the CWA to landowners and managers. The area consists of the White River Basin above Mud Mountain Dam impoundment. This document may be applicable to, other areas with similar water quality and fish concerns. A, statewide approach for using watershed analysis to meet CWA requirements' is under development (Washington Department of Ecology, 1997a). The U.S. Forest Service is additionally developing broad guidance for lands it manages that have impaired waters.

This document was developed by the Upper White River Chinook TMDL Framework Team. Team members include:
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Carol Smith *- Washington Department of Fish and Wildlife*
Paula vanHaggen *- U.S. Environment Protection Agency*
* Team co-chair
**Team co-chair/project lead.

The team worked together from May 1996 until November 1997 with an average of one day per month invested to support plan development. The project goal and objectives are summarized below.

Project Goal

The goal of the project is to meet state critical fish stock habitat needs for White River spring chinook, in the Upper White River drainages by melding Clean Water Act compliance attainment with forest watershed analysis and management. This approach is envisioned to include water quality-based salmonid habitat targets, forest management and restoration objectives and implementation, and monitoring to allow adaptive management and evaluation of success of measures.

Project Objectives

Project objectives include:

1. The development of a guidance document for upper White River landowners, resource managers and other interested parties that details a framework for enabling CWA and watershed analysis processes to work together.

2. To provide process guidance that allows predictability for landowners under the CWA and watershed analysis processes to work together.

This document presents the accomplishments of the project objectives. Implementation of watershed analysis, as well as restoration elements based on watershed analysis, and baseline and long-term monitoring are now necessary to achieve the project goal. Some of these elements are in progress.

NOTE: During the Framework Team's draft document review, it was requested that the Mud Mountain watershed administrative unit (WAU) be added to this project. Because this area was not included in the public meeting or in the project development stage or precursor studies we were not able to do this. However, this WAU is important for the spring chinook. Two forested streams within this WAU are on the state Section 303(d) list for temperature. The team recommends that it is appropriate for this area to additionally be accomplished as per plan guidance.

ACKNOWLEDGMENTS

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Ecology administrative, review, data, GIS, graphic, and policy support: Bill Backous, Cathy Brockmann, Carey Grunenfelder, Tia Johnston, Vicki Jones, Will Kendra, Clay Keown, Tom Leonard, Donna Lynch, Keli McKay Means, Dave Roberts, Anita Stohr, Mike Templeton, Dick Wallace.

Watershed analysis module and prescription team members for the Middle White and Clearwater watershed analyses: Lil Herger, Periann Russell, Jeffrey Clark, Christopher Earle, Jeff Kirtland, Jeff Light, Jim Stark, Walt Pulliam, Chuck Frame, Don Schuh, Mike Bradley, Jeff Thomas, Pat Reynolds, Don Nauer, and David Adams. (Note: several Framework Team members additionally participated on the analyses.)

Additional document review, conceptual help, or assistance: Cassie Phillips, Jerry Gorsline, and Chuck Baranski.

Environmental Protection Agency (EPA) 205j funding for Ecology field assessments supported the project accomplishments.

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1. INTRODUCTION

This guidance document provides a framework for enabling the federal Clean Water Act (CWA) and state and federal watershed analysis processes to work together to address habitat needs (including stream temperature) for White River spring chinook. The area covered by the document is the White River Basin upstream of the impoundment of Mud Mountain Dam, in Pierce and King Counties of western Washington (Figure 1). The major land use in the drainage is forest management. The U.S. Forest Service (USFS), National Park Service, and Weyerhaeuser Company are primary landowners. The guidance has been developed by a multi-entity team of landowners, land managers, Tribes and other parties with interest in the successful restoration of the White River spring chinook to their historical habitat of the Upper White River Basin.

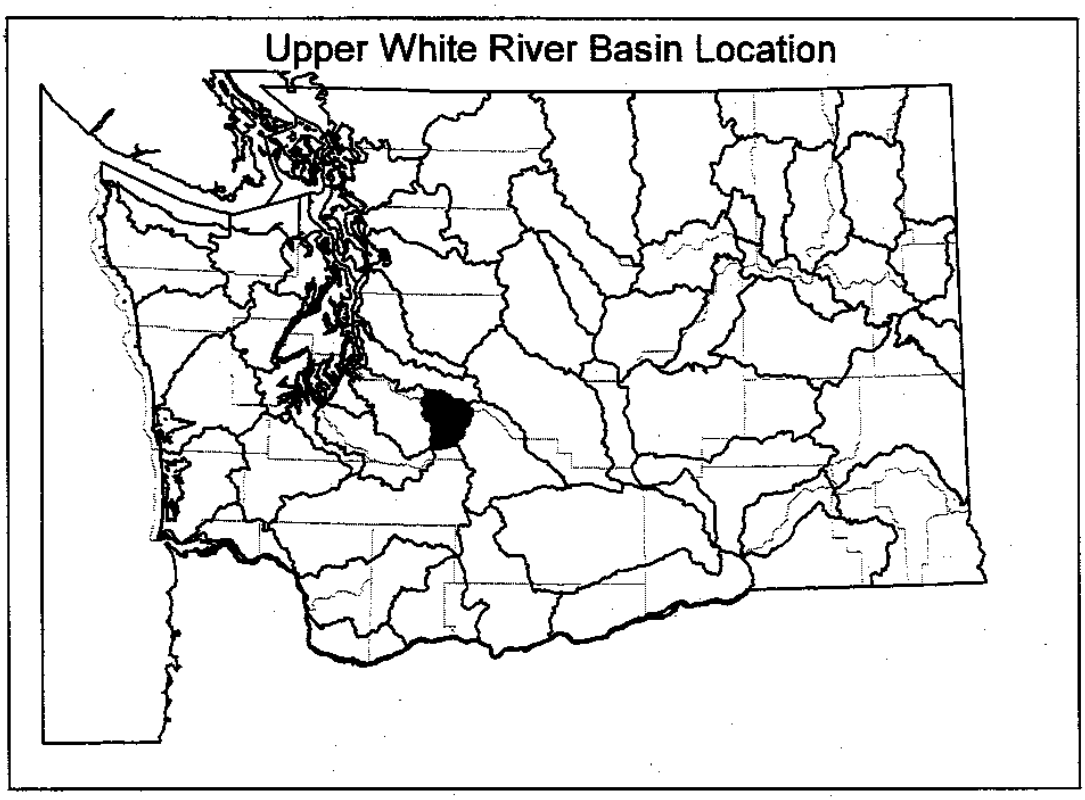

Figure 1. Map of Washington State showing the location of the Upper White River Basin.

The following information is included in this document:

1. Background materials on White River spring chinook, state and federal watershed analyses, and water quality regulations; and

2. An implementation or "how to" guide for accomplishing water quality-based pollution controls for spring chinook habitat.

This guidance, through its included implementation guide, proposes how to meet CWA requirements for support and protection of chinook habitat, including temperature. It does this by detailing necessary adaptations and additions to federal or state watershed analyses. Figure 2 shows how the analyses are modified to accomplish CWA requirements.

The guidance is an outcome of CWA regulations and Washington State's water quality prioritization process. When water quality of a stream is threatened or impaired, the CWA requires the development of "limits" on pollutants creating harm to the environment; these limits are called water quality-bases (pollution) controls. During scoping of the South Puget Sound Water Quality Management Area in 1994-95, Ecology determined that the upper White River drainages were a priority for assessment and development work for water quality-based controls. Two streams within the drainage base, the Greenwater and the Clearwater, are on the state's CWA Section 303(d) list of impaired waters based on temperature data. Additional data on large woody debris and pools indicates stream habitat impairments related to beneficial use support are likely widespread within the upper White River and its tributary streams (Emmett, 1995).

The Upper White River Basin was selected for development of water quality-based controls to support urgent needs of the White River spring chinook salmon. This basin is the primary historical spawning area for this stock which is a state critical stock (Washington Department of Fisheries et al., 1993) and is additionally proposed for threatened with extinction status under the Federal Endangered Species Act (ESA). Extensive stock restoration work is underway and appears to be successful. The numbers of spawning adults have been increasing annually in recent years. The number of returns in 1995 and 1996 were the largest since the 1950's. The focus of this document is on spring chinook; however, because the efforts are directed toward overall biological system health, other species will benefit as well.

Development of this document represents the second of a three-part water quality process for addressing the Upper White River Basin chinook habitat needs. The first part was initiated in 1995 and consisted of a field assessment study to evaluate the nature and extent of habitat impairments. Stream temperature and spawning gravel fine sediments were assessed for the Greenwater and Clearwater Rivers and for Huckleberry Creek. Additionally, in the Clearwater River, seven permanent channel cross-sections (five with scour monitors) were established to monitor spawning area sour and fill and processes associated with survival in salmon egg nests (redds). The field assessment was accomplished by and/or in consultation with watershed parties: U.S. Forest Service, Puyallup Tribe Fisheries, Muckleshoot Tribe Fisheries, Weyerhaeuser, Washington Department of Fish and Wildlife, Washington Department of Natural Resources, Washington Department of Ecology. Interns from Clover Park Vocational Technical College and The Evergreen State College provided field assistance. The U.S. EPA provided funding to support Ecology's work. A report detailing field assessment study results is being written by Washington Department of Ecology (In Progress).

This document completes the second part of the process: prepare a guidance document for enabling CWA regulations and watershed analyses processes to work together to meet chinook habitat needs in the Upper White River Basin.

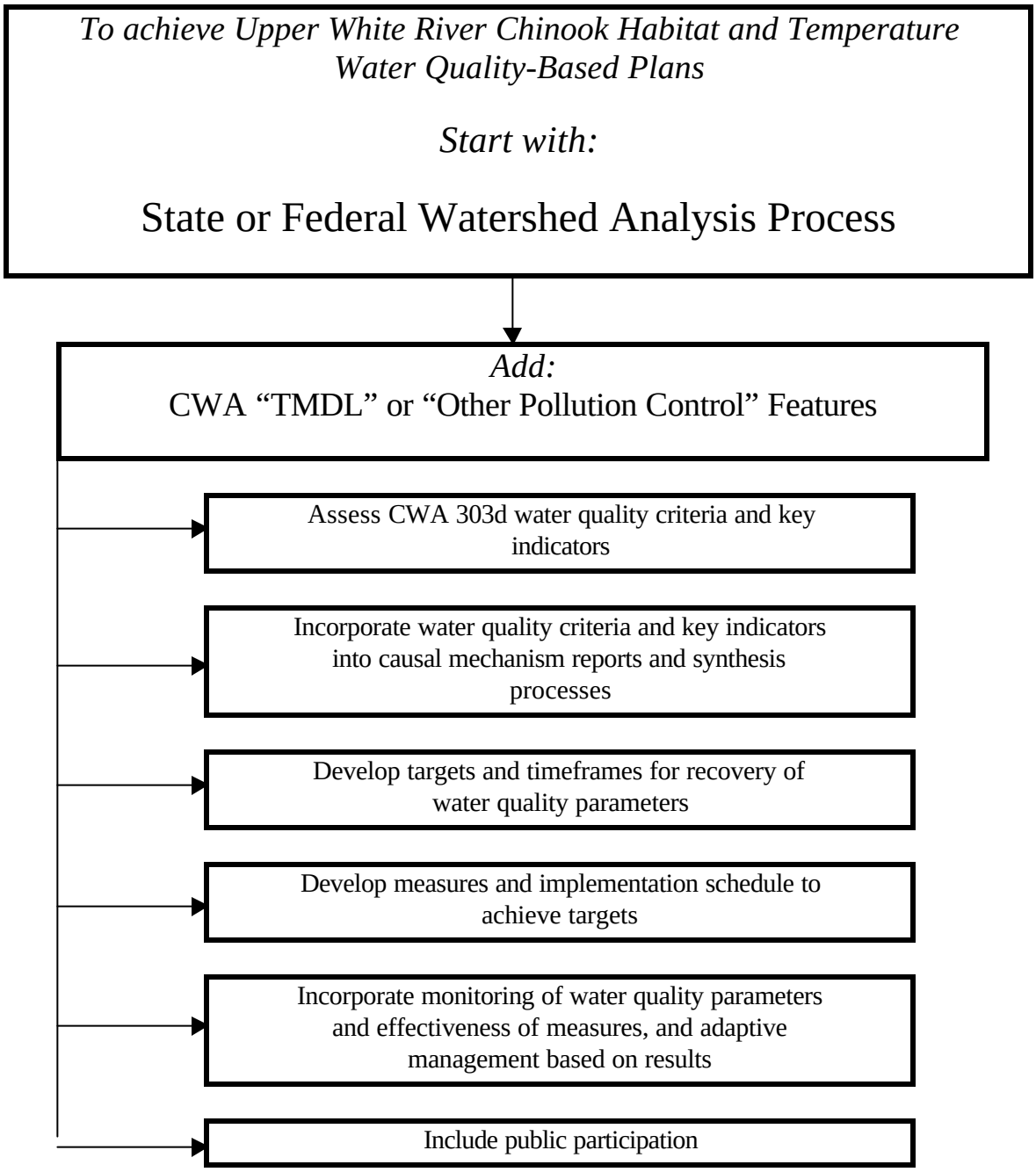

Figure 2. Overview of how to achieve upper White River chinook habitat water quality-based plans through the addition of CWA "TMDL" or "Other Pollution Control" features.

The third and final part of this process, which is not a component of this document, will be the development and implementation of water quality-based plans in the Upper White River Basin. Watershed analyses for the Clearwater watershed administrative unit (WAU), and the Middle White WAU are currently in progress and being accomplished as pilot implementation efforts. In addition, a monitoring group is being formed to steer implementation of monitoring components. Tahoma Audubon has taken the lead to initiate baseline monitoring in the Greenwater River. Resources, of both people and finances are necessary to accomplish development and implementation of the water quality plans.

II. BACKGROUND

This section contains background information on White River spring chinook, the federal Clean Water Act, the state Water Quality Management approach, and federal and state watershed analysis processes. This information is important for development of the Upper White River Basin water quality-based plans.

A. White River Spring Chinook

White River spring chinook differ from other Puget Sound chinook stocks in return timing, spawning distribution, and genetic characteristics. Adults return to the river from May to mid-September and spawn from early September through mid-October (Washington Department of Fish and Wildlife et al., 1996). The fish travel to the upper White River watershed, spawning in the upper mainstem White River as well as major tributaries such as the Clearwater River, Greenwater River, Huckleberry Creek, and West Fork White River. This differs from fall chinook which generally spawn in the lower reaches of mainstem rivers. The genetic baseline for White River spring chinook shows that they are very different from other chinook stocks in Washington State, including the summer/fall chinook stock that spawns in the Puyallup River (Busack and Shaklee, 1995).

Two impassable dams prevent returning White River spring chinook from reaching their natural spawning areas. Puget Sound Power and Light Company has a diversion dam at rivermile (RM) 24.3 and the U.S. Army Corps of Engineers operates Mud Mountain dam at RM 29.6. Adults are trapped at the diversion dam near Buckley Washington, and trucked upstream of Mud Mountain Dam where they are released in the White River.

Based upon work with other spring chinook stocks, young fry are thought to emerge from their redds from late February through March (Smith and Wampler, 1995). After a short rearing period of three to eight weeks in still water and shallow river margins, spring chinook typically migrate downstream to rear in broad, low-gradient channels where they are protected by vegetative cover (Chapman, 198 1; Wunderlich, 1982; Smith and Wampler, 1995). However, because emergence from a redd appears to occur over a time period of several weeks, the use of shallow river margins occurs over a broad time period as well. Studies by Dunston (1955) found that chinook juveniles from the White River migrate as yearlings or sub-yearlings. Most spring chinook return as three or four-year-old adults, but some return as two, five, or six-year-olds.

In the 1940s, the number of White River spring chinook arriving to the Buckley trap averaged 2,953 annually (Washington Department of Fish and Wildlife et al., 1996). The population levels fell in the late 1940s and continued to falter for the next several decades. By the 1980s, the number of returning adults was as low as 6 (Figure 3). In 1977, adults were captured at the Buckley trap to develop a hatchery program which is still in existence today. Adults were transported to Hupp Springs Hatchery near Purdy, Washington, where there is cool, high quality water to maintain the fish. Fish produced from this program were released into Minter Creek. Returning adults have been used to maintain the program.

