Lower Cispus Watershed Analysis

Mountain goats on Juniper Ridge

Gifford Pinchot National Forest
Cowlitz Valley Ranger District
April 2003

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Chapter 1 - Overview

Introduction

Watershed analysis is an analytical tool designed to describe the biophysical processes and interactions that operate on a landscape at the watershed scale. The purpose of the analysis is to provide a scientific understanding of ecological processes that can be used to guide future management activities within the watershed. Management direction pertinent to conducting watershed analysis is found within the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA, USDI 1994).

A. ANALYSIS PROCESS

The Lower Cispus Watershed Analysis updates and replaces the Lower Cispus West and Lower Cispus East Watershed Analyses (March and April 1996). The process used to conduct the Lower Cispus Watershed Analysis is a synthesis of previous efforts that have been utilized on the Cowlitz Valley Ranger District. The key tasks involve, 1) identifying issues and questions that are relevant to key management objectives, 2) characterizing the historic and current condition of the watershed's physical, biological, and human elements, 3) determining trends based upon historic and current conditions, and 4) interpreting the results in the form of recommendations that are responsive to the key watershed processes identified.

Based upon funding limitations for the analysis, limited field data was collected during the process. Data used in the analysis was from the previous watershed analysis plus that collected during the limited field visits or extracted from existing sources. Data sources, data gaps, and any associated assumptions are noted at the beginning of each respective resource section in Chapter 3.

The information presented in this document may need periodic updating to reflect changing conditions and newly discovered information. An analysis file to track document edits will be on file in the planning department at the Cowlitz Valley Ranger District. A process for tracking and disseminating edits of these documents needs to be developed.

B. WATERSHED OVERVIEW

The Lower Cispus watershed encompasses about 123,500 acres in the Cispus River drainage of the Gifford Pinchot National Forest. Most of the watershed is National Forest land, with some private land inclusions also. The northern portion of the watershed is bounded by the ridges forming the boundary between the Cispus and Cowlitz River watersheds while the southern boundary is defined by the break between the Cispus and Lewis River watersheds. To the east is the boundary between the Lower Cispus and Upper Cispus watersheds (primarily Juniper Ridge). To the west is the boundary between the Lower Cispus and Lower Cowlitz watersheds (primarily the ridge that runs between Goat Mountain and Tumwater Mountain). See Maps 1, 2 and 3, Regional and Local Vicinities and Topography.

The eight subwatersheds in the analysis area were named according to the primary aquatic feature they encompass and/or their general location. Table 1-1 lists the eight subwatersheds and associated aquatic features within the Lower Cispus watershed. See Map 4, Sixth-field Watershed Boundaries, for a display of their locations.

Table 1-1 : General Location of subwatersheds

Sixth-field	Acres	Name	Other Aquatic Features
170800040501	29,706	Yellowjacket Creek	Pinto Creek
170800040502	12,838	McCoy Creek	Sunrise Creek, Jumbo Creek
170800040503	11,612	Cispus River - Camp Creek	Dry Creek, Covel Creek
170800040504	9,994	Greenhorn Creek	1918 Creek, Soldier Creek
170800040505	23,128	Iron Creek	Ferrous Creek, Big Creek, Wakepish Creek
170800040506	8,025	Woods Creek	Ames Creek
170800040507	13,490	Quartz Creek	Red Springs Creek, Deep Lake
170800040508	14,728	Lower Cispus River Frontal	Crystal Creek, Copper Canyon

The major roads through the watershed are Forest Roads 23 and 25 (see Chapter 3, Transportation System for other roads within the Lower Cispus watershed). Road 23 is a major forest arterial connecting the towns of Randle and Trout Lake. Road 25 is a major forest arterial connecting Randle and Cougar. Other major roads within the watershed are Forest Road 26 in the Quartz Creek drainage; Forest Road 28, that traverses the Yellowjacket Creek drainage; Forest Road 77, that provides recreation access to the Burley Mountain area; and Forest Road 99, that connects the Iron Creek area to Windy Ridge in the Mount St. Helens National Volcanic Monument.

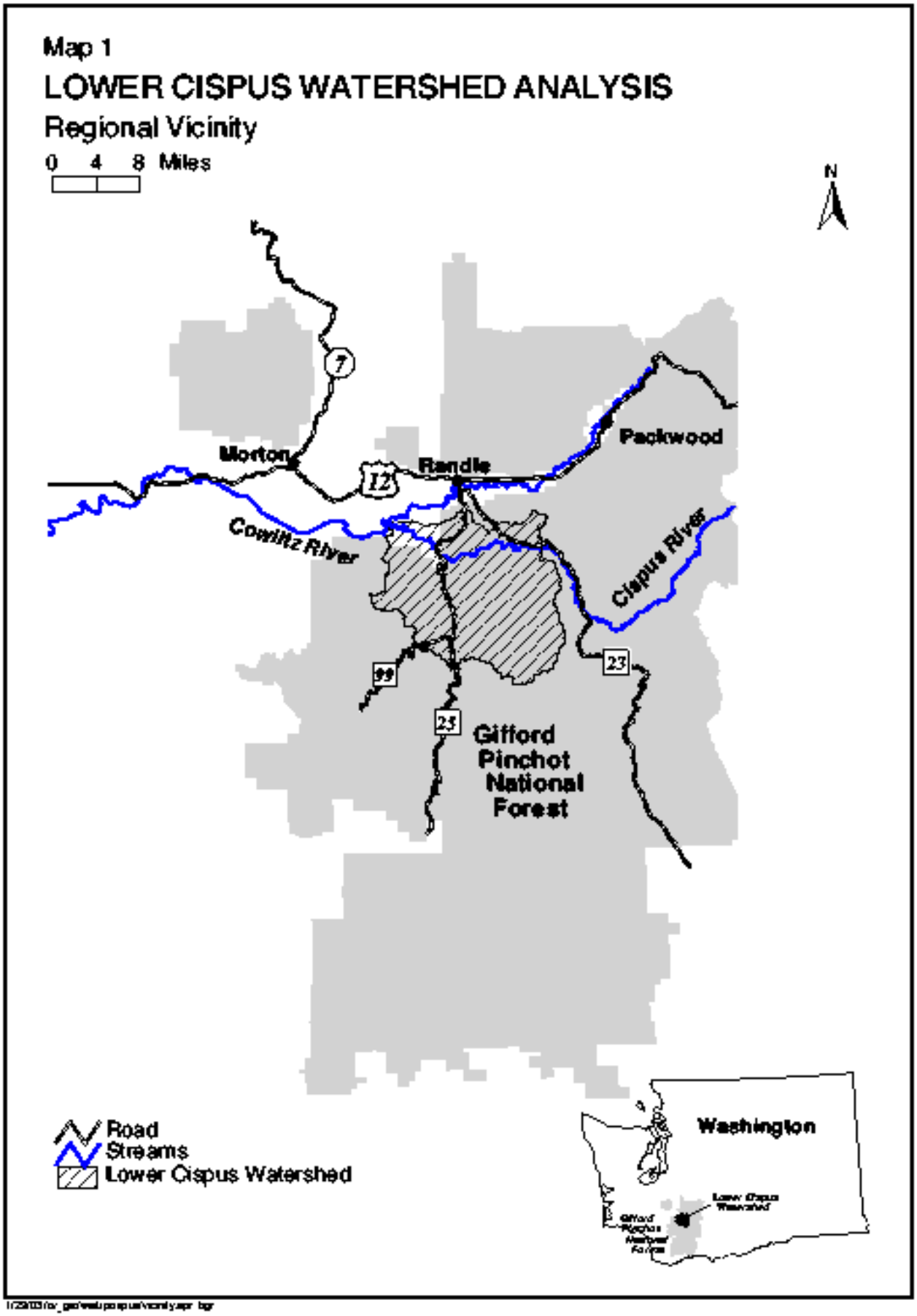
1. Management Direction

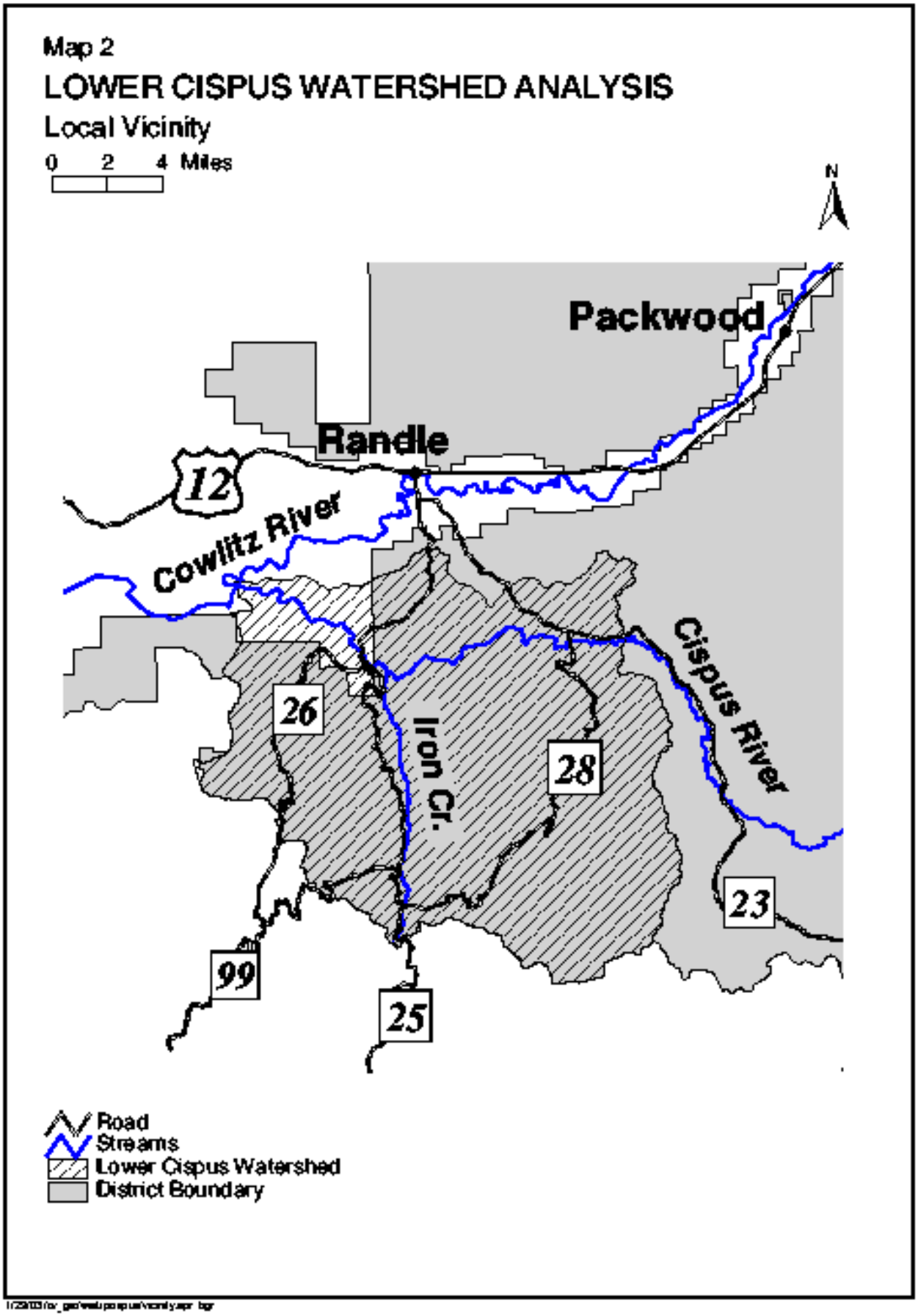
Lands within the Lower Cispus watershed are managed according to direction provided by *Gifford Pinchot National Forest, Land and Resource Management Plan*, *Amendment 11* herein referred to as Amendment 11. This document combines direction from the *Gifford Pinchot National Forest Land and Resource Management Plan* (USDA 1990) and the *Record of Decision (*ROD*) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Spotted Owl* (USDA, USDI 1994), herein referred to as the Northwest Forest Plan.

Management direction is applied to specific lands using the overlying direction from the 1994 Northwest Forest Plan and the underlying Management Area Category (MAC) direction of the 1990 GP Forest Plan. Amendment 11 documents the combination of these two levels of management direction.

a. Northwest Forest Plan

The following Northwest Forest Plan land management designations are within the Lower Cispus watershed. See Map 5, Land Management Allocations - NW Forest Plan, GP Forest Plan.


Map 1
LOWER CISPUS WATERSHED ANALYSIS
Regional Vicinity
0 4 8 Miles
N
7
Morton
12
Randle
Packwood
Cowlitz River
Cispus River
99
25
23
Gifford Pinchot National Forest
Road
Streams
Lower Cispus Watershed
Washington


Map 2
LOWER CISPUS WATERSHED ANALYSIS
Local Vicinity
0 2 4 Miles
N
Packwood
Randle
12
Cowlitz River
Cispus River
Iron Cr.
26
28
23
99
25
Road
Streams
Lower Cispus Watershed
District Boundary

Map 3

LOWER CISPUS WATERSHED ANALYSIS
Watershed Boundary and Topography

0 1 2 miles

N

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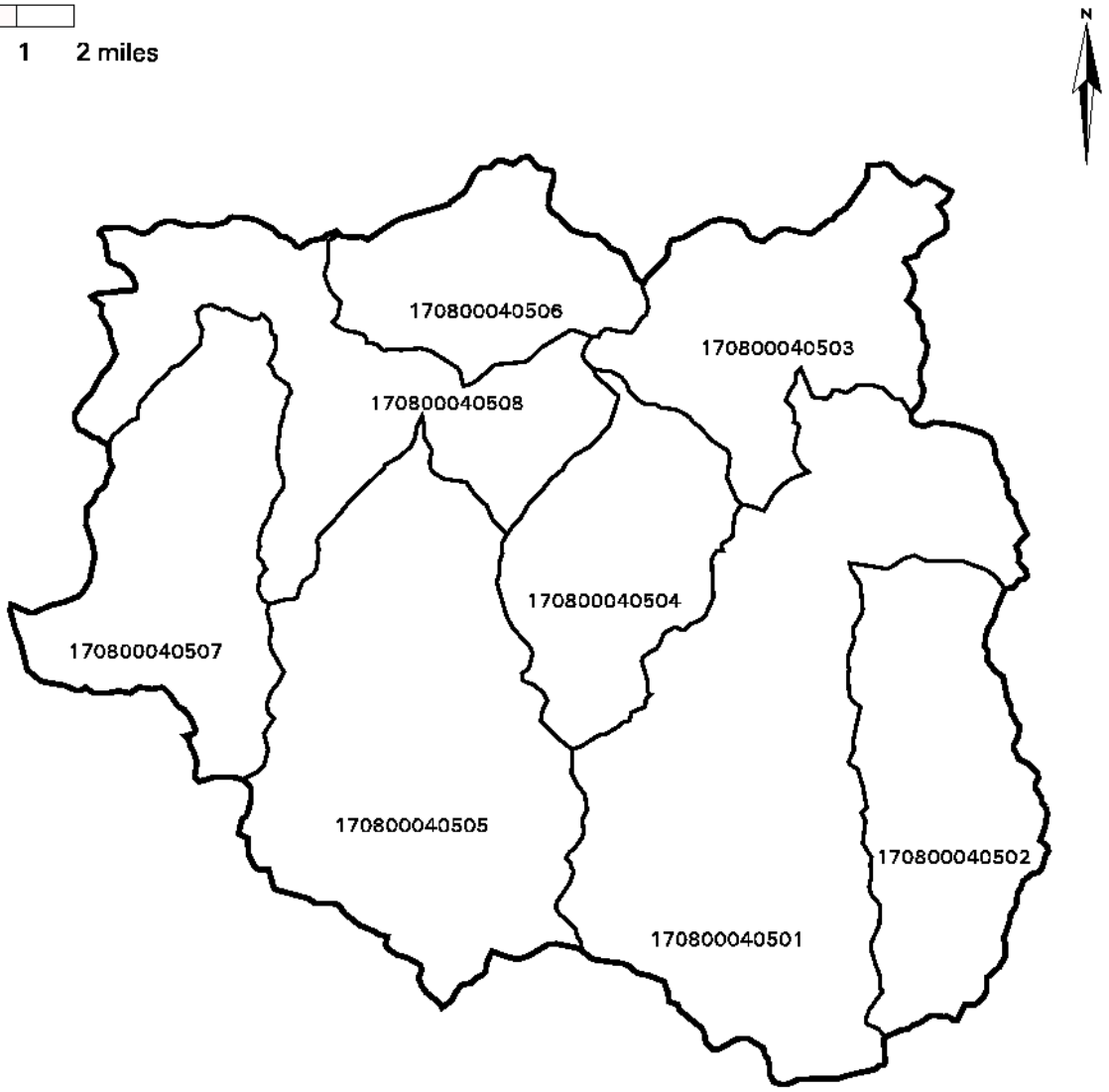
Map 4

LOWER CISPUS WATERSHED ANALYSIS

Sixth-Field Watershed Boundaries

0 1 2 miles



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Cispus Adaptive Management Area – lands where the development and testing of technical and social approaches to achieving desired ecological, economic and social objectives is emphasized with the overall objective being management on a ecosystem basis. Management recommendations for the Cispus Adaptive Management Area have been developed as part of the Cispus AMA Guide [March 1998]. See Chapter 6 for more information regarding these management recommendations.

Administratively Withdrawn Areas - includes wildlife, recreation, visual and other areas not managed to provide timber outputs.

Congressionally Withdrawn Areas - includes lands within congressional designations that normally preclude timber harvest, in this case the Mount St. Helens National Volanic Monument.

Late Successional Reserves - lands where the objective is to protect and enhance conditions of the late-successional and old-growth forest systems.

Matrix - lands where most scheduled timber harvest is expected to take place.

Private Land – Lands that are either outside the Forest boundary or inside the Forest and owned by private individuals or other government agencies such as the State of Washington.

Table 1-2 lists the acreage and percent of each subwatershed that is occupied by each land management allocation.

Table 1-2: Acreage and Percent of Each NW Forest Plan Land Management Allocation within Each Sixth-field Watershed

Sixth-Field Watershed	Adpative Management Area		Administrative Withdrawn Areas		Congressionally Withdrawn Areas		Late-Successional Reserves		Matrix		Private Land		Totals
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
YellowJacket Creek	41	<1%	9,375	32%	0	0%	262	1%	20,028	67%	0	0%	29,706 100%
McCoy Creek	10	<1%	7,515	58%	0	0%	11	<1%	5,302	41%	0	0%	12,838 100%
Cispus River- Camp Creek	6,080	52%	14	<1%	0	0%	4,748	41%	21	<1%	749	6%	11,612 100%
Greenhorn Creek	0	0%	1,229	12%	0	0%	5,825	58%	2,940	30%	0	0%	9,994 100%
Iron Creek	0	0%	2,616	11%	3	<1%	1,407	6%	18,704	81%	398	2%	23,128 100%
Cispus River- Woods Creek	0	0%	0	0%	0	0%	6,800	85%	0	0%	1,225	15%	8,025 100%
Quartz Creek	0	0%	1,014	8%	136	1%	7,051	52%	4,043	30%	1,245	9%	13,490 100%
Lower Cispus River Frontal	0	0%	537	4%	4	<1%	5,729	39%	1,593	11%	6,866	46%	14,728 100%
Total	**6,131**	**n/a**	**22,300**	**n/a**	**143**	**n/a**	**31,833**	**n/a**	**52,631**	**n/a**	**10,483**	**n/a**	**123,521**

b. Management Allocation Categories (MACs)

The following table summarizes the MAC designations found on Map 5, Land Management Allocations - NW Forest Plan, GP Forest Plan, and gives the reference information where specific management direction can be found.

Table 1-3: Management Area Categories, GP Forest Plan

MAC Designation	Acres	Description	Amendment 11 Pages
LS	15,684	General Late Successional Reserves	Pages 5-31 to 5-32
ES	2,027	Deer and Elk Winter Range	Pages 6-21 to 6-24
3W	193	Administrative Sites	Pages 4-3 to 4-5 and 5-18 to 5-20
AA	143	Mount St. Helens National Volcanic Monument	Pages 3-2 to 3-6
RL, RM	8,709	Roaded Recreation without Timber Harvest	Pages 4-14 to 4-16 and 5-36 to 5-38
UD, UH, UL	17,155	Unroaded Recreation without Timber Harvest	Pages 4-22 to 4-24 and 5-44 to 5-46
VL, VM	26,972	Visual Emphasis	Pages 5-49 to 5-51 and 6-41 to 6-44
9L, BL	500	Special Interest	Pages 4-17 to 4-21 and 5-39 to 5-43
2L	97	Developed Recreation	Pages 4-6 to 4-9 and 5-21 to 5-24
NA, NL	4,925	Scenic River	Pages 4-28 to 4-32, 5-52 to 5-56 and 6-36 to 6-40
TS	36,634	General Forest	Pages 6-25 to 6-27
99	10,483	Private Land	Not Applicable

c. Other Northwest Forest Plan Designations

Key Watersheds - This allocation overlays the land allocation of designated areas. Tier 2 Key Watersheds may not contain at-risk fish stocks, but are an important source of high quality water. Lands included within Inventoried Roadless areas that fall within Key Watersheds have special direction that precludes new road construction (Amendment 11, pages 2-10 to 2-11). See Map 6, Key Watersheds and Roadless Areas.

Riparian Reserves - This allocation includes areas along streams, wetlands, ponds, lakes, and unstable or potentially unstable areas. Riparian Reserves overlay all other management allocations. Riparian dependent resources receive primary emphasis and special standards and guidelines apply (see Amendment 11, pages 2-4 to 2-10). See Map 7, Riparian Reserves.

d. Other Areas of Interest

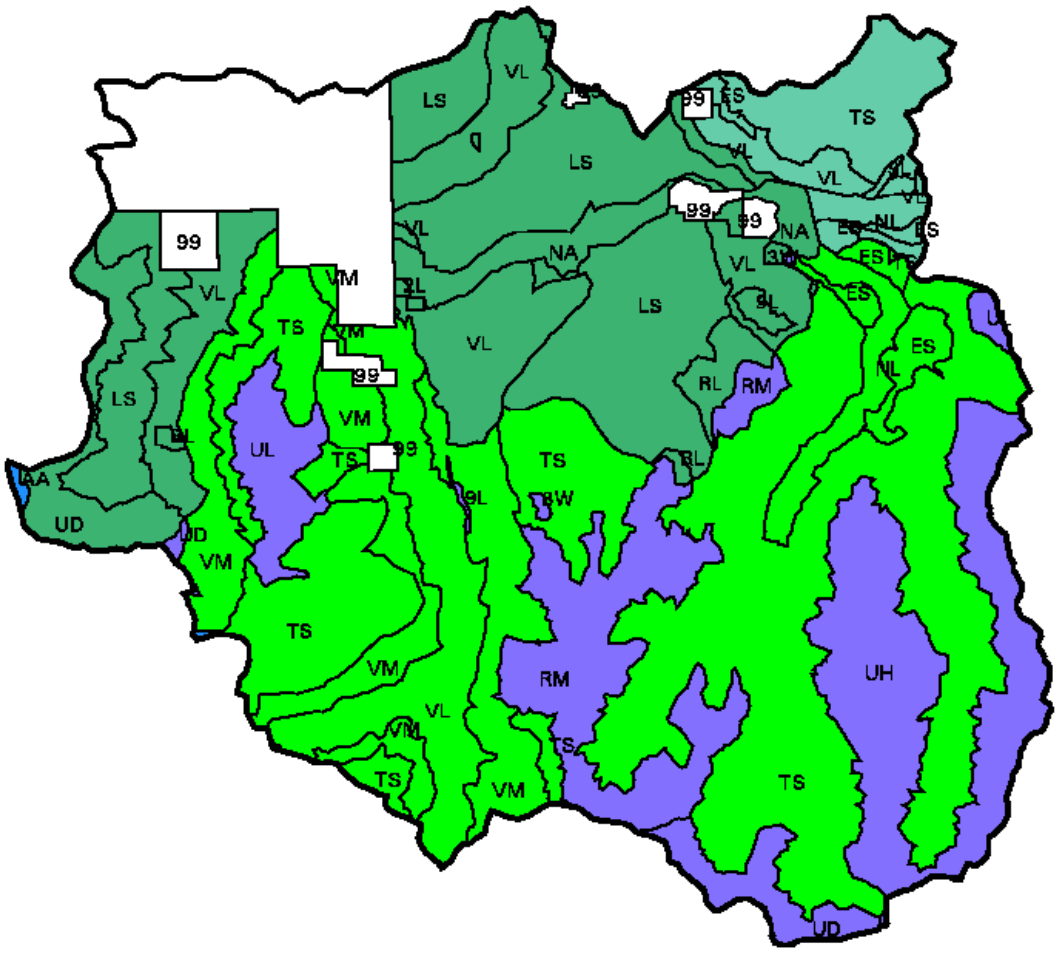
Inventoried Roadless Areas – Inventoried Roadless Areas are areas without roads that have been identified as having the potential for designation as Wilderness. The Northwest Forest Plan included references to these areas in regard to their value as high quality habitats in Key Watersheds. No new roads will be constructed in roadless areas in Key Watersheds. See Map 6 for their locations.

Map 5

LOWER CISPUS WATERSHED ANALYSIS

Land Management Allocations - NW Forest Plan, GP Forest Plan

0 1 2 miles



Planning Allocations

- Adaptive Management Area
- Administratively Withdrawn
- Congressionally Withdrawn
- Late Successional Reserve
- Matrix
- Private

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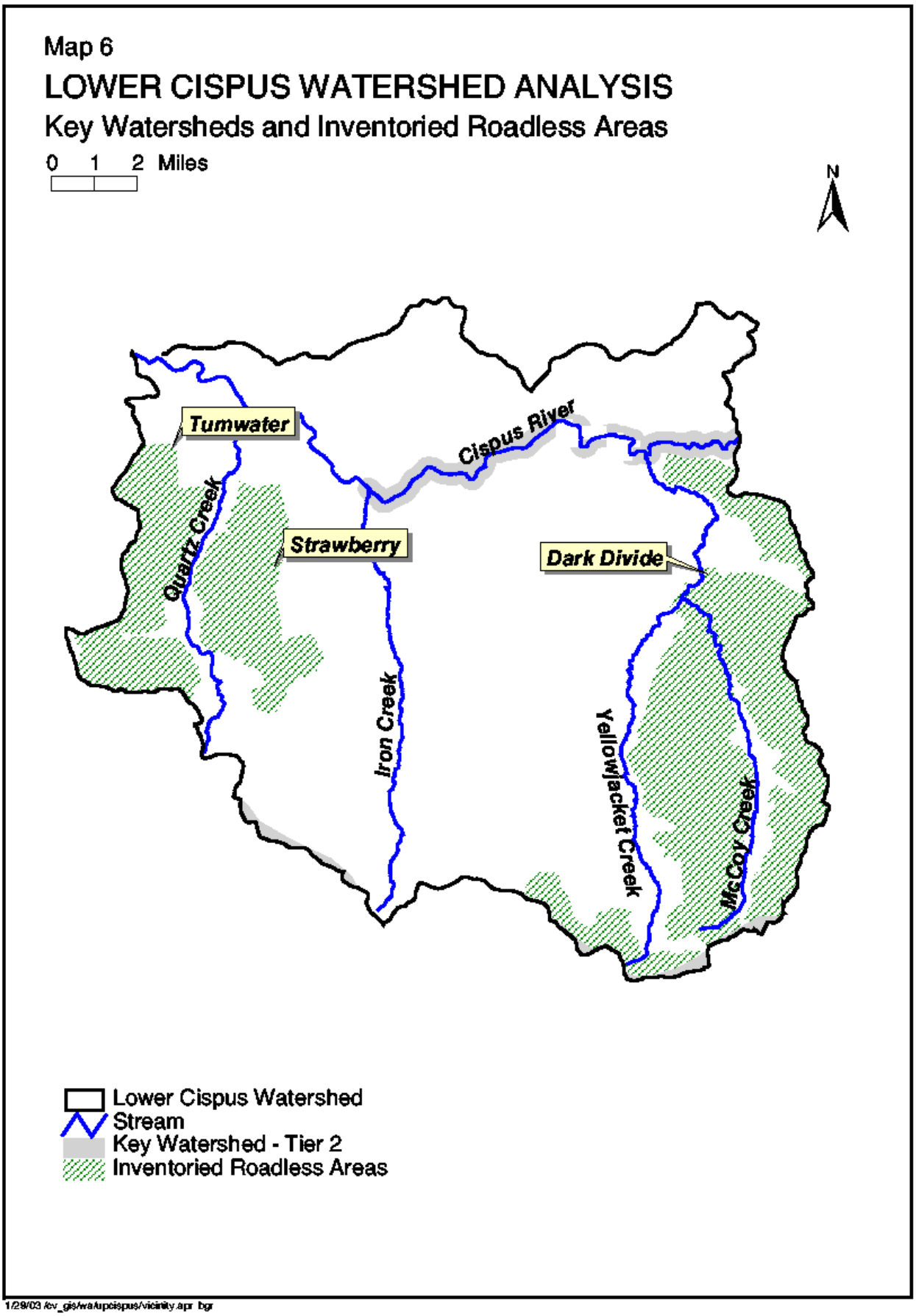
Map 6
LOWER CISPUS WATERSHED ANALYSIS
Key Watersheds and Inventoried Roadless Areas
0 1 2 Miles
N
Tumwater
Cispus River
Quartz Creek
Strawberry
Dark Divide
Iron Creek
Yellowjacket Creek
McCoy Creek
Lower Cispus Watershed
Stream
Key Watershed - Tier 2
Inventoried Roadless Areas
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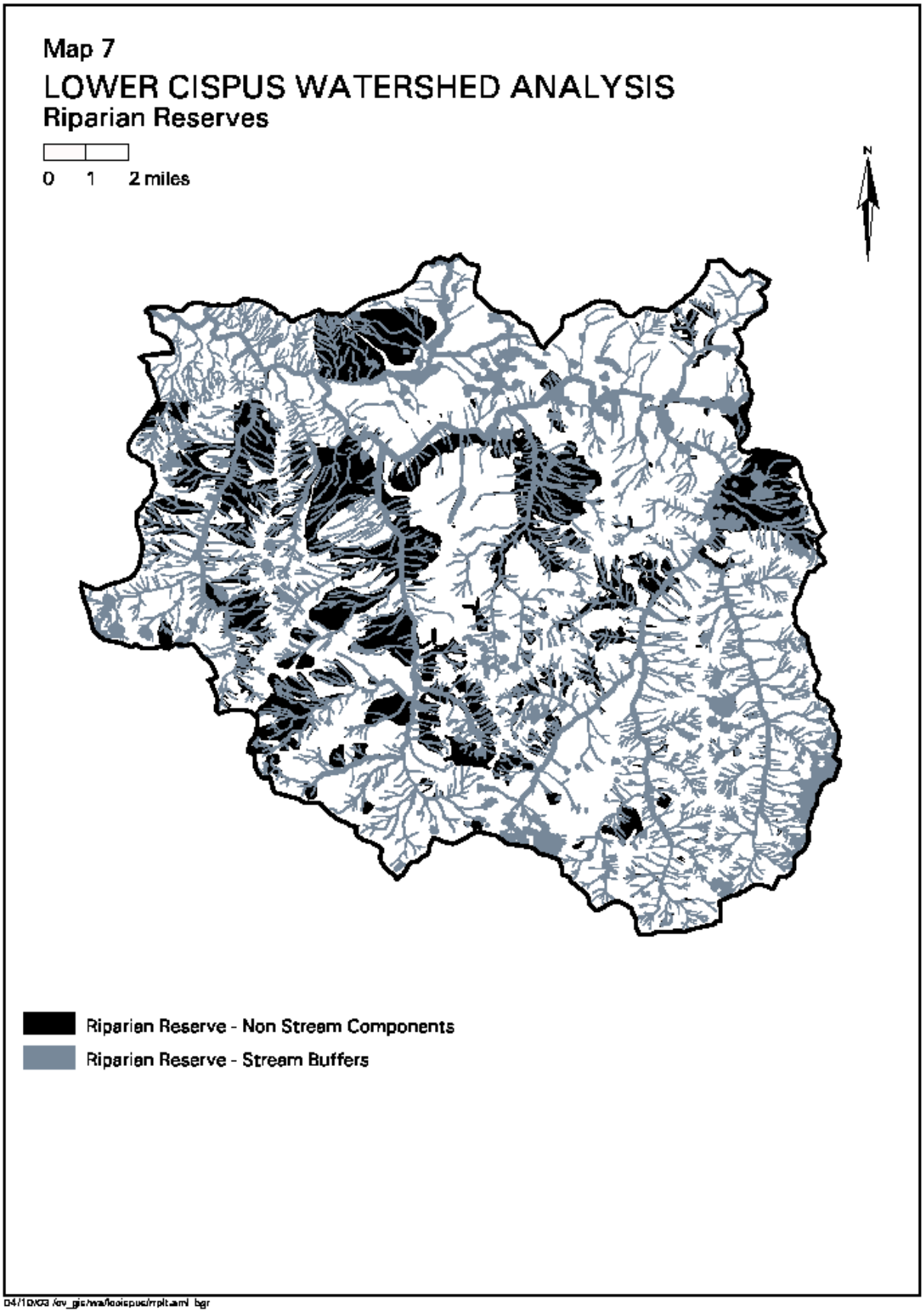

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Chapter 2 - Issues and Key Questions

Within any given area there are many issues that must be considered prior to the implementation of management activities. The following list of issues and associated questions focuses this analysis on issues that were deemed most pertinent to management within the Lower Cispus watershed. They are grouped by topical categories to assist the reader in finding particular areas of interest. The issues and key management questions were developed by the interdisciplinary team in association with the line officer on the Cowlitz Valley Ranger District. The analysis questions represent the fundamental information necessary to answer the key management questions.

A. WATER RESOURCES ISSUES

The water quality/quantity issue being addressed is whether changes to vegetation, soils, and aquatic features in the Lower Cispus watershed are having notable or cumulative effects on water quality and quantity. Resources and processes relevant to evaluating these conditions include channel migration and widening, presence of amphibians, condition of fish habitat, amount and frequency of soil disturbance, rates of human-caused sediment input as compared to natural rates, and continuity of "large tree" forest in riparian areas.

Key Management Questions

1. For the entire watershed and each subwatershed, what is the current rating for each of the 19 fish habitat indicators described by the USFWS?

2. For the entire watershed and each subwatershed, do existing conditions meet Aquatic Conservation Strategy Objectives?

3. Are streams, stream segments, roads, stream crossings, trails, riparian areas, and sideslopes in need of restoration in order to improve aquatic habitat? Are there areas with concentrated restoration needs?

4. What monitoring and other activities are required and recommended to comply with state water quality standards?

5. Where are there opportunities to implement the Cispus AMA Guide as it relates to aquatic resources? Where are there opportunities to implement the Forest Late-Successional Reserve Assessment as it relates to aquatic resources?

Analysis Questions at the Subwatershed Level

1. How have the increases to stream temperature affected fish habitat and distribution? What priority restoration projects are recommended to improve water temperatures? Where are these restoration projects located?

2. Are there any known water quality problems in addition to stream temperature? If so, how do these water quality problems affect the health and distribution of fish?

3. Are changes in peak flows and/or base flows of streams occurring as a result of past and current land uses? If so, where is this occurring?

4. Are there areas that have roads with high numbers of stream crossings resulting in an increased stream drainage network? If so, on which roads should drainage be improved (including decommissioned if recommended in Roads Analysis).

5. What is the condition of riparian reserves in terms of shade, future wood recruitment and connectivity? What priority restoration projects are recommended to improve shade, future wood recruitment and connectivity?

6. How, and in what streams, has the sediment regime, channel morphology, and floodplain changed from historic conditions? How has this affected fish habitat? What priority restoration projects are recommended to improve fish habitat and channel stability.

7. When, and to what magnitude, did large scale natural disturbances (fires, floods, earthquakes) occur in the watershed?

8. Where are potential aquatic fish refugia, and which have a high priority for restoration?

9. On fish-bearing streams, where are the road crossings which provide unobstructed routes to wood and fish? Which road crossings are highest priority to restore based on species, and habitat quantity and quality?

10. Is fish abundance increasing in the watershed?

11. What type and where has restoration occurred? How effective have these projects been? What is the recommended restoration plan for the watershed?

B. BIOLOGICAL RESOURCES ISSUES

What is the current distribution and amount of forest vegetation structural stages?

1. How has the distribution and amount of forest structural stages changed over time?

2. Are there areas near private property with structures where pre-commercial or commercial thinning or other treatments may reduce fire hazards?

3. What is the current status and distribution of Proposed, Endangered, Threatened, and Sensitive (PETS) plant, animal, and fish species and their habitats in the watershed, and are there opportunities present to maintain or improve habitat conditions for these species?

   - List of documented and suspected PETS species in the watershed
   - Synopsis of recent survey results
   - Habitat analysis: Northern spotted owl, listed fish

4. What is the status and distribution of "survey and manage" plant and animal species and their habitats in the watershed, and are there opportunities to maintain or improve habitat conditions for these species?

   - List of documented and suspected survey and manage species
   - Synopsis of survey results and known distribution in the watershed

5. What is the status and distribution of selected plant and animal species or groups including big game species (deer, elk, mountain goats), cavity excavators, and exotic plant and animal species within the watershed? Do opportunities exist to enhance habitat conditions for these species, or control numbers and colonization of invasive species?

   - Big game winter range habitat analysis
   - Mountain goat distribution
   - List of exotic and invasive plants and animals and distribution in the watershed

6. What is the overall condition of wildlife habitat in the watershed considering forest fragmentation, connectivity of late-successional habitats, special and unique habitats, etc.?

   - Fragmentation/interior forest analysis
   - Connectivity analysis (riparian and non-riparian)
   - Listing of special/unique habitats

7. Which areas are in need of restoration in order to improve terrestrial habitat? Are there areas with concentrated restoration needs?

8. Where are there opportunities to implement the Cispus AMA Guide as it relates to terrestrial resources? Where are there opportunities to implement the Forest Late-Successional Reserve Assessment as it relates to terrestrial resources?

C. PHYSICAL RESOURCES ISSUES

1. For the watershed and each subwatershed, what are the potential areas of concern from mass wasting or surface erosion based on natural occurrence and management activities? (pages 3-152 to 3-156)

   - Current information and spatial location of mass wasting events
   - Areas of potentially unstable soils in the watershed, and unstable soils by subwatershed.
   - Historical sequence of debris flows and landslides.
   - Transport of material to streams from upland sites.
   - Land use activities that may have increased potential for mass wasting or surface erosion.

2. Is sediment from roads reaching streams, and what roads are of most concern?

- Miles of road in each subwatershed
- Proximity of roads to streams.
- Number of roads crossing streams using bridge or culvert.
- Known problem roads for maintenance.
- Current use of roads.
- Road surfacing type.

3. Are natural disturbances (landslides, volcanic activity, etc.) a potential source for transporting sediment or adding sediment to the natural regime?