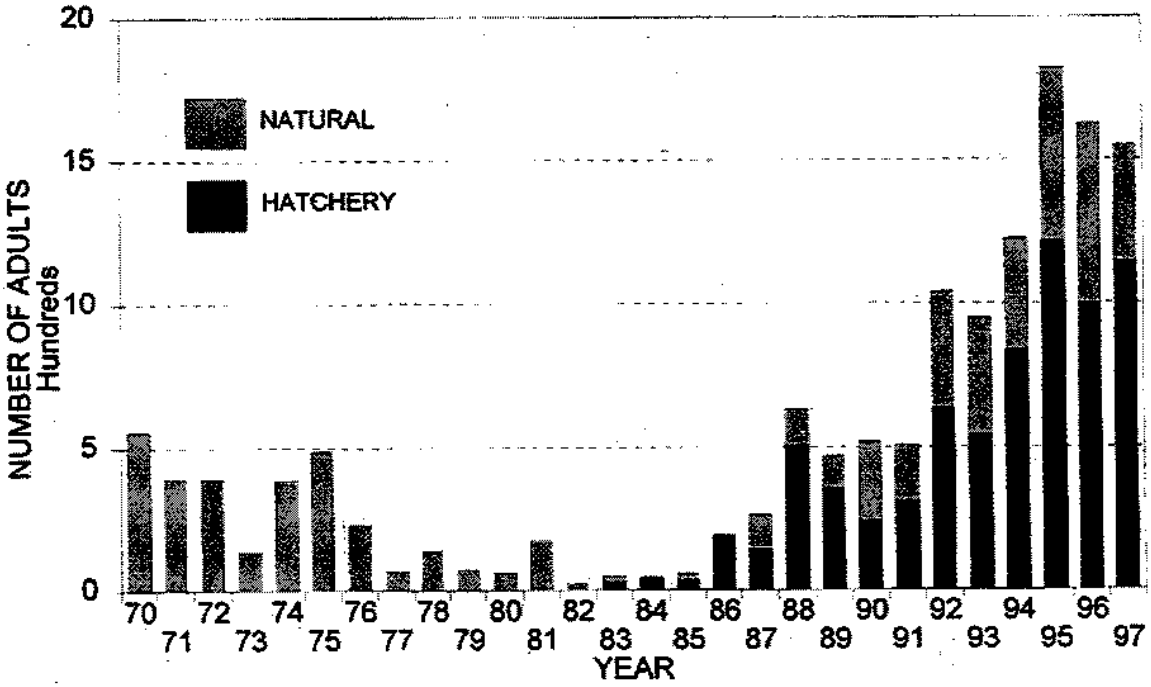

Figure 3. Numbers of White River spring chinook adults that returned to the Buckley trap from 1970-1997. Shown are both those from hatchery programs as well as those that were progeny of wild spawners.

A saltwater captive brood program was also founded in the late 1970s as a second component to the White River spring chinook-rebuilding program. At first the saltwater net pen program was near Manchester, but later moved to Squaxin Island. A small number of chinook yearlings were transferred each year from Hupp Springs to the netpens and kept in the pens until they matured as adults. Upon maturity, adults were transported back to Hupp Springs to be included in the spawning population. Although experimental, this contributed greatly to egg production and facilitated the expansion of the program to include production at White River Hatchery (a third component) near Buckley, as well as rearing and release of juveniles into the upper White River watershed to re-seed the natural environment.

Several acclimation ponds have been constructed and operated by the Forest Service and Puyallup Indian Tribe to imprint hatchery spring chinook to the upper White River watershed and facilitate their return as naturally spawning adults.

Currently, no additional fish are being transferred to the saltwater netpens. The anadromous programs at White River Hatchery and Hupp Springs Hatchery are still operating, and every year, several hundred thousand-chinook juveniles are planted in the upper White River. The number of returning adults has had a strong but variable increasing trend in the 1990s. In 1996, the number of returning adults included 628 natural spawners and in 1997 there were 402 natural spawners.

The White River spring chinook salmon recovery plan (Washington Department of Fish and Wildlife et al., 1996) includes initial and long-term goals for the chinook recovery. They are as follows (pages 3-4):

"The initial goal of this recovery plan is to restore White River spring chinook to the White River watershed This goal will be achieved when the interim escapement goal of 1,000 unmarked spawners per year is met in three out of the four consecutive years with the normal level of incidental sport, commercial and tribal harvest.

The long-term goal of this recovery plan is to restore the native population of White River spring chinook stock in the White River watershed to healthy, productive condition. To achieve this goal, escapements should equal or surpass the escapement goal in three out four consecutive years. The escapement goal should reflect the watershed carrying capacity and should be met with a full complement of directed and incidental harvest in sport, commercial, and tribal fisheries. "

B. Federal Clean Water Act And State Water Quality Management Area Background

1. Federal Clean Water Act

The purpose of the Clean Water Act is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (CWA Section 101). Section 303(d)(1)(C) and EPA's implementing regulations (40 CFR Part 130) require each state to identify waters for which existing required pollution controls are not stringent enough to attain applicable water quality standards (i.e., are water quality-limited).

The Clearwater and Greenwater Rivers currently are identified on the state's Section 303(d) list due to water temperatures that exceed water quality standards. Temperature exceedances are a concern because they impact spring chinook salmon, a designated beneficial use for this watershed and a critical/proposed ESA stock in Washington. Temperatures in excess of standards or otherwise changed from natural conditions can cause lethal, sub-lethal, and other biological effects on stream organisms.

Boise and Scatter Creeks, tributaries to the White River below Mud Mountain Dam, are also on the Section 303(d) list for temperature. Temperature data for the Water River mainstem (near Camp Creek), Lyle Creek, Milky Creek, Brush Creek, and habitat parameters such as large woody debris (LWD) loads for the Clearwater River, Greenwater River, and Huckleberry Creek may additionally meet requirements for listing.

For waters on the Section 303(d) list, Ecology may either establish a Total Maximum Daily Load (TMDL) for appropriate pollutants of concern or show that "Other Pollution Controls" (OPCs) will result in water quality standards being met. In addition, other entities besides Ecology can accomplish a TMDL or OPC and submit the documentation to Ecology. When a TMDL is completed or other pollution controls are identified, the state may remove the water from the list. EPA must approve either action.

After reviewing the two different legal mechanisms under the CWA for addressing waters under Section 303(d), the Framework Team recommended that the most appropriate approach for the White River water quality-based management plans is to address issues through the federal regulation provisions for "Other Pollution Controls." Many of the waters addressed will be preventive, meaning the plans will help ensure that these waters remain off the list.

Readers and users of this document are encouraged to contact either Ecology's TMDL coordinator (360-407-6000) or Ecology, SWRO water quality staff to discuss any new information that may exist from proposed revisions to EPA Section 303(d) implementing guidance or state forest practices regulations.

The governing CWA statute, federal regulations, and EPA guidance direct Ecology as to which action is most appropriate. The list contains those waters that do not meet water quality standards. Not all of the waters on the list require a TMDL. Only those waters not meeting

standards due to pollutants require TMDLs. Other waters that do not meet standards do not require a TMDL but will require an OPC to be removed from the 303(d) list. Citations from the governing rules are shown below.

The Clean Water Act defines pollutants and pollution as different things:

Under Section 502(6), *"the term 'pollutant' means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharge into water.*

Under Section 502(19), *"the term 'pollution' means the human caused alteration of the chemical, physical, biological, and radiological integrity of water."*

Federal regulations and EPA guidance describe different processes for waters impaired from pollutants versus waters impaired by pollution not caused by pollutants:

Section 303(d)(1)(C) states waters should be listed where *"effluent limitations ... are not stringent enough to implement any water quality standard applicable to such waters."*

Section 502(11) defines effluent limitations as "constituents which are discharged from point sources." However, EPA guidance (U.S. Environmental Protection Agency, 1991) has interpreted that discharges from nonpoint sources that result in standards not being met should be also included in the list. In 1992, Ecology listed only those waters impacted by point sources. The EPA approval of that list was based on the condition that waters impacted by nonpoint sources alone is included in subsequent lists. Therefore, the list contains all waters impaired by both pollutants and those impaired by pollution not caused by a pollutant.

Section 303(d)(1)(C) states TMDLs will be established *"for those pollutants which the Administrator identifies ... as suitable for such calculation."*

Under 40 CFR 130.7(c)(1)(ii), EPA identified which pollutants are suitable for TMDLs as *"TMDLs shall be established for all pollutants preventing or expected to prevent attainment of water quality standards."*

Under 40 CFR 130.7(b)(1)(iii), the Section 303(d) list *"shall identify the pollutants causing or expected to cause violations of the water quality standards."*

In draft guidance for the preparation of the 1998 list (Grubbs, 1997), EPA states that *if "there is no parameter to allocate ... the TMDL process is not appropriate."*

In the response (S) to comments of the EPA promulgation of the 1994 Idaho Section 303(d) list (U.S. Environmental Protection Agency, 1994), it is stated: *"Therefore, in the absence of information showing that the use impairment can be attributed to a pollutant, EPA decided not to list the water."*

The U.S. Supreme Court decision on the Elkhorn case [Jefferson County PUD No. 1 and City of Tacoma v. Wash. Dept. of Ecology, 114 S. Ct. 1900 (1994)], described the violation of water

quality standards based on water quality: *"In any event, there is recognition in the Clean Water Act itself that reduced stream flow, i.e., diminishment of water quantity can constitute water pollution."*

Review of the citations above makes it clear that TMDLs should be established to address pollutants and not necessarily all forms of pollution. This makes sense when the answer to controlling these pollutants it usually in the form of a load (although other appropriate measures can also be used for certain parameters, e.g. sediment and temperature). Pollutants are expressible as loads and can be allocated. Therefore, violations of the water quality standards due to pollution are to be covered under other pollution controls as defined in federal regulations.

In light of the above, Ecology has adopted a Section 303(d) listing policy (Washington Department of Ecology, 1997b) where waters are to be identified with specific pollutants on the list that would be allocated in a TMDL. Other violations of the standards due to habitat alteration and not related to a pollutant (e.g., instream flow) or impairment of designated uses alone would be listed but identified as not requiring a TMDL. In these cases, the action to address the listing would fall under the regulations for OPCs.

a. TMDLs

By definition (40 CFR, Section 130.2), a TMDL is the sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and background. The regulations also state that TMDLs can be expressed in terms of "other appropriate measures" and therefore, do not have to be actual loads.

The CWA [Section 303(d)(1)(C)] states that a TMDL:

"Shall be established at a level necessary to implement the applicable water-quality standards with seasonable variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality."

A margin of safety may be provided by: 1) using conservative assumptions in the calculation of the loading capacity of the waterbody; and 2) establishing allocations that, in total, are lower than the defined loading capacity.

There are six submittal requirements for TMDLs (U.S. Environmental Protection Agency, 1993). They are:

- Transmittal letter - Ecology requests to EPA that document be considered a TMDL;
- Problem formulation - shows problems exists and there is a need for special management;
- TMDL data and supporting studies - data and information that is collected as part of the planning process is presented to support assumptions needed to make resource management decisions. This includes the method and results used to establish TMDL interim targets and final goals;

- Anticipated pollution control action(s) and implementation schedule - pollution controls, a schedule for implementation and projected dates to reach target conditions and final goals are identified;
- Public participation - public involvement and a responsiveness summary to public comments is required; and
- Follow-up monitoring - monitoring is required to assess progress toward meeting TMDL goals and targets. From the results of the monitoring, EPA, Ecology, and participants decide whether the TMDL is on track toward meeting water quality requirements.

After the state develops or approves a TMDL, the state formally submits the TMDL to the EPA for review and approval.

b. OPCs

TMDLs are not necessary if OPCs, for example, best management practices (BMPs) required by local, state, or federal authority are stringent enough to implement any applicable water quality standards. Factors to be considered in evaluating whether OPCs are stringent enough include (U.S. Environmental Protection Agency, 1995):

- Data analysis of the controls relative to the problem;
- Mechanisms requiring implementation of pollution controls;
- Reasonable time-frame for attaining water quality standards; and
- Monitoring to track implementation and effectiveness of controls.

Data analysis links the specifically identified controls to the water quality concern so that applicable water quality standards are attained. The data analysis must be specific to the water quality problem, show that the required controls will result in attainment of the water quality standards and protection of beneficial uses, and be based on scientifically valid representative information of known quality.

Required mechanisms ensure that the identified pollution controls will be implemented. Controls may be considered required in this context if they are required in a permit or a license or backed by a performance bond, crop support payment, or contract.

Reasonable time-frame clearly defines the expectation of implementation and water quality standard attainment. Examples of reasonable timeframes include a permit cycle (five years), prior to the next 303(d) listing cycle, a period established by a compliance schedule, or the timeframe established by state water quality standards. This is determined on a case-by-case basis considering receiving water characteristics, persistence, behavior, and ubiquity of pollutants, type of restoration necessary, available controls, and state requirements.

Monitoring will provide information on implementation and the effectiveness of controls. Where BMPs or other controls will be implemented, monitoring will show whether they are, in fact, being implemented and whether the expected progress toward attaining water quality standards is being achieved.

The BMPs intended to meet the terms of OPC need to address impairments caused by past practices and ensure that future activities will not cause impairment to water quality. The water quality management plan or other document that explains how the four factors are addressed may meet requirements of an OPC. If it does, then the water quality segment represented by the OPC would not need a TMDL. A watershed analysis based on Ecology guidance (Washington Department of Ecology, 1997a) may meet most of the requirements of such a plan and help serve to exclude waters from the Section 303(d) list. The plan or equivalent document will be reviewed by Ecology when developing the 303(d) list of impaired waters (this occurs every two years) and by EPA when reviewing Ecology's proposed 303(d) list and the water quality-impaired waterbodies not proposed for listing.

c. Preventive TMDLs/OPCs

EPA regulations (40 CFR 130.7) and EPA guidance (U.S. Environmental Protection Agency, 1991; U.S. Environmental Protection Agency, 1995) mandate that impaired waterbodies be addressed according to options discussed above. In addition, TMDLs and OPCs that meet the CWA may be accomplished proactively for parameters not on the state's Section 303(d) list. This preventive plan will exclude the waterbody from future Section 303(d) lists per federal regulations as long as implementation occurs.

d. Water Quality-Based Plan

The term "water quality-based plan" is a generic term used in this document. It refers to both TMDLs and OPCs that may meet the CWA.

2. State Water Quality Management Area Process

Since 1993, Ecology has been using a five-step process to manage water quality issues in 23 water quality management areas (WQMAs) across the state. For each WQMA, the five steps occur over five years, with each step taking about a year.

Specific activities in a WQMA take place during the five-step process. These activities are:

1. Identify known and suspected water quality problems within the watershed - this step is called scoping, and results in the publication of a needs assessment;

2. Conduct water quality monitoring and special studies;

3. Analyze water quality and the effects of pollution;

4. Develop technical reports that summarize water quality, areas of concern, and strategies to respond to these concerns; and

5. Issue wastewater discharge permits and implement other pollution prevention and control actions that respond to priority water quality issues.

An important factor with the process is that after the steps are completed, the process begins again. The WQMA process is a key component of Washington State's efforts to meet requirements of the CWA.

In 1995, as a result of the WQMA process, the Southwest Regional Office of Ecology identified important issues related to the White River spring chinook. They included (Emmett, 1995):

"Several streams within forested areas of the WQMA were placed on the 303(d) list because stream temperatures exceed state water quality standards. Specific causes of the high temperatures have not been investigated. High temperatures in forested streams tend to result from a combination of management in riparian areas and channel shape. Channels that are, made shallower and wider contribute to stream temperatures that are higher than those found under natural conditions."

"The Professional Resource Organization - Salmon (1994) petition specifically includes the White River spring chinook. According to the petition this is the last remaining native spring chinook stock in southern Puget Sound. This petition has been determined by NMFS to be of merit" and will be reviewed to determine if listing is warranted.

And, in a summary of needs and recommendations, the first item listed is:

"White River for in-stream flows (and/or habitat for the White River spring chinook) and Watershed Action Plan assessment. A focused effort is recommended to assess water quality parameters affecting salmonid habitat for the watershed of White River, West Fork White River, Clearwater River, Greenwater River, and Huckleberry Creek. The Clearwater and Greenwater Rivers, Boise Creek, and Scatter Creek are currently listed as water quality limited for temperature. A TMDL for water quality parameters affecting salmonid habitat should be developed in coordination with Water Resources and the watershed partners that have been identified with these areas. Should the spring chinook be listed under the ESA, the above-recommended work would be equally important; the TMDL would potentially be a component of a habitat conservation plan.

As an outcome of the WQMA scoping process, Ecology initiated field assessments in the upper White River for temperature and chinook habitat as well as the work represented by this guidance document. Additional work elsewhere in the White River (not covered here) is being accomplished by Ecology.

C. State And Federal Watershed Analysis Processes

Watershed analyses for the private and federal lands in the Upper White River Basin are the core of the recommended water quality-based pollution controls. Resource assessment components of the analyses identify areas where habitat-related water quality parameters and stream temperature can be or have been affected by management. Causes of these impacts are determined by investigating linkages of hillslope processes to the channel environments. Prescriptions (state process) and information providing other aspects needed for watershed restoration are included. Monitoring (required for water quality-based plans) provides feedback for adaptive management and assurance that protection and restoration measures are working. Table 1 has a description of the primary components included in federal and state analyses and provides an overview of additional elements and considerations necessary for them to meet federal Clean Water Act requirements.

Aspects of each process would benefit the other. For instance, federal watershed analyses would be strengthened by the greater field, data collection, and prescription phases of the state process. Likewise, aspects of federal analyses that allow focus on restorative needs for purposes of the CWA would be beneficial in the state process. The included implementation guide (Part III) covers sub-basin priorities for accomplishing watershed analysis and monitoring implementation. It also includes the level of sufficiency needed for these analyses to accomplish development of water quality-based controls for spring chinook habitat.

Background information specific to state and federal watershed analyses is provided below. This information clarifies intentions, included elements, and outcomes of these two similar but different processes.

1. State Analysis Process

Washington State watershed analysis applies to private and state land. Regulations governing the analyses are found in WAC 222. Methods for accomplishing the analyses are found in the Forest Practices Board Manual (Washington Forest Practices Board, 1997 and updated versions). The purpose of state watershed analysis is to provide protection to specific public resources (fish, water, and capital improvements of the state) through a watershed-wide, cumulative effects assessment approach.

To accomplish this purpose, forested basins have been delineated into WAUs ranging in size from 10,000 to 60,000 acres. The analyses are initiated by either the state, based from a prioritized list or by landowner(s) that own ten percent or more of the analysis area. Primary components of the analysis are shown below.

Resource assessments. This is accomplished by a team of state-certified scientists who look at watershed hydrology, hillslope stability, erosion, riparian condition, channel morphology, fish habitat, public works, and water quality.

Table 1. State and federal watershed analysis components shown with Clean Water Act elements necessary for achievement of water quality-based plans.

	RESOURCE ASSESSMENT	SYNTHESIS	PRESCRIPTIONS	MONITORING & ADAPTIVE MANAGEMENT	PUBLIC PROCESS
STATE WATERSHED ANALYSIS PROCESS – LEVEL 2	Address critical questions outlined in each module which facilitate identification of hazards (e.g., unstable slopes) and vulnerabilities (e.g., salmonid rearing habitat).	Hypotheses are discussed for how the watershed functions. Casual mechanism statements and rule calls are developed.	Prescriptions developed for areas of resource sensitivity. Voluntary actions are also identified.	Monitoring module provides guidance. This module is voluntary. Adaptive management occurs at the 5-year review of the watershed analysis.	SEPA. Watershed analysis public review.
	RESOURCE ASSESSMENT	SYNTHESIS	CONTROL/RESTORATION	MONITORING & ADAPTIVE MANAGEMENT	PUBLIC PROCESS
FEDERAL WATERSHED ANALYSIS PROCESS	Identify dominant physical, biological, and human processes or features. Explain how ecological conditions have changed over time as a result of human influence and natural disturbances.	Discuss and display dominant processes and causal mechanisms that explain relationships between current and past conditions. Discuss major natural and human-related changes that have fundamentally altered the capability of the ecosystem to achieve conditions required to meet key management objectives.	Recommended management actions and restoration activities are presented for areas/resources of concern. Recommendations for timing, sequencing of actions, anticipated rates and time frames for achieving management objectives are developed. NW Forest Plan Standards and Guidelines contain controls designed to protect aquatic species.	Recommended inventory and monitoring needs. Adaptive management is ongoing based on monitoring. Watershed analysis is revisited as monitoring and inventory data or new management activities warrant.	Input into watershed analysis. NEPA.
FEDERAL CLEAN WATER ACT (ELEMENTS TO INCLUDE IN STATE AND FEDERAL WATERSHED ANALYSES)	1. Are there 303(d) listed parameters? If so, include in assessments. 2. Do the assessments identify water quality (including fish habitat) degradation? For fish beneficial uses, and other narrative water quality standards, include or develop key indicators. (These are parameters that indicate the condition of beneficial use.)	1. Integrate the 303(d) variable or key indicator into relevant causal mechanism statements. 2. Determine management objectives for restoration of the indicators. (See management objectives chart.)	1. Quantitatively address target in relevant management objectives (e.g., how long will pollution control take to achieve the management object and what are interim target points where success can be measured? 2. Determine restoration measures necessary for management objectives/	1. Monitoring is required. 2. Inclusion of key indicators/303(d) variables and effectiveness of watershed process measures/prescription is needed. Monitoring is used to determine if progress towards achieving water quality standards is occurring. Adaptive management is necessary and occurs as part of the 5-year review for state watershed analyses and will be specified for federal analyses.	1. A responsiveness summary to comments from public meetings and reviews is required for TMDLs. 2. A strong public involvement process is encouraged.

			water quality attainment. 3. Develop implementation schedule. (When will activities used to achieve management resource objectives occur?)		

Synthesis. Cause and effect relationships for watershed processes, especially those that may be impacting public resources, are developed based on the assessment. Casual mechanism reports describe these relationships.

Prescriptions. New rules (prescriptions) to protect public resources are written based on information in causal mechanism reports.

The analyses are accomplished by scientists and resource specialists. A monitoring module is voluntary.

Completed watershed analyses are peer reviewed by Department of Natural Resources and other qualified scientists. Additionally there is a 30-day public comment period and a concurrent 15-day State Environmental Policy Act (SEPA) review. WAC 222 specifies completed analyses are to be revisited after five years (or earlier where resource characteristics necessitate revisiting) to determine if prescriptions are working and resources are being protected and/or recovering. At this time, any needed revisions to the analysis are made.

Analyses are used for protection of public resources in the following manner:

1. Areas of resource sensitivity identified by the assessments and included in the causal mechanism reports have specific rules developed for them as described earlier; and

2. Where forest practices are to occur in one of these areas, the prescriptions for that site are followed. (Class IV Special classification for individual forest practices applications and alternate plans are forest regulatory alternatives to implementing watershed analysis prescriptions.) All prescriptions must meet or exceed standard forest practice rules.

Prescription largely focus on timber harvest within riparian areas and unstable slopes as well as road construction, maintenance and abandonment, and implementation of road maintenance and abandonment plans.

2. Federal Analysis Process

Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis, Version 2.2, revised August 1995 (Regional Interagency Executive Committee and Intergovernmental Advisory Committee, 1995) is used to direct analysis of watershed conditions, processes, and functions on federal lands managed under the Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (U.S. Department of Agriculture and U.S. Department of Interior, 1994). This guide provides the framework for analysis. Actual procedural modules are under development.

Watershed analysis is conducted before implementation of land management actions. The analyses are completed by interdisciplinary teams made up of experienced resource specialists and are issue-driven and incremental. The teams focus on seven core topic areas that address watershed-specific problems or concerns. Analysis teams identify and describe ecological processes of greatest concern, establish how well or poorly those processes are functioning and

determine conditions under which management activities, including restoration, should and should not take place. Analyses are completed using existing information, however, the incremental nature of the process allows new information from surveys and inventories, monitoring, or other analyses to be added at any time.

a. Uses Of Federal Ecosystem Analyses At The Watershed Scale

- Assist in developing ecologically sustainable programs to produce water, timber, recreation, and other commodities.

- Facilitate program and budget development by identifying and setting priorities for social, economic, and ecological needs within and among watersheds.

- Establish a consistent, watershed-wide context for project level National Environmental Act (NEPA) analyses.

- Establish a watershed context for evaluating management activity and project consistency given existing plan objectives (i.e., Aquatic Conservation Strategy objectives).

- Establish a consistent, watershed-wide context for implementing the Endangered Species Act, including conferencing and consulting under Section 7.

- Establish a consistent, watershed-wide context for local government water quality efforts and for protection of beneficial uses identified by the states and tribes in their water quality standards under the federal Clean Water Act.

b. Ecosystem Analysis At The Watershed Scale Has Six Steps

- Characterization of the watershed. Identify dominant physical, biological, and human processes or features that affect ecosystem functions or conditions.

- Identification of issues and key questions. These focus the analysis on the key ecosystem elements most relevant management questions and objectives, human values, or resource conditions.

- Description of current conditions.

- Description of reference conditions. Explain how ecological conditions have changed over time as a result of human influences and natural disturbances.

- Synthesis and interpretation of information. Explain significant differences between current and reference conditions, any similarities, and trends and their causes. The capability of the system to achieve key management plan objectives is also evaluated.

- Recommendations that are responsive to watershed processes identified in the analysis and include monitoring needs, data gaps, and limitations of the analysis.

c. Core Topic Areas

- Erosion processes
- Hydrology
- Vegetation
- Stream channel
- Water quality
- Species and habitats
- Human uses

Ecosystem analysis at the watershed scale is not a decision-making process, rather it is a stage-setting process. The ROD sets out the prescription under which various land allocations will be managed (these are the standards and guidelines). The analysis is used to help meet the ecosystem management objectives defined by the standards and guidelines. An analysis is required to change riparian reserve widths. The analysis information is also used for developing project-specific proposals and determining monitoring and restoration needs for a watershed.

III. IMPLEMENTATION GUIDE

A. Introduction

This guide covers "how to" aspects for accomplishing water quality plans for Upper White River Basin spring chinook habitat and water temperature. These plans are based on state and federal watershed analyses. The plans are intended to meet requirements for either TMDLs or "Other Pollution Controls" (OPCs) under the CWA for listed impairments as well as non-listed habitat parameters (e.g., large woody debris). For state analyses, this guidance should be used in concert with Ecology (1997a).

1. Plan Locations And Priorities

Seven WAUs, sub-basins delineated for implementation of watershed analysis at the state level and six National Forest System (NFS) fifth field watersheds (that overlap with the WAUs) are included in the Upper White River Basin. Figure 4 shows locations of these sub-basins, general ownership, Section 303(d) listed waters, and generally expected extent of spring chinook habitat. Table 2 includes the seven sub-basins of the White River Basin above Mud Mountain Dam, their size, ownership (or management status), and a prioritized list for plan accomplishment.

Accomplishment of water quality-based plans is needed for the Clearwater and Greenwater WAUs. These streams are listed as water quality impaired on the state's CWA Section 303(d) list and have been prioritized by the Framework Team for plan development.

Sub-basins with streams not currently on the state's list of high importance to chinook restoration efforts are the Middle White, West Fork White, Huckleberry, and Upper White. These streams are recommended for development of water quality-based plans according to this implementation guide. Reasons for this are two-fold:

1. These watersheds are important for chinook spawning, incubation and rearing or otherwise are important for overall White River Basin water quality health; and

2. Temperature exceedances and/or habitat degradation are known to occur within these drainages (Mt. Baker Snoqualmie National Forest, 1995; Wampler, 1987; Washington Department of Ecology, In Progress; Weyerhaeuser, 1996).

Where waters have not been listed, such plans are termed "preventive." A final sub-basin, Fryingpan includes Mt. Rainier and is primarily in Mt. Rainier National Park. As the Park is managed for preservation of natural processes, impairments due to forest management activities, which are the focus of this implementation guide, have not occurred.

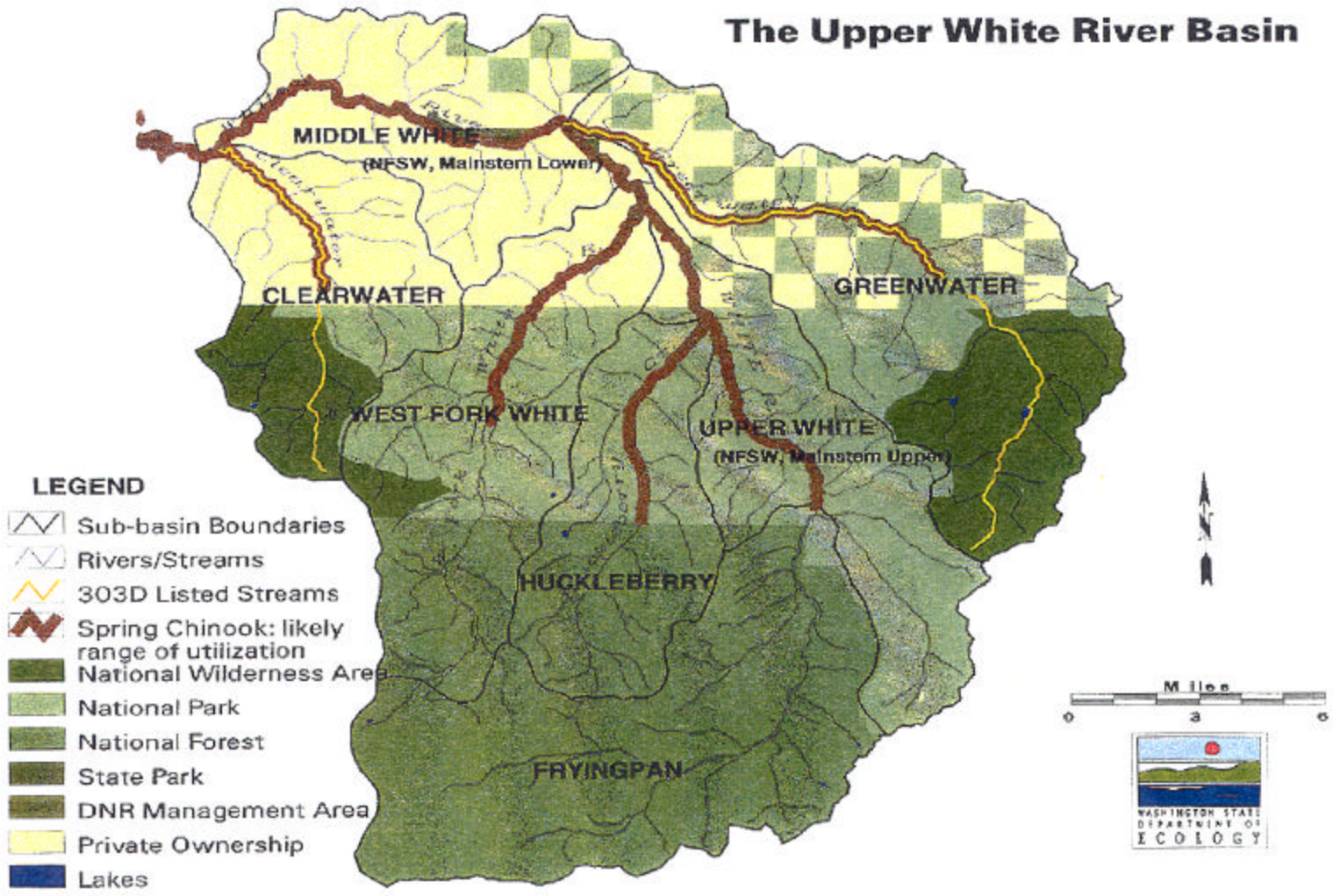

Figure 4. The Upper White River Basin. Depicted are: major sub-basins; general ownership patterns; Section 303(d) listed streams; and the general extent of spring chinook habitat. Sub-basins shown are state Watershed Analysis Watershed Administrative Units. National Forest System Watersheds (NFSW) encompass Forest Service land within these sub-basins. An exception is the Mainstem Upper White NFSW which includes Forest Service ownership within Fryingpan WAU and additionally has its downstream boundary upstream of the West Fork White River confluence.

Table 2. Upper White River sub-basin planning areas with size, ownership, and priority for plan accomplishment. These are based on WAUs originally delineated for implementation of state watershed analysis.

Watershed Administrative Unit (WAU)/National Forest System Watershed	Size of Sub-Basin* (Acres)	Ownership**	% of Sub-Basin	Plan Priority***
Clearwater	25,000	Forest Service Wilderness (USFS) Weyerhaeuser	14 32 54	1
Middle White/Mainstem Lower	28,500	State DNR Forest Service State Parks Weyerhaeuser	1 8 2 89	1
Greenwater	48,900	Forest Service Wilderness (USFS) Weyerhaeuser	40 32 28	1
West Fork White	34,900	Forest Service National Park Wilderness (USFS) Weyerhaeuser	49 28 4 18	2
Huckleberry	23,500	Forest Service National Park	46 54	2
Upper White/Mainstem Upper	28,700	Forest Service National Park Weyerhaeuser	90 2 8	3
Fryingpan	48,700	Forest Service National Park	3 97	(Doesn't apply)
(Total):	238,200			

*GIS derived data. This data is generalized, based on WAUs and is not a substitute for site specific acreage determinations. The data does not breakout small private holdings.
**Note: a recent land exchange between Weyerhaueser and the USFS has changed ownership sub-basin percents. The new percents are not reflected here.
***Those listed as 1, 2, and 3 are all priorities for accomplishment. This sequencing for watershed analysis is recommended by the team and is based on known fish use.