    - Review tephra deposits in the area from Mount St. Helens.
    - Review literature for other natural activities that may have occurred in the watershed.

4. Which areas are in need of restoration in order to improve physical resources? Are there areas with concentrated restoration needs?

5. Where are there opportunities to implement the Cispus AMA Guide as it relates to physical resources? Where are there opportunities to implement the Forest Late-Successional Reserve Assessment as it relates to physical resources?

D. SOCIAL AND ECONOMIC RESOURCES ISSUES

1. What are the number, distribution, and resource conditions of Concentrated Use Areas (CUAs) within the watershed?

    - MM/INFRA (infastructure database) inventory of CUAs in progress.

2. What recreation uses occur within the watershed and how do they affect resources, especially water resources?

    - Recreation user survey, NRUM survey currently in progress; number of users, kinds of use, locations of concentrated recreation use.

3. What are the number, location, and condition of developed recreation sites and trails?

    - Trail condition surveys in progress.

4. What are the trends in recreation use and site conditions?

    - NRUM study, SCORP and other regional or programmatic studies.
    - Trail and CUA inventories in progress.

5. What are the opportunities for expansion of recreation activities, expansion of existing facilities and trails, opportunities for new facilities?

6. Are there opportunities to implement the Cispus AMA Guide as it relates to social and economic resources? Are there opportunities to implement the Forest Late-Successional Reserve Assessment as it relates to social and economic resources?

Chapter 4 - Interpretations/Areas of Concern

Introduction

This chapter focuses on the interpretation of data presented in Chapter 3 as it pertains to current and proposed management within the watershed. It is through understanding of the function of the various ecosystem elements that the context for future management is set. As in Chapter 3, the information is presented for the major water resources, biological resources, physical resources, and social and economic resources within the Lower Cispus watershed.

A. WATER RESOURCES

1. Temperature

Peak summer stream temperatures are a concern in the Cispus River mainstem and all the major tributaries of the Lower Cispus River watershed. The streams where temperatures are above 16ºC for prolonged periods, and also have both anadromous and resident fish habitat, are the areas of most concern. The mainstem Cispus River has 20.3 miles of both anadromous and resident fish habitat that has temperatures above 16 ºC for prolonged periods. Yellowjacket Creek has 6.1 miles of both resident and anadromous habitat where temperatures are above 16 ºC for prolonged periods. Iron Creek and Greenhorn Creek mainstems also have temperatures above 16 ºC for prolonged periods, with 1.0 and 1.8 miles, repectively, of both anadromous and resident fish habitat.

2. Shade

Solar radiation to streams is the primary factor of increasing stream temperatures. Riparian vegetation, stream width, and stream orientation are three of the influences determining how much solar radiation reaches a stream each day. Previous land management practices affected processes that influenced stream temperatures. Previous riparian harvest decreased shade to streams and removal of large woody debris (along with increased sediment delivery) resulted in unstable streams, and in some cases, increased steam widths.

The mainstem Cispus River is wide and braided in some areas within this watershed. The riparian vegetation of the river has less influence on the amount of solar radiation reaching the stream than the width of the river. An in-depth aerial photographic study of the mainstem Cispus River will be completed in the Summer of 2003 and will focus on the most significant factors heating the mainstem.

Shade levels were approximated for each subwatershed. Subwatershed shade levels were less than or equal to 71% in Yellowjacket Creek, Iron Creek, Cispus River-Camp Creek, Quartz Creek, and Woods Creek. Riparian stands where shade is currently 15% less than if the trees were 160 feet tall are identified as high priority for treatment with the goal of accelerating tree growth in all these subwatersheds (Table 4.1). Most of these stands are pole size trees, where precommercial thinning will be recommended after field review. The Yellowjacket Creek subwatershed (68% shade) is considered the highest priority for increasing shade due to its low shade level and 6.1 miles of anadromous habitat. Restoration in Cispus River-Camp Creek and Iron Creek is also considered a

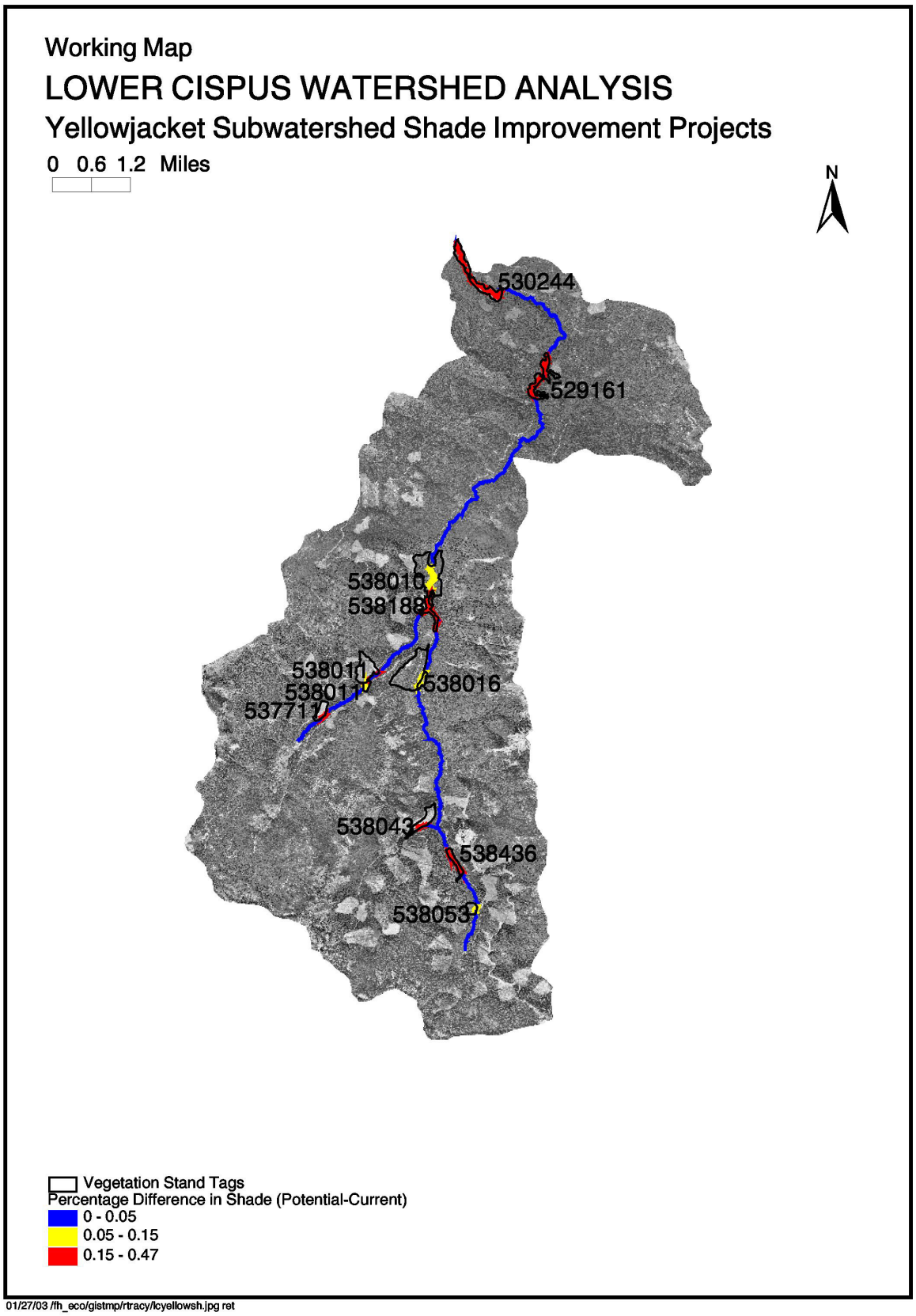
high priority.

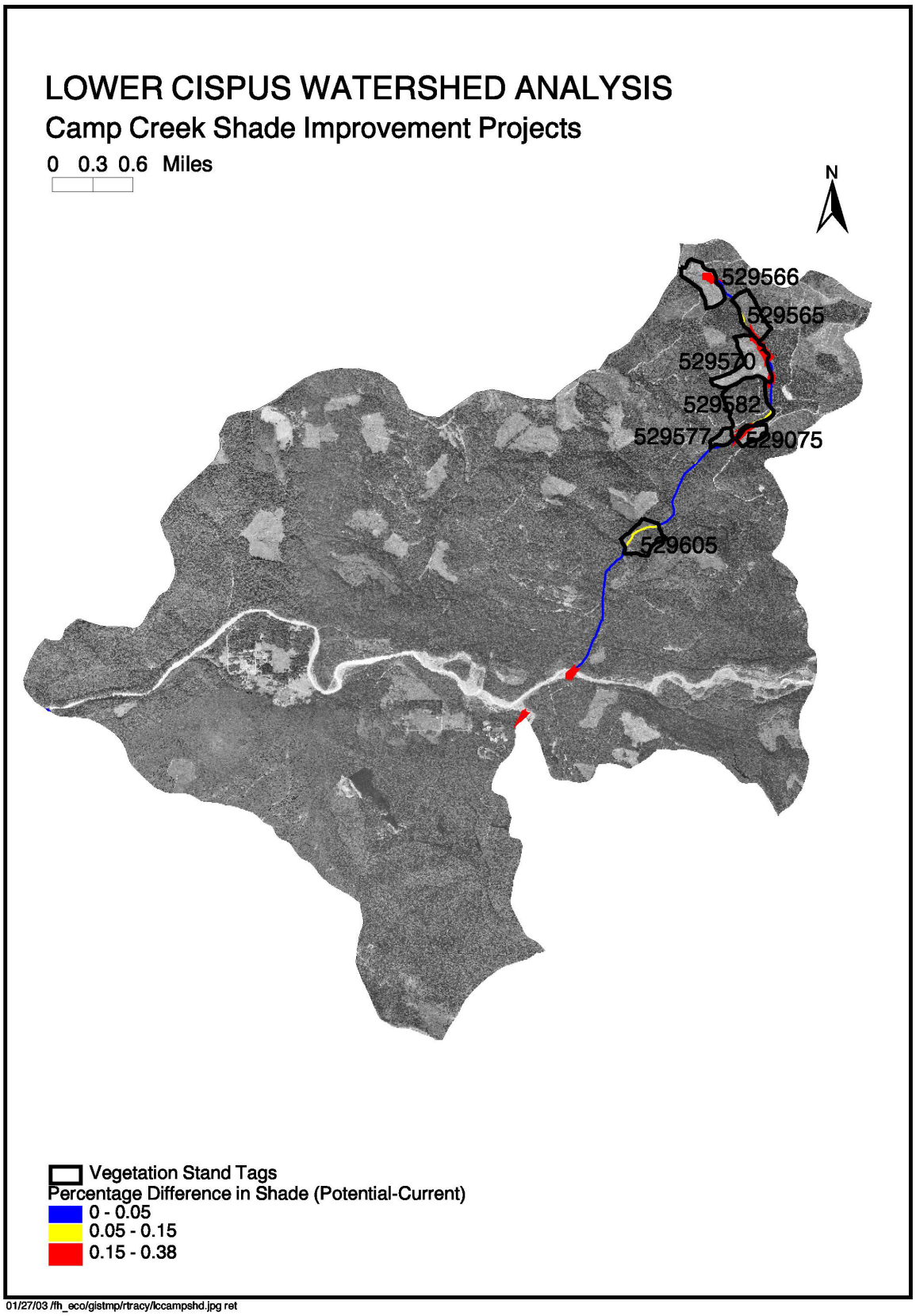
Woods Creek has low subwatershed shade (49%), which may be attributable to numerous ponds and wetlands where stream widths influence the stream temperatures more than tree height. Further investigation into Woods Creek is necessary to determine the causes of low subwatershed shade levels. Only one stand was identified where shade is currently 16% less than the shade from 160 feet tall trees. Subwatershed shade levels increased only 3% when all the riparian stands were modeled as 160 feet tall.

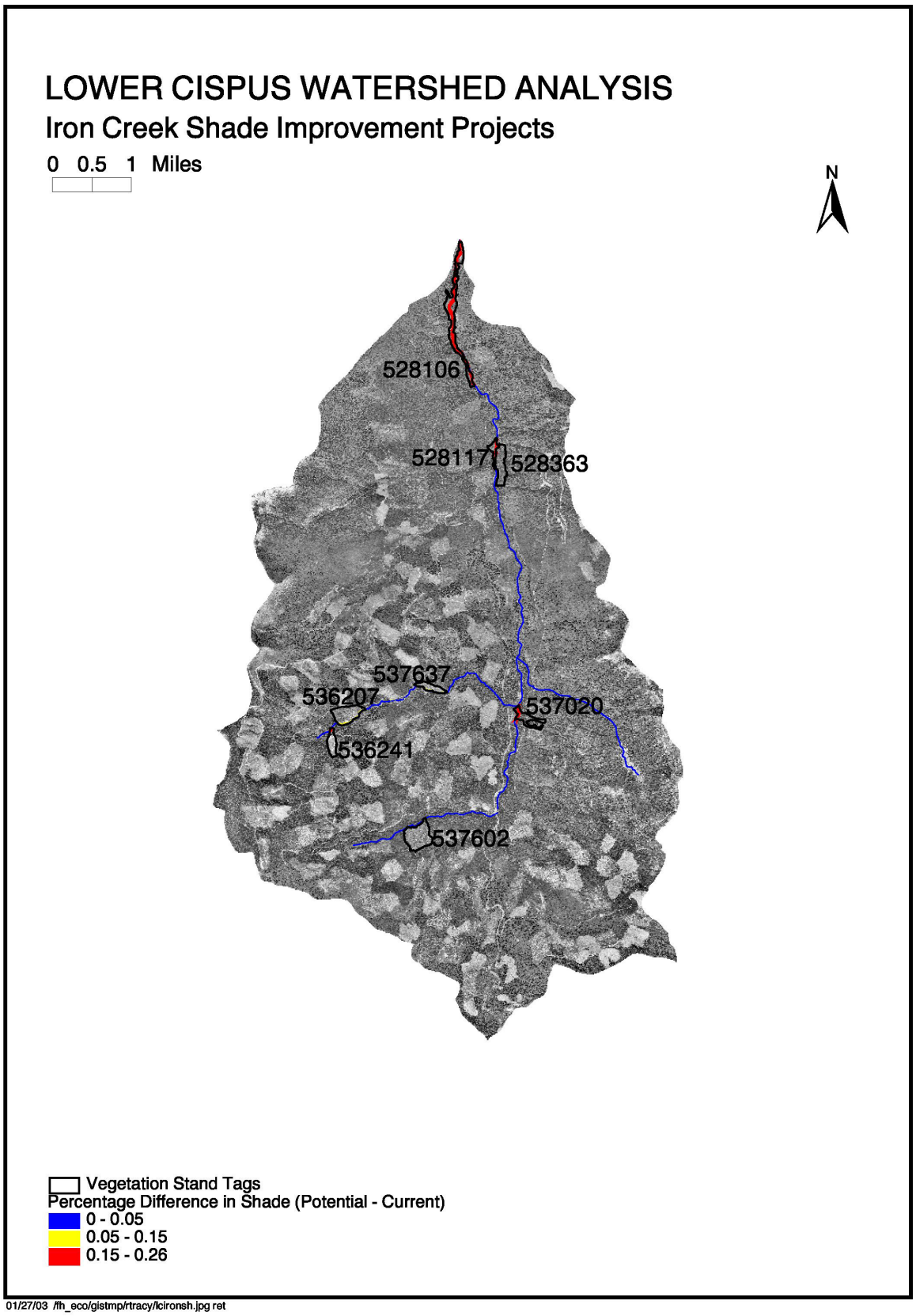
Table 4.1- Riparian stands where shade is currently 15% less than shade from 160 feet trees.

Subwatershed	High Priority Stands (stand tag IDs)	Moderate Priority Stands (stand tag IDs)
Yellowjacket Creek	538436 538043 537711 538188 529161 530244	538010 538011 538016 538053
Cispus River-Camp Creek	529566 529570 529075	529565 529582 529577 529605
Iron Creek	528106 528117 528363 537020 536241	537602 537637 536207

The Quartz Creek subwatershed shade level was 70% and is partially attributeable to the denuding of riparian vegetation within the blast zone of the Mt. St. Helens volcanic eruption. Precommercial thinning of the riparian stands within this area is considered a moderate priority.


Working Map
LOWER CISPUS WATERSHED ANALYSIS
Yellowjacket Subwatershed Shade Improvement Projects
0 0.6 1.2 Miles
N
530244
529161
538010
538188
538011
538016
537717
538043
538436
538053
Vegetation Stand Tags
Percentage Difference in Shade (Potential-Current)
0 - 0.05
0.05 - 0.15
0.15 - 0.47
01/27/03 /fh_eco/gistmp/rtracy/lcyellowsh.jpg ret


LOWER CISPUS WATERSHED ANALYSIS
Camp Creek Shade Improvement Projects
0 0.3 0.6 Miles
N
529566
529565
529570
529582
529577
529075
529605
Vegetation Stand Tags
Percentage Difference in Shade (Potential-Current)
0 - 0.05
0.05 - 0.15
0.15 - 0.38
01/27/03 /fh_eco/gistmp/rtracy/lccampshd.jpg ret


LOWER CISPUS WATERSHED ANALYSIS
Iron Creek Shade Improvement Projects
0 0.5 1 Miles
N
528106
528117
528363
537637
536207
537020
536241
537602
Vegetation Stand Tags
Percentage Difference in Shade (Potential - Current)
0 - 0.05
0.05 - 0.15
0.15 - 0.26
01/27/03 /fh_eco/gistmp/rtracy/lcironsh.jpg ret

3. Future Wood Recruitment

Future wood recruitment is considered low in all of the subwatersheds since all subwatersheds have a smaller percentage of large trees than the reference condition in 1880. Future wood recruitment is considered to be currently available from the large tree forest stage, and near term recruitment potential is considered from the small tree forest stage. Iron Creek, Woods Creek and Lower Cispus Frontal has the largest decline from the historic condition. These subwatersheds also have higher percentages (greater than 25% higher) of small tree structure than the reference condition. The lower ratio of large tree and higher ratio of small tree indicates that less large wood recruitment is currently available within these subwatersheds. Near-stream treatments to accelerate the growth of stands with small tree structure will shorten the time these subwatersheds have limited large wood recruitment potential.

4. Riparian aquatic connectivity

Riparian aquatic connectivity has been affected by roads within riparian corridors. The Gifford Pinchot National Forest Roads Analysis assessed the aquatic risks that roads have to the aquatic ecosystem, including assessment of number of stream crossings and areas where high density of roads exist within riparian areas. Stream crossings are the locations on the road system with the greatest propensity for impacting aquatic resources through impeding downstream movement of wood and bedload, impeding upstream movement of aquatic organisms and by providing the linkage between roadside ditches and natural stream channels.

This roads analysis summarized by subwatersheds indicates that Iron Creek, Yellowjacket Creek and Cispus River-Camp Creek are the three subwatersheds with the greatest negative effect. Road decommissioning, and road stabilization for the long-term, and drainage improvements along with surface maintenance will be prioritized in these subwatersheds. Specific road recommendations are listed in Chapter 6 – Recommendations.

5. Increased Peak Flows

Increased peak flows were considered to exist if WAR increases were 10% or greater and the channel had evidence of increased peak flow effects. Woods Creek and Quartz Creek had Water Available Runoff increases of 16% and effects were evident in the creeks. Crystal Creek and Copper Canyon Creek, tributaries to the mainstem Cispus River within the Lower Cispus River Frontal Subwatershed had Water Available Runoff increases of 15% and 24%, respectively.

The Woods Creek subwatershed is entirely within the Woods Late Successional Reserve (LSR) where regeneration harvest is unlikely due to LSR objectives. Management within the LSR will not decrease the hydrologic maturity of the stands. Therefore, hydrologic maturity of stands within the Forest Service lands will continue to increase, thereby decreasing any effects of increased peak flows. The privately-managed lands (15% or the subwatershed) will continue to have the potential to increase peak flows to the lower portion of Woods Creek. Similarly, the National Forest lands in Copper Canyon Creek are within the Quartz LSR, where regeneration harvest is unlikely due to LSR objectives. The privately-managed lands (67% of the subwatershed) will continue to have the potential to increase peak flows to the lower portion of Copper Canyon Creek.

The Quartz Creek subwatershed and the National Forest land in Crystal Creek have portions managed as Matrix where objectives include production of commercial yields of wood. Regeneration harvest in these areas could result in increases to Water Available Runoff, resulting in increase peak flows and channel instability. Avoiding increases to peak flows should be considered when managing stands with these areas with particular empahasis in the Quartz Creek Subwatersheds where excessive sediments within the channel exist from the 1980 Mt. St. Helens volcanic eruption.

6. Sediment delivery from roads and harvest related landslides

Sediment delivery from roads and harvest related landslides has changed the natural sediment regime by increasing the amount of sediment streams process. The three subwatersheds where the most sediment delivery from roads is occurring are Iron Creek, Cispus River-Camp Creek, and Cispus River Frontal. The three subwatersheds with the most acres of management-related landslides are Yellowjacket Creek, Quartz Creek, and Iron Creek.

Road Decommissioning, and road stabilization for the long-term, and drainage improvements along with surface maintenance will be prioritized in Iron Creek, Yellowjacket Creek, and Cispus River-Camp Creek. Specific road recommendations are listed in Chapter 6 – Recommendations.

Timber harvest units associated with harvest-related landslides are generally pre-1994 when the Northwest Forest Plan revised management objectives. Corrective actions were accomplished where appropriate to these landslides after the 1996 flood. Landslide potential from natural causes will continue to contribute large sediment loads. Management activities throughout the watershed should be done in a manner to limit any additional sediment delivery to streams.

B. BIOLOGICAL RESOURCES

1. DISTURBANCE REGIMES

a. Fire

There are currently no known specific areas of concern where fuels resulting from timber harvest have accumulated to an extent which would pose an ususual risk of a catastrophic fire. There are stands within one-half mile of private lands with structures that could be either precommercially or commercially thinned over the next decade to potentially reduce the fire risk. Thinning may reduce the potential for crown fire by removing “ladder fuels” and increasing crown spacing. These activities may meet the intent of the National Fire Plan. Any proposed activities must be consistent with current management direction for the area. There is also an opportunity to provide “Firewise” information to the residents to help them protect their homes and themselves, working with the Lewis County Fire District and the Washington State Dept. of Natural Resources.

b. Insects, Disease, and Animals

Our limited knowledge indicates that current insect, disease and animal damage (bear damage) occurrences in this watershed appear to be within the range of natural variability. However, we don't know the precise limits of that range. In general, the damaging agents residing in western Washington forests (and in this watershed) seem to have a relatively narrow range of natural variability. There are no records or data that indicate any past insect, disease, or animal damage disturbance in this watershed was of such magnitude as to adversely affect the ecosystem.

The generally moderate environment of western Washington forests leads to less drought and other tree stresses that are often related to insect outbreaks (and sometimes to disease occurrence). Consequently, insect outbreaks will tend to be infrequent, small in size, and very low to moderate in severity. We can expect most insect and disease occurrences to be widely and irregularly distributed across the parts of the watershed occupied by their respective hosts, with attacks often being associated with host trees under environmental stress. Damage to stands by bears is tied directly to the resident bear population (of which we have little reliable data) and their targets of opportunity (i.e., the number of young, managed stands with the preferred tree species and tree size).

Insects

As noted in Chapter 3, there was a relatively small outbreak (approx. 3,066 acres) of balsam woolley adelgid scattered across this watershed in 1990, with the bulk of it occurring in the Iron Creek subwatershed. Balsam woolley adelgid occurrences/outbreaks have the potential to be rather large. Although we have no record of large, serious outbreaks of this insect in the watershed, a large, serious outbreak did occur on the Gifford Pinchot National Forest in 1954 near Mt. St. Helens (Johnson *et al*, 1963). Being a recently introduced insect into this forested ecosystem, it is unclear how it will react over the long-term.

We can expect the balsam woolley adelgid to continue (mostly in scattered, relatively small patches less than 100 acres) affecting the growth and vigor of Pacific silver fir (as well as killing some of them) in this watershed. As an introduced species, this insect has no natural enemies to help control it. It is probably the one insect in the watershed that can cause a significantly large, damaging outbreak in portions of the watershed where Pacific silver fir is either a dominant or important secondary tree species. Such an outbreak is most likely to occur in areas of high site productivity where Pacific silver fir is most susceptible; most likely in the Iron Creek subwatershed, but also with some likelihood in portions of the upper (southern) half of the Yellowjacket Creek and McCoy Creek subwatersheds.

We can expect the Douglas-fir beetle (mostly in small, scattered patches of less than 10 acres) to continue killing Douglas-fir in this watershed, especially in connection with areas of unsalvaged windthrow and/or root disease. Large, significant outbreaks of this insect are possible in portions of the watershed where Douglas-fir is dominant, but that would most likely happen in conjunction with a large windthrow event or wildfire, especially if there was no significant salvage of the dead/down material. Based on past experience and available

data, beetle outbreaks are most likely to occur in the lower to middle elevations of the watershed in the Cispus River-Camp Creek, Quartz Creek, Woods Creek, and Yellowjacket Creek subwatersheds.

Disease

Disease infections generally move slowly through the forest. In this watershed, root disease occurrences are generally small in size (<1 acre to 10+ acres), and the number of infection centers in the Western Hemlock Zone portion of the watershed (while generally small in size) can be relatively high. The damage severity of disease occurrences in the watershed ranges from very low to severe, but for most diseases it is most often in the very low to moderate range; although for laminated root rot, damage severity can often be in the high to severe range in localized areas.

Laminated root rot and Armillaria root disease are expected to continue killing trees as the infections move through the stands where they are currently located, but laminated root rot is the greater concern of the two. In some managed stands reforested with highly susceptible Douglas-fir during the 1950s, 1960s, and 1970s, where laminated root rot was located prior to harvesting, the level of disease inoculum and the virulence of the disease has increased. The disease has been provided a new generation of highly susceptible host trees. Young stands of this type are not likely to reach maturity before they are effectively destroyed by the disease, if they were moderately to heavily infected before regeneration harvest.

It is not known with any great certainty how many stands like this exist, but this type of situation is one which has the potential to increase the amount of laminated root rot in the watershed, as well as prolong the time it takes for the disease to naturally subside in these stands. On a site specific basis, the significant presence of laminated root rot in some portions of this watershed may have a detrimental effect on the future production of deer and elk winter range optimal cover and the hydrologic recovery of some young stands. These problems will most likely increase in the Lower Cispus River Frontal, Woods Creek, and Cispus River-Camp Creek subwatersheds and the northern portion of the Yellowjacket Creek subwatershed.

In the recent past (1980s and 1990s), efforts have been made to reduce the level and spread of laminated root rot through the regeneration harvest of infection centers, followed by the planting of intermediately susceptible, tolerant, resistant, or immune tree species to grow for a rotation. Managing regenerated infection centers with a mix of tree species less susceptible to the disease will slow or limit its damage and spread. Western white pine has been widely used in this role.

White pine blister rust and its impact on the 67 young, managed grass/pole stands where western white pine is a significant component of their species composition is a concern in this watershed. Western white pine was planted in many of these stands to: 1) minimize the impacts of laminated root rot, and/or 2) increase planting survival on environmentally tough sites, and/or 3) increase the overall vegetation diversity. There is concern that death of a significant number of white pine trees in these stands will make it impossible to meet the

objectives for which this species was planted in specific locations. This disease has affected (to some degree) young stands primarily in the Cispus River-Camp Creek-Cispus River, Iron Creek, Yellowjacket Creek, and Quartz Creek subwatersheds. The district is currently working through the Forest Silviculturist to obtain specific funding from Region 6 Forest Pest Management over the next 2 or 3 years to address this concern. The funding would provide dollars to: 1) survey stands to determine infections levels, 2) develop guidelines for prunable stands, and 3) prune stands that would benefit most from treatment. Treatment would consist of pruning the live limbs from the lower portion of each white pine tree in a stand to reduce the chance of infection (for those not yet infected), and/or reduce the chances of mortality of those that already have branch infections.

Animals

Bear damage to young, managed stands appears to be the leading damaging agent within the watershed over the last 12 years. It also appears that the bear population is on the rise in this watershed, which may have some relation to recent changes in the bear hunting regulations that no longer allow dogs to be used during the hunt.

We can expect bear damage to continue (for the foreseeable future) much in the same amounts and locations (Yellowjacket Creek, Lower Cispus River Frontal, Iron Creek, Quartz Creek, and Greenhorn Creek subwatersheds) where young, Douglas-fir dominated stands of 25-50 years of age are present. The bears will continue to damage and/or kill individual trees (mostly pole-sized to small tree sized Douglas-fir) and small groups scattered through stands. Although the activity will decrease the amount of future commercial thinning volume that could be removed from these stands, it will also increase the amount of structural diversity in these often homogenous stands. There will be small openings created in the canopy, creation of small snags and down wood, plus the opportunity for development of future sources of structural diversity as indivdually damaged trees continue to live and develop imperfections/deformaties over time.

Bear damage, at present, should not be of great concern, but should be monitored in order to determine if the stand damage over time becomes unacceptable and begins to impact important resouce needs.

c. Nutrient Capital Deficiency

Not enough is currently known about this soil/site condition in parts of the middle to upper Yellowjacket Creek and McCoy Creek subwatersheds to make any predictions about how serious it is or what direction it might take, or anticipate what course of action (if any) might be appropriate to address it. It is certainly a factor to consider in the overall health of the watershed, but there simply is not sufficient data or knowledge to intelligently analyze it.

d. Windthrow

Prior to the start of timber harvest activities in the mid-1940s, it appears (from looking at aerial photos) that very little windthrow of significance took place in the watershed.

Available evidence indicates that timber harvest activities (mainly regeneration harvest by clearcut and roadbuilding) have increased the amount of windthrow and the number of windthrow events in this watershed, but not in a dramatically significant way. Future windthrow events of a minor nature are likely to occur along the margins of existing clearcuts, future regeneration harvest units, and to a lesser degree in commercial thinning units (especially those that have laminated root rot infections) when windthrow conditions are right. Under the right conditions (high wind and water-saturated soils) these events could impact significant acres, but not necessarily in large patches; more likely in a large number of smaller patches. Overall, the amount of future windthrow in this watershed is not expected to be a significant concern unless a major sustained gale-force to storm-force wind event were to occur.

2. FOREST VEGETATION

a. Vegetation Structural Stages

Chapter 3 described what is known about the forest vegetation structural stages at two discrete points-in-time (1880 and 2003). Natural variability is a complex temporal and spatial property of all ecosystems. There is insufficient vegetation data over a long span of time in this watershed to accurately or meaningfully describe the range of natural variability for forest vegetation in this watershed. It would be erroneous to conclude that the differences described between forest vegetation in 1880 and 2003 constitute the range of natural variability. Therefore, we will simply compare the historic or reference forest vegetation structural stage data to the current forest vegetation structural stage data to determine trends and possible areas of concern within the watershed.

The amount, pattern, and distribution of forest structural stages across this watershed will continue to be influenced by natural and man-caused disturbance. The agents of disturbance most likely to continue to significantly modify the forest vegetation of this landscape are regeneration harvest, commercial thinning harvest, precommercial thinning, and fire; with insect outbreaks, disease infections, windthrow, volcanic eruption, and mass wasting playing a less prominent role.

Amounts

The current forest structural stage amounts existing in this watershed are significantly different than those found in 1880 (see Table 4.2- Comparison of historic and current vegetation by structural stage). From 1880 to 2003 the composition of forest structural stages has shifted from large tree forest dominance with little grass/pole forest to small tree forest dominance with a much increased component of grass/pole forest. During this period, the following factors have influenced forest vegetation structure: two large fires in the early 1900s, a large amount of regeneration timber harvest in the watershed (25,594 acres in the last 50-55 years), forest growth (natural succession) and since the 1930s, vigorous suppression of wildfires.

Table 4.2: Comparison of historic and current vegetation by structural stage				
Structural Stage	Year 1880		Year 2003	
	Acres	%	Acres	%
Grass/Pole	12,319	10	30,448	24
Small Tree	30,203	25	50,601	41
Large Tree	73,232	59	34,179	28
Hardwood	124	<1	124	<1
Non-Forest	*7,643	6	*8,169	7

*Note: The difference in the two non-forest acreage figures is due to the fact that some areas of the watershed that were forested before Euro-American settlers arrived have been converted to permanent non-forest acres (e.g., recreation sites, fields, rock/gravel quarries, etc.).

From 1880 to 2003 there has been a dramatic reduction of 39,053 acres in the total amount of large tree forest, a decrease from 59% to 28% of the watershed's acreage. That shift was largely the result of clearcut regeneration harvest over the past 55 years, along with much a lesser amount destroyed by fire and the volcanic eruption of Mt. St. Helens. There has also been some increase in large tree forest acres due to natural succession.

Between 1880 and 2003 there has been a substantial increase in the acres of both grass/pole and small tree forest structure.

Grass/pole forest has increased by 18,129 acres, shifting from 10% to 24% of the watershed's acreage. This was largely a result of clearcut regeneration harvest activity but can also be attributed, to some degree, to wildfires prior to 1930 at upper elevations with low site productivity such as those stands in the Pinto Rock area that occupy parts of the Iron Creek and Yellowjacket Creek subwatersheds. In large measure, regeneration harvest has acted as the main surrogate for wildfire as a creator of grass/pole forest, along with a relatively small number of acres that were destroyed by the volcanic eruption of Mt. St. Helens (1980) in the upper Quartz Creek subwatershed.

Small tree forest has increased by 20,398 acres, shifting from 25% to 41% of the watershed's acreage. This was largely the result of natural succession.

For a comparison of the amount and distribution of historic (1880) and current (2003) vegetation structure by subwatershed subwatershed see Tables 3.8 and 3.10 in Chapter 3.

With the advent of fire suppression activities in the 1930s, the number of acres lost to wildfire has dropped substantially. Over the next few decades, if regeneration harvest levels remain as low as the current trend, and if acres affected by wildfire remain as low as they have been the last several decades, the total amount of grass/pole forest in the watershed will steadily decrease, with the total amounts of small tree and large tree forest increasing through

natural succession and the application of forest management activities (primarily precommercial and commercial thinning).

Pattern, Distribution, Patch Size and Shape

The grass/pole forest is widespread across much of the watershed; its distribution and placement over the decades having been targeted primarily in the large, contiguous patches of large tree forest that existed prior to the start of harvest activities in the watershed. The regulated distribution of small, geometric grass/pole forest patches has seriously fragmented and disconnected much of the forest landscape, as opposed to the highly connected, large contiguous patches of forest that we believe existed in 1880.

A major difference exists in the location, size, shape, structure, and timing of initiation of the grass/pole forest patches created by timber harvest from the grass/pole forest patches that were created by wildfire events many decades ago. The grass/pole patches resulting from clearcut harvest (often followed by yarding, piling, and burning of unmerchantable logs and broadcast burning) contain very few large snags, large, live remnant trees, or large down wood (as a general rule). Until recently, the nature of timber harvest activities (both regeneration harvest and commercial thinning) across the watershed has meant the simplification of forest structure and patch geometry.

Harvest activities tended to eliminate snags, live remnant trees, result in fewer vigorous/diseased/damaged trees, less large, down wood, and reduced canopy layering. Clearcuts (and subsequent management activities) created grass/pole patches (usually less than 50 acres in size) with hard, distinct, straight edges, single-layered canopies, a less diverse species composition, and generally healthy undamaged trees with few deformities (i.e., a much simpler and less diverse structure -- both vertically and horizontally). As these simplified grass/pole patches grow into small tree forest (and eventually large tree forest patches), they will carry forward the more simplified structural characteristics of their clearcut harvest origins unless altered by natural disturbance or management activities.

The small tree forest currently forms the largest, and most connected forest patches in the watershed. The size of large, intact patches of small tree forest has remained about the same as 1880 in the east half of the watershed, with some minor fragmentation. Small tree forest location and distribution has not changed much in the east half of the watershed because the fires in the early 1900s reset the existing 1880 small tree forest located there to grass/pole forest, and it has now grown back to small tree forest as it was in 1880. In the west half of the watershed the size and connectivity of patches of small tree forest has increased through natural succession.

Some of the small tree stands in the watershed (primarily in the Cispus River-Camp Creek-Cispus River and Yellowjacket Creek subwatersheds) have been commercially thinned each decade since the 1960s to promote growth and vigor, but without much thought or direction to promote stand structural diversity. Until the 1990s most of the stands thinned were natural stands that originated from the fires in the early 1900s. In the 1990s we also began to commercially thin young, managed stands that originated from clearcut regeneration harvest

in the 1950s and had grown into small tree forest with little structural diversity. The thinnings in the 1990s began to be guided by prescriptions that promoted structural diversity (vertical and horizontal) in small tree stands.

The fragmentation of the landscape and the simplification of stand structure through various management activities over the past decades is a serious concern in this watershed. Where management allocations allow, and to meet desired resource objectives in accordance with management direction, future management activities (e.g., precommercial thinning, commercial thinning, regeneration harvest) should attempt to create more diversity in grass/pole and small tree stands over time. Natural and managed grass/pole and small tree stands throughout the watershed should continue to be considered for thinning treatments that will ensure healthy stands that can attain large tree/late successional conditions in the future.

Between the mid-1940s and today much of the large tree forest in the watershed has been highly fragmented, disconnected, and isolated by a high concentration of clearcut harvest. While being widespread across much of the landscape, the nature of today's large tree forest patches (most being small, narrow, gangly, and sometimes isolated) has been dramatically altered since 1880. The interior characteristics and nature of the sunlight, shade, canopy closure, vegetation species composition, large standing and down wood, and moisture regimes in these narrow patches are much different than those found in the large tree patches prior to the start of timber harvest activities. This can have dramatic impacts to a variety of forest resources. The nature of these small, narrow, isolated patches may also make them more unstable -- more susceptible to windthrow and the quickening of their natural aging/deterioration process.

A serious concern for the future will be how to restore larger, more connected patches of the various forest structural stages across this landscape that will have the structural and spatial characteristics needed to meet this area's mangement direction and resource needs. It should be noted that the private lands in this watershed are not expected to contribute to the amount of future large tree forest because of their relatively short harvest rotations.

Management

The *Northwest Forest Plan*'s emphasis on leaving snags, live remnant trees in various states of health and condition in patches and as scattered individuals, pieces of large down wood, more varied tree species composition, unthinned patches and canopy gaps in thinnings, variety in tree sizes and spacings, etc., will slowly return some of the structural complexity lost over the past few decades through clearcut regeneration harvest and some of the earlier commercial thinnings we performed.

Under today's emphasis of an ecosystem approach to management, the rate, type, and nature of timber harvest has changed dramatically, which will alter the successional trends in the watershed as well as the locations and configurations of current and future vegetation structural stage patches. Forty-three (43) percent of the watershed is dominated by the Matrix management allocation, while two Late Successional Reserves drive management on approximately 26% of the watershed. In the LSRs, only treatments that will hasten the

development of late-successional forest (such as precommercial thinning and commercial thinning in stands up to 80 years of age, with some exceptions beyond that) are permitted. A minor part (5%) of the watershed is within the Cispus AMA and is managed under the LAD (Landscape Analysis and Design) guidelines which include a number of design units. The remainder of the watershed resides in Administratively or Congressionally Withdrawn allocations (18%) that basically allow no harvest activities, and in private landholdings (8%) that will very likely continue to be heavily managed with timber harvest.