The Forest Service has completed a focused federal watershed analysis in the Greenwater NFS watershed (U.S. Forest Service, 1996). Several watershed restoration/flood damage repair projects with monitoring plans were scheduled for and initiated in 1997. In addition, a federal watershed analysis was completed for the Upper White NFS watershed (Mt. Baker-Snoqualmie National Forest, 1995) and some watershed restoration activities are being incorporated into master planning at the Crystal Mountain Resort ski area.

The Clearwater and Middle White WA Us are undergoing state watershed analysis and are being accomplished as pilot implementation efforts for this guidance as OPCs.

2. Included Elements Of A Water Quality-Based Plan

The term "water-quality-based plan" as used in this document refers to both TMDLs and to OPCs. This implementation guide covers both options and notes where known differences in requirements will occur. The following guidance should allow for acceptance into either option. The Framework Team recommends OPCs as the best approach for developing and implementing these water quality-based plans.

Primary elements of water quality-based plans for these watersheds are:

- Resource assessment including determination of cause-effect linkages;
- Identification of needed pollution controls and restoration actions to meet water quality standards with an implementation schedule;
- Specifications for how monitoring and adaptive management will occur; and
- Public involvement.

In the six sub-basins prioritized in Table 2, state and federal watershed analyses are the core for accomplishment of the water quality-based plans. Table 3 indicates how either watershed analysis process may be used to meet plan accomplishment and what additional information or work is necessary to meet requirements for a successful plan.

Sections that follow give guidance for accomplishing the plan elements.

Table 3. Upper White River chinook habitat water quality-based plan elements, sub-elements, how elements are accomplished, and which ones are required for state and private, or federal lands.

Water Quality Plan Element	Plan Element Or Sub-Element Description	Where Or How Element Is Accomplished	State And Private Land	Federal Land
Resource Assessment	1. Identification of beneficial uses and water quality criteria affected. 2. Key indicators of chinook habitat.	Watershed analysis (including other existing information).	X	X
	Determination of causes of or threats to habitat.	Watershed analysis	X	X
	Synthesis – development of linkages between key indicators and causes of or threats to habitat.*	Watershed analysis	X	X
Pollution Control/ Restoration Actions And Implementation Schedule	Identification of controls for forest management activities.	Standards and guidelines from the Mt. Baker Snoqualmie Forest Plan, the ROD, and from federal watershed analysis.		X
		Prescriptions (rules which exceed current standards) based on watershed analysis findings and standard rules.	X	
	Identification of restoration needs.	Watershed analysis: specifically for the water quality-based plan.	X	X
	Implementation schedule for control and restoration elements.	Specifically for the water quality-based plan.	X	X
Monitoring And Adaptive Management	A monitoring and adaptive management plan (including key indicators for chinook habitat and effectiveness of watershed management measures.	Specifically for the water quality-based plan using the state watershed analysis-monitoring module, federal watershed analysis monitoring methods, or a site specific monitoring approach where appropriate.	X	X
Public Process And Participation	Public participation for the water quality-based plan development and a responsiveness summary.	Specifically for the water quality-based plan and through SEPA or NEPA.	X	X

*This includes a temperature analysis that addresses factors in addition to riparian shade.

B. Resource Assessment

Resource assessments provide information on the current status of chinook habitat and stream temperature and on causes of habitat and temperature impairment. These assessments are accomplished through state (level II) and federal watershed analyses. There are two necessary categories of assessments:

- Those that address stream habitat and provide needed information for identifying the water quality status for chinook habitat and for water temperature; and
- Those that identify causes of, or threats to chinook habitat and water temperature.

Key indicators for chinook habitat (including temperature) are included in the assessments. Linkages between the indicators and watershed processes impacting habitat are developed in synthesis. Management objectives for habitat restoration (focused on the indicators) are then developed for use in control and restoration plan development. These plan elements are covered below.

1. Identification Of Beneficial Uses Affected

Chinook beneficial use support includes migration, rearing; spawning, and harvesting (WAC 173-201A). In the Upper White River Basin migration needs for juveniles and adults include adequate holding pools (adults), cover, shade, water temperatures, and flows. Juvenile rearing needs include shallow to moderate depth rearing areas (changing as the juveniles grow) with food sources, cool water temperatures, cover from predators, and refuges from high flows. Spawning needs include: holding pools with cover near spawning gravels, cool water temperatures, adequate amounts of spawnable size gravels relatively clean of fine sediments in locations with adequate flows, and an incubation environment relatively free from extensive fine sediment deposition and channel shifting or other changes in channel flow or sediment transport processes that would cause loss of redds (egg nests). Harvest is not a focus of this guidance but is incorporated in the overall strategy for White River spring chinook recovery (Washington Department of Fish and Wildlife et. al., 1996).

a. Current Beneficial Use Support Information For The Upper White River Basin

The Muckleshoot Tribe Fisheries, Puyallup Tribe Fisheries, Forest Service, and Ecology have collected data on temperature and fish habitat in the Upper White River Basin. A report being written by Washington Department of Ecology (In Progress) compiles much of this information. The included studies showed Huckleberry Creek is in compliance with the state temperature criterion of 16.0°C, while the Greenwater, Clearwater, White River, and some tributary streams are not. Based on fine sediment ratings in Washington Forest Practices Board (1997), spawning gravel fine sediment percentages in 1995 in Huckleberry Creek and the Clearwater River rated "good". Samples taken in three reaches in 1993 in the Clearwater River had fair ratings. The difference in values between the 1993 and 1995 Clearwater samples indicates spatial and/or temporal variation in this parameter. In the Clearwater River, fine sediments have been observed in the channel margins and side channels. No samples have been taken in these locations. Fines had a fair rating for 1995 in the Greenwater River. Channel cross-section and Scour monitor results in the

Clearwater River during the 1995 - 1996 incubation period indicated substantial channel instability and high likelihood of redd loss for many sites.

Weyerhaeuser and Muckleshoot Tribe Fisheries as part of watershed analysis for the Middle White and the Clearwater WA Us have collected information on current characteristics offish habitat within drainages of the mainstem White River, the lower Greenwater River, and the Clearwater River (Weyerhaeuser, 1996). The analyses found that amounts of both large woody debris key pieces and holding pools were in the poor category according to ratings in Washington Forest Practices Board (1997). Similar findings were reported in the Forest Service focused watershed analysis for Road 70 in the Greenwater River (U.S. Forest Service, 1996).

A temperature assessment done in 1996 in support of the Middle White and Clearwater watershed analyses and water quality data needs looked more thoroughly at Clearwater, Greenwater, and White River temperatures (Washington Department of Ecology, In Progress). This work found exceedances of the temperature criterion on the following rivers and creeks: Clearwater, Greenwater, mainstem White River, Lyle, Milky, Brush, and Camp. Whereas Camp Creek had only one day exceeding the standard, the extent of exceedances within the mainstem Clearwater River (river miles 2.7 and 4.3) was 65 percent of days between July 15, and August 15. In the Greenwater River (at river mile 1.2) 71 percent of the days between July 15, and August 15, were in exceedance. River mile 43.4 of the White River mainstem incurred exceedances of the water quality standard on 46 percent of the days between July 15, and August 15. No exceedances were documented for Mineral, Slippery, or Byron Creeks.

In the Clearwater River in 1996 (Washington Department of Ecology, In Progress) reach assessments found the following factors to be related to temperature exceedances: shade and riparian characteristics, channel width/depth ratio, warm water being delivered from upstream locations (mainstem and some tributaries), lack of topographic shade, and a south facing exposure (river mile 4.3 only). Factors related to temperature exceedances in the Greenwater (river mile 1.2) in 1996 were shade and riparian conditions and channel width1depth ratio. In summary, existing information on temperature, spawning gravels, large woody debris key pieces, and holding pools indicates that chinook beneficial uses are poorly supported in the drainages studied.

b. Spring Chinook Use Support And Water Temperature Assessment To Be Accomplished During Watershed Analysis

An integral part of water quality-based plans is current status information on the condition of spring chinook habitat and temperature. For the purposes of these plans, detailed (level II) assessments for the channel, riparian, fish, and water quality modules are needed for the state watershed analysis process and similar levels of intensity for core topic areas are needed for federal analyses. Intensive resource assessment work performed using either process is needed to identify the current status of the chinook habitat in the watershed(s). Inventories of locations of fish bearing waters including identification of culvert blockages are important aspects to include.

Where the level of data available for federal watershed analyses does not meet this need, the analysis findings will trigger gathering the information. Where they exist TFW monitoring protocols or similar Forest Service protocols are recommended for this work.

Including key indicators for chinook habitat in the assessment is necessary. These indicators are identified and discussed below. Whereas most of the indicators are state watershed analysis parameters, there have been some adaptations and additions. State watershed analysis allows for the use of additional parameters and indices to be used. Washington Forest Practices Board (1997) specifies on pages F-22 (Table F-2):

"Also, these are not the only parameters that can be used to describe the condition of habitat in a reach. Other indices or habitat descriptions can be used when they are clearly documented."

Federal watershed analysis provides flexibility in selection of parameters based on relevant issues in the watershed (Regional Interagency Executive Committee and Intergovernmental Advisory Committee, 1995).

Note: EPA is preparing an additional temperature analysis for the Clearwater/Middle White watershed analyses. It is not yet available to cite.

Stream temperature is included as an indicator and is also a water quality criterion under the state water quality standards in WAC 173-201A. State watershed analysis provides for extensive review of stream temperature conditions through analysis of riparian shade. In addition to this, for the water quality-based plans, stream temperature analysis should be supported by thermograph data. Thermal reach assessments upstream of the thermographs are used to identify primary factors involved with temperature exceedances (refer to Appendix B for more information). This information is necessary for providing linkage between temperatures, input variables associated with temperature, and watershed processes.

During the resource assessment, additional parameters or beneficial uses may be identified as not meeting water quality standards. If they are to be included in the water quality-based plan, similar attention to that described above for chinook habitat and temperature is given to describing their status. Where such parameters are interactive with or related to ones integrated into the analysis, it is reasonable to discuss this situation and in some cases rely on the existing indicator(s)/indices of resource concern.

2. Water Quality Goal, Key Indicators and Targets For Chinook Habitat

a. Water Quality Goal

The water quality goal for the upper White River for spring chinook is:

"To meet the migration, rearing and spawning needs of the chinook."

The White River Spring Chinook Technical Committee has developed interim and long-term goals for the chinook population (Washington Department of Fisheries et al., 1993). This information is

located in the previous spring chinook background section. These goals will be used additionally as the water quality goal for beneficial use support.

b. Key Indicators

Key indicators are parameters that provide information on how adequately chinook life history needs are supported by stream conditions in the interim before the water quality goal is attained. These parameters are checked first as part of watershed analysis, then over time, as part of a monitoring program that documents progress towards meeting beneficial use support. The focus of this section is to cover what the indicators are for the Upper White River Basin, their relationship to watershed processes and affected uses, indicator targets and interim targets and how to accomplish measurement of the indicators.

Table 4 contains key indicators developed by the team for measuring spring chinook beneficial use support in the Upper White River Basin. Methods for assessment, target measures, affected uses, input variables and their linkages to watershed processes are shown. The target for water temperature is the numeric criterion and anti-degradation portion of the state water quality regulation (WAC 173-201A). Appendix A contains background information developed and or reviewed by the team regarding key indicator methods, targets, similar parameters, and compatibility with state watershed analysis and Forest Service regulations.

Key indicators were developed by the team based on expertise of participants and available literature. A field trip was held to look at a variety of sites in the watershed with discussions held on the most relevant indicators for those sites. The bottom line for indicator inclusion was the question; "Which parameters, if monitoring showed them to be in good condition, would give us the most confidence that chinook habitat was healthy?" Wherever possible, parameters and methods were chosen that were either part of state or federal watershed analysis methods or were compatible with them.

Holding pools is one of five indicators with targets specified for White River spring chinook habitat water quality plans. The others are large woody debris key pieces, temperature, redd survival from scour and channel change, and riparian vegetation outside of the channel migration zone. Two additional indicators (channel width to depth ratio and active channel/channel migration zone aerial photo review) are included for informational and interpretation purposes with either no targets or informal targets.

The Upper White River Basin contains glacial and non-glacial channels. These pose different considerations for habitat characteristics and for our ability to measure these characteristics. As a result, some indicators are specified individually for these situations.

Redd survival was not included as an indicator in glacial channels for two reasons:

1. *Natural background sediment and flow dynamics in the glacial channels make management relationships difficult to discern; and*

2. *Physically working within these channels is difficult and in some cases not possible.*

Note, however, the team recommends redd survival work be accomplished in these channels to provide auxiliary information where possible.

Table 4 – Key indicators for the goal "To meet the migration, rearing and spawning needs of the chinook." (See text and APPENDIX A for more information.)

River*	Water Quality Key Indicator	Methods	Measures	Affected Uses	Input Variables ¬ Linkage ®	Watershed Processes
All Chinook Use Rivers	Large woody debris (LWD) key pieces.	Use State Watershed Analysis.	**Target:** State Watershed Analysis index for good condition. **Interim Target:** Watershed Analysis index for fair condition.	Chinook spawning, rearing, and holding.	Wood	Hydrology, Vegetation, Erosion/Mass wasting.
	Holding pools.	Use State Watershed Analysis adapted with USFWS Habitat Suitability Index.	**Target**: State Watershed Analysis diagnostics with USFWS Habitat Suitability Index (HIS) Rating of A. **Interim Target:** HIS Rating of B.	Chinook holding (before and during spawning).	Sediment Flow Wood	Hydrology, Large woody debris & Vegetation, Mass wasting & Erosion.
	Channel width/ depth ratio.	Field measurements. Forest Service stream surveys.	**No target:** Informal target may be developed. For use in support and interpretation of other indicators.		Flow Sediment	Mass wasting & Erosion Hydrology Vegetation.
	Temperature.	Thermographs and stream temperature reach assessments.	**State water quality criterion.** **Interim Target:** To be developed.	Chinook holding, spawning, incubation and rearing.	Shade/energy Sediment Flow	Large woody debris & Vegetation Hydrology, Mass wasting & Erosion.
Non-Glacial Chinook Use Rivers	Redd survival from scour and channel change.	TFW scour method adapted with redd elevations.	**Target:** To be developed. **Interim Target:** To be developed.	Chinook egg and alevin incubation.	Flow Sediment Wood	Hydrology, Large woody debris & Vegetation, Mass wasting & Erosion.
Glacial Chinook Use Rivers	Riparian vegetation outside of channel migration zone.	Evaluate riparian zone outside of channel migration zone.	**Target:** State Watershed Analysis Riparian High. **Interim Target:** Moderate.	Chinook holding, spawning, incubation and rearing.	LWD recruitment Overhead cover Channel stability	Hydrology, Large woody debris & Vegetation, Mass wasting & Erosion.
	Active channel/ channel migration zone aerial photo review.	Trend analysis of channel and vegetation patterns.	**No target:** For use in support and interpretation of other indicators.		Flow Sediment Wood	Hydrology, Large woody debris & Vegetation, Mass wasting & Erosion.

*Non-glacial chinook use rivers are: Clearwater, Huckleberry, and Greenwater. Glacial chinook rivers are: West Fork White and the mainstem White. All chinook use rivers are: Clearwater, Huckleberry, Greenwater, West Fork White and mainstem White, and other accessible tributaries.

Because it is difficult to accomplish field inventory of standard habitat parameters (e.g. holding pools, LWD) in the glacial channels, two indicators were developed to strengthen confidence in beneficial use support determinations for these waters. These are the riparian vegetation outside the channel migration zone and the active channel/channel migration zone aerial photo review. In the Clearwater River, gravel availability is an issue but was not added to the key indicators list. However, it was recommended to be included in baseline monitoring (discussed later) and at the five-year adaptive management time frame for the Clearwater, the issue of gravel availability is to be revisited.

Additional parameters would be meaningful and in specific watersheds or over time, additions or modifications based on mew information are expected. The included parameters and methods should be considered a starting place. The list of indicators should be brief to allow for feasible implementation.

c. Targets

Measures of whether beneficial use support is being accomplished are classed as targets and interim targets. Where numeric criteria exist, the specific criterion is the target. For use in a water quality-based plan, the key indicators must be quantifiable with a target set that represents best available information on standards attainment.

For example, with holding pools, the team has recommended that the method for analysis and target determination have two steps.

1. The state watershed analysis indices of resource concern for pools will be used. These have quantitative characteristics for percent pool, pool frequency, and percent wood cover in pools. These data are gathered during state watershed analysis.

2. To link pool data to chinook holding, further analysis of these data with diagnostics for chinook holding pools according to habitat suitability index information by Raleigh (1986) will be accomplished.

In some cases, such as for amounts and sizes of large woody debris in large rivers (>20 m wide) targets would benefit from research. In addition, monitoring of undisturbed areas (or relatively undisturbed) should be initiated to obtain better information on targets.

In watersheds where targets are not currently being attained and where such attainment will take substantial time, interim targets that represent milestones towards attainment of the target values or criteria are necessary. These will need to be considered and developed for each analysis area. Where targets are derived from indices of resource concern in state watershed analysis, the index for fair condition may be an appropriate interim target. Targets and interim targets need to take into account reasonable restoration and recovery periods for the indicator. They also need to factor in outside influences such as extreme storms which may significantly influence or set back recovery time-frames.

3. Determination Of Causes Of Impacts Or Threats To Chinook Habitat And Temperature

Watershed analysis assessments are used to identify causes of problems and threats to chinook habitat and temperature. State analysis hazard modules or Forest Service core topic areas or modules covering hydrology, riparian function, and mass wasting and other erosion processes provide this information. The resource assessments must provide enough information to allow confidence in incorporating water quality parameters and key indicators into the situation sentence(s) for state watershed analyses or the synthesis chapter for federal analyses. Detail and accuracy provided by Level II work (state analyses) and comparable level work for Forest Service analyses is necessary as a basis for watershed management and restoration measures planning.

The objective of this work is to identify locations with potential for causing or increasing impacts to habitat and temperature and with potential for allowing habitat and temperature restoration. There are two categories of areas that are identified:

- Areas where halting existing impacts and preventing future impacts is important (e.g. road-haul sediment delivery or harvest on an unstable hillslope with potential for mass wasting); and

- Areas with active and natural restorative needs. Active restoration for state analyses includes road maintenance or abandonment. Federal analysis prescribes broader restoration measures that include road decommissioning and/or storm-proofing and active channel restoration where appropriate. Both provide focus to "natural" watershed process restoration through improved watershed management (such as better mass wasting prevention).

Under state watershed analysis these locations or conditions are called "areas of resource sensitivity." Preventive measures or restorative measures (in the case of roads) are addressed in the prescription phase of watershed analysis.

Federal analyses identify conditions, processes, and locations within the watershed with heightened concerns. Protection generally is achieved through implementation of Forest Plan standards and guidelines as well as restoration and other recommendations identified in the watershed analysis.

4. Synthesis: Developing Linkages Between Key Indicators And Causes Of Impacts Or Threats To Chinook Habitat And Temperature

For water quality-based plans linkage between inputs from watershed processes and affected resources is important. Linkage with key indicators is needed as well.

An important part of having state watershed analysis function for a water quality-based plan is to consider the key indicators in the causal mechanism reports (CMRs). Specifically, the situation sentences should address the key indicators [and any other parameters listed under Section 303(d)].

Federal analyses need to identify water quality issues in the watershed characterization. The analyses then need to identify and track key indicators [including Section 303(d) parameters] in the description of current and reference conditions and through synthesis, linking indicators to all relevant ecological processes.

For both state and federal analyses, the indicator will need to be linked to the scope of relevant inputs and watershed processes. An example of this is the importance of linking temperature to shade and also to other watershed processes influencing the temperature regime. For state analyses this will necessitate including indicators in multiple CMRs.

For the Forest Service, the management objectives charts and linkage development accomplished will be used primarily to develop restoration plans but will also be used with other management actions. For state watershed analysis both the CMRs and draft Management Objectives Charts will be used next in prescriptions.

Key indicator linkage steps for the Upper Mite River Basin chinook habitat plans are:

1. Review key indicators in light of watershed analysis information.

- *Are key indicators as per Table 4 the most relevant for chinook habitat? (Because the key indicators will be included in a monitoring program it is preferable to retain them over time. However, flexibility to change or add new indicators based on new data may be necessary.)*
- *Are there other resource parameters (e.g. in state watershed analysis indices of resources concern) that should be included to more fully represent chinook habitat needs? If so, these should be added.*

2. In development of causal mechanism/situation sentences, refer to key indicator Table 4 and address indicator where appropriate in situation sentence linkages. A good example is seen in the Hydrology 1 CMR in Weyerhaeuser (1996). In the situation sentence linkages to the key indicators of redd survival, holding pools and water temperature are included. Similarly, for Forest Service analyses, incorporate cause and effect linkages with key indicators into the synthesis write-up.

3.a. STATE AND PRIVATE LANDS. Fill in the following portions of the Prescription Management Objectives Chart (see Table 5 for non-glacial rivers, Table 6 for glacial rivers and Table 7 for an example from the Clearwater Watershed Analysis).

- *Relevant CMRs (note which causal mechanism reports included linkages to the key indicators).*
- *Current condition of the key indicator.*
- *Elements of the Management Objective column are drafted at this time. Table 4 specifies targets to be used (under the "measures " column). Additional information is provided in Appendix A. The prescription team will later finalize time frames and targets.*

3.b. FEDERAL LANDS. Using the format of Tables 8 and 9 (adapted from Mt. Baker Snoqualmie National Forest findings and recommendations tables) identify current conditions of the key indicators for reaches of the river(s) used by spring chinook. Develop

management objectives through identification of targets (refer to Table 4 "measures") and timeframes.

Table 5. State watershed analysis management objectives chart: for White River Basin non-glacial chinook habitat key indicators.

DATE: _____
FILLED OUT BY:

STREAM: _____ GMU: _____ SEGMENTS: _____
_____

INDICATOR	CURRENT CONDITION	CASUAL MECHANISM REPORTS	MANAGEMENT OBJECTIVE	PRESCRIPTION	MONITORING OBJECTIVES	NOTES*
LWD Key Pieces	Pieces per channel width: Rating:		Pieces per channel width (target): Rating: Time-frame: Pieces per channel width (interim target): Rating: Time-frame:			
Chinook Holding Pools	Qualifying pools per channel width: Rating:		Qualifying pools (target): Rating: Time-frame: Qualifying pools (interim target): Rating: Time-frame:			
Width/Depth Ratio	W/D:		W/D:			
Temperature	Relate to criterion:		Target: Stream temperature will meet water quality standards. Time-frame: Interim target (detail): Time-frame:			
Redd Survival from Scour and Channel Change	Rating:		Target: Rating: Time-frame:			

*Notes: use this column to specify attachments with background information from prescriptions. Capture discussion elements useful for monitoring plan development (e.g., expected time-frame for standards attainment and prognosis considerations).

Table 6. State watershed analysis management objectives chart: for White River Basin glacial chinook habitat key indicators.

DATE: _____
FILLED OUT BY:

STREAM: _____ GMU: _____ SEGMENTS: _____
_____

INDICATOR	CURRENT CONDITION	CASUAL MECHANISM REPORTS	MANAGEMENT OBJECTIVE	PRESCRIPTION	MONITORING OBJECTIVES	NOTES*
LWD Key Pieces	Pieces per channel width: Rating:		Pieces per channel width (target): Rating: Time-frame: Pieces per channel width (interim target): Rating: Time-frame:			
Chinook Holding Pools	Qualifying pools per channel width: Rating:		Qualifying pools (target): Rating: Time-frame: Qualifying pools (interim target): Rating: Time-frame:			
Width/Depth Ratio	W/D:		W/D:			
Temperature	Relate to criterion:		Target: Stream temperature will meet water quality standards. Time-frame: Interim target (detail): Time-frame:			
Redd Survival from Scour and Channel Change	Rating:		Target: Rating: Time-frame:			
Active Channel/ CMZ Aerial Photo Review	Characterize channel dynamics:		No target (for informational purposes).			

*Notes: use this column to specify attachments with background information from prescriptions. Capture discussion elements useful for monitoring plan development (e.g., expected time-frame for standards attainment and prognosis considerations).

Table 7. In progress example from the Clearwater River: state watershed analysis management objectives chart for chinook habitat key indicators.

DATE: December 18, 1996
FILLED OUT BY: JS-H

STREAM: Clearwater **GMU: Clearwater Alluvial** **SEGMENTS: 1, 7, 35, and 54**

INDICATOR	CURRENT CONDITION	CASUAL MECHANISM REPORTS	MANAGEMENT OBJECTIVE	PRESCRIPTION	MONITORING OBJECTIVES	NOTES*
LWD Key Pieces	Pieces per channel Width: *0 in seg. 7* Rating: *Poor* *All segs have low instream LWD. All segs but 7, and part of 35, have L recruit. potential. These have M to H recruit potential.*	*MW1, 2, 4* Riparian: *D1, 2, 3, 4, 5, 6, 7, 8, 9* *HI*	Pieces per channel width (target): *<.5* Rating: *Good* Time-frame: *Not completed* Pieces per channel width (interim target): *.2 to .5* Rating: *Fair* Time-frame: Not completed	*Not completed*	*Not completed*	*Current condition based on watershed analysis.*
Chinook Holding Pools	Qualifying pools per channel width: *0* Rating: *Poor* *Seg. 7 & 35-WA found 13 channel widths/pool (not holding pools).*	*MW1, 2, 4* *RE1, 2* *HE1, 2* Riparian: *D1, 2, 3, 4, 5, 6, 7, 8, 9* *HI*	Qualifying pools (target): Rating: *Good – HIS of A, plus good pool frequency* Time-frame: *Not completed* Qualifying pools (interim target): Rating: *Fair – HIS of B* Time-frame: *Not completed*	*Not completed*	*Not completed*	*The watershed analysis found only 1 qualifying pool per segment (7 & 35). Depths do not meet the HS1 2 m target. Frequency meets poor indice under watershed analysis. See WA pg. 28.*
Width/Depth Ratio	W/D: *Seg. 1, 7, and 35 W/D range = 38 to 52*	*MW1, 2, 4* *HI*	W/D: *Informal indicator for information purposes.*	*Not completed*	*Not completed*	*Current condition based on Ecology 1995-96 data.*
Temperature	% of days greater than 16°C. July 15 to August 15: *12 to 65. Riparian shade below target in all segments.*	*MW1, 2, 4* Riparian: *D1, 2, 3, 4, 5, 6, 7, 8, 9, 12* *HI*	Target: Stream temperature will meet water quality standards. Time-frame: *Not completed* Interim target (detail): Time-frame: *Not completed*	*Not completed*	*Not completed*	*Current condition based on Ecology 1996 data. D12 is specific to temperature.*
Redd Survival from Scour and Channel Change	Rating: *Poor*	*MW1, 2, 4* Riparian: *D1, 2, 3, 4, 5, 6, 7, 8, 9* *HI*	Target: *To be determined* Rating: *Good* Time-frame: *To be determined*	*Not completed*	*Not completed*	*Current condition from watershed analysis fish habitat module. Based on 1995-96 Ecology data.*

*Notes: use this column to specify attachments with background information from prescriptions. Capture discussion elements useful for monitoring plan development (e.g., expected time-frame for standards attainment and prognosis considerations).

Table 8. Forest Service watershed analysis findings and recommendations for White River Basin non-glacial chinook habitat key indicators.

DATE: _____
FILLED OUT BY:_____

STREAM: _____ SEGMENT/RESEARCH: _____

ISSUE (CHINOOK INDICATOR)	FINDING (CURRENT CONDITION)	CAUSE	TREND	MANAGEMENT GOALS AND STANDARDS (MEASURES)	RECOMMENDATIONS	
					RESTORATION	MONITORING
LWD Key Pieces	Pieces per channel width: Rating:			Pieces per channel width (target): Rating: Time-frame: Pieces per channel width (interim target): Rating: Time-frame:		
Chinook Holding Pools	Qualifying pools per channel width: Rating:			Qualifying pools (target): Rating: Time-frame: qualifying pools (interim target): Rating: Time-frame:		
Width/Depth Ratio	W/D:			W/D:		
Temperature	Relate to criterion:			Target: Stream temperature will meet water quality standards. Time-frame: Interim target (detail): Time-frame:		
Redd Survival from Scour and Channel Change	Rating:			Target: Rating: Time-frame:		

*Notes: use this column to specify attachments with background information from prescriptions. Capture discussion elements useful for monitoring plan development (e.g., expected time-frame for standards attainment and prognosis considerations).

Tables 9. Forest Service watershed analysis findings and recommendations for White River Basin glacial rivers chinook habitat key indicators.

DATE: _____
FILLED OUT BY:_____

STREAM: _____ SEGMENT/RESEARCH: _____

ISSUE (CHINOOK INDICATOR)	FINDING (CURRENT CONDITION)	CAUSE	TREND	MANAGEMENT GOALS AND STANDARDS (MEASURES)	RECOMMENDATIONS RESTORATION	RECOMMENDATIONS MONITORING
LWD Key Pieces	Pieces per channel width: Rating:			Pieces per channel width (target): Rating: Time-frame: Pieces per channel width (interim target): Rating: Time-frame:		
Chinook Holding Pools	Qualifying pools per channel width: Rating:			Qualifying pools (target): Rating: Time-frame: qualifying pools (interim target): Rating: Time-frame:		
Width/Depth Ratio	W/D:			W/D:		
Temperature	Relate to criterion:			Target: Stream temperature will meet water quality standards. Time-frame: Interim target (detail): Time-frame:		
Active Channel/ CMZ Aerial Photo Review	Characterize channel dynamics:			No target (for informational purposes).		

C. Pollution Control Actions, Restoration Actions, And Implementation Schedule

Water quality-based plans require that pollution controls and restoration actions be tied to a schedule for implementation and to time frames for water quality recovery. In addition, there must be a mechanism requiring implementation. For example, state prescriptions are approved by DNR and become enforceable requirements of future forest practice applications.

1. Control And Restoration Actions

Using information from resource assessments, the analyses next identify measures that will be taken to address resource concerns (i.e., to achieve water quality standards through pollution source "control" or watershed-based "restoration" measures). Management objectives charts initiated in the synthesis section are used here to identify restorative targets. Control or restoration measures need to address targets and time frames.

Adjustments to management objectives charts may be needed based on information developed for implementation of control and restoration measures.

In state watershed analysis development of control and restoration measures (such as road plans leading to restoration) occurs in the prescriptions process. Prescriptions primarily address pollution prevention measures for areas such as unstable hillslopes. Restoration activities, in addition to road maintenance and abandonment plans, need to be identified during the prescription process based on the watershed analysis assessments, synthesis determinations and findings, and the appropriate water quality standards.

Assessment team members may be needed to work either on or with the prescription team to address quantitative aspects of resource management objectives.

In the federal sector, watershed analysis results in management recommendations (including restoration needs, monitoring, protection of sensitive areas, and resources) that are responsive to issues identified in the watershed analysis process and Forest Plan standards and guidelines (U.S. Forest Service, 1990; U.S. Department of Agriculture and U.S. Department of Interior, 1994). At this point, the analysis process is complete and implementation of measures will occur as funding and priorities allow.

For watershed analyses with state regulated and Forest Service lands, Forest Plan standards and guidelines apply to the Forest Service managed land. However, should state prescriptions be more protective they would additionally apply to Forest Service lands. This follows from Washington Department of Ecology and U.S. Department of Agriculture: Forest Service (1979). This document is a Memorandum of Understanding (MOU) between the agencies regarding water quality protection on lands managed by the U.S. Forest Service. The MOU states:

"The USFS will meet or exceed the prescribed state forest practice criteria and standards."

Elements to accomplish or work toward during development of control and restoration measures and monitoring needs are:

Use quantitative methods for determining adequacy of measures for restoration of chinook habitat and temperature;

Keep management objectives for the resource indicators in mind - also consider "how do we get to interim target?";

Complete relevant portions of management objectives charts (i.e., note which prescriptions or actions are addressing the indicator targets); and

Document information useful for monitoring plan development.

2. Implementation Schedule

Implementation schedules can be, but are not necessarily accomplished in state analysis. Forest Service analysis does not include a schedule. However, in both cases, water quality-based plans require that an implementation schedule be developed. Development of the schedule is a decision step for the Forest Service.

Include the following information in the schedule:

- Control or restoration actions to be taken to achieve water quality standards. For state watershed analysis include the prescription numbers, and for federal watershed analysis, describe the action;
- Time-frame for actions to be taken; and
- Stream reaches or basins affected and linkages to key indicators (refer back to management objectives or findings and recommendations tables).

3. Expected Outcome

Prescriptions and voluntary restoration elements for state processes and relevant standards and guidelines as well as restoration elements for Forest Service analyses are developed that together with the implementation schedule provide a plan for working toward and achieving habitat and temperature restoration management objectives.