Most of the current grass/pole stands reside in Matrix, with a fair amount being in LSR, and a minor amount being in the AMA. Over the next few decades, much of the grass/pole forest will become small tree forest. Much of the current small tree forest will succeed to large tree forest. This means that over the next 80-90 years much of the forested landbase in the watershed will become large tree forest, assuming continued absence of large wildfires.

In the Matrix allocation (43% of the watershed) where timber harvest (regeneration and commercial thinning) is allowed in most areas, the initiation of grass/pole forest (and succession from grass/pole to small tree to large tree) will continue to occur over time in a somewhat regulated manner. It is in the Matrix allocation (and to some degree in the AMA) where the only man-caused initiation of grass/pole forest by regeneration harvest will be allowed. Regeneration harvest will not occur in the Riparian Reserves within the Matrix, thus succession of current structural stages in those reserves will continue toward a large tree forest condition (if they are not already in that condition).

In the Late Successional Reserves (26% of the watershed), regeneration harvest is not allowed (with very minor exceptions) and commercial thinning is only allowed in stands less than 80 years of age (with some exceptions), so there will be no new initiation of grass/pole forest unless by wildfire. Over time existing grass/pole and small tree forest will develop into large tree forest (the goal of a LSR).

With the advent of the *Northwest Forest Plan* the overall amount of regeneration harvest in the watershed has declined in the 1990s (and will in all likelihood remain low in the foreseeable future); the amount of possible regeneration harvest has been shifted to a much smaller land base of allocations that allow harvest. Commercial thinning, especially in young, managed small tree stands, will likely increase in the future as we try to improve structural diversity and develop these stands into large tree forest more quickly than natural succession would allow.

One of the tools used to control the stocking of managed grass/pole stands to meet a variety of resource objectives is precommercial thinning. Since 1991, the budgets and acres treated for timber stand improvement have dropped precipitously (although in the last 2-3 years funding and acres treated have increased), while the acres of grass/pole stands needing stocking control (those acres initiated by clearcut harvest in the late 1970's and early 1980's) continue to come on line each year. There is a concern that the stocking levels of many of those grass/pole stands will not be managed, foregoing the opportunity to accelerate the early and important development of various desired conditions, depending on the management allocations in which they reside (thus affecting future wildlife habitat, hydrologic recovery,

production of large woody debris and large snags, and timber production, etc.). There is a projected need of approximately 7,222 acres of precommercial thinning in this watershed between now and 2012. That total estimated precommercial thinning need over the next 10 years is broken down as follows in the subwatersheds: Iron Creek (1,645 acres), Quartz Creek (1,499 acres), Yellowjacket Creek (1,465 acres), Greenhorn Creek (780 acres), Cispus River-Camp Creek (687 acres), McCoy Creek (465 acres), Woods Creek (348 acres), and Lower Cispus River Frontal (333 acres). Some portion of that precommercial thinning need are potential stewardship units where bough material or Christmas trees may be removed in return for precommercial thinning of those stands.

3. WILDLIFE, BOTANY, AND FISH

There are several areas of concern within the watershed for wildlife, fisheries and botany. One obvious area of concern is the lack of survey information for many species of animals and plants, including habitat surveys. Although there has been a considerable amount of data collected since the Lower Cispus West and Lower Cispus East Watershed Analyses were completed in 1996 for some listed and survey and manage species, much of this has been limited to sites where proposed projects have been located, which in the Lower Cispus watershed has usually been mid-seral forest stands proposed for commercial thinning. Other habitat types have occasionally been surveyed for other projects, or as part of general inventories, but many habitats have been greatly under-represented, or absent in survey efforts.

a. Listed Species

Wildlife

Northern spotted owl - As identified in the previous chapter, most of the northern spotted owl pairs in the watershed are below the "incidental take" habitat thresholds within their potential home ranges. Additionally, and cumulatively, the increasing presence of barred owls in the landscape may make it very difficult for spotted owls to persist in the watershed at historic numbers. Presently, few owl surveys are being conducted, and these are mostly of an opportunistic nature. Also, the habitat use patterns in the watershed are poorly understood, particularly use of the thousands of acres of mid-seral, "foraging" stands that are present, as is their contribution to owl productivity and survival. There is no data available on the use of commercially thinned, mid-seral stands by spotted owls or barred owls as well. It is very likely that the Woods LSR in particular will simply not be supporting any spotted owls in the future, as the scattered wetlands and hardwoods there appear to be a "magnet" for barred owls.

Other listed terrestrial species - As stated above, the largest area of concern is the lack of status and distribution information for many listed wildlife species. Of particular importance are the large forest carnivores such as the gray wolf, grizzly bear and wolverine, who range over several watersheds and are difficult to detect. Very little data is available for listed bat species in the watershed, and these animals should be a high priority for surveys and monitoring. The Cascades torrent salamander, which has a limited distribution in proximity to Mt. St. Helens, is relatively common in the watershed; the status and distribution of this species needs clarification, and long-term monitoring of population trends would be very beneficial.

Plants

TES species: Population trends

The greatest area of concern is the lack of distribution and abundance information for most TES plant species. In addition, population dynamics of known sites of TES plant species have, for the most part, not been consistently or systematically monitored. The one exception is the *Cimicifuga elata* site within the Woods Creek subwatershed. Because this site is easily accessible, revisits have been made to this site a few times since it was originally discovered in 1994; two of these revisits (1996 and 2002) were documented. These records indicate that the population, which was never large or robust (when first observed it consisted of 6 plants), has declined to only 3 observed plants. Notes on monitoring forms in 1996 and 2002 indicated a need for some control of competing, weedy vegetation at the site. However, this action has apparently never been taken. This site is also directly adjacent to a high use picnic area, and any control of encroaching vegetation needs to be done with consideration of the fact that doing so could make the plants more visible and more accessible to visitors, which would constitute a real risk to this small population.

TES species: Habitat trends

Also of concern is a general lack of knowledge on the status and trends of certain habitats important to TES plant species. For example, meadows appear to play an important ecological role for many plant species, including a number of TES species. Future management directives within the analysis area should include schemes that maintain and favor existing meadow habitat, in order to ensure that quality habitat is available for the numerous species of TES plants that occur in these areas. However, little is known about the trends occurring in meadow habitat. Previous analyses of the trends of meadow habitat in adjacent watersheds (Middle and Lower Cispus Watershed Analyses) suggested that significant losses of meadow habitat may be occurring there. It is likely that similar losses are occurring in the Lower Cispus watershed.

b. Survey and Manage Species

Wildlife

Salamanders and Mollusks - In addition to a lack of survey information in many habitat types across the watershed, an area of concern is the effect of timber harvest, particularly commercial thinning, on both known sites (particularly mollusks) and future habitat conditions. The size of protected areas in different situations, microclimatic effects of reducing canopy, and the treatment of deciduous trees like big-leaf maple in thinned areas need further monitoring and study. It is possible that some mid-seral stands containing bigleaf maple trees that are being over-topped by Douglas-fir and other conifers exist in Lower Cispus, which will eventually reduce or eliminate their habitat suitability for species such as *Cryptomastix devia.* If such stands are identified, active management may be necessary to reduce competition and retain the deciduous component in some of these stands, if managing these sites for "survey and manage" mollusks is a priority.

Plants

Population trends

Surveys for survey and manage plants, including vascular plants, lichens, bryophytes and fungi have been heavily concentrated in project areas; as a result, our understanding of the distribution and abundance of these species is limited within the watershed analysis area. Population dynamics of known sites of survey and manage species have not been monitored. Without information on population trends it is difficult to assess how these species are responding to changes within the watershed. In order to manage these species for persistence in the long-term, a better understanding of their distribution across the watershed is needed. This information could help managers maintain connectivity of habitat, allowing for effective dispersal of these species over time and space.

Habitat trends

Late-seral habitat is fragmented within the analysis area. While individual populations of late-seral dependent species may be protected in the short term, this landscape pattern may pose a long term viability problem for these species. This is clearly true for many species of epiphytic lichens that have been shown to have dispersal limitations, particularly *Pseudocyphellaria rainierensis*.

c. Management Indicator Species

Deer and Elk - The amount of forage in deer and elk winter range comprises only 9% of the total NF acres at present, which is less than the desired level of 10-15%. The amount of forage will soon be declining further as young, regenerating forest stands mature into hiding and thermal cover. In the absence of disturbance, either natural or man-made (e.g. timber harvest), the carrying capacity of the winter range will be decreasing in future decades, although this will be partially offset by the presence of adjacent private lands which provide forage in some sections of the watershed.

Road densities on deer and elk winter range are well above the Gifford Pinchot Forest Plan goal of 1.7 miles of open road per square mile. Opportunities to reduce road densities, however, appear to be somewhat limited as several of these open roads are main arterials such as Forest Roads 23 and 25.

Mountain goat- A concern is the lack of understanding of this species' habitat requirements in the area, and how habitat disturbance, or the absence of disturbance, may affect mountain goats (either positively or negatively). Recent fires have created relatively large meadows in parts of Juniper Ridge that are extensively used by mountain goats for foraging, and may contribute to their increasing numbers in this area. The long-term effect to goats on Juniper and Languille Ridges from the motorized trail systems also is unknown, as are the effects of interspecific competition with deer and elk. Mountain goat habitat relationships are much less clear than they are for deer and elk, and further data is needed before conclusions about cover, forage, and other habitat variables can be made.

d. Non-native Species

The extent to which exotic species are affecting native plant and animal species is an unknown in the watershed. Areas of potential concern include disturbed sites, dispersed camping areas, roadsides, trails, and other areas subject to concentrated human use.

Amphibians and Mollusks

The Lower Cispus watershed is the one area on the Cowlitz Valley District where introduced, non-native mollusks (mainly slugs) have been noted with some regularity. Therefore, it is the area where these animals may become established and potentially compete with native gastropods by increasing to large numbers at various sites, and then expanding into adjacent forest stands. Also, the introduced bullfrog has been observed in Lower Cispus and may over time complete with native amphibians. Specific, potential areas of concern are Woods Creek (ie. Watchable Wildlife Area), Kraus Ridge, and other sites where there is concentrated human activity, such as Iron Creek campground or dispersed recreation sites.

Noxious Weeds

It is clear that noxious weed infestations are a existing and increasing danger to the integrity of aquatic and terrestrial ecosystems across the Forest, and data gathering efforts are greatly needed in order to be able to assess the problem and prioritize control actions.

Primary corridors for noxious weed dispersal within the analysis area include roads, trails, and riparian areas. Road verges, parking areas, campgrounds, horse camps, log landings, boat launches, trail heads, quarries, borrow pits and other frequently disturbed areas, especially those accessible by motor vehicles, are likely to be noxious weed hot spots which act as dispersal centers for these species.

In addition to a lack of basic distribution and abundance data, there has been little control of known noxious weed populations within the watershed. Control work has been limited to relatively small efforts at hand pulling scotch broom (*Cytisus scoparius*) along roadsides. Plans and limited Title II (RAC) funding are in place to increase the amount and scope of noxious weed control work across the district over the next two years. Unfortunately, the amount of funding is very limited and will only address a small part of a very large problem for a relatively short time. Long term noxious weed control program funding is needed in order to begin the process of halting, and eventually reducing, the infestation and spread of noxious weeds on the Forest. Future spread of these species into previously uninfested areas is inevitable given the variety of dispersal methods and corridors that are available.

e. Forest Fragmentation and Connectivity

The watershed contains thousands of acres of mid-seral, interior forest habitat at present, in some very large patches, but much less late-seral ("large tree") interior habitat. This is particularly true for lower-elevation (less than 3500 feet) late-successional, interior habitat in larger (greater than 100 acres) patch sizes. A concern is the maintenance of these areas until the mid-seral stands succeed to late-successional, interior habitat in the sizes and amounts desired based on management direction.

Connectivity is a concern in Lower Cispus, particularly in some riparian corridors in the western half of the watershed, as noted in the previous chapter.

Plants

On a landscape level, the connectivity of special habitat types is important for many reasons, including the dispersal of plant propagules (e.g. seeds, spores, etc), and the maintenance of diverse gene pools among species.

The connectivity of late-successional or old growth habitat may be important for many old-growth associated species, and is of particular importance to some survey and manage epiphytic lichens and bryophytes.

f. Fish and Fish Habitat

The matrix of pathways (see table 4.3) and indicators is one way of rating habitat conditions. The rationale for the ratings of individual subwatersheds is contained in the tables of Fish Appendices V -XII. In general subwatersheds that are rated as Functioning At Unacceptable Risk are areas of concern and these areas should be targets for restoration projects. Those subwatersheds that are rated as Functioning At Risk are areas that could easily become areas of concern. A cautious approach to project planning is advised in both of these situations. The following discussion further refines the location of the concerns and points out exceptions to the general rule.

Table 4.3- Environmental Baseline Rating

Pathway	Indicator(s)	Properly Functioning	Functioning at Risk	Functioning at Unacceptable Risk
WATER QUALITY	Temperature Bull trout		McCoy Creek	All Subwatersheds (Except McCoy Creek)
	Temperature Other Species		All Subwatersheds	
	Sediment		All Subwatersheds (Except Quartz Creek)	Quartz Creek
	Chemical Contaminants/Nutrients	All Subwatersheds (Except Quartz Creek)	Quartz Creek	
HABITAT ACCESS	Physical barriers	Quartz Creek	Woods Creek, Yellowjacket Creek,	Iron Creek, Greenhorn Creek, Lower Cispus River Frontal, Cispus River-Camp Creek , McCoy Creek
HABITAT ELEMENTS	Substrate in rearing areas	McCoy Creek	All Subwatersheds (except McCoy Creek)	
	Large Woody Debris		Greenhorn Creek	Iron Creek, Lower Cispus River Frontal,Woods Creek,Yellowjacket Creek,Cispus River-Camp Creek , McCoy Creek, Quartz Creek
	Pool Frequency and Quality FWS		Iron Creek, Woods Creek	Greenhorn Creek, Lower Cispus River Frontal, Yellowjacket Creek, Cispus River-Camp Creek, Quartz Creek, McCoy Creek.

	Pool Frequency and Quality NMFS		Iron Creek, Woods Creek	Greenhorn Creek, Lower Cispus River Frontal, Yellowjacket Creek, Cispus River-Camp Creek, Quartz Creek, McCoy Creek.
	Large pools	Quartz Creek	All Subwatersheds (except Quartz Creek)	
	Off-channel habitat	Woods Creek	Iron Creek, Greenhorn Creek, Lower Cispus River Frontal, Yellowjacket Creek, Cispus River-Camp Creek, Quartz Creek and McCoy Creek.	
	Refugia			All Subwatersheds
CHANNEL DYNAMICS and CONDITION	Width / Depth Ratio		Woods Creek, McCoy Creek	Iron Creek, Greenhorn Creek, Lower Cispus River Frontal, Yellowjacket Creek, Cispus River-Camp Creek and Quartz Creek.
	Streambank condition FWS	McCoy Creek	Iron Creek, Greenhorn Creek, Lower Cispus River Frontal, Yellowjacket Creek, Woods Creek, Cispus River-Camp Creek.	Quartz Creek
	Streambank condition NMFS	McCoy Creek	Iron Creek, Greenhorn Creek, Lower Cispus River Frontal, Yellowjacket Creek, Woods Creek, Cispus River-Camp Creek and Quartz Creek.	
	Floodplain connectivity	Yellowjacket Creek, McCoy Creek, and Quartz Creek	Woods Creek, Cispus River-Camp Creek	Lower Cispus River Frontal, Greenhorn Creek, Iron Creek
FLOW / HYDROLOGY	Peak/base flows	McCoy Creek Greenhorn Creek	Yellowjacket Creek, Lower Cispus River Frontal, Iron Creek, Cispus River-Camp Creek	Woods Creek, and Quartz Creek
	Drainage network	McCoy Creek and Woods Creek	Yellowjacket Creek, Lower Cispus River Frontal, Iron Creek, Cispus River-Camp Creek and quartz creek	
WATERSHED CONDITIONS	Road density and location		Yellowjacket Creek, Greenhorn Creek, McCoy Creek, and Quartz Creek	Woods Creek, Lower Cispus River Frontal, Iron Creek, Cispus River-Camp Creek

	Disturbance regime		McCoy Creek	All Subwatersheds (Except McCoy Creek)
	Disturbance history		McCoy Creek	All Subwatersheds (Except McCoy Creek)
	Riparian reserves	Cispus River-Camp Creek	Yellowjacket Creek, Greenhorn Creek, Quartz Creek, and McCoy Creek	Woods Creek. Iron Creek, Lower Cispus River Frontal
SUBPOPULATION CHARACTERISTICS / SPECIES AND HABITAT	Subpopulation size, Growth and survival, Life history Diversity and isolation, Persistence and genetic integrity, Integration of species and habitat conditions	No Rating. (The Forest Service has insufficient data in order to rate these indicators).		

Water Quality

Water Temperature

Bull Trout

Bull trout are very temperature sensitive; they do not tolerate temperatures that most other salmon and trout find suitable. Water temperatures are suitable for bull trout only in the McCoy Creek sub-watershed. In addition there are a some smaller isolated areas with suitable water temperatures. These areas include but are nor limited to the Cispus River above Yellowjacket Creek, upper Iron Creek, upper Greenhorn Creek, upper Pinto Creek Badger Creek, upper Quartz Creek, and upper Crystal Creek. Water temperatures even in these areas are considered to be marginal.

Other Species

Water temperature is a moderate concern for the species other than bull trout. Water temperatures in lower Yellowjacket Creek (below its exit from the canyon), lower Greenhorn Creek (at the 76 Rd. bridge), lower Iron Creek (below the 2510 junction), Cispus River (above Greenhorn Creek to the lower end of the watershed) regularly exceed 16ºC for several days a year. The seven-day average maximum temperatures also exceed 16ºC. Water temperatures are warm for an extended period of time and may influence the health and ability of trout and salmon to compete with minnows and other species that are more tolerant of warm water temperatures.

These higher water temperatures are due to the high wetted width-to-depth ratios observed and some loss of shading from fragmented riparian reserves. These relatively high temperatures are the results of accumulated temperature throughout the watershed. Therefore, the source of the problem is not isolated to the areas with the high temperature. We discuss problem areas in other sections of the document including: Watershed Conditions-Riparian Reserves and Channel Conditions and Dynamics - Width to Depth Ratio sub-sections of the fisheries section and the hydrology section.

Sediment

Fine sediment is a moderate concern throughout the entire watershed. The amount of fine sediment in spawning areas is largely an unmeasured quantity. Observations of fine sediment in most of the

streams, many landslides and many road failures suggest that amount of fine sediment is at an elevated level in most of the streams. This sediment is likely reducing the amount of spawning success. The fine sediment blocks the flow of water through redds and smothers eggs before they hatch (Bjornn and Rieser, 1991). Fine sediments also prevent fry from emerging from the gravel (Bjornn and Rieser, 1991). The current condition is not 100% lethal, but it is likely reducing the number of fry that successfully emerge from the redds. Potential spawning is severely degraded only in small areas (e.g., "Cispus C" Restoration Site, where fine sediment makes up 48% of the sediment).

There are two sources for the fine sediment that is clogging spawning gravels. The source of much of the fine sediment in the Cispus River is glacial flour, and there is nothing land management can do to control this contribution. This source of sediment, however, does create a baseline condition that is less than for ideal fish reproduction. The result is that even small amounts of sediment contributed by management-related sources have the potential to affect the reproductive success of fish.

The moderate amount of fine sediment in the tributary streams, however, indicates that glacial flour is not the only source of fine sediment. The hydrology section of this document indicates several sources of sediment and these can be reduced.

Yellowjacket Creek and the Cispus River are the areas of most concern because these are areas with the most habitat for threatened species. These are the highest priority areas for restoration.

Chemical Contamination/Nutrient Enrichment

Chemical contamination is of little concern in this watershed. Red Springs Creek in the Quartz Creek sub-watershed and Cispus River-Camp Creek in the McCoy Creek sub-watershed are the only areas of any concern. Both of these streams have indicators of acid rock drainage. Acid rock drainage lowers the pH of water and is often associated with hard rock mines. The low pH brings heavy metals into solution, which poisons aquatic life forms. One report said that there was no life in Red Springs Creek. This was not confirmed by other reports. Further investigation is needed to determine the magnitude, source and extent of any problem. There is no indication of pollution in either of the receiving streams, Quartz Creek or McCoy Creek.

There areas are no other areas of concern for this indicator in the watershed. A few campers at dispersed campsites, however, are careless with garbage and sewage. These sites are unsightly and smelly messes.

Current Restoration - On the positive side, the reintroduction of anadromous fish into the watershed is helping to restore a historical source of nutrients. The decaying bodies of salmon and steelhead are valuable source of nutrients for invertebrates and vertebrates alike.

Habitat Access

Physical Barriers

There are several culverts that are likely preventing the free movement of all species and age classes of fish up and down the stream. Table 3.23 and Map 27 display the location of the culverts, species that are blocked and the amount of upstream habitat.

Culverts block only 1.9 miles (4.2%) of potential anadromous habitat. We expect 0.7 miles of habitat will be restored in 2003 with the replacement of the Covel Creek culvert and removal of the 2500057 Rd. culvert. The remaining culverts are only partial barriers and will require further study before deciding the best treatment for these sites. Much of the habitat above these culverts is of marginal quality because it is in high gradient sections of streams with small pools.

At most, culverts definitely (all species, all life stages and year- around) block 11.2 miles (13%) of resident habitat on a year-around basis. We expect 1.5 miles of habitat will be restored in 2003 with the replacement of the Covel Creek culvert and removal of the FR 2500057 culvert. In addition, there are 5.73 miles (6.5%) of habitat that may be blocked on a seasonal-only basis. Both the year-around and partial blockages (seasonal or single life strage) culverts may not prevent the habitation of upstream habitats, but they do prevent the complete interaction between fish upstream and downstream.

In addition to the culverts, a small dam installed to create a pond on Woods Creek, approximately 0.20 miles upstream from the 2500057 crossing, is currently providing little opportunity for fish passage. Under certain conditions this dam may block access to a mile of low quality anadromous habitat. This dam is not an immediate priority because of the low quality of the habitat upstream from its location, however further studies should be conducted to determine the feasibility of providing passage at this structure.

Current Restoration – The district is working with the Cowlitz tribe to replace the culvert at Covel Creek with a structure that will allow for better fish passage. We expect the work to take place in the summer of 2003. There is a funded KV project to remove the uppermost culvert on Woods Creek in 2003.

Habitat Elements

Substrate Character

The areas of concern are the same for substrate character as they are for sediment. Most of the streams are moderately embedded. This condition is reducing the number of suitable spaces for aquatic organisms to use as refuges from predators and high flows.

The hydrology section of this document lists the priority areas for watershed restoration projects and recovering hydrologic maturity.

Woody Debris

The lack of woody debris is a major area of concern. There is a general lack of woody debris throughout the entire watershed. Only a few stream reaches meet the reference condition of 80 pieces per mile (see Map 28). Although the data summary shows a large amount of wood in Quartz Creek and Cispus River-Camp Creek, recent visits (1997-2002) did not find wood in the reported densities. We are treating this as a data anomaly.

The lack of woody debris is due in part to large fires in the early 1900s, salvage harvest from streams and riparian harvest.

This lack of wood has many consequences for aquatic habitats. Woody debris is often a key element in protecting streambanks and stabilizing channels. When wood is lacking in the system, stream channels often become overly wide, and lack pool-like habitats. The remaining pool-like habitat is often of low quality because of the lack of depth and cover.

Recent Restoration - The re-introduction of wood as part of restoration projects along the Cispus River, lower Yellowjacket Creek, lower Iron Creek, and lower Quartz Creek, is helping to restore channel stability and fish habitat.

The engineered logjam structures designed by Tim Abbe are protecting stream banks, and large pools have developed in association with each jam. These logjams are also providing cover for fish. Although these projects are beneficial, they cover only a small fraction of the problem area. In addition, these structures are not permanent and require maintenance. The flood of January 31, 2003 damaged several of the structures and completely washed out one of the structures.

Pool Frequency and Quality

Pool frequency and quality are areas of major concern. There is a general lack of quality pool habitat in the watershed (See Map 30 and 31). Only Iron Creek and Woods Creek have the number of pools to meet the reference conditions in a substantial portion of the stream. Even is these two streams the pools lack the depth and cover of quality pools.

The lack of quality pools is most important for Chinook salmon and coho salmon. Quality pools are key habitats for adult salmon waiting to spawn and rearing juvenile chinook and coho salmon. Quality pools provide areas of weak currents, and the depth and cover associated with quality pools provide refuge from terrestrial predators. A lack of pools makes the existing habitats more crowded and reduces the fitness of fish in those habitats.

Although pools are important to all species, and they prefer these habitats, other species (including but not limited to steelhead, coastal cutthroat trout and rainbow trout) are more adapted to using pocket water in riffles.

The lack of quality pools is due to the lack of structure provided by large woody debris and cumulative effects of fires and management actions including timber harvest and road construction, which have altered sediment and peak flow regimes.

Recent Restoration - On the positive side, the engineered logjams on the Cispus River have created a few quality pools. These pools are over 3 feet deep and have a substantial amount of cover provided by the logjams. The flood of January 31, 2003, however, modified these pools and removed one the logjams creating that created a pool. Other restoration work on Yellowjacket and Iron creeks has improved the quality of existing habitats by adding cover and structure to make these habitats more stable in time.

Large Pools

Large pools are an area of moderate concern. There is a moderate lack of large pools in these habitats in the watershed. Projects in this watershed need to at least protect the remaining large pools. All of the surveyed streams had a few pools greater than 3 feet deep (see Map 31). Of the surveyed streams only Quartz Creek, Iron Creek and Yellowjacket Creek have substantial areas where most of the pools are greater than 3 feet deep. Observations along Yellowjacket Creek after the 1996 flood, however, found that many of the deep had been filled sediment during the floods of 1995 and 1996. The large pools in Iron Creek make up only a small proportion of the habitat. The pools in the main river appear to be shallower than one would expect for a river of its size.

The Cispus River has many pools greater than 3 feet deep, however, the depth of pools is less than the potential for a river of its size. Large pools in rivers the size of the Cispus River are generally deeper than 6 feet.

As a result of this lack of deep pools, salmon and steelhead have a reduced number of places to stage prior to spawning. This is particularly important for the summer run of Chinook salmon, which spend up to two months in the Cispus River prior to spawning.

The lack of deep pools is due to 1) the lack of structure provided by large woody debris and 2) cumulative effects of fires and management actions including timber harvest and road construction, which have altered sediment and peak flow regimes.

Current Restoration- On the positive side, the engineered logjams on the Cispus River have created a few deep pools, but the structures appear to be easily damaged in even moderate floods.

Off-Channel Habitats

The condition of off-channel habitats is a moderate concern in this watershed. There are many off-channel habitats in the areas that are conducive to forming these habitats (response reaches). The concern is that these habitats appear to be unstable and in some cases ephemeral in nature. This leads to a situation in which fish may be trapped in these habitats. For example, the side channels associated with the Cispus “B” and “Cispus “C” restoration sites are only accessible during certain flows. The braided nature of this area of the Cispus River also contributes to its warming.

Refugia

There are no areas that would qualify as quality refugia in the Lower Cispus watershed. Most of the

area lacks the habitat conditions to qualify as a refuge to support a population of fish.

Channel Condition and Dynamics

Width-to-Depth Ratios

Width-to-depth ratios are an area of major concern in Iron Creek, Greenhorn Creek, Lower Cispus River Frontal, Yellowjacket Creek, Cispus River-Camp Creek, and Quartz Creek subwatersheds. Monitoring of stream widths has shown an increase in the width relative the depth of the streams in the response reaches of these watersheds, especially after floods (Lower Cispus East and Lower Cispus West watershed analyses). The areas in the worst condition are the lower mile of Yellowjacket Creek and the Cispus River between the North Fork Cispus River and Tower Rock Campground. These areas are highly braided and the channel frequently changes location. In addition, sections of Cispus River-Camp Creek, Crystal Creek, and Wakepish Creek regularly flow sub-surface during the summer. This is an indication that these streams are overloaded with coarse sediments.

The problem in Greenhorn Creek is different; much of upper Greenhorn Creek is a relatively shallow sheet of water flowing over a wide bedrock channel. In this case there is a lack of wood and other elements to retain sediment in the system.

The high width-to-depth ratios contribute to increases in stream temperature, which affects the health, and sometimes composition, of aquatic communities.

Streambank Condition

Streambank condition is somewhat unknown in this watershed. Although they noted areas of obvious erosion, previous surveys did little to quantify bank erosion. Areas of bank erosion are spread throughout the watershed.

Quartz Creek is the stream of highest concern. The eruption of Mt. St. Helens in 1980 denuded the streambanks in the upper portion of the stream.

The other streams are of moderate concern. Stream surveys show multiple areas of bank instability in Iron Creek, Greenhorn Creek, Crystal Creek, Cispus River-Camp Creek, Woods Creek, Ames Creek, tributaries to Woods Creek, and Yellowjacket Creek. There are also some areas of bank erosion along the Cispus River (specifically near the old Cispus Valley Bridge location, across from the mouth of Iron Creek, and several areas in the lower river). Both of these areas would be difficult to protect because the stream banks are vertical and across the river from good access points.

Current restoration Projects- The engineered logjams at Cispus “A”, Cispus “B” and Cispus “C” have reduced the potential for erosion at these sites, however, damage observed after the January 2003 flood, suggests that these structures are only temporary.

Floodplain Connectivity

Although many of the streams in this watershed are well connected to their floodplains and

associated wetlands, there are a few areas of concern. The 76 Road (in Lower Cispus River Frontal) has been rip-rapped in a couple of locations. A few land owners in in the community of Cispus (Cispus River-Camp Creek Cispus River subwatershed) have construted dikes to protect their property. In these spots the river is being prevented from meandering and building new floodplain. The lower sections of Iron Creek and Greenhorn Creek are down cutting through flood deposits and have lost contact with their floodplains in these areas. In these locations, the energy of the stream during flood events will remain elevated and elevated amounts of sediment will be transported until a new floodplain is developed.

Of lesser concern is a section of down-cutting stream in a tributary to Woods Creek (Woods Creek tributary 8) near the Woods Creek Watchable Wildlife Area, and the location of the 25 Rd in the floodplain of Woods Creek.

Flow/Hydrology

Change In Peak/Base Flows

Changes in peak and base flows are an area of moderate concern. Stream peak flows are likely higher than they were in historic times in parts of Iron Creek, Yellowjacket Creek, Cispus River-Camp Creek Cispus River, Woods Creek, Quartz Creek Lower Cispus River Frontal. I, therefore, rated most of the subwatersheds as either Functioning At Risk, or Functioning at Unacceptable Risk because of moderate losses of hydrologically mature vegetation from management actions and natural events, moderate increases in the drainage network, and evidence of channel widening. These increases are from the cumulative effects of "natural events" (slow recovery from fires in the late 1800s and early 1900s) and management activities (timber harvest and road building).

The eruption of Mt. St. Helens denuded a large portion of the Quartz Creek sub-watershed. In addition, timber harvest on private lands in the lower part of the sub-watershed has also decreased the overall hydrologic maturity.

Although Yellowjacket Creek has relatively good values for Aggregate Recovered Percentage (ARP) and Water Available for Runoff (WAR) we have observed large changes in channel location associated with small storm events. In addition, the flood event of 2002 was larger in this sub-watershed than the rest of the watershed. Although these problems may not be totally related to increased peak flow, activities (regeneration timber harvest and road building) that would increase peakflow would exacerbate current situation, thus the rating of functioning at risk.

Woods Creek shows few changes to the channel, but base flows are low and sections of Ames Creek are dry during summer.

Only McCoy Creek and Greenhorn Creek have ARP and WAR values that indicate very little change from historic conditions.

In addition, there are sections of potential fish habitat with subsurface flows in the Lower Cispus River Frontal (Copper Canyon Creek), Iron Creek subwatershed (Wakepish Creek), Woods Creek (Ames Creek) and Cispus River-Camp Creek subwatershed (Covel Creek, Cispus River-Camp

Creek, and Dry Creek). These are likely to be more related to increased sediment delivery and transport than increase water run off. The largest concern about Ames Creek, Cispus River-Camp Creek, Covel Creek, and Dry Creek is winter and spring flows attract spawning coho and steelhead, and subsurface flows later strand or kill fry when sections of these streams become dry. Although the problems may not be totally related to increased peak flow, activities (regeneration timber harvest and road building) that would increase peakflow would exacerbate current situation, thus the rating of functioning at risk.

Drainage Network Increase

The presence of roads, particularly the road ditches, have moderately increased the amount of functional stream channel. This increase in the length of functional stream channel helps to speed the rate at which rain and snow melt runoff. This can increase the frequency and magnitude of peak flow events. The Lower Cispus Frontal, Iron Creek, Yellowjacket Creek and Cispus River-Camp Creek are the watershed of greatest concern.

Only McCoy Creek has a very low increase in the drainage network.

Watershed Conditions

Road Density and Location

The location and density of roads is likely affecting stream condition in several subwatersheds. The major area of concern is the location of roads in the riparian reserves. The riparian reserves are areas that are either relatively close to streams or unstable areas. These are the areas that are most likely to affect streams and aquatic habitats. The Woods Creek , Lower Cispus River Frontal, Iron Creek, and Cispus River-Camp Creek subwatersheds are the areas of greatest concern. These all have road densities of greater 2 miles per square mile in the stream-side riparian reserves and relatively high number of stream crossings.

The density and location of roads is of moderate concern in the rest of the subwatersheds. Road densities in these subwatersheds are all above 1 mile per square mile. Only in McCoy Creek does the road density in riparian reserves drop below 1 mile per square mile in the riparian reserve.

Riparian Reserves

The condition of riparian reserves is a moderate concern for fish species. The riparian reserves are moderately fragmented. There is a wide spread decrease in large trees which provide shade and are a source of source down large wood. Only the Cispus River-Camp Creek sub-watershed meets the reference condition for the large tree class. Although Quartz Creek is better than the historic condition, the historic condition was considered to be much less than desirable because of a large fire that occurred in about 1850. The greatest concern is in lowest elevation subwatersheds (Iron Creek, Woods Creek, and Lower Cispus River Frontal) where not only is there a lack of large tree stands, but and there is an abundance stands in the grass/pole stage.

Disturbance Regime and Disturbance History

This watershed has been highly disturbed in the past. Some of the "natural disturbances" include the following events:

- Large fires near the turn of the 20th century (1880 to 1920), which removed much of the vegetation from parts of the watershed.
- Repeated eruptions of Mt .St. Helens, which dumped large volumes of ash on the watershed.
- Four large floods since 1970, which have altered the stream channels. A review of the USGS stream gauge data at the Cispus near Randle (14232500) shows that there have been seven ten-year-plus floods in since 1970. Although it is not possible to conclude that this represents an elevated frequency of flooding, it does show that a relatively large number of substantial floods have occurred in the last 32 years.
- Add to these disturbances timber harvest and the associated road construction.
- Records of timber harvest begin in the 1940s. It peaked in the 1980s and declined in the 1990s.

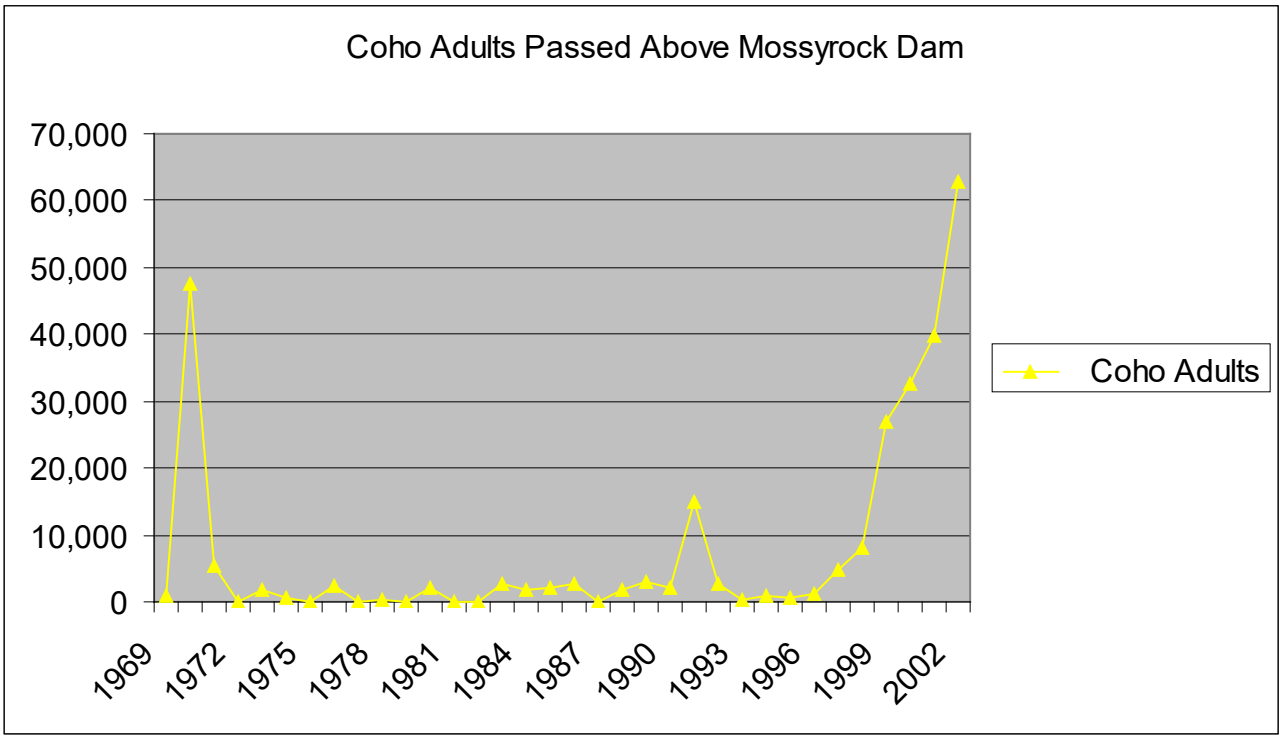
McCoy Creek is the least disturbed of all of the subwatersheds.