D. Monitoring And Adaptive Management

State and federal watershed analyses include the concepts of monitoring and adaptive management. Monitoring to track implementation and effectiveness of control/restoration measures and progress towards meeting water quality standards is required for water quality-based plans. Prescriptions and other restoration measures are intended to support attainment over time of indicator targets and chinook beneficial use support. Feedback from monitoring is necessary for confirmation that measures being taken are guiding habitat restoration in the correct direction and pace.

Adaptive management is a process that allows for effectiveness of measures being taken for resource protection and restoration to be evaluated. It then provides a mechanism to make corrections in management when monitoring results or other new information indicates changes would be beneficial.

Specifics on monitoring and adaptive management for the water quality-based plans follow.

1. Monitoring

For state analysis, a voluntary monitoring module is included in the watershed analysis manual. Using this module in a manner that incorporates key indicators is recommended.

Monitoring is integral to and required as part of The Northwest Forest Plan (U.S. Department of Agriculture and U.S. Department of Interior, 1994). The Northwest Forest Plan intended integration with the CWA and state water quality standards. The following paragraph regarding effectiveness monitoring of aquatic ecosystems describes this relationship (p. E7).

"The health of aquatic and riparian ecosystems is dependent on water quality. Effectiveness monitoring that assesses the physical, chemical, and biological integrity of aquatic ecosystems is necessary to ensure conditions that will maintain water quality and support aquatic organisms. The Clean Water Act directs that states adopt water quality standards and criteria as necessary to protect designated beneficial uses. The standards and criteria of the Clean Water Act, which apply to both federal and nonfederal lands, will be used in effectiveness monitoring to determine if water quality and the health of aquatic systems are being maintained.

Federal land managers have flexibility in developing site-specific monitoring plans that encompass key indicators.

The following hypothesis will guide monitoring for chinook habitat in the Upper White River Basin:

Forest watershed management implemented through watershed analysis derived, water quality-based plans will spatially and temporally restore habitat conditions for chinook rivers, leading to beneficial use support.

Monitoring is intended to be a cooperative endeavor among all watershed parties. To facilitate cooperative monitoring, a steering committee is being formed.

The Team Identified monitoring categories necessary for the upper White River water quality-based plans:

- Baseline monitoring of the key indicators;
- Implementation and effectiveness monitoring; and,
- Monitoring the goal of meeting White River spring chinook beneficial use support.

These categories are discussed below.

a. Baseline Monitoring Of The Key Indicators

A baseline assessment of the key indicators in all of the streams used by the chinook is needed. This information is necessary to design long-term monitoring plans for the sub-basins, and to accurately tack the habitat indictors over time. The baseline developed will be used as a yard stick for measurement of resource improvement. It is not expected to represent historic habitat conditions. Cooperatively applying for grant funds for this element is recommended.

Where watershed analyses have occurred, they are able to provide a diagnosis of conditions for all or most of the key indicators.

This diagnosis will be useful in determining:

- Where the most important reaches are in terms of habitat characteristics (including those reaches where change would be expected) and fish use. This will allow focus for implementation of baseline monitoring; and
- If there are adaptations to indicators chosen or other changes in indicators that would be beneficial.

For those watersheds that have not undergone watershed analysis, a reconnaissance level review will be necessary before baseline monitoring can be implemented. For example, a combination of spawner surveys, Puyallup radio tagging data, and aerial photo review can be used to determine monitoring locations for the riparian vegetation/active channel review.

Gravel availability is recommended for inclusion in baseline monitoring.

b. Implementation And Effectiveness Monitoring

This monitoring component is the heart of the long-term monitoring plan or plans to be developed. It includes both monitoring of control and/or restoration measures, and monitoring of the key indicators.

Control and restoration measures have two focuses for monitoring. The purpose of the first, implementation monitoring, is to determine if measures were implemented as planned. The second focus is on effectiveness of measures implemented. In general, it is expected in early years of the habitat water quality plans that the effectiveness of implemented measures will be a priority

monitoring component. However, it may be numerous years before we can hope to know if many of the management measures have been effective.

Monitoring of key indicators based on the baseline monitoring recommendations and watershed analyses will provide progress checks toward meeting the goal of water quality standards attainment. Not all reaches of a watershed must be monitored for all key indicator targets to test whether the management plan is effective. Such "census" monitoring can be too expensive to implement well.

Key indicators are to be monitored on the most sensitive and representative reaches within each chinook use river (Clearwater, Huckleberry, Greenwater, West Fork White, and mainstem White).

c. Monitoring Of The Goal: "To Meet The Migration, Rearing, And Spawning Needs Of The White River Spring Chinook"

The White River Spring Chinook Technical Committee (Washington Department of Fish and Wildlife et al., 1996) interim and long-term escapement goals will be used for the CWA beneficial use support goal (see chinook background for more information). Warren (1994) provides background upon which the interim goal was developed and describes that the goal would be expected to be revised as more information was developed. For example, the interim goal did not include spawning fish in the mainstem White River. Ladley et al., (1996) have now documented substantial spawning activity in the mainstem for 1996. Monitoring of this goal is currently accomplished by the Tribes and state and federal fish agencies and is expected to continue.

d. Monitoring Plans

Monitoring plans will be developed by watershed cooperators for baseline (under development), implementation, and effectiveness monitoring components. The baseline monitoring for the key indicators shall be upper basin-wide in coverage; subsequent follow-up monitoring is expected to additionally be basin-wide. However, implementation and some aspects of effectiveness monitoring will likely be best accomplished at the watershed analysis scale of a WAU or fifth field National Forest System watershed.

The plans will address quality assurance and control needs. They additionally will include statistically valid study designs that encompass methods, parameters, timing (frequency and duration), data analysis and interpretation and sampling locations.

For chinook habitat key indicators much of this information has been developed and is found in Appendix B.

2. Adaptive Management

Adaptive management for state regulated watershed analyses occurs at five-year review intervals, or in some cases earlier if necessary (e.g., occurrence of catastrophic events). If expected progress towards targets (or interim targets) for the key indicators is not met by the time

of the review, linked prescriptions must be re-evaluated. Washington Department of Natural Resources is the primary regulator regarding adaptive management for the state process.

Likewise, the Forest Service is the lead for adaptive management for the land it manages. Forest Service monitoring plans will specify timelines for results reporting and criteria for triggering management activity review (feedback, i.e., adaptive management). The timeline will generally depend on the type of key indicators or other parameters being monitored but is expected to be similar to that used by the state.

During adaptive management reviews the need for changes in prescriptions or management actions, targets, indicators, time-frames, or the biological goal will be evaluated. Modifications can be made at this time. Opportunities for public involvement for this work should mirror those for watershed analysis accomplishment. Findings and changes as a result of the review will be made available to the public.

Ecology reports results of the adaptive management process to EPA through CWA Section 303(d) processes. EPA makes decisions on the adequacy of the adaptive management that occurs based on its CWA authorities.

E. Public Process and Participation

The right to be informed and to provide input into and help shape decisions is the keystone of public process and participation. Provisions of the CWA, Forest Service NEPA regulations, and state watershed analysis regulations all include forms of public participation.

Minimum requirements for public participation for water quality-based plans are:

- For a TMDL, comments must be taken from the public and agencies and a responsiveness summary must be prepared and be part of the submittal package.
- Other Pollution Controls (OPCs) under EPA guidance (U.S. Environmental Protection Agency, 1995) do not require public participation during their development. However, exclusions of water from the CWA Section 303(d) list are subject to public review during 303(d) list development. The public is allowed to comment on any proposed exclusion. Ecology writes a responsiveness summary on these comments, and the exclusion decision is approved or disapproved by EPA as part of the list (Washington Department of Ecology, 1997b).

Minimum requirements for watershed analyses are:

- For the state of Washington watershed analysis process, landowners, and Tribes are entitled to participate. A 30-day notice/comment period is required for prescriptions, and for SEPA, a 15-day notice is required.
- For federal watershed analysis public involvement and NEPA are not required since it is not a decision making process. On the Mt. Baker Snoqualmie National Forest, public participation is encouraged. There is typically a public "kick-off" meeting or letter, with a request for input on issues and concerns about the watershed. Participation on the assessment team is an opportunity.

Activities "actions" initiated after, or resulting from a Forest Service watershed analysis, are subject to NEPA and the public participation process requirements. Where an analysis is initiated specifically for a water quality-based plan, the plan will become the "action" and public participation requirements will be fulfilled at that time. Development of the implementation schedule is a decision step and is a trigger for NEPA review.

Although OPCs do not specifically require public participation, the Framework Team recommended that a more complete public involvement process to gather public input on issues and concerns, provide information about the process and present major findings be accomplished. Based on this, the following public involvement elements were developed for water quality-based plans in the Upper White River Basin:

1. *Public notice of a "kick-off" meeting. This will include notice in a local newspaper and posting at key locations within/near the study area.*

2. *Preparation of a summary report of comments received at the public meeting, or received via other avenues and response(s) comments.*

3. *Periodic updates on the process and conclusion(s) to be prepared and mailed to all parties requesting a copy.*

4. *A press release on the project.*

5. *SEPA/NEPA review.*

6. *Documentation of the above steps for later submittal to Ecology.*

During the development of this guidance and coincident with accomplishing the Clearwater and Middle White watershed analyses, a public meeting was held. Appendix B contains background on the meeting as well as a responsiveness summary to comments received.

F. Submittal And Ecology / EPA Review Information

Basic documentation requirements for submittal (to Ecology) to satisfy Section 303(d) and review information is listed below.

1. Documentation Requirements

a. A Summary Fact Sheet

See Washington Department of Ecology (1997a) for example. Include:

- A short general description of the watershed including a map to show the federal forest system watershed, or the state watershed administrative area;
- A list of current waterbodies in the submittal area that are on the 303(d) list;
- Which waterbodies and applicable water quality parameters (e.g., temperature) and rules [e.g., WAC 173-201A-030(1)(c)(iv)], are being included;
- Summary of data and supporting studies;
- Overview of water quality goals, targets, time-frames, and actions being taken to achieve goals and targets;
- Technical supporting documentation bibliography;
- Overview of public participation; and
- Implementing mechanisms.

b. Copies Of The Management Objectives Charts Or Findings And Recommendation Charts

c. Copy Of The Implementation Schedule

In addition, have the following documentation available for submittal if it is needed:

- Data and supporting studies; and,
- Monitoring plan overview and adaptive management time-frames and process.

2. Review Process

Ecology will review the documentation and determine whether the submitted information is a TMDL or OPC. Materials will be reviewed for completeness. TMDLs are forwarded to EPA for approval. OPCs are forwarded to EPA during the subsequent Section 303(d) listing cycle.

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APPENDIX A
KEY INDICATOR BACKGROUND INFORMATION

Background information developed by the Upper White River Chinook TMDL Framework Team on the key indicators is included in this Appendix.

Some methods and targets are incomplete. Remaining methods will be developed as part of baseline and long-term monitoring plan designs. Likewise, for some parameters, targets and interim targets will need further development based on the data found in watershed analyses and the baseline monitoring.

Large Woody Debris Key Pieces

General Background Information

In larger rivers, and glacial rivers, accumulations (i.e., jams) of LWD are important. In glacial channels, LWD functions to assist in creation of spawning and holding habitats. The structural role of LWD in channel morphology may be less than in smaller, non-glacial channels. Key LWD pieces function both as catalysts for jams or independently to create deep pools, trap spawning gravels, and dissipate flow velocities and stream energy. By definition in the state watershed analysis manual (Washington Forest Practices Board, 1997), these pieces are independently stable in relation to their channel, therefore, of sufficient size to withstand high flows. To provide key LWD to the channel, the riparian area must be able to provide long-term inputs of a functional size to the channel.

The parameter of LWD key pieces is also intended to be indicative of cover for spawning habitat. Where key piece LWD indices are being met, it is assumed a healthy riparian forest is additionally able to provide spawning habitat cover. Monitoring of LWD in tributaries needs to include sections representing the entire freshwater migrational path as chinook need to hold sporadically en route to their spawning sites. Also to be considered is assessment of potential recruitment for future key pieces.

Methods

Follow protocols in state watershed analysis (Washington Forest Practices Board, 1997) for LWD key pieces.

For channels >20 m there is no information or developed indices for LWD key pieces. Until such information exists, the current indices for 20 in channels should be used. This follows protocols in state watershed analysis. Note that research is needed to relate LWD to stream type.

Baseline Monitoring Characteristics

- Number of reaches - one to several, based on issues, accessibility, and cost.
- Reach - 20 to 30 channel widths.
- Reaches to be within important chinook habitat.
- Streams to be sampled - Clearwater, Greenwater, Huckleberry.

Long-term Monitoring (Intervals, Locations, Etc.)

- Interval - three to five years
- Locations - within chinook habitat and potentially elsewhere to describe how watershed is functioning.

Targets and Interim Targets

Use state watershed analysis (Washington Forest Practices Board, 1997) indices of resource condition (Tables 1,2,3). These indices are numbers of key pieces per bankful width. Use of the indices as targets and interim targets would work as follows: if the resource is currently rated as Poor, an interim target would be the Fair category, with the target being the Good category. As per the note in methods, research is needed.

Table 1. Target and interim targets for LWD.

Table 2. Minimum size to qualify LWD as a key piece.

Table 3. Minimum volume to qualify as a key piece.

Compatibility Notes

U.S. Department of Agriculture and U.S. Department of Interior (1994), pg. E-7 lists coarse woody debris (size and quantity) for effectiveness monitoring in aquatic ecosystems.

National Marine Fisheries Service (NMFS) (1996) includes properly functioning is >80 pieces per mile >24 in diameter >50 ft long. This equals a size of >.6 m diameter >15.24 m long and is comparable to state watershed analysis piece size as a rough average of the 6 - 20 m bankful channel categories. The NMFS piece count equals >1.5 pieces per 30 m. for a 15 m bankful channel where state watershed analysis would call for >1 piece.

Holding Pools

General Background Information

It is expected that pool data for the Clearwater and Greenwater Rivers and for Huckleberry Creek will be amenable to standard available field methods. Surveys of holding pools in glacial channels may need to occur at different times and with different methods than in the non-glacial rivers. Suggestions to consider for the mainstem:

1. Depth sounding sin drift boats (consider also for glides and riffles); and

2. Studies from the Puyallup Tribe's radio-tagging program may indicate where pools are.

Methods

Use a two-part methodology.

Part one – use the state watershed analysis (Washington Forest Practices Board, 1997 or most recent version) methodologies for percent pool, pool frequency, and percent wood cover in pools (Tables 4,5,6,7).

Part two – overlay the above information with the U.S. Fish and Wildlife Service Habitat Suitability Indices (HIS) (Raleigh et al., 1986) for chinook holding pools.

Note that the state watershed analysis channel size for pool diagnostics is <15 m bankful width for percent pool, pool frequency, and pool cover. Accounting for this factor is one of several needs with the holding pool methodology that may need consideration during implementation.

Baseline Monitoring Characteristics

- Number of reaches – one to several, based on issues, accessibility, and cost.
- Reach – 20 to 30 channel widths.
- Reaches to be within important chinook habitat.
- Streams to be sampled – Clearwater, Greenwater, Huckleberry.

Long-term Monitoring (Intervals, Locations, Etc.)

- Interval – three to five years.
- Locations – within chinook habitat and potentially elsewhere to describe how watershed is functioning.

Targets and Interim Targets

Using state watershed analysis diagnostics, adapt/adopt overlay of HIS indices for holding pools. This includes definitions for first, second, and third class pools and a rating system A, B, and C that would give better definition to state watershed analysis of resource condition.

Table 4. State watershed analysis holding pool targets.

Table 5. State watershed analysis percent pool targets.

Table 6. State watershed analysis pool frequency targets.

Table 7. State watershed analysis percent wood cover in pools targets.

*No values - needs assessment.

U.S. Fish and Wildlife Service HIS overlay target information (Raleigh et al., 1986) pp. 13-14.

Pool class rating is measured during the late growing season low flow period.

a. >or = 30 percent of the habitat classified as pools is composed of 1st class pools.
b. >or =10 percent but <30 percent of the habitat classified as pools is composed of 1st class pools or > or = 50 percent is 2nd class or better pools.
c. < 10 percent of the habitat classified as pools is composed of 1st class pools and <50 percent is 2nd class pools.

HIS definitions:

First-class pool: Large and deep. Pool depth and area are sufficient to provide a low velocity resting area for several adult chinook. More than 30 percent of the pool bottom is obscure due to surface turbulence, turbidity, or the presence of structures such as logs, boulders, or overhanging objects. Or, the greatest pool depth is ≥ 2 m in streams > 5 m wide.

Second-class pool: Moderate size and depth. Pool depth and area are sufficient to provide a low velocity resting area for a few adult chinook. From 5 to 30 percent of the bottom is obscured by surface turbulence, turbidity, or the presence of structures. Typical 2nd class pools are large eddies behind boulders and low velocity moderately deep areas beneath overhanging banks and vegetation.

Third-class pool: Small in area, or shallow, or both. Pool depth and area are sufficient to provide a low velocity resting area for one to very few adult chinook. Cover, if present, is in the form of shade, surface turbulence, or very limited structure. Typical 3rd class pools are wide, shallow areas of streams or smaller eddies behind boulders. The entire bottom of the pool may be visible.

Compatibility Notes

U.S. Department of Agriculture and U.S. Department of Interior (1994), includes key monitoring item of pool frequency and quality (width, depth, and cover).

USFWS/Muckleshoot 1980's surveys (Wampler, 1987) used the following criteria for holding pools in the upper White River drainage:

1. Surface Area - 10 feet by 10 feet minimum per fish;

2. Pool Depth - 2 feet minimum acceptable

3. Velocity - 5 f/s maximum acceptable; and

4. Cover - Type 1, 2, 4, or 5 minimum (Type 2 includes > or = to 3 feet diameter boulders).

Wampler (1986) developed the following optimum criteria for holding adult chinook salmon:

1. Total depths ≥ 14.1 feet;

2. Mean column velocity 0.0 - 3.7 feet;

3. Dominant substrate - small cobble; and

4. Protective cover - overhead wood.

The Upper Green/Sunday Washington State watershed analysis defined sufficient holding pools as ≥3 per 100 in of stream; 2 was considered fair, and < or = to 1 was considered poor.

Channel Width/Depth Ratio

General Background Information

The primary purpose of this parameter is for use in support and interpretation of other indicators. Bankful width and depth information is taken in state watershed analysis, however, there is no analysis of their ratio included. The team determined that without specific information relative to W/D ratios for the upper White Basin, targets could not be meaningfully set. Over time, specific information on the Upper White River Basin channels could potentially change this determination.

Methods

Bankful width and depth measurements are taken during state watershed analysis and Forest Service Region 6 Level II stream surveys (U.S. Forest Service, 1993). However, no sampling design for W/D ratio is currently developed.

Potential informal interpretation references:

1. Rosgen (IN: Mt. Baker-Snoqualmie National Forest, 1995) has developed information on low gradient channels that may be useful.

2. Forest Service stream stability index (Pfankuch, 1978) rates data into categories of:

   Excellent – W/D less than 7;
   Good – W/D 8 – 15;
   Fair – W/D 15 – 25; and
   Poor – W/D – 25 or more.

3. W/D should be related to stream type (see Rosgen IN: Mt. Baker-Snoqualmie National Forest, 1995).

Baseline Monitoring Characteristics

- Number of reaches – one to several, based on issues, accessibility, and cost.
- Reach – 20 to 30 channel widths.
- Reaches to be within important chinook habitat.
- Minimum of ten samples per reach.
- Streams to be sampled – Clearwater, Greenwater, Huckleberry.
- For the White River and the West Fork White River ("probably") width from aerial photos will be used.

Long-term Monitoring (Intervals, Locations, Etc.)

- Interval – three to five years.

- Locations - within chinook habitat and potentially elsewhere to describe how the watershed is functioning.

Targets and Interim Targets

No targets will be set: this indicator is for informal interpretation of other indicators.

Compatibility Notes

The U.S. Department of Agriculture and U.S. Department of Interior (1994) specifies this parameter for use in aquatic ecosystem effectiveness monitoring.

National Marine Fisheries Service (1996) uses W/D as an indicator.

1. Properly functioning: <10.

2. At risk: 10 - 12.

3. Not properly functioning: >12.

Stream Temperature

General Background Information

This parameter differs from the others as it is an adopted state water quality criterion.

Methods

Temperature data will be take with thermograph data loggers using standard protocols. Monitoring locations and frequencies will be detailed in monitoring plans.

Thermal reach assessments 600 m upstream of thermographs [see Washington Department of Ecology, (In Progress) for methods example] are used to identify riparian, channel, and flow inputs to temperature conditions in mainstem chinook use areas.

U.S.G.S. gages on Greenwater and Boise Creeks will be used for tracking flow data.

Baseline Monitoring Characteristics

- Baseline exists for Clearwater.
- Partial baseline exists and needs to be finished for Greenwater.
- Baseline needed for Huckleberry and West Fork White.

Long-term Monitoring (

- Thermograph data at select location (to be determined).
- Track flow and climatic data.
- Consider temperature station at lower-end of W/D reach.
- Consider taking data in mainstem White River.

Criteria and Interim Targets

The criterion for temperature is the state water quality standard for Class AA waters (WAC 173-201A). It reads:

"Temperature shall not exceed 16.0°C (freshwater) or 13.0°C (marine water) due to human activities. When natural conditions exceed 16.0°C (freshwater) or 13.0°C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C."

An additional part of the water quality standards to be met is the anti-degradation requirement. It is specified in WAC 173-201A-070 as follows:

1. *"Existing beneficial uses shall be maintained and protected and no further degradation which would interfere with or become injurious to existing beneficial uses shall be allowed.*

2. Whenever the natural conditions of said waters are of a lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria.

3. *Water quality shall be maintained and protected in waters designated as outstanding resource waters in WAC 173-201A-080.*

4. Whenever waters are of a higher quality than the criteria assigned for said waters, the existing water quality shall be protected and pollution of said waters which will reduce the existing quality shall not be allowed, except in those instances where:

a) It is clear, after satisfactory public participation and intergovernmental coordination, that overriding considerations of the public interest will be served;

b) All activities which result in the pollution of waters from nonpoint sources shall be provided with all known, available and reasonable best management practices; and

c) When the lowering of water quality in high quality waters is authorized, the lower water quality shall still be of high enough quality to fully support all existing beneficial uses.

5. Short-term modification of water quality may be permitted as conditioned by WAC 173-201A-110."

Compatibility Notes

The U.S. Department of Agriculture and U.S. Department of Interior (1994) specifies this parameter for use in aquatic ecosystem effectiveness monitoring.

Redd Survival From Scour And Channel Change
Non-Glacial Channels Only

General Background Information

Scour studies led by Ecology in the Clearwater River during the 1995 – 1996 incubation cycle (Washington Department of Ecology, In Progress) found extensive scour, deposition, and channel change in the sites monitored. Results and observations indicated a high level of mortality to incubating salmonid eggs and alevin. The characteristic uses of the upper White Basin streams for chinook are holding, spawning, incubation, and rearing. Incubation, during the one year of study (which included a record-setting flood), was substantially impaired. A reconnaissance redd study also occurred during the 1996 – 1997 incubation period with elevations and locations marked for a total of 33 redds in the Greenwater, Clearwater, and mainsteam White Rivers. Results are not yet available from this work. In addition, redd survival studies in the Greenwater River are in progress for the 1997 – 1998 incubation period.

Redd survival was not included as a key indicator for glacial channels. The team considered sediment and flow dynamics in these systems to be of too large a scale to analyze aspects of redd survival attributed to human caused versus natural processes. However, if attainable, scour, or redd survival studies in these channels is desirable and may provide auxiliary important information.

Methods

Based on first year Puyallup radio tagging results (Ladley et al., 1996) the Clearwater and Greenwater Rivers and Huckleberry Creek will be the priority rivers for this work. However, note that where feasible, the mainstem should be included. In addition, should subsequent years find that spawning in the West Fork is occurring, it shall be considered for addition into survival studies.

Monitoring/indicator reaches will be chosen based on best available information on chinook spawning locations (e.g., Ladley et al., 1996).

U.S.G.S. flow gages are located on Greenwater River, Boise Creek (may be best for Clearwater) and the White River.

It is recommended that initial study design be based on the TFW scour module and on the 1996-97 reconnaissance effort. The scour module would be used by developing a pair of cross-sections with scour monitors that would be permanent and/or reset over time. This set would be located within a reach where individual redds would be monitored for their elevation, habitat type, and location. This approach allows scour and several redd survival aspects to be investigated for specific redd locations without intrusive methods that could cause mortality to incubating embryos.

Flow data will be available for analysis of survival results and over time will be used to assess flow and redd loss relationships.

Time-frame

This method will be used for five years. At that time the monitoring steering group will evaluate the method, results, targets and determine further monitoring time-frames and methods.

Baseline Monitoring Characteristics

Focus on Clearwater, Greenwater, and consider Huckleberry. Establish a five-year baseline using TFW scour methodology adapted with redd elevations.

Long-term Monitoring (Intervals, Locations, Etc.)

To be determined after baseline is accomplished.

Targets and Interim Targets

To be determined after the baseline is established. Workgroup recommendations are that targets be based on natural cycles of storm/scour upon which the fish have survived over time, a target based on frequency of scour is of interest.

Potential target definitions based on flow:

- Some: < or = ten percent increase in net flow, magnitude, intensity, or duration of stream flow events which cause scour to spawnable gravels; and
- Low potential: no net increase in flow, magnitude, intensity, or duration of stream flow events which cause scour to spawnable gravels.

Table 8. Redd scour targets based on Washington Forest Practices Board (1997).

*No values - This will be accomplished after the baseline is accomplished.

Compatibility Notes

This is not an aquatic systems key indicator in the U.S. Department of Agriculture and U.S. Department of Interior (1994). However, there is no similar element that this would be incompatible with.

Riparian Vegetation Outside of Channel Migration Zone Glacial Channels Only

General Background Information

The purpose of this indicator is to monitor the riparian zone outside of the channel migration zone on the glacial rivers. It is used in tandem with the active channel/channel migration zone aerial photo review (below) to provide information on the health and interactions of this zone with the rivers and chinook habitat.

Methods

This indicator will be accomplished along with active channel/channel migration zone review. The state watershed analysis is riparian module provides methodology for measuring length of riparian vegetation by dominant species, size, and density. Alternately, the Mt. Baker Snoqualmie National Forest has developed five vegetation classes for looking at shade and LWD recruitment. These classes are "draft" and do not have field verification. This classification system may be most useful on Forest Service lands.

As per active channel aerial photo review, use aerial photo blow ups. Adapt the state watershed analysis methodology to allow measurement of dominant species, size and densities within two distances from the channel: 0 - 30 ft. and 30 - 100 ft.

Baseline Monitoring Characteristics

- White and West Fork White Rivers (only).
- Select reaches based on chinook use.
- Monitor the 100 feet outside of channel migration zone using watershed analysis methods.
- Aerial photos - consider scale needed (will 1:12,000 be adequate?)

Long-term Monitoring (Intervals, Locations, Etc.)

- Intervals - five years
- Assess need for additional reviews following major flood/etc. events.

Targets and Interim Targets

The target for this riparian zone located outside of the active channel/channel migration zone is a late seral stage forest. Interim targets need further development but potentially would be described in terms of percent of zone/length or segment that meets the target.

Compatibility Notes

Further review of the compatibility of the Forest Service draft methods with the state riparian methods would be useful.

Active Channel/CMZ Aerial Photo Review
Glacial Channels Only

General Background Information

The purpose of this review is to gather information on the overall stability of the channel network. In the glacial systems, the complex network of channels provides areas with a variety of flow and sediment characteristics; this diversity includes areas suitable for chinook holding, spawning, and rearing habitat. In the mainstem White River it is expected that most chinook habitat will be in side channels and perimeters of mainstem reaches. In the West Fork White River due to its smaller size, main channel reaches may be most used by adult fish with perimeters and side channels most used by juvenile fish. However in both cases, the existence of the channels and habitat does not assure survival for the fish if the channels tend to shift location, especially during the incubation period. This aerial photo review will provide important information over time on the stability of channel networks. It will provide support data for evaluation and understanding of the glacial key indicator results for LWD and holding pools.

Methods

1. Identify reach.

2. Using aerial photographs at five to ten year intervals, develop blow-ups of reach.

3. From aerial photo blow-ups, map channel migration zone, channel network, and vegetation.

4. Analysis: look for trends over time in channel locations and vegetation characteristics.

Targets and Interim Targets

None - intended for support and interpretation of other indicators.

Baseline Monitoring Characteristics

- Number of reaches - one to several, based on issues, accessibility, and cost.
- Reach - 20 to 30 channel widths.
- Reaches to be within important chinook habitat.
- Streams to be sampled - White River, West Fork, White River.
- Aerial photos - consider scale needed (will 1:12,000 be adequate?)
- Estimates of side channel areas, gravel bars.
- Characterize channel dynamics (bars, side channels, cause and effects).

Long-term Monitoring (Intervals, Locations, Etc.)

- Interval - five years.
- Locations - within chinook habitat and potentially elsewhere to describe how watershed is functioning.

- Assess need for additional reviews following major flood/etc. events.

Compatibility Notes

No issues identified.

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APPENDIX B
PUBLIC MEETING AND RESPONSIVENESS SUMMARY

Public Meeting of September 4, 1996

A public meeting was held in Enumclaw on September 4, 1996, for the upper White River chinook habitat TMDL guidance development. Enumclaw was close to the project area and near populations expected to be most impacted by the process. The timing allowed for completion of initial developmental work by the Framework Team before the meeting and for a series of subsequent team meetings before the project was completed which allowed benefits from comments received.

Newspaper display ads were placed in the Tacoma News Tribune and the Courier Herald. A press release/meeting flier was also given to the papers.

Presentations at the public meeting consisted of the following:

- Welcome and opening remarks;
- The White River Spring Chinook Recovery Plan;
- The Clean Water Act requirements;
- Report on the Upper White TMDL guidance development process;
- Slides of fish habitat and habitat issues; and
- An overview of the state watershed analysis process being implemented in the Clearwater and Middle White drainages.

Comments and questions were taken from the audience. An offer was made to the general public to comment on the project during the meeting or any time thereafter. As of June 1998, one letter (attached in this appendix) was received. A responsiveness summary prepared in response to the questions and letter received is included below. In addition, a letter received early July 1998 is attached.

Responsiveness Summary

The following responsiveness summary contains a listing of comments and responses made at the public meeting and the comment letter received. Additional comments on the project are still welcome, and may be submitted to the Framework Team chairs.

Comment 1:

> Where is the watershed (and are the Greenwater and White Rivers in the project area?)

Response to Comment 1:

> The location of the watershed is the upper reaches of the Puyallup/White River system. The location is depicted on an area map. (The area map was available and displayed at the public meeting.) The project area is also presented in figure 1, Map of Washington State, showing the

location of the Upper White River Basin. The Greenwater and White Rivers are among the waters in the project area.

Comment 2:

Does a TMDL address all nonpoint sources of pollution or focus on impact?

Response to Comment 2:

A TMDL addresses specific parameters that do not meet water quality standards in a water body. The parameter(s) are listed in the 303(d) list. TMDLs may also be prepared to prevent water quality problems from developing.

Comment 3:

What is the temperature standard?

Response to Comment 3:

The temperature standards is 16°C and includes anti-degradation provisions.

Comment 4:

Was there a loss of habitat between the fall of 1995 and spring 1996 due to flooding? Did the floods hurt our fish? I do not see any fish there now - is there a lack of monitoring?

Response to Comment 4:

Preliminary information indicates that there were areas with significant negative changes in habitat as a result of flooding. Extensive bank erosion was documented, as was shifting of channel locations that left incubating chinook and pink salmon redds dewatered.

It is probable that the significant flood events in 1996 had a harmful impact on fish and fish habitat. With respect to monitoring, it is generally recognized that additional information can help improve our understanding of the dynamics of the ecosystems we study and manage. Information is available on the number of salmon that pass upstream of Mud Mountain Dam. The suspended sediment is glacial fed streams can make certain forms of monitoring more difficult.

Comment 5:

The overheads (transparencies) were helpful. Are copies available?

Response to Comment 5:

Comment noted. Copies of the overheads and other supporting material are available from Joanne Schuett-Hames or Bob Duffy.

Comment 6:

Referring to a photographic slide presented of Clay Creek ...} The siltation is noted. Has there been significant widening of the creek? Is more change expected due to "blowout"? What is the gradient of this section of the creek?

Response to Comment 6:

Yes, there is significant siltation depicted in the slide. There has been very significant widening of the creek probably due to recent flood events. The gradient depicted in this section of the creek is about five percent.

Comment 7:

Is it probable that some of the disturbances depicted in the slides are from logging?

Response to Comment 7:

Yes, forest management activities contribute to the habitat changes depicted in some of the slides.

Comment 8:

When do conifers come back along a stream?

Response to Comment 8:

While the process of succession begins immediately after a disturbance, it usually takes decades before mature conifers re-establish along a stream. In the Pacific Northwest, herbaceous growth quickly establishes itself in disturbed areas along a stream. If natural succession continues, herbaceous growth is typically replaced by deciduous trees. Only after many years do conifers become firmly established along streams.