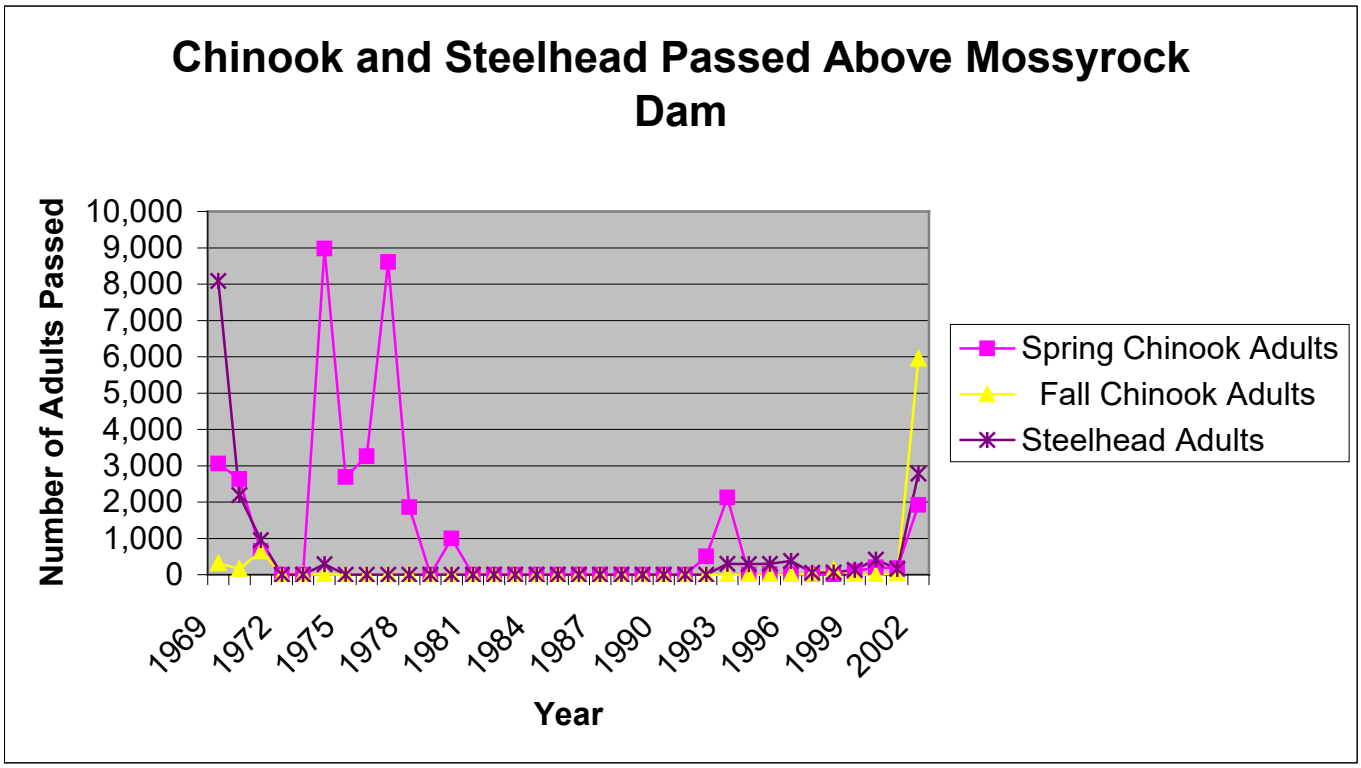
Subpopulation Characteristics

The current condition of fish populations is a major unknown in this watershed. The large of numbers returning adults and smolts captured at Cowlitz Falls Dam are encouraging; however, many of the transported adults are of hatchery origin, so large numbers of fish do not necessarily reflect the condition of the habitat. Of the TES populations only the coho, and perhaps the resident coastal cutthroat trout, are large enough to be considered stable and resilient to natural fluctuation in the environmental conditions.

The anadromous populations are dependent upon the reintroduction program for transport around the dams on the Cowlitz River. Figures 4.1 and 4.2 show the number of transported coho and Chinook salmon, and steelhead passing above Mossyrock Dam since 1969 (these numbers include fish using the all five of upper Cowlitz River watersheds, some unknown fraction use the Lower Cispus Watershed).

Figures 4.4 and 4.5- Graphs displaying the number of fish passing above Mossyrock Dam, 1969-2002.





From the late 1970s to 1993 these fish were viewed as "mitigation excess" hatchery fish and there was no focused effort to maintain a population of fish in the Lower Cispus Watershed. The passage of adults for reintroduction did not start until after 1996.

The number of coho in 2002 was large (62,960) and exceeds the peak of 47, 423 in the early 1970s. The number of chinook (7,871) and steelhead (2,787) are still below peak numbers (8,981 and 8,088 respectively) after the dam construction, the the goals for these population have not been reached. In addition, much of the fish habitat is in an "At Unacceptable Risk" condition.

C. SOCIAL AND ECONOMIC RESOURCES

1. RECREATION

The following are concerns and opportunities:

Roaded access

Road conditions within the watershed are deteriorating and frequently do not meet maintenance level standards for recreation destinations, primarily trailheads. This is particularly true for Level II Maintenance roads. Road maintenance priorities are set based loosely on volume and type of use and some recreation destinations are not high enough on the priorities list to receive consistent maintenance to standard. Potholes, washboarding, and lack of brushing can create damaging or hazardous conditions for people pulling trailers.

In the future, recreation managers should work closely with road maintenance personnel to ensure that needs for recreation access are considered in establishing overall District road maintenance priorities. Depending on the evolution of the Northwest Forest Pass system, use of roads for recreational purposes could be included in the system, thereby making pass revenues available for road maintenance on high priority recreation routes.

Motorized trail use

Total demand for and use of motorized trails appears to be somewhat static and relatively low in comparison with other uses. There appears to be growing use of 4-wheel ATV's or quads, partly because of a proliferation of models, heavy marketing, and the incorrect perception that they can be ridden almost anywhere.

While it would be desirable to provide more miles of ATV trail, new motorized trails are a very difficult "sell" in today's environmental world. Compounding this, our terrain, soils, heavy rainfall, and many stream channels that are often deeply incised, combine to make it difficult and costly to build and maintain new trails to ATV standards.

A related issue is the use of unlicensed ORV/ATVs on open public roads. The existing Forest policy is that unlicensed ORV/ATV on open forest roads is not allowed. This policy is currently under review and may be modified in the future to allow unlicensed vehicles on level 1 or level 2 roads that are open to motorized use. In some locations, this policy change may allow for the development of loop routes associated with existing trails.

We need to continue to work toward eliminating backlog trail maintenance and providing field monitoring of motorized use. Education and enforcement are critical to maintain these opportunities

as motorized use of all types is being challenged for environmental reasons. This is particularly true in the Dark Divide Roadless area within the McCoy Creek drainage.

Several sections of the Tongue Mt, Boundary, Langille and Juniper Ridge trails are located on steep grades or in wet areas. Current and projected future recreation use will further degrade these trails beyond the intended maintenance standard. Reconstruction and relocation are planned for several sections of Langille and Juniper Ridge trails; however, due to the ongoing debate on motorized use in the Dark Divide these projects continue to be delayed.

It is probable that the relatively large system of ATV/ORV trails that we maintain exists in a precarious balance between limited use, fairly intense maintenance, and moderate tolerance of the environmental community. Increases in use, decreases in maintenance, or decrease in tolerance could put the program at risk. Education and enforcement are important elements in maintaining this balance.

Dispersed recreation

Dispersed use appears to be increasing due to overall increase in recreation demand, more people able to afford self-contained camp units, and fees in developed sites. Existing and developing dispersed use is heavily biased toward stream and lakeshores, including riparian habitat. Although we have little or no actual data that indicates that this is contributing to unacceptable levels of sedimentation, pollution, or other water degradation, some of these impacts are fairly obvious. However, the total contribution of sedimentation may well fall within the natural range of variability of sedimentation in affected streams, and certainly within the peaks created by recurring natural and seasonal events. Intensive monitoring and measurement would have to be done to identify and evaluate sedimentation and other impacts associated with dispersed use.

Ongoing inventories and surveys of dispersed areas (Concentrated Use Areas) will help to display the number and size of our dispersed camp areas, and will help to determine a priority for addressing this issue. Removing or rehabilitating such sites, as well as changing the expectations and behaviors of users, will be a major undertaking and will require better data upon which to make such a decision and significant resources to accomplish the objective. It is possible that closing known sites may lead to the development of new sites in less desirable locations. The well-defined need to address known, measurable adverse watershed impacts will be a key factor in attempting to make these changes.

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Developed Campgrounds

Although there are minor shortages of camp spaces in some campgrounds during the highest peak use periods, such as Labor Day, the existing capacity of campgrounds appears to be sufficient to meet demand. This takes into consideration that demand is somewhat modified by fees and that capacity is established for some level below peak use in order to support reasonable occupancy percentages. Even with today's PAOT capacity (people at one time), overall occupancy figures expressed as a percent of total sites occupied are low, sometimes in the teens.

For the future, emphasis should be placed on upgrading existing campgrounds. The primary needs are for improved facilities to meet ADA barrier-free/accessibility standards. A listing is not really meaningful or necessary because this situation changes incrementally from year to year and annual priorities are based on specific conditions or needs.

A secondary need for upgrading campgrounds is improved opportunity for larger RV's. While the demand is certainly there, this is somewhat in contradiction to the Northwest Forest Plan direction that encourages more rustic or no facilities. Campgrounds on the CVRD generally fall within this category. Neither the Northwest Forest Plan guidance nor available funding nor other priorities indicate that any significant change in facilities or clientele is warranted.

Concession management of most campgrounds is here to stay. Success depends largely on their recruiting, training, and ongoing supervision of field site hosts. An opportunity for improvement is for the concession operator to be more involved as our partner in the field. This includes providing more local information and information on current conditions, becoming more aware of our policies and practices, having more written information to hand out to customers, etc. Concession campgrounds are managed to meet or approach the full service level.

We should attempt to maintain a few opportunities for no-fee camping, including campgrounds that require the Northwest Forest Pass. Emphasis in management of these sites is for a reduced service level, meeting the critical MM standards for safety and sanitation.

Northwest Forest Pass

The Northwest Forest Pass program continues to evolve. There is movement toward a "national pass" and the facilities for which the pass is currently targeted tend to be the more highly developed sites such as the Woods Creek Watchable Wildlife Area and less toward trailheads. As this program changes it is possible that the district will receive less funding through this program and may affect the ability of the district to perform trail maintenance.

The pass and resulting revenues come with a significant obligation for facility operation and maintenance. It is important to balance the needs for maintenance of trails, trailheads, dispersed sites, low standard developed sites, overall signing, and enforcement. This balance will change as conditions change and as accomplishments with appropriated funds, grant funds, and volunteers change. Focus NWFP funds on meeting basic standards of safety and sanitation in developed sites (MM standards), resource protection needs on trails, safety conditions at trailheads, and quality signing.

Continue to use grants to leverage all funds.

Interpretation

There are several existing interpretive sites within this watershed including Quartz Creek Big Trees Interpretive Site, Layser Cave Interpretive Site and Woods Creek Watchable Wildlife Area. Opportunities for improving or expanding interpretive and educational experiences exist at these and

other sites including Yellowjacket Ponds and Cispus Learning Center. Specifically, it would be desirable to expand the educational opportunities at the Woods Creek site.

We should continue to work with partners in providing interpretive programming at Tower Rock and Iron Creek Campgrounds during the summer season.

2. TRANSPORTATION SYSTEM

Areas of concern related to the transportation system were detailed in Chapter 3; refer to this chapter for further information.

Chapter 5 - Subwatershed Evaluations

In the ensuing tables, each subwatershed is evaluated in terms of meeting the nine Aquatic Conservation Strategy (ACS) objectives and additional management objectives relating to the upland conditions. A brief description of each of the objectives follows, with an explanation of the evaluation criteria that were used to assign the various ratings. ACS objectives are presented as they appear in the *Northwest Forest Plan* (USDA, USDI 1994).

A. WATER RESOURCES

Watershed Riparian Evaluation

Aquatic Conservation Strategy objectives:

1. **"Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted." (ROD, page B-11)**

   Evaluation Criteria - Compare historic/reference and current conditions, examine aquatic features such as perennial streams, intermittent streams, wetlands, lakes and ponds. Note: We interpret this ACS objective to refer to the continued physical existence of the variety of aquatic features from historic or reference times to the present. It does not address the quality of aquatic conditions, as these are addressed in the other ACS objectives.

   Assumptions - The overall drainage networks have increased due to roading - roads intercept groundwater which increases the network of channels carrying water. New intermittent and ephemeral streams exist as road cross drains cause water to flow where channels previously did not exist.

   The following ratings were used:

   Good: Watershed conditions display a natural and relatively undisturbed drainage system.

   Fair: Watershed conditions display moderate human disturbance, with some road-caused interference of drainage patterns.

   Poor: Greater than 10% stream drainage increase from historic conditions.

2. **"Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species." (ROD, page B-11)**

Evaluation Criteria - Compare historic/reference and current conditions, examine spatial and temporal connectivity of aquatic and riparian systems. Note: The basis of this evaluation was on *hydrologic* connectivity; *riparian* connectivity is addressed in ACS # 8.

The following ratings were used:

Good: Roads cause no blockages or culvert obstructions, few roads with high number of stream crossings, and no dams.

Fair: Impassable culverts with little or low quality habitat, few roads with high number of stream crossings, and some wetlands/floodplains are disconnected.

Poor: Subsurface flow, impassable culverts with high quantity or quality habitat and greater than 30 miles of roads with high number of stream crossings.

Assumptions: Human and natural features which influence hydrologic connections include hydroelectric facilities (or other stream flow diversions), road crossings of streams (primarily used to address barriers to fish migration, and does not account for possible barriers for other aquatic species because of data gaps), roads built along floodplains and wetlands, sediment deposits instream (gravel bars) or flow routed subsurface.

3. "Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations." (ROD, page B-11)

Evaluation Criteria - Compare historic/reference and current conditions, examine the physical integrity of the following aquatic systems: a) shorelines (lakes and ponds); b) stream banks - includes observations regarding channel widening, channel migration, and occurrence of large woody debris (LWD) as it relates to pool formation and stream bank cutting; c) stream bottom configurations; and d) condition of upper banks and inner stream gorges of deeply incised streams.

The following ratings were used:

Good: Shorelines of lakes and ponds, streambanks, channel conditions, channel migration, observed LWD concentrations, stream channel configuration, upper bank and inner gorge conditions resemble natural (historic) conditions.

Fair: Shorelines of lakes and ponds display moderate increases in erosion due to management influences. Moderate alterations in streambank and channel conditions, channel migration, stream channel configuration, upper bank and inner gorge areas when compared to historic conditions.

Poor: Shorelines of lakes and ponds display numerous signs of increased erosion due to management influences. **A**lterations in streambank and channel conditions, channel

migration, stream bottom configuration, upper bank and inner gorge areas do not compare to historic conditions.

4. **"Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities." (ROD, page B-11)**

   Evaluation Criteria - Compare historic/reference and current conditions, examine water quality of aquatic, riparian, and wetland ecosystems:

   The following ratings were used:

   Good: Peak summer stream temperatures always less than 16 degrees Celsius (°C) and no known sources of contamination and pH and conductivity within expected ranges.

   Fair: Peak summer stream temperatures greater than 16 °C for limited periods (less than 7 days) and no known sources of contamination and pH and conductivity within expected ranges.

   Poor: Peak summer stream temperatures greater than the Washington standard of 16°C for prolonged periods (7 or more days) and/or known sources of contamination and/or pH and conductivity outside of expected ranges.

5. **"Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport." (ROD, page B-11)**

   Evaluation Criteria - Compare historic/reference and current conditions, examine elements of the sediment regime (input, storage, and transport) including: timing, volume, rate, and character of sediment.

   Assumptions - Erosion from roads delivers fine sediment to streams. Sediment delivered to streams from mass wasting is both fine and coarse.

   The following ratings were used:

   Good: The timing, volume, and rate of sediment delivery to streams is similar to historic conditions. Spawning areas for fish are not impaired by fine-grained material.

   Fair: The timing, volume, and rate of sediment delivery to streams has been moderately altered throughout the watershed as a result of management activities. Some spawning areas for fish show are slightly to moderately impaired by an excess of fine-grained material.

Poor: The timing, volume, and rate of sediment delivery to streams has been severely altered throughout the watershed as a result of management activities. Management related landslides greater than or equal to 85 acres. Roads contributing an estimated 20 tons/sediment/year greater than or equal to 9 miles. Spawning areas for fish are being impaired by an excess of fine-grained material

6. **"Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected." (ROD, page B-11)**

Evaluation Criteria - Compare reference and current conditions, examine the ability of in-stream flows to create and sustain riparian, aquatic, and wetland habitats by looking at timing, magnitude, duration, and spatial distribution.

The following ratings were used:

Good: Water Available Runoff less than 10% and Drainage Extension (from roads) is less than 5.0 percent.

Fair: Water Available Runoff greater than or equal to 10% with limited evidence of channel instability and Drainage Extension (from roads) is greater than 5.0 percent.

Poor: Water Available Runoff greater than or equal to 10% with evidence of channel instability and Drainage Extension (from roads) is greater than 10.0 percent.

7. **"Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands." (ROD, page B-11)**

Evaluation Criteria - Compare historic/reference and current conditions, examine floodplain inundation and the elevation of water tables in meadows and wetlands. All evaluations presented in the following tables are based on observation factors such as roading along floodplains or near wetlands.

Assumptions - The majority of inventoried wetlands are associated with either high ridges and talus slopes or floodplains adjacent to streams. The majority of wetlands under the forest canopy are not inventoried. The floodplain area considered for stream channels is the area located in the two-year peak flow riparian zone.

The following ratings were used:

Good: Predominately natural and undisturbed floodplain and wetland conditions. No roads in the floodplain.

Fair: Moderate disturbance to wetlands, water tables, and channel conditions as a result of management activities. Floodplain may or may not contain roads.

Poor: Moderate to high disturbance of wetlands, water tables, and channel conditions as a result of management activities. Floodplain contains roads, and roads cross streams.

8. "Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability." (ROD, page B-11)

Evaluation Criteria - Compare historic/reference and current conditions, and examine the composition and structural diversity of plant communities in riparian areas, looking specifically for functions regarding the following:

a. thermal regulation (summer and winter)
b. nutrient filtering
c. rate of surface and bank erosion and channel migration
d. amount and distribution of coarse woody debris
e. structural diversity of forest in the riparian zone

Assumptions - Because we don't have specific data to address each of the functions (a. through e.) above, we are using forest vegetation structure to act as a surrogate for these functions. Large tree forest generally provides all of the above functions (a. through e.). Small tree forest generally provides functions a, b, and c. Grass/pole forest has the potential to provide functions a and b, though to a lesser degree than the other forest structural stages. Exceptions to the above will be described in the rationale column of the individual sixth-field evaluations. For a description of the physical characteristics used to define large tree, small tree, and grass/pole forest structure, see Chapter 3, Forest Vegetation - Vegetation Structural Stages.

The following ratings were used:

Good: The Riparian Reserves are dominated by connected large tree forest, or by combination of mostly large and some small tree forest. Shade for perennial streams (Class 1 and II) in the subwatershed is greater than 80%.

Fair: The Riparian Reserves contain a varied combination of large tree, small tree, and grass/pole forest. Shade for perennial streams (Class 1 and II) in the subwatershed is greater than 70% but less than 80%.

Poor: Twenty-five percent of the Riparian Reserves are in the grass/pole stage. Large tree forest may exist in small isolated stands. Shade for perennial streams (Class I and II) in the subwatershed is less than 70%.

9. "Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species." (ROD, page B-11)

Evaluation Criteria - Assess current conditions and examine the ability of the area to support well-distributed populations of native plants, invertebrates, and vertebrate riparian-dependent species by reviewing the following conditions:

a. forested riparian habitat connectivity
b. percent and distribution of small and large tree habitat in Riparian Reserves
c. riparian-dependent species presence (plants and animals)

Note: Data on species occurrence and populations in riparian areas is non-existent in this watershed.

The following ratings were used:

Good: Riparian Reserves that are dominated by connected large tree forest, or by some combination of large and small tree forest. Grass/pole forest and/or non-forest disruptions in the connectivity would be very small and would not represent a dispersal barrier for less mobile species.

Fair: Riparian reserves that possess a varied combination of large tree, small tree, and grass/pole forest. Large and small tree forest do not provide consistent connectivity throughout the sixth-field. Patches of non-forest habitat resulting from management activities may also represent a dispersal barrier for less mobile species.

Poor: Riparian Reserves that are dominated by grass/pole forest, or by some combination of grass/pole and small tree forest. Large tree forest may exist in small isolated stands. Patches of non-forest habitat resulting from management activities may also represent a dispersal barrier for less mobile species.

Ratings Confidence

The evaluation ratings are assigned a level of confidence for accuracy according to the following scale:

High: High confidence that the assigned rating is accurate. That confidence is based on data gathered from recent exams, surveys, and/or personal on-the-ground knowledge. Data directly pertains to the condition being evaluated.

Moderate: Moderate confidence that the assigned rating is accurate. That confidence is based on data gathered from a combination of exams, surveys, personal on-the-ground knowledge, aerial photograph interpretation, and/or professional judgement. Data collected in stand exams and surveys may not be recent.

Low: Low confidence that the assigned rating is accurate. Lack of field data or data that pertains directly to the condition being evaluated.

B. BIOLOGICAL RESOURCES

Watershed Upland Evaluation

1) Late-Successional Habitat Condition

Evaluation Criteria - Assess and examine the current condition of late-successional habitats (also referred to as "large tree" forest stands throughout this document) with respect to amount, distribution, and condition. The following criteria will be used:

a. fragmentation/connectivity of late-successional forest habitat
b. amount and condition of late-successional forest habitat

The following ratings were used:

Good: Late-successional habitat occurs in larger patches of interior forest habitat, and is well – connected to other patches of late-successional forest. Organisms oriented to late-successional forest can both breed and travel/disperse in the the area with few problems.

Fair: Late-succesional forest occurs in moderate-sized patches of interior forest habitat, and connectivity although of concern on a localized basis, is still possible. Organisms oriented to late-successional forest can both breed and travel/disperse the area, although at reduced levels due to some local "problem areas."

Poor: Late-successional forest occurs in small, isolated patches and interior forest habitat is rare or occurs in very small patches. Connectivity is a concern due to the disjunct nature of the LS forest patches, and organisms oriented to late-successional forest have minimal opportunities for both breeding and travel/dispersal in the area.

2) Plant and Animal Distribution and Abundance

Evaluation Criteria - Assess and examine the current road network with respect to road type (primary, secondary, local) and use (open, closed, restricted). The following criteria will be used:

a. Total road density
b. Open road density

Also determine if there are known locations for introduced, non-native plants and animals, and if there are high-use recreation or other sites where non-natives may be introduced, including trails. Include potential for animal disturbance, such as motorized trails.

The following ratings were used:

Good: Native plant and animal species are well-distributed and occur at "natural" levels in the existing habitat base.

Fair: Native plant and animal species are moderately well-distributed, and/or occur at lower than "natural" levels due to localized areas of non-native species invasion, high road densities, or other factors that have resulted in displacement of native species form some sites.

Poor: Native plant and animal species are not well-distributed and/or face obstacles to natural abundance levels due to either invasion of non-native species, high road densities, or other factors which have resulted in substantial displacement of native species from the area.

Table 5-1: Watershed Evaluations – Subwatershed 170800040501 – Yellowjacket Creek

Management Objectives	Rating	Confidence	Rationale
Riparian Conditions			
1) Existence of aquatic features at landscape scale	Fair	High	Perennial Streams: No change. Intermittent Streams: Little change. Lakes, Ponds and Wetlands: No change. Drainage Network : 5.8%
2) Connectivity within and between watersheds	Fair	High	No artificial anadromous fish barriers. Resident fish barriers - 3 for 3.6 miles, although natural barriers above and below each. Roads with high number of stream crossings= high
3) Integrity of aquatic systems	Poor	High	Pool Frequency: Pool Frequency is lower than reference values. 1996 flood filled pools. 21 miles do not meet criteria. Woody Debris: Less than refernce values. 15 miles poor condition Streambank Stability: Lower Yellowjacket Creek exhibits dramatic shifts in channel position during floods.
4) Water quality for healthy ecosystems	Poor	High	Temperature:19.3 ºC (2001)at mouth with prolonged periods greater than 16 ºC. No known sources of contaminants. PH and conductivity within expected ranges.
5) Appropriate sediment regime	Poor	High	Spawning Gravel: Moderately elevated amount of fine-grained material in Yellowjacket Creek. Pools filled with sediment during 1996 floods. Management related landslides = High. Roads contributing high amounts of sediment = High
6) In stream flow	Poor	High	WAR increase – 10% in lower sub-watershed. Moderate drainage extension (5.8%) Observed dramatic channel changes.
7) Floodplain function	Poor	Mod	Lack of woody debris has decreased duration of floodplain inundation.

8) Structural diversity of plant communities in Riparian Reserves	Fair	High	Mid and Late-Seral Stands: Lacks late-seral tree component compaired to historic. Class I and II stream shade – Poor (68%)
9) Habitat to support well-distributed populations of riparian species	Fair	Mod	Moderate riparian corridor fragmentation from roads and harvest. 71% of RRs are in large and small tree habitat, most grass/pole is in upper drainages (Pinto and Yellowjacket)
Upland Conditions			
1) Late-successional habitat condition	Fair	Mod	LS habitat has been fragmented, but some larger patches still exist. Mid-seral stands dominate north end of sub-basin, a result of past fires.
2) Plant and Animal Distribution/Abundance	Fair	Mod	Road density exceeds two miles/sq. mile. Some noxious weed sites documented in north end. Motorized tail on east boundary, and contains Pole Patch unmaintained campground.

Table 5-2: Watershed Evaluations – Subwatershed 170800040502– McCoy Creek

Management Objectives	Rating	Confidence	Rationale
Riparian Conditions			
1) Existence of aquatic features at landscape scale	Good	High	Perennial Streams: No change. Intermittent Streams: Little change. Lakes, Ponds and Wetlands: No change. Drainage Network : 2.7%
2) Connectivity within and between watersheds	Poor	High	No artificial anadromous fish barriers. Resident fish barrier – 2 (Rd 2900115 and partial at 2900000 at Jumbo Creek) for 2.6 miles.
3) Integrity of aquatic systems	Poor	High	Pool Frequency: lower than reference values. 6 miles do not meet criteria Woody Debris: Less than reference values.5 miles in poor condition. Width/Depth: Channel widening in reaches 1 and 5 Lower Cispus East WA Channel stability: Excessive mobile deposits in upper reaches (RM 4-8), several draws sluiced out.
4) Water quality for healthy ecosystems	Good	High	Temperature: 15.2°C (2001) max temp. No known sources of contaminants. pH and conductivity within expected ranges.
5) Appropriate sediment regime	Fair	Mod	Slightly elevated amounts of fine sediment in spawning gravels. Current mining operations disturbing natural sediment sorting and mobilizing sediments (RM 0-4).
6) In stream flow	Good	High	WAR increases 4%. Only 2.7% drainage extension.
7) Floodplain function	Good	High	Almost no road in floodplains.
8) Structural diversity of plant communities in Riparian Reserves	Fair	High	Mid and Late-Seral Stands: Lacking late-seral compontnt compared to historic. Class I and II stream shade– good (84%).
9) Habitat to support well-distributed populations of riparian species	Poor	Mod	Only 18% of RRs are in large tree, 37% in small tree. Connectivity a concern in upper McCoy Creek.

Management Objectives	Rating	Confidence	Rationale
Upland Conditions			
1) Late-successional habitat condition	Poor	Mod	Very little (456 acres) interior large tree forest present, a result of fragmentation from harvest. Mid-seral (small tree) stands dominate north end of basin. 38% of existing large tree stands are interior forest.
2) Plant and Animal Distribution/Abundance	Fair to Good	Mod	Relatively low road density (1.1 miles/sq. mile), but relatively high number of motorized trails on Languille and Juniper Ridges. No known infestations of introduced plants or animals.

Table 5-3: Watershed Evaluations –Subwatershed 170800040503- Cispus River -Camp Creek

Management Objectives	Rating	Confidence	Rationale
Riparian Conditions			
1) Existence of aquatic features at landscape scale	Poor	High	Perennial Streams: No change. Intermittent Streams: Little change. Lakes, Ponds and Wetlands: No change. Drainage Network : 5.5%. Cispus River shifts channel position. Significant human disturbances including dike at Tom Music bridge, excessive large wood removal on floodplain.
2) Connectivity within and between watersheds	Poor	Mod	Artificial anadromous fish barriers block 0.7 miles of habitat. Resident: Several culverts need further evaluation. Sub-surface flow out of Camp Creek. Roads with high number of stream crossings – High.
3) Integrity of aquatic systems	Poor	High	Pool Frequency: lower than refernce values. 2.5 miles of Camp Creek Do not meet criteria. Woody Debris: Removed in past salvage operations. Channel stability - Dramatic shift in river channel position. Camp and Covel Creeks subsurface flow.
4) Water quality for healthy ecosystems	Poor	High	Temperature: 18.1ºC (2000) in mainstem. Exceeds 16ºC for prolonged periods. Wide-braided channel. No known sources of contaminants. PH and conductivity within expected ranges.
5) Appropriate sediment regime	Poor	Mod	Moderately elevated amount of fine sediment in spawning area. Management related landslides - High. Roads contributing high amounts of sediment – High. Management related sediment delivery from Lower Cispus Watershed. Subsurface flows in Camp and Covel Creeks.
6) In stream flow	Fair	Mod	WAR increases 10% for Camp Creek w/ little evidence instream
7) Floodplain function	Poor	High	Rd 2300 in floodplain from North Fork to River Mile 10.

Management Objectives	Rating	Confidence	Rationale
			Dike at Tom Music bridge preventing full use of south side floodplain.
8) Structural diversity of plant communities in Riparian Reserves	Fair	High	Lacks large tree component. Unstable channel prevents development of large trees. Housing (Community of Cispus) development in the floodplain.
9) Habitat to support well-distributed populations of riparian species	Fair	Mod	72% of RRs are in combination of small and large tree. Roads in RRs are a potential connectivity concern.
Upland Conditions			
1) Late-successional habitat condition	Poor to fair	Mod	No large blocks of interior late-successional (large tree) present. Mid-seral (small tree) fire stands dominate south end of basin. 39% of existing large tree stands are interior habitat.
2) Plant and Animal Distribution/Abundance	Poor	Mod	High road density (3.8 miles/sq mile), several known sites of non-native plants and animals. Multiple high human-use areas, and lots of dispersed camping along Cispus R.

Table 5-4: Watershed Evaluations – Subwatershed 170800040504– Greenhorn Creek

Management Objectives	Rating	Confidence	Rationale
Riparian Conditions			
1) Existence of aquatic features at landscape scale	Fair	High	Perennial Streams: Upper Greenhorn Creek experienced large scale fire and landslide disturbances resulting in a homogeneous bedrock channel. Intermittent Streams: Little change. Lakes, Ponds and Wetlands: No change. Drainage Network : 4.4%.
2) Connectivity within and between watersheds	Poor	High	No artificial anadromous fish barriers. Resident Barriers: 1 (Rd 7700)
3) Integrity of aquatic systems	Poor	High	Pool Frequency: Lower than refernce values 5.3 miles do not meet criteria. Homogenous bedrock channel Woody Debris: Less than refernce value 6 miles in Poor condition. Width/Depth: Wide and shallow channel.
4) Water quality for healthy ecosystems	Poor	High	Temperature: Greenhorn Creek 19.9 ºC and 1918 Creekl 20. 5 ºC in 2002. Exceeds 16ºC for prolonged periods. No known sources of contaminants. PH and conductivity within expected ranges.
5) Appropriate sediment regime	Fair	Mod	Rate of sediment transport higher due to lack of stream complexity. Moderately elevated fines in spawning gravels.
6) In stream flow	Good	High	WAR increases range from 4 to 9%
7) Floodplain function	Fair	Mod	Few roads in floodplains. Disturbed floodplain from large scale fires in early 1900s.
8) Structural diversity of plant communities in Riparian Reserves	Fair	High	Lacks large trees when compared to historic. Class I and II stream shade – Fair (79%).
9) Habitat to support well-distributed populations of riparian species	Good	High	Only 18% of RRs are in large tree, but 62% are in small tree from past fires. Lack of channel diversity (few pools and low wood).

Management Objectives	Rating	Confidence	Rationale
Upland Conditions			
1) Late-successional habitat condition	Poor to Fair	Mod	Sub-basin dominated by mid-seral, fire origin stands. Moderate fragmentation of exisiting large tree stands, only 26% of existing large tree stands are interior forest
2) Plant and Animal Distribution/Abundance	Fair	Mod	Relatively high road density (2.3 miles/sq.mile). Distribution and abundance of non-native plants and animals is unknown.

Table 5-5: Watershed Evaluations –Subwatershed 170800040505– Iron Creek

Management Objectives	Rating	Confidence	Rationale
Riparian Conditions			
1) Existence of aquatic features at landscape scale	Fair	High	Perennial Streams: No change. Intermittent Streams: Some changes. Lakes, Ponds and Wetlands: No change. Drainage Extension:7.2%. High Road Density: 3.12 m/m^2.
2) Connectivity within and between watersheds	Poor	High	No artificial anadromous fish barriers. Resident Fish: 3 barriers blocking 6 miles of habitat. Roads with high number of stream crossings – High.
3) Integrity of aquatic systems	Fair	Mod	Pool Frequency: Moderately low, 5 of 15 miles surveyed meet criteria. Woody Debris: Less than refernce value, 7.25 miles in poor condition. Channel stability: Channel widening at lower stream reach.
4) Water quality for healthy ecosystems	Poor	High	Temperature:18.1 ºC (2000) at mouth. Exceeds 16ºC for prolonged periods. No known sources of contaminants. PH and conductivity within expected ranges.
5) Appropriate sediment regime	Poor	High	Excess fine-grained material in the spawning gravel. Management related landslides = High. Roads contributing high amounts of sediment = High.
6) In stream flow	Fair	Mod	WAR increases – 10% in Wakepish and Big Creek drainages. Areas scoured to bedrock in low gradient reaches and upper- most drainage portions in volcanic blast zone. Drainage network extension: 7.2%.
7) Floodplain function	Fair	Mod	Channel incision through sediment deposition from 1996 flood in lowest ½ mile. Lack of vegetation and large wood affect floodplain inundation.
8) Structural diversity of plant communities in Riparian Reserves	Poor	Mod	Lacking large tree when compared to historic. Slightly elevated grass pole. Class I and II stream shade – Fair (71%).

Management Objectives	Rating	Confidence	Rationale
9) Habitat to support well-distributed populations of riparian species	Poor	Mod	Lacks quality fish habitat. Although 69% of RRs are in small and large tree, there are connectivity gaps in tribs. to Iron Creek such as Benham and Big Creeks from past timber harvest
Upland Conditions			
1) Late-successional habitat condition	Poor	Mod	Except for big, large tree interior patch at north end, sub-basin has been heavily fragmented with large reductions in total and interior large tree forest. 31% of existing large tree stands are interior habitat.
2) Plants and Animal Distribution/Abundance	Poor	Mod	High road density (3.6 miles/sq.mile), especially at south end of sub-basin. Contains several high-use areas such as Wakepish sno park and Elk Pass and Bear Meadows (parking areas). Known sites of noxious weeks.

Table 5-6: Watershed Evaluations – Subwatershed 170800040506– Woods Creek

Management Objectives	Rating	Confidence	Rationale
Riparian Conditions			
1) Existence of aquatic features at landscape scale	Good	High	Perennial Streams: No change. Intermittent Streams: No change. Lakes, Ponds and Wetlands: No change. Drainage Extension: 2.7%.
2) Connectivity within and between watersheds	Poor	High	Artificial anadromous barriers – 3 barriers 1.3 miles. A damm create a pond blocks upto 1 mile of anadromous habitat. Resident fish barrier: 3 barriers 2.3 miles of habitat.
3) Integrity of aquatic systems	Fair	High	Pool Frequency:High. 6.9 miles of 10 surveyed miles meet criteria. Woody Debris: Lower than refernce value, 9 miles of stream in poor condition. Low residual pool depth. Abandoned floodplains and streambank instability.
4) Water quality for healthy ecosystems	Fair	Mod	Temperature: 15.3 º C (1999) at RM 1.5 One instantaneous reading 20º C (1999) in lowest half mile. No known sources of contaminants. PH and conductivity within expected ranges.
5) Appropriate sediment regime	Fair	Mod	Spawning Gravel: High level of embeddedness and silt. Management related landslides - Low. Roads contributing high amounts of sediment – Low.
6) In stream flow	Fair	Mod	WAR increases 16%. Drainage extension: 2.7%.
7) Floodplain function	Fair	Poor	Baseflows less than expected for a low gradient stream.
8) Structural diversity of plant communities in Riparian Reserves	Poor	High	Lacks large tree, elevated grass pole when compared to the historic conditions. Class I and II stream shade – Poor (less than 70%).
9) Habitat to support well-distributed populations of riparian species	Fair to poor		Fair fish habitat. 60% of RRs are in large and small tree, but roads have fragmented reserves locally and past

Management Objectives	Rating	Confidence	Rationale
			salvage has removed down wood and snags.
Upland Conditions			
1) Late-successional habitat condition	Fair to poor	Mod	Although at least one large block of interior large tree habitat exists, past salvage in many large tree stands have reduced their habitat capability. 43% of existing large tree stands are interior forest.
2) Plant and Animal Distribution/Abundance	Poor	Mod	High road density (3.9 mile/sq. mile). Known sites of both non-native plants and animals (e.g. Woods Cr. WWA, and Kraus Ridge).

Table 5-7: Watershed Evaluations – Subwatershed 170800040507– Quartz Creek

Management Objectives	Rating	Confidence	Rationale
Riparian Conditions			
1) Existence of aquatic features at landscape scale	Fair	High	Perennial Streams: Some changes. Intermittent Streams: Some changes. Lakes, Ponds and Wetlands: No change. Drainage extension: 5.7% Eruption of Mt.St. Helen created a large scale natural disturbance in upper quarter of subwatershed.
2) Connectivity within and between watersheds	Good	High	No artificial anadromous fish barriers. No artificial resident fish barriers. Roads with high number of stream crossings – Low.
3) Integrity of aquatic systems	Poor	High	Pool Frequency: Lower than reference,7 of 9 miles do not meet criteria. Woody Debris: Less than reference value 7 miles of 9 miles in poor condition. Width/Depth: Greater than expected.
4) Water quality for healthy ecosystems	Fair	Mod	Temperature: 16.3 ^{o}C (2001) at RM 1.5. Exceeds 16^{o}C for limited period. No known sources of contaminants. Possible pH problems in Red Springs Creek.
5) Appropriate sediment regime	Fair	High	Spawning gravel: Somewhat embedded. Management related landslides - High.
6) In stream flow	Poor	High	WAR increases range from 9 to 16%. Drainage extension: 5.7%. Bank cutting in upstream. Debris torrent during 1996 flood.
7) Floodplain function	Fair	Mod	Bridge near mouth constricts floodplain.
8) Structural diversity of plant communities in Riparian Reserves	Fair	High	The area is recovering , but the historic condition was less than desirable. The blast zone is affecting stream conditions. Class I and II stream shade – Poor (70%).
9) Habitat to support well-distributed populations of riparian species	Good	Mod	Lack of quality fish habitat. 43% of RRs are in large tree, highest of all sub-basins. Good connectivity except for blast zone (upper Quartz Cr.).