Comment 9:

Can bars capture sediment?

Response to Comment 9:

Yes, the physical features of a stream, such as steepness, impact the amount and timing of sediment movement downstream.

Comment 10:

What are the benefits of wood verses larger rock in a stream?

Response to Comment 10:

As wood decays, nutrients are released to the aquatic ecosystem. These nutrients contributed to the food chain are essential for the survival of fish and would be unavailable if only larger rocks were to be found in a stream. In addition, in Pacific Northwest streams, large wood is important for channel structure such as development of pools and riffles. There are not enough large rocks to accomplish these functions.

Comment 11:

What studies indicate that temperature affects fish, and what are the maximum times for higher temperatures to impact fish?

Response to Comment 11:

Water quality standards for temperature are established by the state of Washington for many parameters, including temperature. The standards are supported by the best available research. High water temperature has a negative impact on all life stages of fish. However, we find that the late summer and early fall are the times of the year with the greatest chance of standards exceedances for temperature.

Comment 12:

Will Weyerhaeuser Corporation do monitoring?

Response to Comment 12:

While final monitoring arrangements have not yet been worked out, a cooperative approach that uses the balanced abilities of a variety of entities will be necessary to carry out a successful monitoring program.

Comment 13:

What area has been analyzed by state or federal watershed analysis? What are the boundaries?

Response to Comment 13:

State watershed analyses are currently being conducted for the Clearwater and Middle White Basins. They are being accomplished as pilot efforts for development of TMDLs or "other pollution controls." The Forest Service has conducted a watershed analysis for Silver Creek and is currently doing a "focused" watershed analysis for the Greenwater Road restoration work. These basins are indicated on the area map.

Comment 14:

When prescriptions are developed in a watershed analysis process, where do the prescriptions apply?

Response to Comment 14:

Prescriptions apply to specified areas of resource sensitivity within watershed analysis unit.

Comment 15:

Are findings integrated with the federal watershed analysis process?

Response to Comment 15:

Yes.

Comment 16:

In regard to an earlier comment during the public meeting that "We are working together," how can the community participate and will the SEPA procedures provide for appeals?

Response to Comment 16:

Interested persons have been, are, and will be welcome and encouraged to offer comments on the presentation at the public meeting, the work of the committee, and all reports developed in conjunction with the project. Comments will be considered and responded to. Comments may be submitted verbally, written, or electronically. After the project report is published, the Team chairs may be contacted at the address indicated at the front of the report. All SEPA decisions are subject to appeal as provided for in SEPA procedures.

Comment 17:

Can a fax with information about this project be sent to the local paper tomorrow?

Response to Comment 17:

Yes. This was done.

Comment 18:

Does SEPA pertain to watershed analysis? Not to a TMDL?

Response to Comment 18:

A SEPA review is conducted for every state watershed analysis; a similar process (NEPA review) is conducted prior to implementing actions identified in federal watershed analysis.

Comment 19:

Is the watershed analysis "packaged" within the TMDL?

Response to Comment 19:

The watershed analysis process is an essential component to protecting the habitat of the White River spring chinook salmon. The guidance is under development of how this will work.

Comment 20:

Can logging occur within ten years of a land exchange?

Response to Comment 20:

The land exchange process is not connected with this project. It would be best to check with the staff involved with the land exchange to get information regarding that process.

Comment 21:

Objective evaluation of adequacy of prescriptions including how well they meet the restoration goal is needed. (See letter pg. 1).

Response to Comment 21:

In the TMDL (or "other pollution control") approach, a key area where scrutiny is given is the analysis of which of the prescriptions are linked to the management objectives for spring chinook key indicators and the time-frame expected for the objectives to be met. Adaptive management, at five-year intervals for state analyses will also be important for review of whether or not prescriptions are meeting the management objectives projected recovery time-frames.

Comment 22:

Standard forest practices regulations are not necessarily adequate to prevent resource degradation of riparian areas not identified as sensitive in state watershed analysis. (See letter pg. 1).

Response to Comment 22:

The manual has been updated to address this issue. In the Clearwater and Middle White analyses no stream reaches covered by the analyses received standard rules calls. Note that some type 4 and all type 5 waters are not at this time part of the riparian assessment.

Comment 23:

Increased focus in state watershed analysis is needed for areas such as inventorying fish-bearing waters and systematic identification of culvert blockages. (See letter pg. 2).

Response to Comment 23:

Yes, this is needed. For the Clearwater and Middle White analyses Weyerhaeuser, Muckleshoot Tribe, and Washington Department of Fish Wildlife worked on water-typing although there may still be errors. The Framework Team guidance for the resource assessment component of the TMDL (or "other pollution control") will include the importance of these needs.

Comment 24:

Assessment of applicable water quality standards at the beginning of the TMDL process is necessary. (See letter pg. 2.)

Response to Comment 24:

In the Upper White River Basin, waters were listed for temperature. Because temperature reflects channel and basin characteristics, follow-up studies were done to look more broadly at other potential habitat-based impairments as well. Largely as a result of that work, the guidance document was scoped to incorporate habitat needs for the chinook. Please note also that the focus of this guidance development was not intended to be on every potential water quality standards issue. I t was felt that to do a good job on chinook habitat and accomplishing the developmental work needed for this, maintaining a focus would be beneficial. Should there be additional water quality impairments that arise in the future, there will need to be a determination as to whether or not the existing or in progress TMDLs or "other pollution controls" will be adequate for those impairments.

Comment 25:

Is the temperature criterion of 16'C optimum for chinook -literature suggests 14°C would be more appropriate. Reference site temperature information would be valuable. (See letter pg. 2.)

Response to Comment 25:

The standard also includes the anti-degradation component making the natural background temperature the actual criterion. Should it be found to be different than 16°C the target would be able to be shifted. The recently adopted state forest practices watershed analysis water quality module has a methodology for determining a reference condition. In the future this module will be able to be accomplished for the Upper White River Basin.

January 14, 1997

Washington Department of Ecology
SWRO
PO Box 47775
Olympia, WA 98504-7775

Re: Draft White River Spring Chinook Habitat Plan

The Washington Environmental Council generally appreciates the rigorous water quality management approach outlined in this November 15, 1996 draft, but we do have some concerns, and offer the following comments:

Washington Forest Practices Watershed Analysis

The minutes for the team meeting of November 25, 1996, reflect concerns expressed by the DNR representatives at prescriptions meetings regarding inclusion of CWA needs into the prescription process. If this water quality management approach, or TMDL, is going to rely on prescriptions generated through the state watershed analysis process, it is essential that these prescriptions meet both the "prevent and avoid" rule standard and the restoration goal specified in WAC 222-22-010(1). An objective method to evaluate the confidence level of prescriptions would help to ensure that prescriptions are soundly reasoned from assessment products and scientific literature. The prescription team should "hand back" their completed prescriptions to the assessment team for review. If the prescription team elects not to respond to an assessment team finding, they should provide a written justification which can then be evaluated by the assessment team. A confidence level should be assigned to prescriptions to match the level of risk and meet a minimum standard of certainty that the prescriptions will meet the above performance standard.

Prescriptions should reflect a management approaches that is conservative and scientifically sound. Managers need to acknowledge uncertainty. "Average" events will not determine the performance of a practice. Risk management decisions must recognize natural disturbances and variability.

In addition, the state watershed analysis approach assumes that cumulative effects can be avoided by identifying sensitive stream reaches and appropriately managing inputs to those areas and that standard forest practice rules will adequately protect areas not identified in the method as sensitive. This is not credible. For example, assessment of LWD recruitment to streams is reactive, responding in most cases to stream areas already deficient to riparian wood recruitment, while application of standards rules on remaining riparian areas will result in cumulative degradation.

The primary strength of Washington's watershed analysis lies in identifying and reducing the dominant, direct physical effects of forest practices on streams. To build on this strength, the assessment should increase its focus on inventorying existing or potential problems that can be remedied, including accurate identification of fish-bearing waters and a systematic identification of culvert blockage to fish passage. Ultimately, we would like to see the process assessing the full variety of impacts at all potentially impacted sites.

Water Temperature Standard

The need to assess the applicable water quality standards at the outset of the TMDL process is highlighted in EPA's "Guidance for Water Quality-based Decisions; the TMDL Process, "EPA 440/4-91-001, April 1991. For example, the first step, the identification of water quality-limited waters, includes the review of

water quality standards. If this step is not performed to the preparation of the list of water quality-limited waters, it should be at the outset of a specific TMDL process. Without taking this step, there is no assurance that the entire technical process will be on a sound basis. Not only will there be no assurance that the beneficial uses are adequately protected by the numeric criterion, but there will also be no basis for concluding that the TMDL has an adequate margin of safety, as required by the statute.

The draft acknowledges that targets selected for key indicators of water quality should represent the best available scientific information and include a margin of safety. We therefore question the selection of the state water temperature criterion of 16 c as a restoration target to support water-quality related habitat needs of the White River Spring chinook salmon when it appears the state criterion is outside the range to temperatures considered optimal for chinook survival and growth. MacDonald (1991) states that the optimal temperature range for most salomid species is 12-14 degrees C. NMFS (1996) in its guidance document for salmon restoration, states that 50-57 degrees F is the temperature range characteristic of "properly functioning" stream habitat. Based on our reading of the literature, and using a conservation assumption, an "optimum" temperature would therefore be closer to 14 C. Where targets are not currently being attained, and where attainment will take substantial time, interim targets are necessary. Perhaps the 16 C criterion should be established as an interim target?

Because temperature and flow patterns characteristic of individual rivers are such important regulators of salmonid life history, it would be valuable to include some discussion and analysis of undisturbed temperature regimes in the next draft. To the extent information on the natural state is available, or could be generated from nearby, undisturbed reference sites, seasonal temperature patterns should be specified that would mimic the natural, undisturbed state. But, if such information is not available, we would recommend using MacDonald's 12-14 degree temperature range unless there are strong (but qualitative) reasons to believe the White River was warmer that streams MacDonald derived his estimates from.

Thank you for the opportunity to comments. We look forward to reviewing future drafts of the White River Spring Chinook Habitat Plan.

Jerry Gorsline, Field Rep.

References:

EPA, 1991, *Guidance for Water Quality-based Decisions: The TMDL Process*, EPA 440/4-91-001.

EPA, 1991. MacDonald, et al., *Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska.*

NMFS. 1996. *Coastal Salmon Conservation; working Guidance for Comprehensive Salmon Restoration Initiatives on the Pacific Coast.*

July 2, 1998

Joanne Schuett-Hames
Washington Department of Ecology
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Olympia, Washington 98504-7775

Subject: White River Spring Chinook Habitat Guidance; A Water Quality Management Approach for the Upper White River, Version 1.0

Dear Joanne:

On behalf of Weyerhaeuser Company, I offer the following comments on the Upper White River Spring Chinook Habitat Guidance document. As you know, Weyerhaeuser has participated on the Upper White River project from its early stages, conducting the watershed analysis that forms the basis for the management plan.

Weyerhaeuser appreciates the leadership the Department of Ecology has demonstrated in developing solutions to water quality issues within the framework of an existing state program: watershed analysis conducted under Washington's Forest Practices rules. This is consistent with our discussions in the Timber/Fish/Wildlife (TFW) process over the past year, and we view the White River pilot as an important test of the concepts under discussion.

Our comments are primarily focused on the overall approach Ecology has taken on the Upper White project. Initially, we want to express our support for Ecology's approach of deferring to the existing program of watershed analysis under the jurisdiction of the Department of Natural Resources to meet Clean Water Act goals. Specifically, we agree that using watershed analysis as an "other pollution control" to achieve water quality standards and remove water bodes from the 303(d) list is the preferred way to address the broad range of issues the team has been working on in the Upper White.

Our main area of disagreement with the Guidance is its suggestion that a Total Maximum Daily Load (TMDL) process could work equally well to address water quality issues on the Upper White. We believe that TMDLs offer far less flexibility than "other pollution controls" in circumstances like those on the Upper White. The Guidance discusses some of the reasons (pages 8-10), and we offer a few more. First, although the Guidance states that a TMDL can be done proactively to address issues that are not on the 303(d) list (a "preventative" TMDL), we do not believe that is a settled issue, legally. Second, TMDLs are not self-enforcing, and must rely on other authorities for implementation. This makes a TMDL a duplicative process for a community such as forestry that is already regulated to protect water quality. As such, Ecology can expect more confusion, and less support, from affected landowners for a TMDL than for a process they are already familiar with.

Finally, in attempting to address habitat-based issues such as those on the Upper White, a TMDL would, we believe, run squarely into the requirement for rulemaking under Washington's Administrative Procedures Act. Watershed analysis is able to include many habitat-based measures, such as pieces of large woody debris (LWD) per channel width, as flexible measures of current conditions and to set goals. Embodied in a TMDL, however, it seems unavoidable that a measure such as LWD would be viewed as a

water quality standard. Whether numeric or narrative, rulemaking is required for Ecology to adopt new water quality standards to apply on the Upper White.

Despite this area of disagreement, we would like to reinforce our appreciation that Ecology has recognized "other pollution controls" as an option on the Upper White. In addition, we would like to point out the additional strengths we see in the Guidance:

- The document, for the first time, integrates watershed analysis under state law with that conducted by the U.S. Forest Service.
- The plan begins with specific escapement goals for White River spring chinook (pages 5-7), and recognizes the impacts of hydropower, fishing, and hatcheries on the run.
- The Guidance clarifies Ecology's requirements for "other pollution controls," including the four elements discussed on page 24 (a resource assessment, pollution controls and restoration actions, monitoring and adaptive management, and public involvement). This will be useful for all non-point source programs, not just watershed analysis.
- The team thoughtfully selected "key indicators" that are focused, tied as much as possible to existing data requirements (e.g., watershed analysis), and recognize the crucial elements of time (e.g., page 33) and natural variability.

The following are areas that would benefit from further clarification:

- The discussion of temperature (pages 28-29) does not mention that natural conditions may replace the numeric criteria for temperature, although this is included in Appendix A. Most of the significant exceedences mentioned appear to be in the larger, mainstem rivers, presumably at lower elevations. It was not clear from the discussion whether the natural potential of these rivers to achieve the numeric criteria had been assessed.
- The conclusion that chinook beneficial uses are poorly supported (page 29) does not appear to be supported by the preceding discussion. That discussion notes that many streams are in compliance with temperature standards, and spawning gravel fine sediment percentages are rated "fair" and "good." Scour was a problem in 1995-1996, but this appears to be related to a major storm event. Overall, the assessment of habitat conditions in the Upper White appears to be consistent with assessments from other watershed analyses: the major problem is a lack of large woody debris, and its accompanying pools. This should not come as a surprise, given the many years of stream clean-out (often agency directed) and removal of trees from riparian areas. The good news is the capability of forest landowners to restore LWD compared to other land uses.
- It seems premature to conclude that a full Level 2 watershed analysis is required to address water quality issues (page 34), because no other level was tested. It would perhaps be more productive to note that Level 2 is adequate, and it is unknown whether other options would also suffice.
- The discussion of implementation measures (page 43) overlooks a few key points. First, it should be noted that TMDLs are not self-enforcing, and require separate implementation plans and authority. Second, the discussion appears to imply that voluntary measures, such as farm plans, cannot be adequate implementation measures. The Clean Water Act recognizes voluntary programs for best management practices, and it would be helpful to distinguish between the need for demonstrated compliance and a requirement of agency enforcement. Finally, among the "elements to accomplish" in implementation (page 44) should be included specific reference to the legal standards of the jurisdiction with implementation authority. The Forest Practices Act, for example, includes the maintenance of a viable forest products industry as one of its legal standards. Economic considerations are a factor under both the Clean Water Act and state regulatory authorities, and should be explicitly recognized in the Guidance.

- The relationship between the monitoring plan on the Upper White and the TFW Monitoring Strategy would benefit from further discussion. Data gathering plans on the Upper White appear to be very ambitious, and perhaps reductions could be achieved by tying the plan more closely to state-wide strategies.

In closing, we support release of the draft Guidance, recognizing it as a work in progress. Because prescriptions are not yet completed under the watershed analysis, it is too early to call the Upper White project a success. Nevertheless, substantial progress has been made. Once prescriptions are completed, and assuming they are cost-effective as well as scientifically sound, we believe the Upper White River pilot will serve as an important model for resolving non-point source issues.

We appreciate the opportunity to comment on the Guidance, and all the hard work that the document represents.

Sincerely,

Cassie Phillips
Director, Forestry
Western Timberlands

cc: Steve Anderson - Enumclaw 102
Dick Wallace - DOE
Bill Wilkerson - WFPA