Management Objectives	Rating	Confidence	Rationale
Riparian Conditions			
Upland Conditions			
1) Late-successional habitat condition	Good	High	Large, unfragmented patches of large tree forest exist and connectivity is good. Much of sub-basin is in unroaded area. 75% of existing large tree forest is interior habitat.
2) Plant and Animal Distribution/Abundance	Good	Low	Lower road density (1.7 miles/sq.mile). Ryan Lake campground of potential concern for noxious weeds.

Table 5-8: Watershed Evaluations– Subwatershed 170800040508–Lower Cispus River Frontal

Management Objectives	Rating	Confidence	Rationale
Riparian Conditions			
1) Existence of aquatic features at landscape scale	Fair	Mod	Perennial Streams: Lower 1.4 miles of Cispus inundated by Lake Scan3wa. Intermittent Streams: Some changes. Ponds and wetlands: No change. Drainage Extension: 8.6.
2) Connectivity within and between watersheds	Fair	High	No artificial anadromous fish barriers. Artificial resident fish barrier: 1 on Crystal Creek.
3) Integrity of aquatic systems	Fair	Fair	Pool Frequency: Much lower than refernce value. Surveyed reach of Crystal Cr. did not meet criteria. Mainstem Cispus River provides better habitat. Woody Debris: Lower than refernce value. Crystal Cr. in poor codition, main Cispus River has little wood. Width to Depth: Good on main river but poor Coopper Canyon Creek.
4) Water quality for healthy ecosystems	Poor	High	Temperature: 18.1ºC (2000) at RM 7. Exceeds 16ºC for limited period. No known sources of contaminants. PH and conductivity within expected ranges.
5) Appropriate sediment regime	Fair	Low	Excess of fine-grained material in some spawning areas. Channel changes are much less than up river. Only a few mid channel bars little channel braiding. A few areas of notable bank erosion. Roads contributing high amounts of sediment – High.
6) In stream flow	Fair	Mod	WAR increases 15 to 24% in tributaries. Subwatersheds within the Upper Cispus River Watershed have WAR increases along with Quartz Creek and Woods Creek subwatersheds. Those increases in subwatershed flow probably change the flow rate, quantity and duration of the Cispus River. Drainage extension: 8.6%.

Management Objectives	Rating	Confidence	Rationale
Riparian Conditions			
7) Floodplain function	Fair	Poor	
8) Structural diversity of plant communities in Riparian Reserves	Poor	High	Lack large tree and high in grass pole when compared to the historic conditions.
9) Habitat to support well-distributed populations of riparian species	Fair		Mainstem habitat good, tributary habitat is fair to poor.
Upland Conditions			
1) Late-successional habitat condition	Good	Mod	Two large interior large tree patches present, and connectivity is good on NF lands. 62% of existing large tree stands are interior forest.
2) Plant and Animal Distribution/Abundance	Fair	Mod	High road density (3.4 miles/sq. mile). Large new private land clearcuts on forest boundary. Contains Iron Creek campground (high use site), increasing potentential for noxious weed infestations.

Chapter 6 - Management Recommendations

Introduction

The purpose of this chapter is to identify those management activities which will contribute to closing the gap between the present condition and the desired future condition of this watershed. All proposed activities will be consistent with management direction from the *Gifford Pinchot Land and Resource Management Plan*, as amended by the *Northwest Forest Plan*.

In order to best recommend the appropriate management activities that will close the gap between the present condition and the desired future condition of this watershed, we first need a picture of that desired future condition. Management direction from the Forest Plan plays a major role in defining this condition. Historic/reference and current conditions for various resources of the watershed were described in Chapter 3. The historic condition, although valuable for a reference, is not the goal for the future condition in most instances. While we may desire to restore certain portions or elements of the watershed to conditions similar to those that existed in historic times, the entire watershed will not reflect historic conditions.

Recommendations are provided at both the watershed scale spanning the entire Lower Cispus River watershed and at the subwatershed scale. This will help avoid duplication of broad recommendations when listing specific recommendations at the subwatershed scale.

The following is a description of the desired future condition for the Lower Cispus watershed.

A. MANAGEMENT DIRECTION

1. Desired Future Condition (Vegetation)

Management direction from the Forest Plan consists of overall forest direction and more site-specific direction associated with designated land allocations. There are six broad categories of land allocations that define the desired course for vegetation development in the Lower Cispus watershed: Adaptive Management Area, Administratively Withdrawn Areas, Congressionally Reserved Areas, Late-Successional Reserves, Riparian Reserves, and Matrix.

a. Adaptive Management Area

Cispus AMA Guide and Landscape Design

A key part of the shared vision for the future of the Cispus AMA is contained in the Landscape Analysis and Design, or Cispus LAD. The Cispus LAD is part of the Cispus AMA Guide, a set of recommendations for managing the AMA. It is a technique to graphically represent a long-term vision of landscape level planning. The LAD was developed by and incorporates the shared vision of many participants, including the public, Forest Service, the U.S. Fish and Wildlife Service and

others. It was extended into the Southwest Washington Province through collaboration with the Provincial Interagency Executive Committee.

The landscape design utilizes landscape design units to provide graphic descriptions, functions, and management strategies for various resource areas. It is intended to be in harmony with existing policies and direction, including the Northwest Forest Plan and the Gifford Pinchot Forest Plan. It provides recommendations for how to implement the Standards and Guidelines of the Forest Plans.

The six types of landscape design units in the Cispus LAD are Old Growth and Riparian Reserves, Managed Habitat, Habitat Development, Managed Mosaic, Natural Mosaic, and Lodgepole. A brief description of each unit follows. For more detailed descriptions and further information, see the Cispus AMA Guide.

Old Growth and Riparian Reserves

The desired future condition of areas designated as Old Growth or Riparian Reserves is characterized by the presence of old and typically large diameter trees. Stands are 170 years old, or more, with average diameters of 30 inches or greater. The trees provide a variety of habitats whether alive or dead, standing or fallen, on the ground, or in streams. Important structural elements include snags and living trees, coarse woody debris, down logs in various states of decay, patches or shrubs, and deep canopy layers. Canopy gaps and small openings throughout the stand also provide for structural diversity. In low lying areas, tree species such as Douglas fir, western hemlock, western redcedar, and grand fir are found.

Riparian Reserves include areas within or adjacent to streams, lakes, ponds and wetlands, and areas considered to be unstable or potentially unstable. They are critical to providing habitat for riparian-dependent species, travel and dispersal corridors for many animals and plants, and connectivity within watersheds. Riparian vegetation moderates high stream flows by decreasing water velocity, enhancing the deposition of fine sediments and organic debris, and providing shade to moderate water temperatures. Tree-dominated riparian plant communities are a source of large wood, essential for creation of structural habitat for aquatic organisms. The wildlife habitat provided by riparian vegetation also influences terrestrial animal diversity. See also the management direction from the Northwest Forest Plan relating to Riparian Reserves, following this section.

Managed Habitat and Habitat Development

The desired future condition of areas designated as Managed Habitat is characterized by a mix of young, middle-aged, and older forest stands. Tree species vary throughout a range of elevation bands. As a result, scenery may change frequently as one moves though these areas. Small openings may be created though activities such as timber harvests and habitat enhancement projects, or naturally occurring openings such as old landslides, rocky outcrops, and meadows. With its diversity of stand structures, Managed Habitat provides for both small, open forage areas (such as young stands favored by deer, elk and mountain goats), dispersal habitat and cover within the older, more dense stands. Late-successional stands would be maintained within riparian reserves in Managed Habitat to provide riparian protection as well as travel corridors for late-successional dependent species.

The desired future condition of areas designated as Habitat Development are similar to the character and management objectives of Managed Habitat. A range of elevations results in a variety of forest types, habitat, and recreational opportunities. However, harvest openings are generally smaller in size than in Managed Habitat, intended to mimic small, naturally occurring openings. This design unit places additional emphasis on the restoration, maintenance, and connectivity of late-successional forest. An active thinning regime may be used to develop structural features characteristic of older forest types. Silvicultural treatments could include manipulation of the distribution and abundance of coarse woody debris, down logs and snags, and the creation for habitat of cavity-dependent species.

Managed Mosaic

Compared to other landscape units, Managed Mosaic is subject to more human activity and vegetation alteration on a landscape scale. These areas include an abundance of early and mid-successional stands, with fast growing young trees. The patterns of stands with different tree ages reflect the underlying landforms, with old growth remaining in riparian or specially protected areas. Openings may be large scale, depending on other resource objectives for the area. This landscape unit is where harvest activity is most evident, intended to mimic past natural disturbances such as wildfires within the Cispus area. Large areas will be open, attracting animals which prefer early successional habitat. The variety of stand structures creates abundant forage and edge habitat.

Natural Mosaic

The Natural Mosaic design unit is located primarily in high elevation areas dominated by large scale natural openings and scattered forest. The area consists of high-elevation meadows, subalpine parkland, and alpine lakes. Subalpine forests thin out with increasing elevation , due to a short growing season and a snowpack that is deep and slow to melt. The elevation and openness of these areas make for many spectacular views. Changes to vegetation are generally the result of natural processes.

Lodgepole

The Lodgepole landscape unit is characterized by mixed stands of lodgepole pine and mountain hemlock that are the result of frequent wildfires. Containing high elevation lakes and adjacent to the Mt. Adams Wilderness, the Lodgepole area is the site of substantial recreation, mainly in developed sites. Changes to vegetation are generally the result of natural processes

b. Administratively Withdrawn Areas

Administratively Withdrawn Areas within the Lower Cispus watershed consist of three Management Area Categories (MACs): Scenic River (NA), Developed Recreation (2L), and Administrative Sites (3W). These areas are not managed to provide timber outputs; there is no scheduled timber harvest. Vegetation in these areas (with exception of the Utility Sites and Corridors MAC) is generally the product of natural disturbance and succession. Fire (natural or human caused) is aggressively

suppressed during periods of high fire hazard. Vegetation is varied in size, age, and species; ranging from natural openings of young immature trees or herb/shrub species to stands of mature and old-growth trees. Over time, forest stands in these allocations are expected to produce large trees, snags, multiple-layered canopies, and large coarse woody debris on the forest floor. Average tree diameters will exceed 21 inches on the majority of the acres. Trees will be smaller in stands located on less productive sites. Douglas-fir, western hemlock, or Pacific silver fir will be the dominant large trees in most of these stands. The proportion of each species is determined by elevation and aspect. Other associated tree species may include red alder, black cottonwood, western white pine, bigleaf maple, and Pacific yew (at lower elevations); and noble fir, mountain hemlock, subalpine fir, western white pine, and Engelmann spruce (at higher elevations). A relatively high percentage of the area (likely greater than 75%) in most of the MAC's is expected to remain in (or develop into) the large tree structural stage.

c. Congressionally Reserved Areas

Congressionally Reserved Areas consist of only one MAC, the Mt. St. Helens National Volcanic Monument (NVM). In this MAC, emphasis is given to allowing the natural geologic and ecologic processes to occur for study and research. The blast zone provides the general public with a very dramatic picture of the effects of the 1980 eruption; these effects will become less noticeable as time passes. Facilities such as roads and viewpoints have been constructed to facilitate appreciation of the area.

d. Late-Successional Reserves

Late-Successional Reserves (LSRs) consist of lands set aside to protect and enhance conditions of late-successional and old-growth ecosystems. Late-Successional Reserves within the Lower Cispus watershed consist of General Late-Successional Reserves (LS), Mountain Goat Winter Range (QL), and Mountain Goat Summer Range (ML). The long-term objective is to provide for the protection of current, and enhance the development of future, late-successional habitat for all species that depend on it. The goal of wildfire suppression is to limit the size of all fires. Regeneration harvest is prohibited, although it may have occurred in the past. Precommercial and commercial thinning may occur in stands up to 80 years of age if the purpose is to benefit the creation and/or maintenance of late-successional forest conditions. Future vegetation will be primarily the result of natural disturbance and succession, except in past harvest plantations or natural stands less than 80 years of age where thinnings will occur. The desired future condition of vegetation in LSR is similar to that described above for Administratively Withdrawn Areas.

e. Riparian Reserves

Riparian Reserves provide an area along all streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. Riparian Reserves are used to maintain and restore riparian structures and functions of streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater

connectivity of the watershed. Riparian Reserves also serve as connectivity corridors among the Late-Successional Reserves.

f. Matrix

Matrix within the Lower Cispus watershed consists of the following MAC's: General Forest (TS), Deer and Elk Winter Range (ES), Visual Emphasis (VL, VM), Mountain Goat Winter Range (QM, QX), Mountain Goat Summer Range (MM, MX), and Scenic Rivers (NL). These allocations all have some level of scheduled timber harvest based on predetermined rotation ages. The timber harvests will include both thinnings and regeneration harvests. Fire is aggressively suppressed during periods of high fire hazard. As a result, the landscape within these allocations will consist of a mosaic of stands of many different sizes and ages at any one point-in-time. Stand sizes will range from grass/pole to large tree and will vary widely over the landscape, consistent with other resource objectives and limitations. The percent distribution of grass/pole, small tree, and large tree structural stages will vary over time, with each represented. Stand stocking, canopy closure, and structural development across the landscape will vary depending on the MAC and the amount and types of thinning (precommercial and commercial) and regeneration treatments. Structural diversity within stands will be affected by Riparian Reserves, TES/survey and manage species, aggregate retention patches, unthinned patches, and created canopy gaps. The tree species mix will be similar to that described for Administratively Withdrawn Areas. The desired future condition for Matrix land is specified by the MAC of that particular area.

B. WATER RESOURCES

The aquatic component of this analysis is based on data available from state, private, and U.S. Forest Service stream surveys. The refence conidtions used for comparison come from several sources: the NOAA Fisheries Matrix of Pathways and Indicators, a U.S. Fish and Wildlife Service document called *A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale*, the GP Forest Plan, Amendment 11, state and federal laws, and interpretation of ACS objectives.

The desired future condition of the various physical components of streams is evaluated primarily using National Marine Fisheries Service Guidelines. Since 1989, standards such as 80 or more pieces of large woody debris per mile are considered "good"; 40 - 80 pieces, "moderate"; and < 40 pieces, "poor". Note that these criteria apply only to streams west of the Cascade crest. Large woody debris was defined by the National Marine Fisheries Service (1996) as 24 inches in diameter and at least 50 feet in length. Evaluation of width-to-depth ratios was based on Rosgen's (1994) stream channel classification.

Water temperatures below 16° Celsius and dissolved oxygen standards above 9.5 mg/l for class AA waters are the state standards. The desired future condition for peak flow is to achieve a value of Hydrologic Recovery (also referred to as Aggregrate Recovery Percentage) of greater than 85% as defined in the Gifford Pinchot Cumulative Assessment Report (USDA Forest Service 1988) Other

desired future conditions for the aquatic component are to meet the ACS objectives (see Chapter 5 of this document for interpretation of ACS objectives), and to meet NMFS and USFWS matrix values.

Sediment delivery to streams via erosion and mass wasting processes has been, and will continue to be, a natural part of the aquatic system. The rates of sediment delivery varied substantially during natural (pre-management) conditions, with relatively higher rates occurring during times of disturbance such as wildfire, flood, earthquake, and volcanic eruption, and lower rates delivered during "quiet" times between disturbance events. With the advent of intensive forest management during the 1950s, road construction and timber harvest have often contributed to sediment delivery rates greater than what occurred under most natural conditions, except perhaps during the more extreme disturbance events. As long as roads exist on steep and rugged slopes within the Lower Cispus River basin, sediment delivery rates will continue to be elevated above the background rate. However, aquatic systems in the basin have experienced many disturbances, and are resilient and adaptable to change. What is desired, is a reduction in the management-related sediment delivery, thereby also reducing the magnitude of sediment pulses that occur during the major flood events.

It is desired that stream channel systems and the associated floodplain areas are not blocked as a result of management activities. The desired future condition of Riparian Reserves is continued large tree development.

C. BIOLOGICAL RESOURCES

1. Wildlife and Plants

The desired future condition relative to wildlife and botanical resources is to maintain viable populations of all native and desired non-native species known or suspected to occur within the watershed.

Habitat enhancement projects would be encouraged to maintain a diversity of habitat conditions. Projects may include prescribed or natural fire, meadow restoration, snag creation, increasing the amount of coarse woody debris, and revegetation with native species.

Within Late-Successional Reserves (LSRs), current grass/pole and small tree stands will be silviculturally treated, where appropriate, to develop large tree character at a quicker rate. Some roads within LSR's may be allowed to close naturally or could be mechanically obliterated. Within several decades, these factors would increase the amount of interior forested habitat within LSRs, thereby improving habitat conditions for dependent species, particularly those requiring large home ranges.

Noxious weed control efforts will emphasize prevention and early treatment. Survey and control efforts are made in cooperation with the Washington Department of Agriculture and Weed Control Extension Agents in counties abutting the Gifford Pinchot National Forest. Treatment priority is based on the state noxious weed rating system, as well as on more local considerations.

State rated Class A weeds pose the most serious threat , and the management goal is to eradicate the species and prevent all seed production. Class B weeds are also a serious threat, but more widespread, and the goal is containment and eventual eradication. Class C weeds are other noxious weeds for which the county has the discretion to set the appropriate level of control. The Washington State Noxious Weed list is available through local county weed boards, or may be accessed at: http://www.wa.gov/agr/weedboard/weed_list/weed_listhome.html.

Within the National Forest deer and elk biological winter range (outside LSRs), optimal cover acreage would be at specified levels and well-distributed across the winter range. Forage openings would also be well-distributed and in amounts as specified by current GP Forest Plan guidelines.

In mountain goat ranges, optimal cover acreage would be maintained. In thermal cover stands, innovative commercial thinning approaches could be used to advance succession of stands to an optimal cover condition. Thinning would only be applied if mountain goats would likely benefit from the treatment. A fire management plan should be drafted to ensure continued viability of meadows and other goat foraging sites.

Threatened and endangered species surveys would be conducted to monitor population trends and recommend management actions. Known sites of TES plant species should be monitored, and population status documented. Special habitat sites would be located and protected where appropriate. The Forest Service would also continue to seek partnerships with individuals, county and state governments, and other federal agencies for species surveys, habitat improvements and general sharing of knowledge.

D. SOCIAL AND ECONOMIC RESOURCES

1. Human Uses within the Watershed

The desired future condition for lands within the Lower Cispus watershed is to provide a variety of human uses in a variety of vegetation and land form settings.

Road facilities provide access for passenger and high clearance vehicles to a variety of developed and dispersed recreation settings (lakes, streams, trailheads). Where necessary to allow for reliable access, road surface drainage should be improved. Where not needed for vehicular access, roads should be closed and/or converted to trails. Roads to trailheads, dispersed camping areas, and other popular recreation sites should be maintained to meet user needs per recommendations in the District Access and Travel Management Plan.

Winter and summer trails provide access to a variety of destinations and scenery. Trail facilities should be well-maintained for intended users. Trails that are difficult to maintain and that receive light use may be abandoned. Recreation access to areas with semi-primitive and primitive settings will be in greatest demand. These include areas without roads or other evidence of management activities where existing and proposed trails provide access.

Vegetative scenery from primary roads in the watershed is varied, and roadside vegetation should be managed to allow for a variety of viewing opportunities into stands. Natural-looking stands and vegetative landscape should dominate views from road and trail travel corridors.

F. RECOMMENDATIONS AT THE WATERSHED LEVEL

Recommendations provided here span the sixth-field subwatersheds and are provided to eliminate the need for duplication within the sixth-field management recommendation tables.

Boundary Changes of Riparian Reserves

This watershed analysis does not identify site-specific, or general changes in Riparian Reserve boundaries. Interim Riparian Reserves, as they are prescribed in the *Northwest Forest Plan*, are recommended based on the evaluation of each sixth-field relative to ACS objectives 1 through 9. Deviation from this course should only occur after thorough review by an interdisciplinary team comprised of a hydrologist, soil scientist, botanist, wildlife biologist, fisheries biologist, and silviculturist. Changes to Riparian Reserve boundaries are not forseen; however, any proposed changes should be based on "on-the-ground" reviews, and determining that such a change would not affect maintenance of the Aquatic Conservation Strategy objectives. Any changes to Riparian Reserve boundaries are to be evaluated and documented as part of the NEPA process.

Regeneration Harvest Within Riparian Reserves

Pages C-31 and C-32 of the ROD describe conditions of acceptable regeneration harvest and salvage activities within Riparian Reserves. Recommendations other than those identified in the *Northwest Forest Plan* should be developed through interdisciplinary, site-specific analysis.

Other Silvicultural Activities (Inside and Outside of Riparian Reserves)

Other silvicultural activities (including precommercial and commercial thinning, pruning, fertilization, and conifer release) should be reviewed by an interdisciplinary team to develop joint proposals for such activities both inside and outside of Riparian Reserves. Within Riparian Reserves, proposals should be designed to improve aquatic conditions and promote the Aquatic Conservation Strategy objectives.

Commercial thinning activity in this watershed should focus first on opportunities in young, managed small tree stands (of clearcut origin) to promote restoration of structural diversity and quicker development of large tree structural characteristics, especially in the two Late-Successional Reserves. Commercial thinning activity in older, natural stands should be of secondary importance unless a specific need is identified.

There will be over 7,000 acres of precommercial thinning need in this watershed over the next 10 years. Pursue opportunities and funding to deal with this backlog of overstocked grass/pole stands. Precommercial thinning activity should focus on treating grass/pole stands to accelerate the early

and important development of various desired conditions according to the management allocation in which they reside.

Recreation

Trails

Address backlog maintenance needs with priority on reconstructing and/or relocating trail segments in wet areas and improving and maintaining drainage structures.

Emphasize late-season drainage structure maintenance to prepare for fall/winter/spring surface runoff impacts.

Consider seasonal use restrictions on trails where use, especially stock and/or ORV use, during wet spring and fall seasons creates the majority of adverse impacts.

Dispersed Areas (Concentrated Use Areas)

Continue with ongoing CUA inventory process; expand to include all known dispersed sites as funding and priority allow.

Identify key CUAs along streams or lakes where soil or vegetation disturbance indicates potential adverse impacts to aquatic resources are occurring as a result of site use.

Harden or close and rehabilitate high priority CUA sites that are preventing accomplishment of ACS objectives.

Increase Recreation patrol activities for site signing, policing, etc.

Install toilets in key CUAs to improve sanitation conditions for watershed and users, as indicated by volume of use, resource impacts, and funding available for purchase, installation, and O&M of each facility.

Roads

Roads have caused erosion and mass wasting at a number of locations in the watershed. This has increased the amount of sediment delivered to streams above historic conditions, and is a cumulative, long-term problem. The challenge is how best to effectively meet management goals while simultaneously reducing the hydrologic effects that an extensive road network on steep slopes tends to produce.

The recommended future management for each permanent Forest road is identified in the Forest Roads Analysis, which was completed in 2002. These are only recommendations, however, and can be changed during individual project analysis with additional public involvement.

Special Forest Products

There are many opportunities to increase the harvest and gathering of special forest products while providing for their long-term sustainability. The Lower Cispus watershed has lands where new harvest opportunities should be explored, including those within Late-Successional Reserves (LSRs) following the Forest-wide Late-Successional Reserve Assessment (USDA Forest Service 1997). Where feasible, stewardship forest product contracts should be established. They allow for more close administration of on-the-ground harvesting. There is also interest in the local community to expand the gathering, storage, and processing of forest products to provide additional local employment.

Wildlife

In deer and elk winter range, look at opportunities to increase the amount of forage for big game, through pruning of shrubs, forage seeding, and precommercial thinning, or through regeneration timber harvest where deemed appropriate. Accelerate the development of optimal cover and understory development through commercial thinning in winter range. Reduce road densities with seasonal closures where feasible and consistent with the Forest Roads Analysis.

Continue mountain goat research in the watershed (and others) to determine what kind of management, if any, would benefit goats; particularly, explore ways to potentially increase forage in goat habitats through prescribed fire or other treatments. In addition, continue the development of "sightability models" that can be used to more accurately to census mountain goats in this area and also all over the Forest.

In stands lacking in snag and down wood habitat, often due to previous timber salvage or commercial thinning, consider creating this habitat through snag and/or down wood creation projects, especially in the Woods LSR.

Theatened and Endangered, Sensitive, and Survey and Manage Species

Explore opportunities for funding surveys for selected species of concern. This will increase our knowledge of the status and distribution of these species within the watershed. In this watershed, some animal species of particular concern are thr northern spotted owl (and barred owl), northern bald eagle, Cascade torrent salamander, Larch mountain and Van Dyke's salamanders.

Bigleaf maple trees are valuable for many wildlife species, and are essential for the mollusk *Cryptomastix devia*. In stands where bigleaf maples are being outcompeted by conifers, consider projects that will reduce this competition and allow persistence of the maple trees. This could be done as part of a snag or down wood creation project, or by commercial thinning depending on the situation.

More consistent monitoring and documentation efforts should be made for all TES plant sites. This type of monitoring and documentation is important because it allows us to track population trends and assess threats to populations which would otherwise go unnoticed. This sort of information

allows early detection of threats to the populations, and leads directly to actions designed to ensure persistence of the populations. Known sites of TES plant species should be periodically revisited, and the status of populations should be documented and shared with the Washington Natural Heritage Program. Pursue seed collection and banking opportunities for TES plant species through Berry Botanic Garden, and seek partnerships and funding focused on developing management and/or monitoring plans for TES plant populations of special concern.

Introduced and Invasive Plant and Animal Species, including Noxious Weeds

Survey for noxious weeds, prioritizing areas at high risk from noxious weed invasion, including areas with concentrated human use, wetlands, riparian corridors near roads or recreation areas, rock quarries/borrow pits and special habitats. Survey data on noxious weed populations should be stored in a database specified by the Forest Noxious Weed Coordinator. Identified populations of noxious weeds should be treated, as appropriate. Infestations in areas not previously infested should be given priority for early treatment. In addition, priority should be given to treating infestations of noxious weeds not previously reported from the watershed.

Of particular interest for survey and control work are corridors that link otherwise isolated patches. These corridors have the potential to bring propagules of species into areas that they otherwise could not reach. Other areas of special interest include where weeds may have been introduced through past land use activities, such as historic sheep drive routes, or dispersed campsites. Areas where riparian or other restoration activities have occurred or are planned are at high risk of new infestation, and should also be a priority for monitoring and control work.

Use of certified, weed-free hay by Forest users with horses or other pack animals should be encouraged, as failure to do so could contribute to the establishment of noxious weeds in previously uninfested areas. When possible, provide information on the use of weed free straw and hay and other ways that visitors can help prevent the spread of noxious weeds by posting information at recreation areas (including campgrounds, trailheads, boat launches and interpretive sites), providing written information at these sites, and by giving educational presentations.

The utilization of gravel piles or quarries with noxious weed populations for road and trail material could also cause the spread of those noxious weeds into previously pristine areas. Thus, control of noxious weeds at these sites is important. Use of off-site gravel and other materials, as well as hay bales, may transport eggs of non-native mollusks; this use should be evaluated carefully to prevent further spread of these introduced gastropods.

Some weed species of special concern in this watershed include spotted, diffuse and meadow knapweed (*Centaurea maculosa*, *diffusa* and *pratensis*) and Japanese and giant knotweed (*Polygonum cuspidatum* and *sachalinense*). These species are known to occur on the Cowlitz Valley District, but have not yet been reported from the Lower Cispus watershed. Their spread is of special concern, and early efforts at detection and control should be a priority. Early detection and control are very important for control of these species. Surveys for the knotweeds should be made along the Cispus River and its major tributaries, as this stream corridor is at high risk of infestation by these species, due to its relative accessibility and proximity to roads. Another concern is the rapidly

spreading perennial bunchgrass species *Brachypodium sylvaticum* (slender false-brome). This has recently been reported as rapidly invading coniferous forest understories in western Oregon. It has not yet been reported from the Gifford Pinchot National Forest. It appears to be spreading fast, however, and, as this species has the potential to prove devastating to native meadow communities, early detection and control should be a priority. Of special concern within the Lower Cispus watershed is the effect that this grass could have upon the highly diverse and unique Camp Creek Cliffs oak bald community, which hosts a number of TES species. This botanical special interest area is truly a jewel of the Gifford Pinchot National Forest, and its protection should be a priority within the watershed.

Fire

Look at opportunities to reduce fire hazards, particularly at the interface of National Forest and private lands with structures. This can be done potentially through precommercial or commercial thinning, and subsequent fuel treatment. These treatments may be consistent with the National Fire Plan goals of reducing the effects of wildfire on communities. The subwatershed tables cite specific drainages and sites where these stands occur and these treatments may be of value. Provide "Firewise" information to residents to help protect their property and themselves from wildland fire.

Fine-grained Sediment in Stream Substrates

There is a need to determine the amount of fine-grained sediment in the substrates of fish-bearing stream; this will require fairly extensive on-the-ground surveys.. Where excessive fine-grained sediments are found in the substrates of streams, the sources of such sediment need to be identified and, if possible, the amounts reduced.

G. RECOMMENDATIONS AT THE SUBWATERSHED SCALE

The following tables contain recommendations and concerns related to specific management activities for each sixth-field watershed. It is important to note that the recommendations are based on current resource conditions and management direction that are not expected to change dramatically. While a sixth-field may not have identified opportunities for certain management activities now, it does not preclude future opportunities.

Table 6-1: Watershed Recommendations -Subwatershed 170800040501–Yellowjacket Creek 67% Matrix, 32% Administratively Withdrawn, 1% Late-Successional Reserves		
Activity	**Recommendations**	**Rationale**
Regeneration Harvest	Consider creating forage openings in deer and elk winter range.	Forage is, and will continue to be, a limiting factor for deer and elk.
Commercial Thinning	Use thinning in Riparian Reserves to produce future large wood recruitment and shade improvement. Thin stands in winter range to develop optimal cover. There will be approx. 1,573 acres available for thinning in 29 small tree managed stands over next 10 years.	Low shade levels in subwatershed. Low levels of large wood in main stem of Yellowjacket, Pinto, and Badger Creeks Subwatershed is below deisred levels of optimal cover in winter range. Promote growth, health, and development of structural diversity in these young, managed stands.
Roads	Decommission 7.4 miles Close/Stabilize 0.2 miles Stabilize and Maintain OH FR 2809 (2.9 miles) Stabilize and Seasonally Open 95.3 miles	High risk for aquatic resources. Winter range, wildlife disturbance.
Recreation and Trails	Reconstruct and relocate Langille/ Juniper Ridge trails. Close “non-system”, motorized trails on Langille Ridge where present Upgrade ROPES course at Cispus Center Restore Yellowjacket Ponds Fishing site if feasible.	Poor condition, poor location causing erosion and high maintenance costs. Reduce disturbance to wildlife and vegetation. Improve accessibility. Lack of similar sites or opportunities.
Fish, Plants Wildlife	Precommercially thin stands to improve shade along Class I and II streams. Placement of large wood in lower Yellowjacket floodplain. Revegetate floodplain in lower Yellowjacket Cr.	Low shade levels and high water temperatures in subwatershed. Channel is currently unstable. Stablize channel and add shade.

Table 6-1: Watershed Recommendations -Subwatershed 170800040501–Yellowjacket Creek 67% Matrix, 32% Administratively Withdrawn, 1% Late-Successional Reserves		
Activity	**Recommendations**	**Rationale**
	Create snags and down wood in older, previously-thinned stands.	Lack of snags and down wood in these areas.
	Interpret restoration sites at Yellowjacket Ponds and Cispus Center.	Increase public awareness of ecosystem function.
	Explore feasibility and desirability to regulate vegetation and water levels in Tongue ponds.	Water levels are low and the pond periodically fills with aquatic vegetation.
Invasive Plants and Animals	Survey for, and treat where appropriate, noxious weeds at Pole Patch CG, Badger Ridge, High Bridge and Langille Ridge Trailheads, Cispus Center vicinity & Yellowjacket Ponds.	Concentrated use areas with high potential for noxious weeds.
	Manually control noxious weeds at instream restoration sites on Yellowjacket and Pinto Creeks.	Known sites of noxious weeds.
Other Restoration	Prune white pine in stands where its species composition is >30% and where those stands would benefit most from the treatment.	White pine blister rust is killing or will kill white pine that is important to maintain adequate stocking and/or meet resource objectives in many grass/pole stands.
	Potential huckleberry habitat enhancement in the Pole Patch, Pinto Rock, Badger area.	Restore health and vigor of huckleberry shrubs in popular huckleberry-picking areas.

Table 6-2: Watershed Recommendations - Subwatershed 170800040502 – McCoy Creek 58% Administratively Withdrawn, 41% Matrix		
Activity	**Recommendations**	**Rationale**
Regeneration Harvest	Consider creating forage openings in winter range	Shortage of forage in watershed's winter range
Commercial Thinning	Thin to promote optimal cover development for big game. There will be approx. 309 acres available for thinning in 7 small tree managed stands over next 10 years.	Shortage of optimal cover in watershed's winter range. Promote growth, health, and development of structural diversity in these young, managed stands.
Roads	See general watershed-wide recommendations.	
Fish, Plants Wildlife	Inventory potential for meadow enhancement projects on Juniper and Langille Ridges. Monitor pH and heavy metals in Camp Creek and McCoy Creek. Recommend mitigation measures of past and present mining operations if warranted.	Increase forage for mountain goats and other species. Possible acid rock drainage in these streams mentioned in Lower Cispus East Watershed Analysis. .
Invasive Plants and Animals	Survey for, and treat where appropriate, noxious weeds at Juniper Ridge Trailhead and Rough Trailhead.	Concentrated use areas with high potential for noxious weeds.
Recreation and Trails	Close non-system "spur" trails on Juniper and Langille Ridges (motorized trail system).	Reduce disturbance to wildlife, especially mountain goats.
Other Restoration	No specific recommendations	No specific recommendations.

Table 6-3:Watershed Recommendations -Subwatershed 170800040503 –Cispus River-Camp Cr. -52% Adaptive Management Area, 41% Late-Successional Reserves, 7% Private Land		
Activity	**Recommendations**	**Rationale**
Regeneration Harvest	Consider creating forage openings in winter range.	Shortage of forage in watershed's winter range.
Commercial Thinning	Thin to promote optimal cover development in small tree stands. There will be approx. 277 acres available for thinning in 13 small tree managed stands over next 10 years.	Shortage of optimal cover in watershed's winter range. Promote growth, health, and development of structural diversity in these young, managed stands.
Roads	Decommission Roads 1.8 miles Close/Stabilize Roads 0.6 miles Stablilize and Seasonal Open Roads 18.8 miles	See Forest Roads Analysis
Fish, Plants Wildlife	Create snags and/or down wood in older, thinned stands where these features are below desired levels Placement of large wood in Cispus River floodplain between the mouth of the North Fork Cipus River and Tower Rock Campground. Revegetate floodplain between the mouth of the North Fork Cipus River and Tower Rock Campground. Specific recommendations for shade improvement will be made in the Water Quality Restoration Plan for Temperature. Precommercial thin stands to improve shade along Class I and II streams of Camp Creek. Replace cuvlerts on Covel Creek and Camp Creek. Continue ongoing partnership with White Pass Junoir High to measure	Past harvest reduced snag and down wood levels below natural levels. Channel is currently unstable. Stablize channel. Restore shade. Low shade levels in Camp Creek drainage. These culvert are at least partial barriers to anadromous fish. Replacement would restore connection to approxiamately 0.6 of habitat. Maintain the on environmental education opportunity in this area.

Table 6-3:Watershed Recommendations -Subwatershed 170800040503 –Cispus River-Camp Cr. -52% Adaptive Management Area, 41% Late-Successional Reserves, 7% Private Land		
Activity	**Recommendations**	**Rationale**
	stream cross-sections on Camp Creek. Interpret restoration sites and forest ecology at Cispus Center. Continue seed collection/ banking effort for *Githopsis specularioides* at Camp Creek Cliffs.	 Increase public awareness of ecosystem function. Help insure persistence of species over long-term.
Recreation and Trails	No specific recommendations	
Invasive Plants and Animals	Survey for, and treat where appropriate, noxious weeds at Camp Creek Cliffs Special Botanical Interest Area, Tower Rock CG, Tongue Mtn. Trailhead, Layser Cave Interpretive Site, in the vicinity of the Cispus Learning Center, and in popular dispersed camping areas along the Cispus River. Manually control noxious weeds at known sites near Cispus River, Cispus Learning Center, and at in-stream restoration sites along the Cispus River (Cispus A, B, C);	Concentrated use areas with high potential for noxious weeds. Known sites of noxious weeds
Other Restoration	Prune white pine in stands where its species composition is >30% and where those stands that would benefit most from the treatment. Consider pre-commercially thinning three stands totalling 99 acres within one-half mile of private lands. Consider commercially thinning 11 stands totalling 1429 acres within one-half mile of private lands with structures.	White pine blister rust is killing or will kill white pine that is important to maintain adequate stocking and/or meet resource objectives in many grass/pole stands. Reduce fire hazard at forest/private land interface.

Table 6-4: Watershed Recommendations - Subwatershed 170800040504 – Greenhorn Creek 58% Late-Successional Reserves, 30% Matrix, 12% Administratively Withdrawn		
Activity	**Recommendations**	**Rationale**
Regeneration Harvest	No specific recommnendations	
Commercial Thinning	Consider thinning to promote development of optimal cover in big game winter range. There will be approx.143 acres available for thinning in 7 small tree managed stands over next 10 years.	Shortage of optimal cover in watershed. Promote growth, health, and development of structural diversity in these young, managed stands.
Roads	See general watershed-wide recommendation	
Recreation and Trails	No specific recommendations	
Fish, Plants Wildlife	Replace the culvert at the FR 77 crossing of Greenhorn Creek Create snags and/or down wood in mid-seral stands, especially those that were commercially thinned in the past. Increase large wood in mainstem at the top of the bedrock reach to aid in recovery from large scale disturbance (moderate priority). Explore possibilities for reducing recreation impacts to *Botrychium minganense* sites and habitat on open knob off Rd. # 7700202, ~ 12 mile north of junction with FR 7700203.	This culvert is a barrier to resident fish and prevents the use some of the best habitat in the watershed. Shortage of snags and down wood in these stands High water temperatures in mainstem possibly from increased width of channel Protect habitat for this listed species.
Invasive Plants and Animals	Survey for, and treat where appropriate, noxious weeds at French Butte Trailhead.	Concentrated use area with high potential for noxious weeds.
Other Restoration	No specific recommendations	

Table 6-5: Watershed Recommendations – Subwatershed 170800040505 – Iron Creek 81% Matrix, 11% Administratively Withdrawn, 6% Late-Successional Reserves, 2% Pvt.		
Activity	**Recommendations**	**Rationale**
Regeneration Harvest	Consider creating forage openings in deer and elk winter range.	Forage is, and will continue to be, a limiting factor for deer and elk.
Commercial Thinning	Use thinning in Riparian Reserves to produce future large wood recruitment and shade improvement. Thin stands in winter range to develop optimal cover. There will be approx. 3,560 acres available for thinning in 87 small tree managed stands over next 10 years.	Low shade levels in subwatershed. Low levels of current and future large wood in subwatershed. Subwatershed is below deisred levels of optimal cover in winter range. Promote growth, health, and development of structural diversity in these young, managed stands.
Roads	Decommission 7.9 miles Close/Stabilize 7.6 miles Maintain OH 21.9 miles Stabilize and seasonally open 8.8	High risk for aquatic resources. Winter range, wildlife disturbance.
Recreation and Trails	Expand trails and interpretive opportunities near Wakepish Sno-park.	Lack of opportunities in high-use area.
Fish, Plants Wildlife	Precommercial thin stands to improve shade along Class I and II streams. Placement of Large Wood in Iron Creek. Reshape and reconnect floodplain in Iron Creek below Rd. 76 Inventory and revegetate decommissioned roads with species preferred by deer and elk. Revisit recreation impacted *Botrychium minganense and B. pinnata* sites at the end of Rd. 7605071 to explore possibilities for installing a sign to discourage impacts.	Low shade levels and high water temperatures in subwatershed. Channel is currently wider than historical and unstable. Confined channel, over-steep banks. Increase big game forage opportunities. Protect habitat for these sensitive species
Invasive Plants and Animals	Survey for, and treat where appropriate, noxious weeds at Wakepish Sno-Park, Bear Meadows, Elk Pass, Strawberry Mtn. Trailhead,	Concentrated use areas with high potential for noxious weeds.

Table 6-5: Watershed Recommendations – Subwatershed 170800040505 – Iron Creek 81% Matrix, 11% Administratively Withdrawn, 6% Late-Successional Reserves, 2% Pvt.		
Activity	**Recommendations**	**Rationale**
	Mosquito Meadows trailhead. Manually control noxious weeds at instream restoration sites on Iron Creek near mouth to mile 1.5.	Known sites of noxious weeds.
Other Restoration	Prune white pine in stands where its species composition is >30% and where those stands would benefit most from the treatment.	White pine blister rust is killing, or will kill, white pine that is important to maintain adequate stocking and/or meet resource objectives in many grass/pole stands.

Table 6-6: Watershed Recommendations - Subwatershed 170800040506 – Woods Creek 85% Late-Successional Reserves, 15% Private Land		
Activity	**Recommendations**	**Rationale**
Regeneration Harvest	LSR; no regen harvest permitted.	
Commercial Thinning	Use thinning in Riparian Reserves to produce future large wood recruitment and shade improvement. High priority to thin young, managed small tree stands to promote late-successional character. There will be approx. 1,642 acres available for thinning in 58 small tree managed stands over next 10 years.	Low shade levels in subwatershed. Low levels of large wood in Woods and Ames Creek and tributaries. Achieve LSR habitat objectives. Promote growth, health, and development of structural diversity in these young, managed stands.
Roads	Decommission Road 2505059. Seasonally close roads per Forest Roads Analysis recommendations Replace fish passage culverts on Roads 25 and 2305.	High risk for aquatic resources. Limit disturbance to wildlife Provide fish passage.
Recreation and Trails	Increase interpretive and educational signing at Woods Cr. Watchable Wildlife (WW). Rehabilitate the native species beds at Woods Creek WW. Explore feasibility and desireability of regulating water levels in beaver ponds at Woods Cr. Watchable Wildlife Area. Add interpretive sign for large Doublas-fir tree near Road 2305.	Improve education opportunities. Improve education opportunities. Maintain pond habitat if beavers are not present. Enhance education opportunity.
Fish, Plants Wildlife	Create snags and/or down wood in previously salvaged large tree stands. Explore the feasibility and desireability of adding spawning gravel where in Woods Cr. between Roads 2305 and 2506. Restore and protect *Cimifuga elata* site in Woods Cr. WW.	To achieve snag and coarse woody debris LSR objectives for these stands Improve anadromous fish habitat. Habitat improvement for this Sensitive species.

Table 6-6: Watershed Recommendations - Subwatershed 170800040506 – Woods Creek 85% Late-Successional Reserves, 15% Private Land		
Activity	**Recommendations**	**Rationale**
	Continue seed collection at *C. elata* site. Investigate causes of low shade levels in Woods Creek and determine restoration where needed. Study the feasibility of improving fish passage at dam on Woods Creek above FR 2500057 .	Help insure persistence of species over long-term. Shade Analysis estimated very low subwatershed shade levels although tree heights are OK. This dam provides poor passage for fish.
Invasive Plants and Animals	Survey for, and treat where appropriate, noxious weeds at Woods Cr. Watchable Wildlife, Kraus Ridge trailhead, Layser Cave. Survey for, monitor, and remove where appropriate, non-native mollusks and amphibians at Woods Cr. Watchable Wildlife and Kraus Ridge area (i.e. *Arion* slugs, bullfrogs) .	Concentrated use areas with high potential or known sites for noxious weeds. Known sites of these introduced, non-native species.
Other Restoration	Consider pre-commercially thinning one stand totalling 51 acres, and commercially thinning seven (managed) stands totalling 311 acres within one-half mile of private land with structures.	Reduce fire hazard at forest/private land interface.

Table 6-7: Watershed Recommendations - Subwatershed 17080040507 – QuartzCreek 52% Late-Successional Reserves, 30% Matrix, 9% Private Land, 8% Admin. Withdrawn		
Activity	**Recommendations**	**Rationale**
Regeneration Harvest	No specific recommendations. Regeneration harvest proposals should closely consider the hydrologic maturity of the entire subwatershed.	Subwatershed had Water Available Runoff increases of 15% in 1996.
Commercial Thinning	Consider thinning to promote development of optimal cover in big game winter range. There will be approx. 492 acres available for thinning in 11 small tree managed stands over next 10 years.	Shortage of optimal cover in watershed. Promote growth, health, and development of structural diversity in these young, managed stands.
Roads	See general watershed-wide recommendations	
Recreation and Trails	No specific recommendations	
Fish, Plants Wildlife	Precommercial thin stands to improve shade along Class I and II streams of Quartz Creek (moderate priority). Monitor pH and heavy metals in Red Springs Creek and Quartz Creek below Red Springs. Recommend mitigation measures of past and present management if warranted (moderate priority). Create snags and/or down wood in older, thinned stand along Quartz Creek.	Low shade levels in subwatershed. Previous observations indicate possible acid rock drainage in this stream. Shortage of these features in this stand; meet LSR objectives.
Invasive Plants and Animals	Survey for, and treat where appropriate, noxious weeds at Ryan Lake camping area, Strawberry Mtn. Trailhead, Quartz Creek Big Tree Interpretive Site, and Green River Horse Camp (just outside watershed boundary).	Concentrated use areas with high potential or known sites for noxious weeds.
Other Restoration	Prune white pine in stands where its species composition is >30% and where those stands would benefit most from the treatment.	White pine blister rust is killing or will kill white pine that is important to maintain adequate stocking and/or meet resource objectives in many grass/pole stands.

Table 6-8: Watershed Recommendations - Sixthfield 170800040508 – Lower Cispus River Frontal. 46% Private Land, 39% Late-Successional Reserves, 11% Matrix, 4% Admin. Withdrawn		
Activity	**Recommendations**	**Rationale**
Regeneration Harvest	Regeneration harvest proposals should closely consider the hydrologic maturity of Crystal Creek drainage.	Crystal Creek drainage had Water Available Runoff increases of 24% in 1996.
Commercial Thinning	Consider thinning to promote optimal cover in mid-seral stands, in big game winter range. High priority to thin young, managed, small tree stands to promote late-successional character. There will be approx. 1,006 acres available for thinning in 29 small tree managed stands over next 10 years. Thin in Riparian Reserves to increase future large wood recruitment potential.	Shortage of optimal cover in watershed's winter range. Achieve LSR objectives. Promote growth, health, and development of structural diversity in these young, managed stands. Low levels of current and future large wood in subwatershed.
Roads	Decommision and Stabilize Close those designated roads within this subwatershed that were rated high in sediment delivery (see Chapter 3)	Subwatershed had high rate of sediment delivery from roads.
Recreation and Trails	No specific recommendations	
Fish, Plants Wildlife	Create snags and down wood in older, thinned stands just north of FR 76/77 junction.	Lack of these features in this stand; achieve LSR objectives.
Invasive Plants and Animals	Survey for, and treat where appropriate, noxious weeds at Iron Creek Campground.	Concentrated use areas with high potential or known sites for noxious weeds.
Other Restoration	No specific recommendations	

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Appendix I - Summary of Fish Habitats

Summary of Fish Bearing Stream Habitats				
Sub- Watershed Number	**Common Name**	**Life History**	**Run Time**	**Sum of Habitat**
Yellowjacket Creek	Bull Trout	Resident	Not Applicable	6.13
	Chinook Salmon	Anadromous	Fall	6.13
	Chinook Salmon	Anadromous	Spring	6.13
	Coho Salmon	Anadromous	Late Fall	6.13
	Mountain Whitefish	Resident	Not Applicable	4.66
	Coastal Cutthroat	Resident	Not Applicable	16.47
	Rainbow Trout	Resident	Not Applicable	19.68
	Sculpin	Resident	Not Applicable	14.91
	Sea-Run Cutthroat Trout	Anadromous	Not Documented	6.13
	Steelhead	Anadromous	Late Winter	6.13
	Yellowstone Cutthroat	Resident	Not Applicable	10.57
McCoy Creek	Bull Trout	Resident	Not Applicable	0.31
	Coho Salmon	Anadromous	Late Fall	0.31
	Coastal Cutthroat	Resident	Not Applicable	8.63
	Resident Rainbow Trout	Resident	Not Applicable	8.14
	Sculpin	Resident	Not Applicable	7.39
	Sea-Run Cutthroat Trout	Anadromous	Not Documented	0.31
	Steelhead	Anadromous	Late Winter	0.31
Camp Creek Cispus River	Suckers	Resident	Not Applicable	7.95
	Bull Trout	Resident	Not Applicable	2.92
	Chinook Salmon	Anadromous	Fall	7.95
	Chinook Salmon	Anadromous	Spring	7.95
	Coho Salmon	Anadromous	Late Fall	9.39
	Eastern Brook Trout	Resident	Not Applicable	8.51
	Dace	Resident	Not Applicable	7.95
	Mountain Whitefish	Resident	Not Applicable	7.95
	Pike Minnow	Resident	Not Applicable	7.95
	Sculpin	Resident	Not Applicable	7.95
	Coastal Cutthroat	Resident	Not Applicable	12.06
	Rainbow Trout	Resident	Not Applicable	9.88

Summary of Fish Bearing Stream Habitats				
Sub- Watershed Number	**Common Name**	**Life History**	**Run Time**	**Sum of Habitat**
	Sea-Run Cutthroat Trout	Anadromous	Not Documented	9.20
	Steelhead	Anadromous	Late Winter	9.13
	Western Brook Lamprey	Resident	Not Documented	7.95
Greenhorn Creek	Coho Salmon	Anadromous	Late Fall	1.80
	Coastal Cutthroat	Resident	Not Applicable	6.80
	Rainbow Trout	Resident	Not Applicable	1.80
	Sculpin	Resident	Not Applicable	1.80
	Sea-Run Cutthroat Trout	Anadromous	Not Documented	1.80
	Steelhead	Anadromous	Late Winter	1.80
Iron Creek	Coho Salmon	Anadromous	Late Fall	3.32
	Mountain Whitefish	Resident	Not Applicable	3.32
	Coastal Cutthroat	Resident	Not Applicable	10.78
	Rainbow Trout	Resident	Not Applicable	10.69
	Sculpin	Resident	Not Applicable	8.64
	Sea-Run Cutthroat Trout	Anadromous	Not Documented	3.32
	Steelhead	Anadromous	Late Winter	3.32
	Westslope Cutthroat Trout	Resident	Not Applicable	3.48
Woods Creek	Coho Salmon	Anadromous	Late Fall	6.97
	Coastal Cutthroat	Resident	Not Applicable	9.55
	Rainbow Trout	Resident	Not Applicable	3.60
	Sculpin	Resident	Not Applicable	9.55
	Sea-Run Cutthroat Trout	Anadromous	Not Documented	7.28
	Steelhead	Anadromous	Late Winter	3.60
Quartz Creek	Coho Salmon	Anadromous	Late Fall	3.14
	Coastal Cutthroat	Resident	Not Applicable	8.29
	Rainbow Trout	Resident	Not Applicable	6.21
	Sculpin	Resident	Not Applicable	7.95
	Sea-Run Cutthroat Trout	Anadromous	Not Documented	3.14
	Steelhead	Anadromous	Late Winter	2.80
Lower Cispus River Frontal	Suckers	Resident	Not Applicable	12.30
	Chinook Salmon	Anadromous	Fall	12.30
	Chinook Salmon	Anadromous	Spring	12.30
	Coho Salmon	Anadromous	Late Fall	13.57

Summary of Fish Bearing Stream Habitats				
Sub- Watershed Number	**Common Name**	**Life History**	**Run Time**	**Sum of Habitat**
	Dace	Resident	Not Applicable	12.30
	Eastern Brook Trout	Resident	Not Applicable	12.30
	Mountain Whitefish	Resident	Not Applicable	12.30
	Pike Minnow	Resident	Not Applicable	12.30
	Sculpin	Resident	Not Applicable	12.30
	Coastal Cutthroat	Resident	Not Applicable	12.63
	Resident Rainbow Trout	Resident	Not Applicable	13.36
	Sculpin	Resident	Not Applicable	12.30
	Sea-Run Cutthroat Trout	Anadromous	Not Documented	12.51
	Steelhead	Anadromous	Late Winter	13.36
	Western Brook Lamprey	Resident	Not Documented	12.30

Summary of Fish Bearing Lake Habitats			
Sub-	**Location**	**Common Name**	**Acres**
170800040501	Tongue Pond	Resident Coastal Cutthroat	3.8
		Resident Rainbow Trout	
170800040507	Deep Lake	Resident Coastal Cutthroat	3.5
170800040508	Lake Scanewa	Chinook Salmon	168.2
		Chinook Salmon	
		Coho Salmon	
		Sea-Run Cutthroat Trout	
		Steelhead	
		Black Crappie	
		Bluegill	
		Bridgelip Sucker	
		Brown Bullhead	
		Eastern Brook Trout	
		Largemouth Bass	
		Largescale Sucker	
		Longnose Dace	
		Mountain Sucker	
		Mountain Whitefish	
		Pike Minnow	
		Prickly Sculpin	
		Resident Coastal Cutthroat	
		Resident Rainbow Trout	
		Smallmouth Bass	
		Speckled Dace	
		Torrent Sculpin	
		Western Brook Lamprey	

Appendix II – Miles of Fish Habitat by Stream

Watershed Number	Location	Common Name	Life History	Run Time	Sum of Habitat
170800040501	Badger Creek	Resident Rainbow Trout	Resident	Not Applicable	0.31
	High Bridge Creek	Resident Coastal Cutthroat	Resident	Not Applicable	1.55
		Resident Rainbow Trout	Resident	Not Applicable	1.55
	Pinto Creek	Resident Rainbow Trout	Resident	Not Applicable	2.73
		Yellowstone Cutthroat	Resident	Not Applicable	0.68
		Yellowstone Cutthroat	Resident	Not Applicable	1.25
	Yellowjacket Creek	Bull Trout	Resident	Not Applicable	6.13
		Chinook Salmon	Anadromous	Fall	6.13
		Chinook Salmon	Anadromous	Spring	6.13
		Coho Salmon	Anadromous	Late Fall	6.13
		Mountain Whitefish	Resident	Not Appllicable	4.66
		Resident Coastal Cutthroat	Resident	Not Applicable	14.91
		Resident Rainbow Trout	Resident	Not Applicable	15.08
		Sculpin	Resident	Not Applicable	14.91
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	6.13
		Steelhead	Anadromous	Late Winter	6.13
		Yellowstone Cutthroat	Resident	Not Applicable	8.64
170800040502	Camp Creek	Resident Coastal Cutthroat	Resident	Not Applicable	0.12
		Resident Rainbow Trout	Resident	Not Applicable	0.12
	Jumbo Creek	Resident Coastal Cutthroat	Resident	Not Applicable	0.56
		Resident Rainbow Trout	Resident	Not Applicable	0.06
	McCoy Creek	Coho Salmon	Anadromous	Late Fall	0.31
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	0.31
		Steelhead	Anadromous	Late Winter	0.31
		Bull Trout	Resident	Not Applicable	0.31
		Resident Coastal Cutthroat	Resident	Not Applicable	7.95
		Resident Rainbow Trout	Resident	Not Applicable	7.95
		Sculpin	Resident	Not Applicable	7.39
170800040503	Camp Creek	Coho Salmon	Anadromous	Late Fall	0.31
		Eastern Brook Trout	Resident	Not Applicable	0.56
		Resident Coastal Cutthroat	Resident	Not Applicable	1.93
		Resident Rainbow Trout	Resident	Not Applicable	1.93
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	0.56
		Steelhead	Anadromous	Late Winter	0.56

Watershed Number	Location	Common Name	Life History	Run Time	Sum of Habitat
	Cispus River	Suckers	Resident	ND	7.95
		Bull Trout	Resident	Not Applicable	2.92
		Chinook Salmon	Anadromous	Fall	7.95
		Chinook Salmon	Anadromous	Spring	7.95
		Coho Salmon	Anadromous	Late Fall	7.95
		Dace	Resident	Not Applicable	7.95
		Eastern Brook Trout	Resident	Not Applicable	7.95
		Mountain Whitefish	Resident	Not Appllicable	7.95
		Pike Minnow	Resident	Not Applicable	7.95
		Sculpin	Resident	Not Applicable	7.95
		Resident Coastal Cutthroat	Resident	Not Applicable	7.95
		Resident Rainbow Trout	Resident	Not Applicable	7.95
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	7.95
		Steelhead	Anadromous	Late Winter	7.95
		Western Brook Lamprey	Resident	Not Documented	7.95
	Covel Creek	Coho Salmon	Anadromous	Late Fall	0.62
		Resident Coastal Cutthroat	Resident	Not Applicable	0.75
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	0.62
		Steelhead	Anadromous	Late Winter	0.62
	Dry Creek *	Coho Salmon	Anadromous	Late Fall	0.51
	Stump Creek	Resident Coastal Cutthroat	Resident	Not Applicable	1.43
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	0.06
170800040504	1918 Creek	Resident Coastal Cutthroat	Resident	Not Applicable	0.06
	Greenhorn Creek	Coho Salmon	Anadromous	Late Fall	1.80
		Resident Coastal Cutthroat	Resident	Not Documented	5.50
		Resident Rainbow Trout	Resident	Not Applicable	1.80
		Sculpin	Resident	Not Applicable	1.80
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	1.80
		Steelhead	Anadromous	Late Winter	1.80
	Jefferson Creek	Resident Coastal Cutthroat	Resident	Not Applicable	0.06
	Soldier Creek	Resident Coastal Cutthroat	Resident	Not Applicable	1.18
170800040505	Benham Creek	Resident Coastal Cutthroat	Resident	Not Applicable	0.28
	Big Creek	Resident Rainbow Trout	Resident	Not Applicable	1.74
	Ferrous Creek	Resident Coastal Cutthroat	Resident	Not Applicable	0.31
		Resident Rainbow Trout	Resident	Not Applicable	0.31
		Westslope Cutthrout Trout	Resident	Not Applicable	2.80
	Iron Creek	Coho Salmon	Anadromous	Late Fall	3.32

Watershed Number	Location	Common Name	Life History	Run Time	Sum of Habitat
		Mountain Whitefish	Resident	Not Appllicable	3.32
		Resident Coastal Cutthroat	Resident	Not Applicable	8.64
		Resident Rainbow Trout	Resident	Not Applicable	8.64
		Sculpin	Resident	Not Applicable	8.64
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	3.32
		Steelhead	Anadromous	Late Winter	3.32
		Westslope Cutthrout Trout	Resident	Not Applicable	0.68
	Wakepish Creek	Resident Coastal Cutthroat	Resident	Not Applicable	1.55
170800040506	Ames Creek	Coho Salmon	Anadromous	Late Fall	1.93
		Resident Coastal Cutthroat	Resident	Not Applicable	2.24
		Sculpin	Resident	Not Applicable	2.24
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	2.24
	Woods Creek	Coho Salmon	Anadromous	Late Fall	4.66
		Resident Coastal Cutthroat	Resident	Not Applicable	5.47
		Resident Rainbow Trout	Resident	Not Applicable	3.60
		Sculpin	Resident	Not Applicable	5.47
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	4.66
		Steelhead	Anadromous	Late Winter	3.60
	Woods Creek Trib 10	Resident Coastal Cutthroat	Resident	Not Applicable	0.58
		Sculpin	Resident	Not Applicable	0.58
	Woods Creek Trib 8	Coho Salmon	Anadromous	Late Fall	0.39
		Resident Coastal Cutthroat	Resident	Not Applicable	1.26
		Sculpin	Resident	Not Applicable	1.26
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	0.39
	Quartz Creek	Coho Salmon	Anadromous	Late Fall	2.80
		Resident Coastal Cutthroat	Resident	Not Applicable	6.21
		Resident Rainbow Trout	Resident	Not Applicable	6.21
		Sculpin	Resident	Not Applicable	6.21
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	2.80
		Steelhead	Anadromous	Late Winter	2.80
	Red Springs Creek	Resident Coastal Cutthroat	Resident	Not Applicable	1.74
		Sculpin	Resident	Not Applicable	1.74
	Unnamed trib Quartz Cr	Coho Salmon	Anadromous	Late Fall	0.34
		Resident Coastal Cutthroat	Resident	Not Applicable	0.34
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	0.34
170800040508	Cispus River	Suckers	Resident	Not Applicable	12.30
		Chinook Salmon	Anadromous	Fall	12.30

Watershed Number	Location	Common Name	Life History	Run Time	Sum of Habitat
		Chinook Salmon	Anadromous	Spring	12.30
		Coho Salmon	Anadromous	Late Fall	12.30
		Dace	Resident	Not Applicable	12.30
		Eastern Brook Trout	Resident	Not Applicable	12.30
		Mountain Whitefish	Resident	Not Applicable	12.30
		Pike Minnow	Resident	Not Applicable	12.30
		Resident Coastal Cutthroat	Resident	Not Applicable	12.30
		Resident Rainbow Trout	Resident	Not Applicable	12.30
		Sculpin	Resident	Not Applicable	12.30
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	12.30
		Steelhead	Anadromous	Late Winter	12.30
		Western Brook Lamprey	Resident	Not Documented	12.30
	Crystal Creek	Coho Salmon	Anadromous	Late Fall	1.06
		Resident Coastal Cutthroat	Resident	Not Documented	0.12
		Resident Rainbow Trout	Resident	Not Applicable	1.06
		Steelhead	Anadromous	Late Winter	1.06
	Copper Canyon Creek*	Coho Salmon	Anadromous	Late Fall	0.45
		Resident Coastal Cutthroat	Resident	Not Applicable	0.45
		Sea-Run Cutthroat Trout	Anadromous	Not Documented	0.45

* This is an intermittent stream and it only provided habitat when water is flowing in the stream.

Appendix III – Acres of Fish Habitat by Lake

Summary of Fish Bearing Lake Habitats			
Sub-Watershed Name	**Location**	**Common Name**	**Acres**
Yellowjacket Creek	Tongue Pond	Resident Coastal Cutthroat	3.8
		Resident Rainbow Trout	
Quartz Creek	Deep Lake	Resident Coastal Cutthroat	3.5
Lower Cispus River Frontal	Lake Scanewa	Chinook Salmon	168.2
		Chinook Salmon	
		Coho Salmon	
		Sea-Run Cutthroat Trout	
		Steelhead	
		Black Crappie	
		Bluegill	
		Bridgelip Sucker	
		Brown Bullhead	
		Eastern Brook Trout	
		Largemouth Bass	
		Largescale Sucker	
		Longnose Dace	
		Mountain Sucker	
		Mountain Whitefish	
		Pike Minnow	
		Prickly Sculpin	
		Resident Coastal Cutthroat	
		Resident Rainbow Trout	
		Smallmouth Bass	
		Speckled Dace	
		Torrent Sculpin	
		Western Brook Lamprey	

Appendix IV

TABLE 1. MATRIX of DIAGNOSTICS / PATHWAYS AND INDICATORS - for use with coastal cutthroat trout, bull trout, steelhead trout, chinook, coho, and chum salmon on the Gifford Pinchot National Forest.

(Remember, the values of criteria presented here are NOT absolute, they may be adjusted for local watersheds given supportive documentation)

DIAGNOSTIC OR PATHWAY	INDICATORS	FUNCTIONING APPROPRIATELY	FUNCTIONING AT RISK	FUNCTIONING AT UNACCEPTABLE RISK
Subpopulation Characteristics within subpopulation watersheds	**Subpopulation Size** Rate separately for bull trout and coastal cutthroat trout using same criteria for each species. For CCT rate at 5th-field watershed scale. For bull trout rate at subpopulation scale. Criteria for steelhead trout, chinook, coho, and chum salmon are to become available through NMFS recovery planning.	Mean total subpopulation size or local habitat capacity more than several thousand individuals. All life stages evenly represented in the subpopulation.	Adults in subpopulation are less than 500 but > 50.	Adults in subpopulation has less than 50 individuals.
	Growth and Survival Rate separately for bull trout and coastal cutthroat trout using same criteria for each species. Criteria for steelhead trout, chinook, coho, and chum salmon are to become available through NMFS recovery planning.	Subpopulation has the resilience to recover from short-term disturbances (e.g. catastrophic events, etc.) or subpopulation declines within one to two generations (5 to 10 years). The subpopulation is characterized as increasing or stable. At least 10+ years of data support this estimate.	When disturbed, the subpopulation will not recover to predisturbance conditions within one generation (5 years). Survival or growth rates have been reduced from those in the best habitats. The subpopulation is reduced in size bu the reduction does not represent a long-term trend. At least 10+ years of data support this characterization. If less data is available and a trend cannot be confirmed , a subpopulation will be considered at risk until enough data is available to accurately determine its trend.	The subpopulation is characterized as in rapid decline or is maintaining at alarmingly low numbers. Under current management the subpopulatiion condition will not improve within two generations (5 to 10 years). This is supported by a minimum of 5+ years of data.

	Life History Diversity and Isolation Rate separately for bull trout and coastal cutthroat trout using same criteria for each species. Criteria for steelhead trout, chinook, coho, and chum salmon are to become available through NMFS recovery planning.	The migratory form is present and the subpopulation exists in close proximity to other spawning and rearing groups. Migratory corridors and rearing habitat (lake or larger river) are in good to excellent condition for the species. Neighboring subpopulations are large with high likelihood of producing surplus individuals or straying adults that will mix with either subpopulation groups.	The migratory form is present but the subpopulation is not close to other subpopulations or habitat disruption has produced a strong correlation among subpopulations that do exist in proximity to each other.	The migratory form is absent and the subpopulation is isolated to the local stream or a small watershed not likely to support more than 2,000 fish.[1]
	Persistence and Genetic Integrity Rate separately for bull trout and coastal cutthroat trout using same criteria for each species. Criteria for steelhead trout, chinook, coho, and chum salmon are to become available through NMFS recovery planning.	Connectivity is high among multiple (5 or more) subpopulations with at least several thousand fish each. Each of the relevant subpopulations has a low risk of extinction. The probability of hybridization or displacement by competitive species is low to nonexistent.	Connectivity among multiple subpopulations does occur, but habitats are more fragmented - Only one or two of the subpopulations represent most of the fish production. The probability of hybridization or displacement by competitive species is imminent, although few documented cases have occurred.	Little or no connectivity remains for refounding subpopulations in low numbers, in decline, or nearing extinction. Only a single subpopulation or several local populations that are very small or that otherwise are at high risk remain. Competitive species readily displace cutthroat trout. The probability of hybridization is high and documented cases have occurred.
HABITAT:				
Water Quality:	**Temperature for Coastal Cutthroat Trout** Rate for coastal cutthroat trout, steelhead trout, chinook, coho, and chum salmon using these criteria.	7 day average maximum temperature in a reach during the following life history stages: [1, 3] rearing: 10 - 14°C	7 day average maximum temperature in a reach during the following life history stages:[1, 3] rearing: 14 - 18°C spawning: 14 - 16°C	7 day average maximum temperature in a reach during the following life history stages:[1, 3] rearing: > 18°C spawning: > 16°C
	Temperature for Bull Trout Rate for bull trout only using these criteria.	7 day average maximum temperature in a reach during the following life history stages: [1, 3] incubation 2 - 5°C rearing 4 - 12 °C spawning 4 - 9°C also temperatures do not exceed 15°C in areas used by adults during migration (no thermal	7 day average maximum temperature in a reach during the following life history stages:[1, 3] incubation <2°C or 6°C rearing <4°C or 13 - 15 °C spawning <4 °C or 10°C also temperatures in areas used by adults during migration	7 day average maximum temperature in a reach during the following life history stages:[1, 3] incubation <1°C or >6°C rearing >15 °C spawning <4 °C or > 10°C also temperatures in areas used by adults during migration

		barriers)	sometimes exceeds 15°C	regularly exceed 15°C (thermal barriers present)
	Sediment (in areas of spawning and incubation; rearing areas will be addressed under "substrate embeddedness") Criteria apply to all species so indicate one rating.	< 12% fines (<0.85mm) in gravel[4];	12-17% fines (<0.85mm) in gravel[4];	>17% fines (<0.85mm) in gravel[4];
	Chemical Contamination/ Nutrients Criteria apply to all species so indicate one rating.	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches[8]	moderate levels of chemical contamination from agricultural, industrial and other sources, some excess nutrients, one CWA 303d designated reach[8]	high levels of chemical contamination from agricultural, industrial and other sources, high levels of excess nutrients, more than one CWA 303d designated reach[8]
Habitat Access:	**Physical Barriers (address subsurface flows impeding fish passage under the pathway "flow/hydrology")** Criteria apply separately to each species so indicate a rating for each species	human-made barriers present in watershed allow upstream and downstream fish passage at all flows for all life history stages	one or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at base/low flows for at least one life history stage	one or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows for at least one life history stage
Habitat Elements:	**Substrate Character and Embeddedness in rearing areas (spawning an1d incubation areas were addressed under the indicator "sediment")** Criteria apply to all species - indicate one rating.	reach embeddedness <20%[9] dominant substrate is gravel or cobble	gravel and cobble are subdominant, or if dominant, reach embeddedness 20-30%[9,10]	bedrock, sand, silt, or small gravel dominant, or if gravel and cobble dominant, reach embeddedness >30%[4,10]
	Large Woody Debris Criteria apply to all species so indicate one rating.	current values are being maintained at greater than 80 pieces/mile that are >24"diameter and >50 ft length ; also adequate sources of woody debris are available for both long and short-term recruitment	current levels are being maintained at minimum levels desired for "functioning appropriately", but potential sources for long term woody debris recruitment are lacking to maintain these minimum values	current levels are not at those desired values for "functioning appropriately",
	Pool Frequency and Quality	pool frequency in a reach closely	pool frequency is similar to	pool frequency is considerably

	Criteria apply to bull trout and coastal cutthroat trout - indicate one rating.	approximates [5]: Wetted width (ft) — #pools/mile 0-5 — 39 5-10 — 60 10-15 — 48 15-20 — 39 20-30 — 23 30-35 — 18 35-40 — 10 40-65 — 9 65-100 — 4 (can use formula: pools/mi = 5,280/wetted channel width / #channel widths per pool); also, pools have good cover and cool water[4], and only minor reduction of pool volume by fine sediment	values in "functioning appropriately", but pools have inadequate cover/temperature[4], and/or there has been a moderate reduction of pool volume by fine sediment	lower than values desired for "functioning appropriately"; also cover/temperature is inadequate[4], and there has been a major reduction of pool volume by fine sediment
	Pool Frequency (from NMFS matrix)[18] Channel Width — # Pools/mile 5 feet — 184 10 feet — 96 15 feet — 70 20 feet — 56 25 feet — 47 50 feet — 26 75 feet — 23 100 feet — 18 **Criteria apply to steelhead trout, chinook, coho, and chum salmon -** indicate one rating.	meets pool frequency standards (left) and large woody debris recruitment standards for properly functioning habitat (above)	meets pool frequency standards but large woddy debris recruitment inadequate to maintain pools over time	does not meet pool frequency standards.
	Large Pools (in adult holding, juvenile rearing, and overwintering reaches where streams are >3m in wetted width at baseflow) Criteria apply to all species so indicate one rating.	each reach has many large pools >1 meter deep[4]	reaches have few large pools (>1 meter) present[4]	reaches have no deep pools (>1 meter)[4]
	Off-channel Habitat	watershed has many functional	watershed has some functional	watershed has few or no

	Criteria apply to all species so indicate one rating.	high water velocity refugia such as ponds, oxbows, backwaters, and other off-channel areas with cover; and side-channels are complex, low energy areas[4]	high water velocity refugia such as ponds, oxbows, backwaters, and other off-channel areas with cover; but side-channels are generally high energy areas[4]	functional high water velocity refugia such as ponds, oxbows, backwaters, or other off-channel areas[4]
	Refugia (at 6th to 7th field subwatershed scale) (see Checklist footnotes for definition of this indicator) Rate separately for bull trout, steelhead trout, chum salmon, and coastal cutthroat trout using same criteria for each species.	habitats capable of supporting strong and significant populations are protected and are well distributed and connected for all life stages and forms of the species [12, 13]	habitats capable of supporting strong and significant populations are insufficient in size, number and connectivity to maintain all life stages and forms of the species[12, 13]	adequate habitat refugia do not exist[12]
Channel Condition & Dynamics:	**Mean Bankfull Width/ Mean Bankfull Depth Ratio in riffles in a reach** Criteria apply to all species - indicate one rating.	W/D ratios and channel types are well within historic ranges and/or site potentials in watershed.[17] Rosgen Type — W/D Ratio A, E, G — < 12 B, C, F — 12 - 30 D — > 40	W/D ratios and/or channel types in portions of watershed are outside historic ranges and/or site potentials.	W/D ratios and channel types throughout much of the watershed are outside of historic ranges and/or site potentials.
	Streambank Condition **Criteria apply to bull trout and coastal cutthroat trout** - indicate one rating.	>80% of any stream reach has ≥90% stability[5]	50 - 80% of any stream reach has ≥90% stability[5]	<50% of any stream reach has ≥90% stability[5]
	Streambank Condition **Criteria apply to steelhead trout, chinook, coho, and chum salmon** - indicate one rating.	>90% stable; i.e., on average, less than 10% of banks are actively eroding[19]	80-90% stable	<80% stable
	Floodplain Connectivity Criteria apply to all species - indicate one rating.	off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian	severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly

			vegetation/succession	
Flow/Hydrology:	**Change in Peak/ Base Flows** Criteria apply to all species - indicate one rating.	watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size, geology and geography	some evidence of altered peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography	pronounced changes in peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography
	Increase in Drainage Network Criteria apply to all species - indicate one rating.	zero or minimum increases in active channel length correlated with human caused disturbance	low to moderate increase in active channel length correlated with human caused disturbance (e.g. ~5%)	greater than moderate increase in active channel length correlated with human caused disturbance (e.g. ~20-25%)
Watershed Conditions:	**Road Density & Location** Criteria apply to all species - indicate one rating.	<1mi/mi² [13]; no valley bottom roads	1 - 2.4 mi/mi² [13]; some valley bottom roads	>2.4 mi/mi² [13]; some to many valley bottom roads
	Disturbance History Criteria apply to all species - indicate one rating.	<15% ECA (>85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed with no concentration of disturbance in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≥15% LSOG in watershed	<15% ECA (>85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed but some disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≥15% LSOG in watershed	>15% ECA (< 85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed and some disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≤15% LSOG in watershed
	Riparian Reserves Criteria apply to all species - indicate one rating.	the riparian reserve system provides adequate shade, large woody debris recruitment, and habitat protection and connectivity in subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% previously unmanaged); adequately buffers impacts from grazing; percent similarity of riparian vegetation to the potential natural community/composition and structure >50%[15]	moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian reserve system; or incomplete protection of habitats and refugia for sensitive aquatic species (≈70-80% previously unmanaged) including from grazing impacts; percent similarity of riparian vegetation to the potential natural community/composition and structure 25-50%	riparian reserve system is fragmented, poorly connected, or provides inadequate protection of habitats for sensitive aquatic species (<70% previously unmanaged), including from grazing impacts; percent similarity of riparian vegetation to the potential natural community/composition and structure <25%[15]
	Disturbance Regime	Environmental disturbance is short lived; predictable hydrograph, high	Scour events, debris torrents, or catastrophic fire are	Frequent flood or drought producing highly variable and

	Criteria apply to all species - indicate one rating.	quality habitat and watershed complexity providing refuge and rearing space for all life stages or multiple life-history forms. [1] Natural processes are stable.	localized events that occur in several minor parts of the watershed. Resiliency of habitat to recover from environmental disturbances is moderate.	unpredictable flows, scour events, debris torrents, or high probability of catastrophic fire exists throughout a major part of the watershed. Stream channels are simplified, providing little hydraulic complexity in the form of pools or side channels. [1] Natural processes are unstable.

SPECIES AND HABITAT:				
Integration of Species and Habitat Conditions	Criteria apply separately to each species so indicate a rating for each species.	Habitat quality and connectivity among subpopulations is high. The migratory form is present. Disturbance has not altered channel equilibrium. Fine sediments and other habitat characteristics influencing survival or growth are consistent with pristine habitat. The subpopulation has the resilience to recover from short-term disturbance within one to two generations (5 to 10 years). The subpopulation is fluctuating around an equilibrium or is growing.	Fine sediments, stream temperatures, or the availability of suitable habitats have been altered and will not recover to predisturbance conditions within one generation (5 years). Survival or growth rates have been reduced from those in the best habitats. The subpopulation is reduced in size, but the reduction does not represent a long-term trend. The subpopulation is stable or fluctuating in a downward trend. Connectivity among subpopulations occurs but habitats are more fragmented.	Cumulative disruption of habitat has resulted in a clear declining trend in the subpopulations size. Under current management, habitat conditions will not improve within two generations (5 to 10 years). Little or no connectivity remains among subpopulations. The subpopulation survival and recruitment responds sharply to normal environmental events.

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TABLE 2. CHECKLIST FOR DOCUMENTING ENVIRONMENTAL BASELINE AND EFFECTS OF PROPOSED ACTION(S) ON RELEVANT INDICATORS

Watershed Name: Location:

DIAGNOSTICS/ PATHWAYS: INDICATORS	POPULATION AND ENVIRONMENTAL BASELINE (list values or criterion and supporting documentation)			EFFECTS OF THE ACTION(S)			
	Functioning Appropriately	Functioning At Risk	Functioning at Unaccept-able Risk	Restore[1]	..Maintain[2]	Degrade[3]	Compliance with ACS
Subpopulation Characteristics Subpopulation Size							
Growth and Survival							
Life History Diversity and Isolation							
Persistence and Genetic Integrity							
Water Quality: Temperature - Bull Trout							
Temperature - Coastal Cutthroat Trout, Steelhead trout, and salmon species							
Sediment							
Chem. Contam./Nutrients							
Habitat Access: Physical Barriers							
Habitat Elements: Substrate Character and Embeddedness							
Large Woody Debris							
Pool Frequency -bull trout and coastal cutthroat trout							
Pool Frequency - steelhead trout and salmon species							
Large Pools							
Off-channel Habitat							
Refugia[4]							
Channel Cond. & Dynamics: Bankfull Width/ Mean Bankfull Depth Ratio							
Streambank Condition - bull trout and coastal cutthroat trout							
Streambank Condition -steelhead trout and salmon species							
Floodplain Connectivity							
Flow/Hydrology: Change in Peak/Base Flows							
Drainage Network Increase							
Watershed Conditions: Road Density & Location							
Disturbance History							
Riparian Reserves							
Disturbance Regime							
Integration of Species and Habitat Conditions							

[1] For the purposes of this checklist, "restore" means to contribute to a restorative trend for a particular indicator. Restoration from a worse to a better condition does not negate the need to consult/confer if take will occur.

[2] For the purposes of this checklist, "maintain" means that the function of an indicator does not change (i.e., it applies to all indicators regardless of functional level).

[3] For the purposes of this checklist, "degrade" means to contribute to a trend toward degradation of an indicator toward the next functional category (i.e., it applies to all indicators regardless of functional level). In some cases, a "functioning at unacceptable risk" indicator may be further worsened, and this should be noted.

[4] Refugia = watersheds or large areas with minimal human disturbance having relatively high quality water and fish habitat, or having the potential of providing high quality water and fish habitat with the implementation of restoration efforts. These high quality water and fish habitats are well distributed and connected within the watershed or large area to provide for both biodiversity and stable populations. (adapted from discussions on "Stronghold Watersheds and Unroaded Areas" in Lee, D.C., J.R. Sedell, B.E. Rieman, R.F. Thurow, J.E. Williams and others. 1997. Chapter 4: Broadscale Assessment of Aquatic Species and Habitats. *In* T.M. Quigley and S. J. Arbelbide eds "An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins Volume III". U.S. Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Land Management, Gen Tech Rep PNW-GTR-405).

Appendix IX – Baseline Rating Table Iron Creek

Watershed area evaluated

- The Iron Creek sub-watershed is a 6th field sub-watershed, Hydrologic Unit Code 170800040505. The watershed is located in the Gifford Pinchot National Forest of southwest Washington. The watershed is defined as the 36 square mile drainage including Iron Creek and all of its tributary streams.
- Table 1 contains a list of sub-watersheds in the Iron Creek sub-watershed *before* and *after* the re-delineation in December 2000.

TABLE 1. Crosswalk list of past and present watershed names and numbers contained in the sub-watershed.

Watershed Name	Watershed # as of December 2000	Watershed # Prior to December 2000	Stream
Iron Creek	170800040505	1708000404F	Benham Creek
		1708000404F	Iron Creek
		1708000404G	Big Creek
		1708000404H	Wakepish Creek
		1708000404I	Iron Creek
		1708000404J	Ferrous Creek

Fish habitat evaluated

The Lower Cispus River watershed contains approximately 10.8 miles of Proposed, Endangered, Threatened and Sensitive (PETS) fish species. The streams containing the number of miles of PETS habitat for each stream are listed in Table 2.

TABLE 2. Summary of Threatened, Proposed and candidate fish habitat in the sub-watershed. See Map 1.

6th Field Watershed Number	Stream	Common Name	Habitat Length (Mi)
170800040505	Iron Creek	Coho Salmon	3.3
		Resident Coastal Cutthroat	8.6
		Sea-Run Cutthroat Trout	3.3
		Steelhead	3.3
	Benham Creek	Resident Coastal Cutthroat	0.3
	Ferrous Creek	Resident Coastal Cutthroat	0.3
	Wakepish Creek	Resident Coastal Cutthroat	1.6

Fish species evaluated

- All of the species listed below currently occur in the Iron Creek sub-watershed.
- coho salmon (*Oncorhynchus kisutch*) Threatened
- steelhead (*Oncorhynchus mykiss*) Threatened
- coastal cutthroat trout (*Oncorhynchus clarki clarki)* Sensitive

*****The US Fish and Wildlife Service listed coastal cutthroat as a proposed species and they were removed the Regional Forester's sensitive species list in 2000 because of it elevated status. Since then the USFWS decided not list this species and removed it from the list of proposed species. We now consider this species status to have reverted to a sensitive species.

TABLE 3. Temperature monitoring in the sub-watershed.

Stream Name	Location	Years Monitored	Days >16 ºC	Years >16 ºC	Max 7-day
Iron Creek	Above Wakepish	1999	0	0	11.8
Wakepish Creek	Near confluence with Iron Cr.	1999	0	0	8.7

Iron Creek	Above confluence with Big Cr.	1999, 2001	0	0	13.2
Big Creek	Near confluence with Iron Cr.	1999, 2001	0	0	13.5
Ferrous Creek	Near Iron Creek confluence	1995, 1999	0	0	13.1
Iron Creek	Below Ferrous Cr.	1999	0	0	10.5
Iron Creek	@ 7708067 slide	2001	0	0	14.2
Iron Creek	Above Fourmile cr.	1999	0	0	12.8
Fourmile Creek	@ 2510 rd	2001	0	0	10.1
Fourmile Creek	Nr Iron Confl	1999	0	0	11.9
Iron Creek	Above Benham Creek	2001	0	0	15.1
Benham Creek	Near confluence with Iron Cr.	1999, 2001	0	0	12.6
Iron Creek	@ 2510 Rd Jct	2001	4	1	16
Iron Creek	Near confluence with Cispus R.	1996, 1999-2002	92	5	17.6

Table 4. List of Level II Stream Surveys

Sub-Watershed #	Stream name	Level II Stream [1]SurveyYears
170800040505	Wakepish Creek	1987
	Hemlock Creek	1987
	Big Creek	1987
	Iron Creek	1993

[1] Stream surveys prior to 1991 did not conform to regional guidelines for stream surveys. Guidelines for fish surveys did not exist prior to 1991.

TABLE 5. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the Iron Creek sub-watershed.

		Environmental Baseline Rating[1]		
Pathway	**Indicator(s)**	**Properly Functioning**	**Functioning at Risk**	**Functioning at Unacceptable Risk**
WATER QUALITY	Temperature Bull Trout			X
	Temperature Other Species		X	
	Sediment		X	
	Chemical Contaminants/Nutrients	X		
HABITAT ACCESS	Physical barriers			X
HABITAT ELEMENTS	Substrate in rearing areas		X	
	Large Woody Debris			X
	Pool Frequency and Quality FWS		X	
	Pool Frequency and Quality NMFS		X	
	Large pools		X	
	Off-channel habitat		X	
	Refugia			X
CHANNEL DYNAMICS and CONDITION	Width / Depth Ratio			X
	Streambank condition USFWS		X	
	Streambank condition NMFS		X	
	Floodplain connectivity			X
FLOW / HYDROLOGY	Peak/base flows		X	
	Drainage network		X	
WATERSHED CONDITIONS	Road density and location			X
	Disturbance regime			X
	Disturbance history			X
	Riparian reserves			X

SUBPOPULATION CHARACTERISTICS / SPECIES AND HABITAT	Subpopulation size, Growth and survival, Life history Diversity and isolation, Persistence and genetic integrity, Integration of species and habitat conditions	No Rating. (The Forest Service has insufficient data in order to rate these indicators).

Basis of evaluations

- The "Matrix of Diagnostics / Pathways and Indicators", provided by the US Fish and Wildlife Service, was used to rate 19 fish habitat indicators. Several sources of information were used to determine the ratings[1]:
- Lower Cispus East and Lower Cispus West watershed analyses, Gifford Pinchot National Forest, Randle Ranger Districts.
- Stream Surveys by the Gifford Pinchot National Forest from 1987 through 1993, listed in Table 4.
- Stream temperature monitoring from 1995 through 2001, listed in Table 3.
- Field observations from 1990 through 2002 by employees of the Gifford Pinchot National Forest. These employees included a number of Hydrologists and Fisheries Biologists employed by the Forest Service during that time period.

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[1] The sources of information were reviewed by Ken Meyer (Fisheries Biologist), Terry Lawson (Biological Technician), and Steve Markman (Hydrologist) of the Cowlitz Valley Ranger District.

Table 6. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the sub-watershed.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Bull Trout Temperature Functioning at Unacceptable Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] incubation <1□C or >6□C rearing >15 □C spawning <4 □C or > 10□C also temperatures in areas used by adults during migration regularly exceed 15□C (thermal barriers present)	The lower reach of Iron Creek regularly exceeds 16ºC during the summer rearing period. We have no data for the spawning or incubation periods.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Cutthroat, Stealhead, Chinook, and Coho. Functioning At Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] rearing: 14 - 18□C spawning: 14 - 16□C	The lower reach of Iron Creek regularly exceeds 16ºC during the summer rearing period. We have no data for the spawning or incubation periods. Therefore I chose the Functioning At Risk Rating.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Sediment (in spawning areas)	Functioning at Risk	12-17% fines (<0.85mm) in gravel[4];	We have no data that directly addresses the condition of spawning gravels. The Lower Cispus West watershed analysis, however, indicates that there is an influx of sediments from roads on, upper portion of Iron Creek. Field observations in the upper portion of the watershed confirmed these ratings.	Lower Cispus West WA p 6-18 to 6-25 Observations along, Iron Creek.
	Chemical Contamination / Nutrients	Functioning Appropriately	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches	We have no data with which to address this indicator. There are no homes, ranches, mills, or mines in this watershed, therefore it highly unlikely that there is any chemical contamination or nutrient enrichment in this sub-watershed.	Lower Cispus West WA p 6-5 6-28
HABITAT ACCESS	Physical barriers	Functioning at Unacceptable Risk	one or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows for at least one life history stage	There are several culverts that are likely preventing the free movement of all species and age class up and down the stream. See map	2001 culvert survey (See Map 1, Baseline Appendix Table 1)

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
HABITAT ELEMENTS	Substrate character and embedded-ness (in rearing areas)	Functioning at Risk	gravel and cobble are subdominant, or if dominant, reach embeddedness 20-30%[9,10]	The rationale for this indicator is the same as that used for spawning gravel condition. The Lower Cispus West watershed analysis, however, indicates that there is an influx of sediments from roads on, upper portion of Iron Creek. Field observations in the upper portion of the watershed confirmed these ratings.	Lower Cispus West WA p 6-18 to 6-25 Observations in Iron Creek between 1997 and 2002.
	Large Woody Debris (LWD)	Functioning at Unacceptable Risk	Current levels are being maintained at minimum levels desired for "Func. Appr." but potential sources are lacking to maintain these minimum values.	The stream survey data shows very little woody in any of the surveyed streams.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Pool Frequency and Quality Bull Trout and Cutthroat	Functioning at Risk	pool frequency is similar to values in "functioning appropriately", but pools have inadequate cover/temperature[4], and/or there has been a moderate reduction of pool volume by fine sediment	The pool frequency in Iron Creek is similar the to criteria for functioning appropriately in the most of the reaches. The pool frequency in the tributary streams, however, are lower than the criteria for functioning appropriately. Over all the pool lack depth, cover and temperatures are elevated.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
HABITAT ELEMENTS (continued)	Pool Frequency and Quality Salmon and Steelhead	Functioning at Risk	pool frequency is similar to values in "functioning appropriately", but pools have inadequate cover/temperature[4], and/or there has been a moderate reduction of pool volume by fine sediment	The pool frequency in Iron Creek is similar the to criteria for functioning appropriately in the most of the reaches. The pool frequency in the tributary streams, however, is lower than the criteria for functioning appropriately. Over all the pools lack depth, cover and temperatures are elevated.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Large Pools (in streams with > 3m in wetted width at baseflow)	Functioning at Risk	Reaches have few pools greater than 1 meter in depth.	Only Iron Creek has substantial numbers of pools greater than 3> feet deep.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Off-channel habitat	Functioning at Risk	Some high water velocity refugia such as ponds, oxbows, backwaters …	Iron Creek is not conducive to the formation of off channel habitats.	Stream Survey Data. Observations by the fisheries staff 1993-2002
	Refugia (at 6th to 7th field watershed scale)	Functioning at Unacceptable Risk	adequate habitat refugia do not exist[12]	Some streams have small areas of fully functioning habitat but they are small and disconnected and would not support large populations of fish.	Observations by the fisheries staff 1997-2002

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
CHANNEL CONDITION AND DYNAMICS	Width/Depth Ratio in riffles	Functioning at Unacceptable Risk	W/D ratios and channel types throughout much of the watershed are outside of historic ranges and/or site potentials.	We have very few if any measurements of bankfull width to depth ratios. The watershed analysis reports poor width to depth ratios in Iron Creek and subsurface flows in Wakepish Creek.	Lower Cispus West WA p 6-5 6-28 (Baseline Appendix Table 2)
	Streambank Condition	Function At Risk	50 – 80% of any stream reach has greater than 90% stability.	We do not have direct measurements of streambank stability. Numerous streambanks experienced a high degree of erosion during the 95-96 floods. Many of these are still unstable because of a lack of root strength (eg. Lower portions of, Iron Creek). Some places (lower Iron Creek) have been strengthened by human made structures.	Field Observations by aquatics professionals 1996-to present.
	Streambank Condition	Function At Risk	80-90% stable	We do not have direct measurements of streambank stability. Numerous streambanks experienced a high degree of erosion during the 95-96 floods. Many of these are still unstable because of a lack of root strength (eg. Lower portions of, Iron Creek). Some places (lower Iron Creek) have been strengthened by human made structures.	Field Observations by aquatics professionals 1996-to present.
	Floodplain Connectivity	Functioning at unacceptable Risk	Severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly	Substantial down downcutting of stream channels occurred during the 1995-1996 floods, which removed lower Iron Creek from its flood plain. The same floods remove the riparian vegetation from the banks in this area.	Field Observations by aquatics professional 1996 to present.
FLOW / HYDROLOGY	Change in Peak/Base Flows	Functioning at Risk	Some evidence of altered peak flow, baseflow and /or flow timing relative to an undisturbed watershed of similar size, geology, and geography.	The watershed condition summaries in the Lower Cispus West watershed analysis rated three of the old sixth field watersheds as poor, and two of the old sixth field watersheds as fair. These ratings were based Aggregated Recovered Percentage (ARP) and Water Available for Runoff (WAR) Models and drainage network extension. Given this spilt it is likely that the timing and magnitude of peakflow have been altered.	Lower Cispus West WA p 6-4 Professional Judgment. (Baseline Appendix Table 3)
	Drainage Network Increase	Functioning at Risk	Low to moderate increase in active channel length correlated with human caused disturbance.	On the whole we model a 7.2% increase in the drainage network based on an estimated 200 ft increase in stream length for each stream crossing. Previous investigations found that 200 feet was a rough average distance between the last ditch relief pipe and a stream crossing. The brake between At Risk and Functioning Appropriately would be at about 3.6 % (50 feet either side of a crossing) this rating is based on information presented by Mike Furniss (Watershed Restoration Conference 2001).	GIS analysis of Stream Crossing and earlier data on the average distance between ditch relief pipes and stream crossings. (Baseline Appendix Table 4)

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
WATERSHED CONDITIONS	Road Density and Location	Functioning at Unacceptable Risk	>2.4 mi/mi² some to many valley bottom roads	The average road density is 3.12 miles/square mile and road density in the riparian reserves associated with streams is 2.36 miles/square mile. Although several roads have been decommissioned in the last 5 years the resulting road densities are still relatively high. In addition, there are about 1.9 stream crossings per mile of stream. Many of these are sources of fine sediment during winter storms. Most of these alter the transport of sediment during floods. Most of the culverts do not drain the floodplain, thus the back up water sediment and accelerate flows downstream increasing stream energy.	Analysis of GIS data. (Baseline Appendix Table 4)
WATERSHED CONDITIONS (continued)	Disturbance Regime	Functioning at Unacceptable Risk	Frequent flood or drought producing highly variable flows …. Channel is simplified … little hydrologic complexity … Natural processes are unstable.	A review of the USGS stream gauge data at the Cispus Near Randle (14232500) there have been seven ten year plus floods in since 1970. Although it is not possible to conclude that this represents an elevated frequency of flooding, it does show that relatively large number of substantial floods have occurred in the last 32 years. The floods in 1995 and 1996 certainly dramatically modified the habitat in Iron Creek.	USGS stream flow gauge data (# 14232500). Field Observations since 1974
	Disturbance History	Functioning at Unacceptable Risk	>15% ECA (< 85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed and some disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≤15% LSOG in watershed	As a whole the Forest Service lands 5th field watershed are near the 63% for Aggregate Recovered Percentage (ARP) (see table). When combined with the relatively high road density in riparian reserves the rating is “Functioning at Unacceptable Risk”.	ARP values from the Lower Cispus West watershed Analyses. Current ARP Estimated from the percent of the potentially forested stand ≥ 8” in diameter at breast height (DBH). (Baseline Appendix Table 3, and 4)
	Riparian Reserves	Functioning at Unacceptable Risk	riparian reserve system is fragmented, poorly connected, or provides inadequate protection of habitats for sensitive aquatic species	Approximately 29% of the stream-side riparian on the forest on in the early seral classes. Large trees make up only 38% of the riparian community. The combination of a large amount the riparian area in the grass/pole stage and low amount in the large tree stage lead to the conclusion that the riparian is substantially fragmented. The lack of woody debris and higher stream temperatures also support this conclusion.	GIS analysis of seral classes in the riparian reserves. Aerial photo review along the Cispus River 1999 flight. Field observations 1997 to present. (Baseline Appendix Table 5)
SUBPOPULA-TION CHARACTER-ISTICS	Subpopulation Size	No Rating		No rating for all of these indicators. The Forest Service has insufficient data in order to rate these indicators.	
	Growth and Survival	No Rating			
	Life History Diversity and Isolation	No Rating			

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Persistence and Genetic Integrity	No Rating			
SPECIES and HABITAT	Integration of Species and Habitat Conditions	No Rating			

Appendix V- Baseline Rating Table for Yellowjacket Creek

LOWER CISPUS RIVER WATERSHED – PROPOSED, ENDANGERED, THREATENED AND SENSITIVE FISH BASELINE CONDITIONS IN 2002

Watershed area evaluated

- The Yellowjacket Creek sub-watershed is a 6th field sub-watershed, Hydrologic Unit Code 170800040501. The watershed is located in the Gifford Pinchot National Forest of southwest Washington. The watershed is defined as the 49.4 squares mile drainage area of Yellowjacket Creek excluding the McCoy Creek Drainage.

TABLE 1. Crosswalk list of past and present watershed names and numbers contained in the sub-watershed.

Watershed Name	Watershed # as of December 2000	Watershed # Prior to December 2000	Stream
Yellowjacket Creek	170800040501	1708000404R	High Bridge Creek
		1708000404R	Tongue Pond
		1708000404R	Yellowjacket Creek
		1708000404S	Yellowjacket Creek
		1708000404T	Badger Creek
		1708000404T	Yellowjacket Creek
		1708000404U	Pinto Creek
		1708000404Y	Lambert Creek

Fish habitat evaluated

The Lower Cispus River watershed contains approximately 83.9 miles of Proposed, Endangered, Threatened and Sensitive (PETS) fish species. The streams containing the number of miles of PETS habitat for each stream are listed in Table 2.

TABLE 2. Summary of Threatened, Proposed and candidate fish habitat in the sub- watershed. See Map 1.

6th Field Watershed Number	Stream	Common Name	Habitat Length (Mi)
170800040501	Yellowjacket Creek	Bull Trout	6.3
		Chinook Salmon	6.3
		Coho Salmon	6.3
		Resident Coastal Cutthroat	14.9
		Sea-Run Cutthroat Trout	6.3
		Steelhead	6.3
	High Bridge Creek	Resident Coastal Cutthroat	1.6

Fish species evaluated

- chinook salmon (*Oncorhynchus tshawytscha*) Threatened
- coho salmon (*Oncorhynchus kisutch*) Sensitive
- steelhead (*Oncorhynchus mykiss*) Threatened
- coastal cutthroat trout (*Oncorhynchus clarki clarki)* Sensitive*
- bull trout (*Salvelinus confluentus*) Threatened**

*The US Fish and Wildlife Service listed coastal cutthroat as a proposed species and they were removed the Regional Forester's sensitive species list in 2000 because of it elevated status. Since then the USFWS decided not list this species and removed it from the list of proposed species. We now consider this species status to have reverted to a sensitive species.

** No bull trout have ever been reported in this watershed. We consider the 0.3 miles only as potential habitat, because a bull trout was reported in Yellowjacket Creek in 1991. This report was the only report of bull trout since 1991.

TABLE 3. Temperature monitoring in the sub- watershed.

Stream Name	Location	Years Monitored	Days >16 ºC	Years > 16 ºC	Max 7-day
Yellowjacket Creek	Above Badger	2001	0	0	13.3
Badger Creek	At Confluence w/Yellowjacket	2001	0	0	11.4
Yellowjacket Creek	Below Badger Creek	1992-1995, 1997	0	0	13.7
Yellowjacket Creek	Above Pinto	2001	0	0	15.5
Pinto Creek	Near Road 7713	1995,	0	0	12.9
Pumice Creek	@ Pinto	2001,2002	8	2	16.2
Pinto Creek	@ Yellowjacket	2001,2002	1	1	15.2
Yellowjacket Creek	Above McCoy	2001	1	1	15.7
Yellowjacket Creek	@ Canyon Exit	2001	8	1	16.6
Yellowjacket Creek	Near confluence with Cispus River	1996, 1999- 2002	130	5	18.8

Table 4. List of Level II Stream Surveys

Sub-Watershed #	Stream name	Level II Stream [1]SurveyYears
170800040501	Badger Creek	1990
	Pinto Creek	1989, 2000
	Lambert Creek	1986
	Yellowjacket Creek	2001

[1] Stream surveys prior to 1991 did not conform to regional guidelines for stream surveys. Guidelines for fish surveys did not exist prior to 1991.

TABLE 5. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the Yellowjacket Creek sub-watershed.

		Environmental Baseline Rating[1]		
Pathway	**Indicator(s)**	**Properly Functioning**	**Functioning at Risk**	**Functioning at Unacceptable Risk**
WATER QUALITY	Temperature Bull Trout			X
	Temperature Other Species		X	
	Sediment		X	
	Chemical Contaminants/Nutrients	X		
HABITAT ACCESS	Physical barriers		X	
HABITAT ELEMENTS	Substrate in rearing areas		X	
	Large Woody Debris			X
	Pool Frequency and Quality FWS			X
	Pool Frequency and Quality NMFS			X
	Large pools		X	
	Off-channel habitat		X	
	Refugia			X
CHANNEL DYNAMICS and CONDITION	Width / Depth Ratio			X
	Streambank condition USFWS		X	
	Streambank condition NMFS		X	
	Floodplain connectivity	X		
FLOW / HYDROLOGY	Peak/base flows		X	
	Drainage network		X	
WATERSHED CONDITIONS	Road density and location			X
	Disturbance regime			X
	Disturbance history			X

		Environmental Baseline Rating[1]		
Pathway	**Indicator(s)**	**Properly Functioning**	**Functioning at Risk**	**Functioning at Unacceptable Risk**
	Riparian reserves		X	
SUBPOPULATION CHARACTERISTICS / SPECIES AND HABITAT	Subpopulation size, Growth and survival, Life history Diversity and isolation, Persistence and genetic integrity, Integration of species and habitat conditions	No Rating. (The Forest Service has insufficient data in order to rate these indicators).		

Basis of evaluations

- The "Matrix of Diagnostics / Pathways and Indicators", provided by the US Fish and Wildlife Service, was used to rate 19 fish habitat indicators. Several sources of information were used to determine the ratings[1]:
- Lower Cispus East watershed analyses, Gifford Pinchot National Forest, Randle Ranger Districts.
- Stream Surveys by the Gifford Pinchot National Forest from 1989 through 2001, listed in Table 4.
- Stream temperature monitoring from 1992 through 2001, listed in Table 3.
- Field observations from 1990 through 2002 by employees of the Gifford Pinchot National Forest. These employees included a number of Hydrologists and Fisheries Biologists employed by the Forest Service during that time period.

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[1] The sources of information were reviewed by Ken Meyer (Fisheries Biologist), Terry Lawson (Biological Technician), and Steve Markman (Hydrologist) of the Cowlitz Valley Ranger District.

Table 6. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the sub-watershed.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Bull Trout Temperature Functioning at Unacceptable Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] incubation <1□C or >6□C rearing >15 □C spawning <4 □C or > 10□C also temperatures in areas used by adults during migration regularly exceed 15□C (thermal barriers present)	Yellowjacket Creek regularly exceed 16ºC during the summer rearing period. We have no data for the spawning or incubation periods.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Cutthroat, Stealhead, Chinook, and Coho. Functioning At Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] rearing: 14 - 18□C spawning: 14 - 16□C	Yellowjacket Creek, regularly exceed 16ºC during the summer rearing period. Only chinook salmon spawn during the monitoring period. Of the streams listed Yellowjacket Creek contain the typical spawning habitats of chinook salmon.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Sediment (in spawning areas)	Functioning at Risk	12-17% fines (<0.85mm) in gravel[4];	We have no data that directly addresses the condition of spawning gravels. The watershed analyses, however, indicate that there is an influx of sediments from roads on Yellowjacket, McCoy (the major tributary to Yellowjacket Creek), Pinto creeks. Field observations have some areas where fine sediments are likely reducing spawning success; however these areas are not wide spread.	Lower Cispus East WA p 6-6 to 6-20 Field Observations 2001-2002.
	Chemical Contamination / Nutrients	Functioning Appropriately	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches	We have no data with which to address this indicator. There are no indications of pollutants in the Yellowjacket watershed.	Lower Cispus East WA p 6-6 to 6-20

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
HABITAT ACCESS	Physical barriers	Functioning At Risk	one or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at base/low flows for at least one life history stage	The culvert on the 7713 road is a barrier to fish migration and blocks 1.1 miles of resident fish habitat, however, several natural water falls prevent the movement of fish form Yellowjacket Creek to this point. There was a population of introduced Yellowstone cutthroat above this culvert. A culvert on the 29 road blocks migration up Highbridge Creek (0.8 miles). This stream is extremely steep and natural migration barriers block the upstream movement of fish. A culvert on the 2810041 needs further study to determine if it is a migration barrier. Previous fish sampling found coastal cutthroat in this area, however, the latest level II stream survey and other sampling found no coastal cutthroat trout in the area. It is several miles upstream of the anadromous barrier on Yellowjacket Creek. Given all of this information a rating of Functioning At risk is the best rating.	2001 culvert survey See Map 1. Baseline Appendix Table 1
HABITAT ELEMENTS	Substrate character and embedded-ness (in rearing areas)	Functioning at Risk	gravel and cobble are subdominant, or if dominant, reach embeddedness 20-30%[9,10]	The rationale for this indicator is the same as that used for spawning gravel condition.	Lower Cispus West WA p 6-5 6-28 Lower Cispus East WA p 6-6 to 6-20 Observations along the Cispus River, Iron Creek, Greenhorn Creek, Woods Creek, Ames Creek between 1997 and 2002.
	Large Woody Debris (LWD)	Functioning at Unacceptable Risk	Current levels are being maintained at minimum levels desired for “Func. Appr.” but potential sources are lacking to maintain these minimum values.	The stream surveys rarely show woody debris approaching 80 pieces per mile. Most of the woody debris does not meet the criteria for large wood.	Stream Survey Data. Baseline Appendix Table 2 2000 and 2001
	Pool Frequency and Quality Bull Trout and Cutthroat	Functioning at Unacceptable Risk	current levels are not at those desired values for “functioning appropriately”,	For the Surveyed stream the number of pools rarely meets the criteria for pool frequency, and the pools are generally shallower than expected given the size of the streams. Post 96 flood surveys fund a decrease in pool number and pool depth on Yellowjacket Creek.	Stream Survey Data. Baseline Appendix Table 2 Observations by the fisheries staff 1993-2002

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
HABITAT ELEMENTS (continued)	Pool Frequency and Quality Salmon and Steelhead	Functioning at Unacceptable Risk	pool frequency is considerably lower than values desired for "functioning appropriately"; also cover/temperature is inadequate[4], and there has been a major reduction of pool volume by fine sediment	For the Surveyed stream the number of pools rarely meets the criteria for pool frequency, and the pools are generally shallower than expected given the size of the streams. Post 96 flood surveys fund a decrease in pool number and pool depth on Yellowjacket Creek.	Stream Survey Data. Baseline Appendix Table 2 Observations by the fisheries staff 1993-2002
	Large Pools (in streams with > 3m in wetted width at baseflow)	Functioning at Risk	Reaches have few pools greater than 1 meter in depth.	Only Yellowjacket Creek, has substantial numbers of pools greater than 3> feet deep. Observations made since the 1996 floods found a decrease in the number of large pools.	Stream Survey Data. Baseline Appendix Table 2 Observations by the fisheries staff 1993-2002
	Off-channel habitat	Functioning at Risk	Some high water velocity refugia such as ponds, oxbows, backwaters …	Some backwaters and side channels are present. The Yellowjacket Creek sub-watershed is generally not conducive to the formation these habitats. Where habitats do exist they are unstable (ie., the channel shifts after high flows).	Stream Survey Data. Observations by the fisheries staff 1993-2002
	Refugia (at 6th to 7th field watershed scale)	Functioning at Unacceptable Risk	adequate habitat refugia do not exist[12]	Some streams have small areas of fully functioning habitat but they small and disconnected and would not support large populations of fish.	Observations by the fisheries staff 1997-2002
CHANNEL CONDITION AND DYNAMICS	Width/Depth Ratio in riffles	Functioning at Unacceptable Risk	W/D ratios and channel types throughout much of the watershed are outside of historic ranges and/or site potentials.	The watershed analyses report channel widening in the Yellowjacket Creek. There is relatively little data for width to depth ratios.	Lower Cispus East WA p 6-6 to 6-20 Baseline Appendix Table 2
	Streambank Condition USFWS	Function At Risk	50 – 80% of any stream reach has greater than 90% stability.	We do not have direct measurements of streambank stability. Yellowjacket Creek streambanks experienced a high degree of erosion during the 95-96 floods. Many of these are still unstable because of a lack of root strength (Lower portions of Yellowjacket Creek),	Field Observations by aquatics professionals 1996-to present.
	Streambank Condition NMFS	Function At Risk	80-90% stable	We do not have direct measurements of streambank stability. Yellowjacket Creek streambanks experienced a high degree of erosion during the 95-96 floods. Many of these are still unstable because of a lack of root strength (Lower portions of Yellowjacket Creek),	Field Observations by aquatics professionals 1996-to present.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Floodplain Connectivity	Functioning Appropriately	off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	There are no places where roads affecting the connection to the floodplain. There is a little channel confinement at the bridges.	Field Observations by aquatics professional 1996 to present.
FLOW / HYDROLOGY	Change in Peak/Base Flows	Functioning at Risk	Some evidence of altered peak flow, baseflow and /or flow timing relative to an undisturbed watershed of similar size, geology, and geography.	The watershed condition summaries in the Lower Cispus East rated the effects to peak flows as low to moderate. These ratings were based Aggregated Recovered Percentage (ARP) and Water Available for Runoff (WAR) Models and drainage network extension. Given this spilt it is likely that the timing and magnitude of peakflow have been altered. In addition, the peak flow in Yellowjacket in 2002 appears to have been larger than one would expect from the storm data alone.	Lower Cispus East WA p 6-20 Professional Judgment. Baseline Appendix Table 3
	Drainage Network Increase	Functioning at Risk	Low to moderate increase in active channel length correlated with human caused disturbance.	On the whole we model a 5.8% increase in the drainage network based on an estimated 200 ft increase in stream length for each stream crossing. Previous investigations found that 200 feet was a rough average distance between the last ditch relief pipe and a stream crossing. The brake between At Risk and Functioning Appropriately would be at about 2.9 % (50 feet either side of a crossing) this rating is based on information presented by Mike Furniss (Watershed Restoration Conference 2001).	GIS analysis of Stream Crossing and earlier data on the average distance between ditch relief pipes and stream crossings. Baseline Appendix Table 4
WATERSHED CONDITIONS WATERSHED	Road Density and Location	Functioning at Unacceptable Risk	>2.4 mi/mi² [13]; some to many valley bottom roads	This sub-watershed is on the borderline between Function At Risk and Functioning At Unacceptable Risk.The average road density is 2.2-miles/square mile and road density in the riparian reserves associated with streams is 2.01. Although several roads have been decommissioned in the last 5 years the resulting road densities are still relatively high. In addition, there are about 1.5 stream crossings per mile of stream. Many of these are sources of fine sediment during winter storms. Most of these alter the transport of sediment during floods. Most of the culverts do not drain the floodplain, thus the back up water sediment and accelerate flows downstream increasing stream energy.	Analysis of GIS data. Baseline Appendix Table 4

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
CONDITIONS (continued)	Disturbance Regime	Functioning at Unacceptable Risk	Frequent flood or drought producing highly variable flows …. Channel is simplified … little hydrologic complexity … Natural processes are unstable.	A review of the USGS stream gauge data at the Cispus Near Randle (14232500) there have been seven ten year plus floods in since 1970. Although it is not possible to conclude that this represents an elevated frequency of flooding, it does show that relatively large number of substantial floods have occurred in the last 32 years. The floods in 1995 and 1996 certainly dramatically modified the habitat in Yellowjacket Creek. In addition a relatively small flood (2 to 5 Year) in 2002 modified the location of channel in the lower mile of Yellowjacket Creek.	USGS stream flow gauge data (# 14232500). Field Observations since 1974
	Disturbance History	Functioning at Unacceptable Risk	>15% ECA (< 85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed and some disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≤15% LSOG in watershed	As a whole the Forest Service lands 6th field watershed are near the 78% for Aggregate Recovered Percentage (ARP). In addition, the road densities in the riparian reserves are moderately high at 2.16 There is a documented history of mining in this sub-watershed. This includes both placer and hard rock mining. There are many current mining claims on this stream. Several of which involve suction dredging with 4- inch dredges. The dredges stir up sediment for short distances and leave behind somewhat unstable streambeds. Most of these are small and operate only on weekends or summer vacations. The effects of these are generally small, however, WDFW is placing limitations on these operations based on the observation of the operations.	ARP values from the Lower Cispus East and Lower Cispus West watershed Analyses. Current ARP Estimated from the percent of the potentially forested stand ≥ 8" in diameter at breast height (DBH). Baseline Appendix Tables 3 and 4
	Riparian Reserves	Functioning at Risk	Moderate loss of connectivity or function (shade, LWD, etc.) …	Approximately 20% of the stream-side riparian on the forest on in the early seral classes. This at the upper limit of the reference condition. Only 30% of riparian falls into the large tree class. This is approximately ½ of reference condition. Adding in historic stream salvage operations, and residences (the community of Cispus) the riparian reserves are moderately fragmented.	GIS analysis of seral classes in the riparian reserves. Aerial photo review along the Cispus River 1999 flight. Field observations 1997 to present. Baseline Appendix Table 5
SUBPOPULA-TION CHARACTER-ISTICS	Subpopulation Size	No Rating		No rating for all of these indicators. The Forest Service has insufficient data in order to rate these indicators.	
	Growth and Survival	No Rating			
	Life History Diversity and Isolation	No Rating			
	Persistence and Genetic Integrity	No Rating			
SPECIES and HABITAT	Integration of Species and Habitat Conditions	No Rating			

Appendix VI Baseline Rating Table for McCoy Creek

Watershed area evaluated

- The McCoy Creek sub-watershed is a 6th field sub-watershed, Hydrologic Unit Code 170800040502. The watershed is located in the Gifford Pinchot National Forest of southwest Washington. The watershed is defined as the 20 square mile McCoy Creek.
- Table 1 contains a list of sub-watersheds in the Cispus River watershed *before* and *after* the re-delineation in December 2000.

TABLE 1. Crosswalk list of past and present watershed names and numbers contained in the sub-watershed.

Watershed Name	Watershed # as of December 2000	Watershed # Prior to December 2000	Stream
McCoy Creek	170800040502	1708000404V	McCoy Creek Lower Portion
		1708000404W	McCoy Creek Upper Portion

Fish habitat evaluated

The Lower Cispus River watershed contains approximately 12.05 miles of Proposed, Endangered, Threatened and Sensitive (PETS) fish species. The streams containing the number of miles of PETS habitat for each stream are listed in Table 2.

TABLE 2. Summary of Threatened, Proposed and candidate fish habitat in the sub-watershed. See Map 1.

Watershed Number	Location	Common Name	Habitat Length
170800040502	Camp Creek	Resident Coastal Cutthroat	0.1
170800040502	Camp Creek	Resident Rainbow Trout	0.1
170800040502	Jumbo Creek	Resident Coastal Cutthroat	0.6
170800040502	Jumbo Creek	Resident Rainbow Trout	0.1
170800040502	Mc Coy Creek	Coho Salmon	0.3
170800040502	Mc Coy Creek	Sea-Run Cutthroat Trout	0.3
170800040502	Mc Coy Creek	Steelhead	0.3
170800040502	McCoy Creek	Bull Trout	0.3
170800040502	McCoy Creek	Resident Coastal Cutthroat	8.0

Fish species evaluated

- We consider all of the species listed below to be listed as threatened or sensitive.
- chinook salmon (*Oncorhynchus tshawytscha*) Threatened
- coho salmon (*Oncorhynchus kisutch*) Sensitive
- steelhead (*Oncorhynchus mykiss*) Threatend
- coastal cutthroat trout (*Oncorhynchus clarki clarki)* Sensitive*
- bull trout (*Salvelinus confluentus*) threatened **

*The US Fish and Wildlife Service listed coastal cutthroat as a proposed species and they were removed the Regional Forester's sensitive species list in 2000 because of it elevated status. Since then the USFWS decided not list this species and removed it from the list of proposed species. We now consider this species status to have reverted to a sensitive species.

** No bull trout have ever been reported in this watershed. We consider the 0.3 miles only as potential habitat, because a bull trout was reported approximately 5 miles downstream in Yellowjacket Creek in 1991. This report was the only report of bull trout since 1991.

TABLE 3. Temperature monitoring in the sub-watershed.

Stream Name	Location	Years Monitored	Days > 16 ºC	Years >16 ºC	Max 7-day
McCoy Creek	Below Scamp	2001	0	0	13.3
McCoy Creek	@ Yellowjacket Creek	2001	0	0	14.7

Table 4. List of Level II Stream Surveys

Sub-Watershed #	Stream name	Level II Stream SurveyYears
170800040502	McCoy Creek	2001

TABLE 5. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the McCoy Creek sub-watershed.

		Environmental Baseline Rating[1]		
Pathway	**Indicator(s)**	**Properly Functioning**	**Functioning at Risk**	**Functioning at Unacceptable Risk**
WATER QUALITY	Temperature Bull trout		X	
	Temperature Other Species		X	
	Sediment		X	
	Chemical Contaminants/Nutrients	X		
HABITAT ACCESS	Physical barriers			X
HABITAT ELEMENTS	Substrate in rearing areas	X		
	Large Woody Debris			X
	Pool Frequency and Quality FWS			X
	Pool Frequency and Quality NMFS			X
	Large pools		X	
	Off-channel habitat		X	
	Refugia			X
CHANNEL DYNAMICS and CONDITION	Width / Depth Ratio		X	
	Streambank condition USFWS	X		
	Streambank condition NMFS	X		
	Floodplain connectivity	X		
FLOW / HYDROLOGY	Peak/base flows	X		
	Drainage network	X		
WATERSHED CONDITIONS	Road density and location		X	
	Disturbance regime		X	
	Disturbance history		X	
	Riparian reserves		X	
SUBPOPULATION CHARACTERISTICS / SPECIES AND HABITAT	Subpopulation size, Growth and survival, Life history Diversity and isolation, Persistence and genetic integrity, Integration of species and habitat conditions	No Rating. (The Forest Service has insufficient data in order to rate these indicators).		

Basis of evaluations

- The "Matrix of Diagnostics / Pathways and Indicators", provided by the US Fish and Wildlife Service, was used to rate 19 fish habitat indicators. Several sources of information were used to determine the ratings[1]:
- Lower Cispus East, Gifford Pinchot National Forest, Randle Ranger District.
- Stream Surveys by the Gifford Pinchot National Forest from 1987 through 2000, listed in Table 3.
- Stream temperature monitoring from 1994 through 2000, listed in Table 3.
- Field observations from 1990 through 2002 by employees of the Gifford Pinchot National Forest. These employees included a number of Hydrologists and Fisheries Biologists employed by the Forest Service during that time period.

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[1] The sources of information were reviewed by Ken Meyer (Fisheries Biologist), Terry Lawson (Biological Technician), and Steve Markman (Hydrologist) of the Cowlitz Valley Ranger District.

Table 6. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the sub-watershed.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Bull Trout Temperature Functioning At Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] incubation <1°C or >6°C rearing >15 °C spawning <4 °C or > 10°C also temperatures in areas used by adults during migration regularly exceed 15°C (thermal barriers present)	The lowest part of McCoy Creek reached 14.7 ºC. This is the only part of the stream accessible to bull trout. We have no data with which to address water temperature during the spawning season.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Cutthroat, Stealhead, Chinook, and Coho. Functioning At Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] rearing: 14 - 18°C spawning: 14 - 16°C	The lowest part of McCoy Creek reached 14.7 ºC. This is the only part of the stream accessible to anadromous species. The cooler water temepertures for the upstream section, which is habitat for the sensitive species coastal would be more suitable, but warming of the water upstream is contributing the higher temperatures down stream. We have no data with which to address water temperature during the spawning season.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Sediment (in spawning areas)	Functioning at Risk	12-17% fines (<0.85mm) in gravel[4];	We have no data that directly addresses the condition of spawning gravels. All but 2 of the 12 pebble counts reported in the 2001 survey had D50 greater than 100mm. Substrates of this size are generally not suitable for spawning gravel and thus are not useful in this analysis. The two samples with small sized substrates 17% to 18% fine material. The Lower Cispus East WA noted increased sediment input from roads and erosion.	Lower Cispus East WA p 6-6 to 6-20
	Chemical Contamination / Nutrients	Properly Functioning	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches	We have no data with which to address this indicator. There are no homes, factories, or ranches in this watershed, therefore we conclude that is highly unlikely that there is any chemical or nutrient contamination.	Lower Cispus East WA p 6-6 to 6-20

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
HABITAT ACCESS	Physical barriers	Functioning at Unacceptable Risk	one or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows for at least one life history stage	There is at least one barrier culvert on McCoy Creek. This culvert is on 2900115 road. It blocks access to approximately 2.25 mile of resident fish habitat.	2001 culvert survey See Map 1and Baseline Appendix Table 1.
HABITAT ELEMENTS	Substrate character and embedded-ness (in rearing areas)	Properly Funtioning	Reach embeddedness <20%[9] dominant substrate is gravel or cobble	We have no embeddedness data. The pebble counts indicate that the gravels are very free of fine sediments.	Lower Cispus East WA p 6-6 to 6-20
	Large Woody Debris (LWD)	Functioning at Unacceptable Risk	Current levels are being maintained at minimum levels desired for "Func. Appr." but potential sources are lacking to maintain these minimum values.	The stream survey never shows woody debris approaching 80 pieces per mile. Most of the woody debris does not meet the criteria for large wood.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Pool Frequency and Quality Bull Trout and Cutthroat	Functioning at Unacceptable Risk	current levels are not at those desired values for "functioning appropriately",	Only the first two reaches meet the desired number of pools, Woody debris is almost absent from pools in these reaches.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1992 and field observations 1996 to2002
	Pool Frequency and Quality Salmon and Steelhead	Functioning at Unacceptable Risk	pool frequency is considerably lower than values desired for "functioning appropriately"; also cover/temperature is inadequate[4], and there has been a major reduction of pool volume by fine sediment	Only the first two reaches meet the desired number of pools, Woody debris is almost absent from pools in these reaches.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
HABITAT ELEMENTS (continued)	Large Pools (in streams with > 3m in wetted width at baseflow)	Functioning at Risk	Reaches have few pools greater than 1 meter in depth.	Only the first two reaches have a large number of deep pools.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Off-channel habitat	Functioning at Risk	Some high water velocity refugia such as ponds, oxbows, backwaters …	The McCoy Creek drainage is not conducive to the formation of off channel habitats.	Stream Survey Data. Observations by the fisheries staff 1993-2002

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Refugia (at 6th to 7th field watershed scale)	Functioning at Unacceptable Risk	adequate habitat refugia do not exist[12]	There are no fully functional areas in the McCoy Watershed.	Observations by the fisheries staff 1997-2002
CHANNEL CONDITION AND DYNAMICS	Width/Depth Ratio in riffles	Functioning at Risk	W/D ratios and/or channel types in portions of watershed are outside historic ranges and/or site potentials	Reaches 1 and 5 are well outside of what would be expected for the channel types the other reaches fall into range described by Rosgen. The lower Cispus East WA identifies channel widening in the upper portion of the sub-watershed.	Stream Survey Data (Baseline Appendix Table 2) Lower Cispus East WA pg6-16
	Streambank Condition	Properly Functioning	>80% of any stream reach has ≥90% stability[5]	The 2001 survey found that only 4.5 % of the banks were raw.	2001 stream survey report
	Streambank Condition	Properly Functioning	>90% stable; i.e., on average, less than 10% of banks are actively eroding[19]	The 2001 survey found that only 4.5 % of the banks were raw.	2001 stream survey report
	Floodplain Connectivity	Properly Functioning	off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	The road density in riparian reserves and road stream crossings are low for this sub-watershed	GIS analysis of riparian road density and stream crossings Appendix I Table 4
FLOW / HYDROLOGY	Change in Peak/Base Flows	Properly Functioning	watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size, geology and geography	The Aggregate Percentage Recovered (ARP), Water Available for Runoff (WAR) and Drainage Network extension models all indicate low potential for effects to peack flows.	Lower Cispus East WA p 6-20 Professional Judgment. (Baseline Appendix Tables 3 and 4)
FLOW / HYDROLOGY	Drainage Network Increase	Properly Functioning	zero or minimum increases in active channel length correlated with human caused disturbance	A 2.7% increase in the drainage is considered to be minimal.	GIS analysis of Stream Crossing and earlier data on the average distance between ditch relief pipes and stream crossings. (Baseline Appendix Table 4)
WATERSHED	Road Density and Location	Functioning Risk	1 - 2.4 mi/mi² [13]; some valley bottom roads	With a road density of 1.1 miles per square mile and riparian road density of .79 miles square mile. The rating for this indicator is barely at risk.	Analysis of GIS data. (Baseline Appendix Table 4)

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
CONDITIONS WATERSHED CONDITIONS (continued)	Disturbance Regime	Functioning At Risk	Scour events, debris torrents, or catastrophic fire are localized events that occur in several minor parts of the watershed. Resiliency of habitat to recover from environmental disturbances is moderate.	There is not a lot of information about scour events in McCoy Creek. The habitat, however, is more typical of a high-energy system (bedrock control with relatively little wood). Some of the high-energy nature maybe due to a lot of natural non forest.	Stream Survey data 2001 and observations from 1998 and 2001.
	Disturbance History	Functioning at Risk	<15% ECA (>85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed but some disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≥15% LSOG in watershed	The ARP value is good at approximately 92, but the percent of riparian vegetation in early seral classes is also relatively high indicating some fragmentation of the riparian reserve. There is a documented history of mining in this sub-watershed. This includes both placer and hard rock mining. There are subtle hints of acid rock drainage in the Camp Creek drainage. This type of pollution can be caused by water infiltrating old mining adits and tailings. There are many current mining claims on this stream. Several of which involve suction dredging with 4- inch dredges. The dredges stir up sediment for short distances and leave behind somewhat unstable streambeds. Most of these are small and operate only on weekends or summer vacations. The effects of these are generally small, however, WDFW is placing limitations on these operations based on the observation of the operations.	Baseline Appendix Tables 3 and 5
	Riparian Reserves	Functioning at Risk	Moderate loss of connectivity or function (shade, LWD, etc.) …	Approximately 19% of the stream-side riparian on the forest on in the early seral classes. Only 18% of the riparian area in the large tree class. This condition is less than ½ of the reference condition. We consider this represent a moderately fragmented community.	GIS analysis of seral classes in the riparian reserves. Aerial photo review along the Cispus River 1999 flight. Field observations 1997 to present. Baseline Appendix Table 5
SUBPOPULA-TION CHARACTER-ISTICS	Subpopulation Size	No Rating		No rating for all of these indicators. The Forest Service has insufficient data in order to rate these indicators.	
	Growth and Survival	No Rating			
	Life History Diversity and Isolation	No Rating			

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Persistence and Genetic Integrity	No Rating			
SPECIES and HABITAT	Integration of Species and Habitat Conditions	No Rating			

Appendix VII Baseline Rating Table Cispus River-Camp Creek

Watershed area evaluated

- The Cispus River-Camp Creek subwatershed is a 6th field subwatershed, Hydrologic Unit Code 170800040503. The watershed is located in the Gifford Pinchot National Forest of southwest Washington. The watershed is defined as the 18.1 square mile drainage area downstream from the confluence of the Cispus River and North Fork Cispus River to the confluence with Greenhorn Creek and includes all of the tributaries to the Cispus River in that area.
- Table 1 contains a list of sub-watersheds in the Cispus River watershed *before* and *after* the re-delineation in December 2000.

TABLE 1. Crosswalk list of past and present watershed names and numbers contained in the sub-watershed.

Watershed Name	Watershed # as of December 2000	Watershed # Prior to December 2000	Stream
Cispus River - Camp Creek	170800040503	1708000404P	Stump Creek
		1708000404Q	Camp Creek
		1708000404Z	Cispus River
		1708000404Z	Covel Creek
		1708000404Z	Tower Rock Spring
		1708000404M	Dry Creek

Fish habitat evaluated

The Lower Cispus River watershed contains approximately 12.05 miles of Proposed, Endangered, Threatened and Sensitive (PETS) fish species. The streams containing the number of miles of PETS habitat for each stream are listed in Table 2.

TABLE 2. Summary of Threatened, Proposed and candidate fish habitat in the sub-watershed. See Map 1.

6th Field Watershed Number	Stream	Common Name	Habitat Length (Mi)
170800040503	Cispus River	Bull Trout	2.9
		Chinook Salmon	8.0
		Coho Salmon	8.0
		Resident Coastal Cutthroat	8.0
		Sea-Run Cutthroat Trout	8.0
		Steelhead	8.0
	Camp Creek	Coho Salmon	0.3
		Resident Coastal Cutthroat	1.9
		Sea-Run Cutthroat Trout	0.6
		Steelhead	0.6
	Covel Creek	Coho Salmon	0.6
		Steelhead	0.6
		Resident Coastal Cutthroat	0.75
		Sea-Run Coastal Currhroat	0.6
	Stump Creek	Resident Coastal Cutthroat	1.4
		Sea-Run Cutthroat Trout	1.4

Fish species evaluated

- All of the species listed below are listed as threatened or are on the Regional Forester's Sensitive Species list and occur in the sub watershed.
- chinook salmon (*Oncorhynchus tshawytscha*) Threatened
- coho salmon (*Oncorhynchus kisutch*) Sensitive

- steelhead (*Oncorhynchus mykiss*) Threatened
- coastal cutthroat trout (*Oncorhynchus clarki clarki)* Sensitive*
- bull trout (*Salvelinus confluentus*) Threatened**

*The US Fish and Wildlife Service listed coastal cutthroat as a proposed species and they were removed the Regional Forester's sensitive species list in 2000 because of it elevated status. Since then the USFWS decided not list this species and removed it from the list of proposed species. We now consider this species status to have reverted to a sensitive species.

** No bull trout have ever been reported in this watershed. We consider the 2.9 miles only as potential habitat, because a bull trout was reported Yellowjacket Creek in 1991. This report was the only report of bull trout since 1991.

TABLE 3. Temperature monitoring in the sub-watershed.

Stream Name	Location	Years Monitored	Days > 16 °C	Years >16 °C	Max 7-day
Cispus River	Below N. Fork Cispus River	2000	0	0	14.7
Cispus River	Above Yellowjacket Creek	2000	1	1	15.5
Cispus River	Above Greenhorn Cr.	2000	18	1	17.4

Table 4. List of Level II Stream Surveys

Sub-Watershed #	Stream name	Level II Stream SurveyYears
170800040503	Camp Creek	1992

TABLE 5. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the Cipsus River Camp Creek sub-watershed.

		Environmental Baseline Rating[1]		
Pathway	**Indicator(s)**	**Properly Functioning**	**Functioning at Risk**	**Functioning at Unacceptable Risk**
WATER QUALITY	Temperature Bull trout			X
	Temperature Other Species		X	
	Sediment		X	
	Chemical Contaminants/Nutrients	X		
HABITAT ACCESS	Physical barriers			X
HABITAT ELEMENTS	Substrate in rearing areas		X	
	Large Woody Debris			X
	Pool Frequency and Quality FWS			X
	Pool Frequency and Quality NMFS			X
	Large pools		X	
	Off-channel habitat		X	
	Refugia			X
CHANNEL DYNAMICS and CONDITION	Width / Depth Ratio			X
	Streambank condition USFWS		X	
	Streambank condition NMFS		X	
	Floodplain connectivity		X	
FLOW / HYDROLOGY	Peak/base flows		X	
	Drainage network		X	
WATERSHED CONDITIONS	Road density and location			X
	Disturbance regime			X
	Disturbance history			X
	Riparian reserves	X		
SUBPOPULATION CHARACTERISTICS / SPECIES AND HABITAT	Subpopulation size, Growth and survival, Life history Diversity and isolation, Persistence and genetic integrity, Integration of species and habitat conditions	No Rating. (The Forest Service has insufficient data in order to rate these indicators).		

Basis of evaluations

- The "Matrix of Diagnostics / Pathways and Indicators", provided by the US Fish and Wildlife Service, was used to rate 19 fish habitat indicators. Several sources of information were used to determine the ratings[1]:
- Lower Cispus East, Gifford Pinchot National Forest, Randle Ranger District.
- Stream Surveys by the Gifford Pinchot National Forest from 1987 through 2000, listed in Table 3.
- Stream temperature monitoring from 1994 through 2000, listed in Table 3.
- Field observations from 1990 through 2002 by employees of the Gifford Pinchot National Forest. These employees included a number of Hydrologists and Fisheries Biologists employed by the Forest Service during that time period.

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[1] The sources of information were reviewed by Ken Meyer (Fisheries Biologist), Terry Lawson (Biological Technician), and Steve Markman (Hydrologist) of the Cowlitz Valley Ranger District.

Table 6. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the sub-watershed.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Bull Trout Temperature Functioning at Unacceptable Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] incubation <1°C or >6°C rearing >15 °C spawning <4 °C or > 10°C also temperatures in areas used by adults during migration regularly exceed 15°C (thermal barriers present)	The lowest part of the Cispus River regularly exceeds 15 ºC. The portion of the Cispus River upstream from Yellowjacket creek is slightly cooler. We have no data with which to address water temperature during the spawning season.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Cutthroat, Stealhead, Chinook, and Coho. Functioning At Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] rearing: 14 - 18°C spawning: 14 - 16°C	The lowest part of the Cispus River regularly exceeds 15 ºC. The portion of the Cispus River upstream from Yellowjacket creek is slightly cooler. Only chinook salmon spawn during the monitoring period.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Sediment (in spawning areas)	Functioning at Risk	12-17% fines (<0.85mm) in gravel[4];	We have no data that directly addresses the condition of spawning gravels. Observations along the Cispus River and its tributaries indicate that the condition of spawning gravel range from functioning appropriately to functioning at unacceptable risk.	Lower Cispus East WA p 6-6 to 6-20 Observations along the Cispus River, Iron Creek, Greenhorn Creek, Woods Creek, Ames Creek between 1997 and 2002.
	Chemical Contamination / Nutrients	Functioning Appropriately	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches	We have no data with which to address this indicator. There are many residences, a couple of ranches in watershed but no towns, mills, or factories.	Lower Cispus East WA p 6-6 to 6-20
HABITAT ACCESS	Physical barriers	Functioning at Unacceptable Risk	one or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows for at least one life history stage	There are several culverts that are likely preventing the free movement of all species and age class up and down the stream. These are on Camp Creek (.2 miles of habitat), Stump Creek (1.7 miles of habitat) and Covel Creek (0.3milesof habitat). There are populations of resident cutthroat above the culverts on Camp Creek and Stump Creek.	2001 culvert survey See Map 1and Baseline Appendix Table 1.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
HABITAT ELEMENTS	Substrate character and embedded-ness (in rearing areas)	Functioning at Risk	gravel and cobble are subdominant, or if dominant, reach embeddedness 20-30%[9,10]	The rationale for this indicator is the same as that used for spawning gravel condition.	Lower Cispus West WA p 6-5 6-28 Lower Cispus East WA p 6-6 to 6-20 Observations along the Cispus River, Iron Creek, Greenhorn Creek, Woods Creek, Ames Creek between 1997 and 2002.
	Large Woody Debris (LWD)	Functioning at Unacceptable Risk	Current levels are being maintained at minimum levels desired for "Func. Appr." but potential sources are lacking to maintain these minimum values.	The stream surveys rarely show woody debris approaching 80 pieces per mile. Most of the woody debris does not meet the criteria for large wood. The high number in Camp Creek are mainly due differences in how wood was counted. The size classes were much smaller for the Camp Creek survey. Previous timber salvage operation reduced the amount of wood in the Cispus River above Yellowjacket Creek.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Pool Frequency and Quality Bull Trout and Cutthroat	Functioning at Unacceptable Risk	current levels are not at those desired values for "functioning appropriately",	For the Surveyed stream the number of pools rarely meets the criteria for pool frequency, and the pools are generally shallower than expected given the size of the streams.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1992 and field observations 1996 to2002
HABITAT ELEMENTS (continued)	Pool Frequency and Quality Salmon and Steelhead	Functioning at Unacceptable Risk	pool frequency is considerably lower than values desired for "functioning appropriately"; also cover/temperature is inadequate[4], and there has been a major reduction of pool volume by fine sediment	For the Surveyed stream the number of pools rarely meets the criteria for pool frequency, and the pools are generally shallower than expected given the size of the streams.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Large Pools (in streams with > 3m in wetted width at baseflow)	Functioning at Risk	Reaches have few pools greater than 1 meter in depth.	Main Cispus River has substantial numbers of pools greater than 3> feet deep. The pools in the main river, however, appear to be shallower than one would expect for a river of its size.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Off-channel habitat	Functioning at Risk	Some high water velocity refugia such as ponds, oxbows, backwaters …	Some backwaters and side channels are abundant . The are mainly located the Cispus River upstream from Yellowjacket Creek. These generally lack stability and cover.	Stream Survey Data. Observations by the fisheries staff 1993-2002
	Refugia (at 6th to 7th field watershed scale)	Functioning at Unacceptable Risk	adequate habitat refugia do not exist[12]	Some streams have small areas of fully functioning habitat but they small and disconnected and would not support large populations of fish.	Observations by the fisheries staff 1997-2002

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
CHANNEL CONDITION AND DYNAMICS	Width/Depth Ratio in riffles	Functioning at Unacceptable Risk	W/D ratios and channel types throughout much of the watershed are outside of historic ranges and/or site potentials.	The watershed analyses report channel widening in the Cispus River.	Lower Cispus East WA p 6-6 to 6-20 (Baseline Appendix Table 2)
	Streambank Condition	Function At Risk	50 – 80% of any stream reach has greater than 90% stability.	We do not have direct measurements of streambank stability. Numerous streambanks experienced a high degree of erosion during the 95-96 floods. Many of these are still unstable because of a lack of root strength (Lower portions of several portions of the Cispus River especially above the 2306 rd.). Some stability is slowly returning naturally and other places have been strengthened by human made structures (engineered log jams upstream from the Tom Music Bridge).	Field Observations by aquatics professionals 1996-to present.
	Streambank Condition	Function At Risk	80-90% stable	We do not have direct measurements of streambank stability. Numerous streambanks experienced a high degree of erosion during the 95-96 floods. Many of these are still unstable because of a lack of root strength (Lower portions of several portions of the Cispus River especially above the 2306 rd.). Some stability is slowly returning naturally and other places have been strengthened by human made structures (engineered log jams upstream from the Tom Music Bridge).	Field Observations by aquatics professionals 1996-to present.
	Floodplain Connectivity	Functioning at Risk	reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation/succession	The 23, 76, 2801 all have sections along the banks of the Cispus River. The main problem is the removal of riparian vegetation. These roads have unsubstantial affects on the channel, side channels or wetlands.	Field Observations by aquatics professional 1996 to present.
FLOW / HYDROLOGY	Change in Peak/Base Flows	Functioning at Risk	Some evidence of altered peak flow, baseflow and /or flow timing relative to an undisturbed watershed of similar size, geology, and geography.	The watershed condition summaries in the Lower Cispus East WA rated the major tributary streams as poor and main river as fair. These ratings were based Aggregated Recovered Percentage (ARP) and Water Available for Runoff (WAR) Models and drainage network extension. Given this spilt it is likely that the timing and magnitude of peakflow have been altered.	Lower Cispus East WA p 6-20 Professional Judgment. (Baseline Appendix Table 3)

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
FLOW / HYDROLOGY	Drainage Network Increase	Functioning at Risk	Low to moderate increase in active channel length correlated with human caused disturbance.	On the whole we model a 5.5% increase in the drainage network based on an estimated 200 ft increase in stream length for each stream crossing. Previous investigations found that 200 feet was a rough average distance between the last ditch relief pipe and a stream crossing. The brake between At Risk and Functioning Appropriately would be at about 2.8 % (50 feet either side of a crossing) this rating is based on information presented by Mike Furniss (Watershed Restoration Conference 2001).	GIS analysis of Stream Crossing and earlier data on the average distance between ditch relief pipes and stream crossings. (Baseline Appendix Table 4)
WATERSHED CONDITIONS	Road Density and Location	Functioning at Unacceptable Risk	>2.4 mi/mi² some to many valley bottom roads	The average road density is 3.89-miles/square mile and road density in the riparian reserves associated with streams is 3.02miles/square mile. Although several roads have been decommissioned in the last 5 years the resulting road densities are still relatively high. In addition, there are about 1.4 stream crossings per mile of stream. Many of these are sources of fine sediment during winter storms. Most of these alter the transport of sediment during floods. Most of the culverts do not drain the floodplain, thus the back up water sediment and accelerate flows downstream increasing stream energy.	Analysis of GIS data. (Baseline Appendix Table 4)
WATERSHED CONDITIONS (continued)	Disturbance Regime	Functioning at Unacceptable Risk	Frequent flood or drought producing highly variable flows …. Channel is simplified … little hydrologic complexity … Natural processes are unstable.	A review of the USGS stream gauge data at the Cispus Near Randle (14232500) there have been seven ten year plus floods in since 1970. Although it is not possible to conclude that this represents an elevated frequency of flooding, it does show that relatively large number of substantial floods have occurred in the last 32 years. The floods in 1995 and 1996 certainly dramatically modified the habitat in Camp Creek and the Cispus River.	USGS stream flow gauge data (# 14232500). Field Observations since 1974
	Disturbance History	Functioning at Unacceptable Risk	>15% ECA (< 85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed and some disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≤15% LSOG in watershed	As a whole the Forest Service lands 5th field watershed are near the 80% for Aggregate Recovered Percentage (ARP) (see table). There have been some activities in the riparian reserves and unstable areas for example a road density 3.03 miles/square mile in the riparian reserves. There are no large refugia remaining.	Current ARP Estimated from the percent of the potentially forested stand ≥ 8" in diameter at breast height (DBH). (Baseline Appendix Tables 3 and 4)

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Riparian Reserves	Functioning at Risk	the riparian reserve system provides adequate shade, large woody debris recruitment, and habitat protection and connectivity in subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% previously unmanaged);	Approximately 10% of the stream-side riparian on the forest on in the early seral classes. There is no substantial difference between current condition and historic condition.	GIS analysis of seral classes in the riparian reserves. Aerial photo review along the Cispus River 1999 flight. Field observations 1997 to present. Baseline Appendix Table 5
SUBPOPULA-TION CHARACTER-ISTICS	Subpopulation Size	No Rating		No rating for all of these indicators. The Forest Service has insufficient data in order to rate these indicators.	
	Growth and Survival	No Rating			
	Life History Diversity and Isolation	No Rating			
	Persistence and Genetic Integrity	No Rating			
SPECIES and HABITAT	Integration of Species and Habitat Conditions	No Rating			

Appendix VIII- Baseline Rating Table Greenhorn Creek

Watershed area evaluated

- The Greenhorn Creek watershed is a 6th field sub-watershed, Hydrologic Unit Code 170800040504. The watershed is located in the Gifford Pinchot National Forest of southwest Washington. The watershed is defined as the 15.6 square mile drainage area including Greenhorn Creek and all of its tributaries.
- Table 1 contains a list of sub-watersheds in the Greenhorn Creek sub-watershed *before* and *after* the re-delineation in December 2000.

TABLE 1. Crosswalk list of past and present watershed names and numbers contained in the sub-watershed.

Watershed Name	Watershed # as of December 2000	Watershed # Prior to December 2000	Stream
Greenhorn Creek	170800040504	1708000404K	1918 Creek
		1708000404K	Greenhorn Creek
		1708000404K	Trapper Creek
		1708000404L	Greenhorn Creek
		1708000404L	Jefferson Creek
		1708000404L	Soldier Creek

Fish habitat evaluated

The Lower Cispus River watershed contains approximately 6.9 miles of Proposed, Endangered, Threatened and Sensitive (PETS) fish species. The streams containing the number of miles of PETS habitat for each stream are listed in Table 2.

TABLE 2. Summary of Threatened, Proposed and candidate fish habitat in the sub - watershed. See Map 1.

6th Field Watershed Number	Stream	Common Name	Habitat Length (Mi)
170800040504	Greenhorn Creek	Coho Salmon	1.8
		Resident Coastal Cutthroat	5.5
		Sea-Run Cutthroat Trout	1.8
		Steelhead	1.8
	1918 Creek	Resident Coastal Cutthroat	0.1
	Jefferson Creek	Resident Coastal Cutthroat	0.1
	Soldier Creek	Resident Coastal Cutthroat	1.2

Fish species evaluated

- All of the species listed below currently occur in the Lower Cispus River watershed and are on the Proposed, Endagered, Threatened, or Sensitive (PETS) species list .
- coho salmon (*Oncorhynchus kisutch*) Sensitive
- steelhead (*Oncorhynchus mykiss*) Threatened
- coastal cutthroat trout (*Oncorhynchus clarki clarki)* Sensitive

*The US Fish and Wildlife Service listed coastal cutthroat as a proposed species and they were removed the Regional Forester's sensitive species list in 2000 because of it elevated status. Since then the USFWS decided not list this species and removed it from the list of proposed species. We now consider this species status to have reverted to a sensitive species.

TABLE 3. Temperature monitoring in the sub-watershed.

Stream Name	Location	Years Monitored	Days >16 °C	Years > 16 °C	Max 7-day

Stream Name	Location	Years Monitored	Days >16 ºC	Years > 16 ºC	Max 7-day
Greenhorn Creek	Above Soldier	2001	0	0	14.7
Soldier Creek	@ Greenhorn	2001	0	0	12.3
Jefferson Creek	@ Rm 0.2	2001	0	0	14.6
Greenhorn Creek	Above 1918	2001	4	1	16.1
1918 Creek	@ Greenhorn	2001,2002	70	2	19
Trapper Creek	@ Greenhorn	2001	0	0	13.5
Greenhorn Creek	@ 76 Rd bridge	2001	29	1	17.9
Greenhorn Creek	Near confluence with Cispus R.	2000-2002	112	3	19.1

Table 4. List of Level II Stream Surveys

Sub-Watershed #	Stream name	Level II Stream[1] SurveyYears
170800040504	Soldier Creek	1989
	Greenhorn Creek	1989
	1918 Creek	1989
	Greenhorn Creek	1989

[1] Stream surveys prior to 1991 did not conform to regional guidelines for stream surveys. Guidelines for fish surveys did not exist prior to 1991.

TABLE 5. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the Greenhorn Creek sub-watershed.

		Environmental Baseline Rating[1]		
Pathway	**Indicator(s)**	**Properly Functioning**	**Functioning at Risk**	**Functioning at Unacceptable Risk**
WATER QUALITY	Temperature Bull Trout			X
	Temperature Other Species		X	
	Sediment		X	
	Chemical Contaminants/Nutrients	X		
HABITAT ACCESS	Physical barriers			X
HABITAT ELEMENTS	Substrate in rearing areas		X	
	Large Woody Debris		X	
	Pool Frequency and Quality FWS			X
	Pool Frequency and Quality NMFS			X
	Large pools		X	
	Off-channel habitat		X	
	Refugia			X
CHANNEL DYNAMICS and CONDITION	Width / Depth Ratio			X
	Streambank condition USFWS		X	
	Streambank condition NMFS		X	
	Floodplain connectivity			X
FLOW / HYDROLOGY	Peak/base flows	X		
	Drainage network		X	
WATERSHED CONDITIONS	Road density and location		X	
	Disturbance regime			X
	Disturbance history			X
	Riparian reserves		X	
SUBPOPULATION CHARACTERISTICS / SPECIES AND HABITAT	Subpopulation size, Growth and survival, Life history Diversity and isolation, Persistence and genetic integrity, Integration of species and habitat conditions	No Rating. (The Forest Service has insufficient data in order to rate these indicators).		

Basis of evaluations

- The "Matrix of Diagnostics / Pathways and Indicators", provided by the US Fish and Wildlife Service, was used to rate 19 fish habitat indicators. Several sources of information were used to determine the ratings[1]:

- Lower Cispus East and Lower Cispus West watershed analyses, Gifford Pinchot National Forest, Randle Ranger Districts.
- Stream Surveys by the Gifford Pinchot National Forest from 1989, listed in Table 4.
- Stream temperature monitoring from 2000 and 2001, listed in Table 3.
- Field observations from 1990 through 2002 by employees of the Gifford Pinchot National Forest. These employees included a number of Hydrologists and Fisheries Biologists employed by the Forest Service during that time period.

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[1] The sources of information were reviewed by Ken Meyer (Fisheries Biologist), Terry Lawson (Biological Technician), and Steve Markman (Hydrologist) of the Cowlitz Valley Ranger District.

Table 6. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the sub-watershed.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Bull Trout Temperature Functioning at Unacceptable Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] incubation <1°C or >6°C rearing >15 °C spawning <4 °C or > 10°C also temperatures in areas used by adults during migration regularly exceed 15°C (thermal barriers present)	Greenhorn Creek, regularly exceeds 15ºC during the summer rearing period. We have no data for the spawning or incubation periods.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Cutthroat, Stealhead, Chinook, and Coho. Functioning At Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] rearing: 14 - 18°C spawning: 14 - 16°C	Greenhorn Creek, regularly exceeds 15ºC during the summer rearing period. We have no data for the spawning or incubation periods. Only chinook salmon spawn during the monitoring period. Therefore I chose the Functioning At Risk Rating.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Sediment (in spawning areas)	Functioning at Risk	12-17% fines (<0.85mm) in gravel[4];	We have no data that directly addresses the condition of spawning gravels. The Lower Cispus East watershed analysis, however, indicate that there is an influx of sediments from roads Greenhorn Creek Observations along the Greenhorn Creek and its tributaries indicate that the condition of spawning gravel ranges from functioning appropriately to functioning at risk.	Lower Cispus East WA p 6-6 and 6-7 Observations along the Greenhorn Creek, 1997 and 2002.
	Chemical Contamination / Nutrients	Functioning Appropriately	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches	We have no data with which to address this indicator. The Lower Cispus East watershed analysis indicated in no concerns in Greenhorn Creek or its tributaries. There are no residences, ranches, towns, mills, or factories in this sub-watershed.	Lower Cispus East WA p 6-6 to 6-20
HABITAT ACCESS	Physical barriers	Functioning at Unacceptable Risk	one or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows for at least one life	The culvert on the 7700000 road at Greenhorn is likely a barrier that blocks a substantial (up to 4.7 mile) of resident coastal cutthroat potential habitat. Restoration has the potential to substantial increase habitat.	2001 culvert survey See Map 1. Baseline Appendix Table 1

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
			history stage		
HABITAT ELEMENTS	Substrate character and embedded-ness (in rearing areas)	Functioning at Risk	gravel and cobble are subdominant, or if dominant, reach embeddedness 20-30%[9,10]	The rationale for this indicator is the same as that used for spawning gravel condition. Observations along the Greenhorn Creek and its tributaries indicate that the condition of substrate ranges from functioning appropriately to functioning at risk.	Lower Cispus East WA p 6-6 and 6-7
	Large Woody Debris (LWD)	Functioning at Risk	Current levels are being maintained at minimum levels desired for "Func. Appr." but potential sources are lacking to maintain these minimum values.	The stream surveys show that woody debris meets 80 pieces per mile criteria in a few reaches, but overall woody debris low. Most of Greenhorn Creek is an extremely steep channel that has been scoured to bedrock. Surveys for the Upper Greenhorn timber sale in 1999 found that large woody debris is slowly being recruited to the channel. Anything that would reduce the rate of recruitment would change the rating to Functioning an Unacceptable risk.	Stream Survey Data. (Baseline Appendix Table2) Observations by the fisheries staff 1999
	Pool Frequency and Quality Bull Trout and Cutthroat	Functioning at Unacceptable Risk	Current levels are not at those desired values for "functioning appropriately",	For the Surveyed streams the number of pools rarely meets the criteria for pool frequency, and the pools are generally shallower than expected given the size of the streams The surveys found that Greenhorn Creek has been scoured to bedrock along much of its length. Only the upper 2 miles and lower 1.5 miles have substantial numbers of quality pools.	Stream Survey Data. (Baseline Appendix Table2) Observations by the fisheries staff 1999
HABITAT ELEMENTS (continued)	Pool Frequency and Quality Salmon and Steelhead	Functioning at Unacceptable Risk	pool frequency is considerably lower than values desired for "functioning appropriately"; also cover/temperature is inadequate[4], and there has been a major reduction of pool volume by fine sediment	For the Surveyed streams the number of pools rarely meets the criteria for pool frequency, and the pools are generally shallower than expected given the size of the streams. The surveys found that Greenhorn Creek has been scoured to bedrock along much of its length. Only the upper 2 miles and lower 1.5 miles have substantial numbers of quality pools.	Stream Survey Data. (Baseline Appendix Table2) Observations by the fisheries staff 1998.
	Large Pools (in streams with > 3m in wetted width at baseflow)	Functioning at Risk	Reaches have few pools greater than 1 meter in depth.	Greenhorn Creek has relatively few pools grater than 3 feet deep. Even these pools appear to be shallower than one would expect in a stream of this size.	Stream Survey Data. (Baseline Appendix Table2) Observations by the fisheries staff 1998.
	Off-channel habitat	Functioning at Risk	Some high water velocity refugia such as ponds, oxbows, backwaters …	Greenhorn Creek is mostly in a confined valley and not conducive to the formation of off channel habitats.	Stream Survey Data. Observations by the fisheries staff 1993-2002
	Refugia (at 6th to 7th field watershed scale)	Functioning at Unacceptable Risk	adequate habitat refugia do not exist[12]	Some streams have small areas of fully functioning habitat but they small and disconnected and would not support large populations of fish.	Observations by the fisheries staff 1997-2002

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
CHANNEL CONDITION AND DYNAMICS	Width/Depth Ratio in riffles	Functioning at Unacceptable Risk	W/D ratios and channel types throughout much of the watershed are outside of historic ranges and/or site potentials.	Most of upper Greenhorn Creek has been scoured to bedrock and is best characterized as thin sheet of water flowing over a bedrock. Lower portion of Greenhorn Creek is deposit zone for the material from Upper Greenhorn Creek. Measurements taken in this zone indicated that channel was a Rosgen F type channel in an area with the potential for a Rosgen B type channel.	Observations from surveys for the Upper Greenhorn timber sale 1998.
	Streambank Condition	Functioning At Risk	50 – 80% of any stream reach has greater than 90% stability.	Upper Greenhorn Creek has an extremely stable bedrock channel, while the lower 1.5 miles is the opposite as the stream flows through unstable alluvial deposits.	Field Observations by aquatics professionals 1999.
	Streambank Condition	Functioning At Risk	80-90% stable	Upper Greenhorn Creek has an extremely stable bedrock channel, while the lower 1.5 miles is the opposite as the stream flows through unstable alluvial deposits.	Field Observations by aquatics professionals 1999.
	Floodplain Connectivity	Functioning at unacceptable Risk	Severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly	Substantial downcutting of stream channels occurred in the lower 1.5 miles during the 1995-1996 floods, which removed some streams from their flood plains. The aforementioned conditions are deemed substantial enough to rate these indicators as Functioning at Unacceptable Risk.	Field Observations by aquatics professional 1999 to present.
FLOW / HYDROLOGY	Change in Peak/Base Flows	Functioning Appropriately	Watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size, geology and geography	This indicator is on the borderline between Functioning Appropriately and Functioning at Risk. The values for ARP, WAR and drainage extension would predict little change in peak flows. The is much evidence of elevated peak flows. The Upper channel is scoured to bedrock and the lower mile and ½ is cutting through deposited material. The observed evidence of peak flow damage is likely to have largely occurred just after the 1918 fire and the watershed is slowly recovering. Further regeneration harvest will likely slow the recovery and place the watershed in a Functioning At Risk condition.	Lower Cispus East WA p 6-20 Professional Judgment. Baseline Appendix Table 3
	Drainage Network Increase	Functioning at Risk	Low to moderate increase in active channel length correlated with human caused disturbance.	On the whole we model a 4.4% increase in the drainage network based on an estimated 200 ft increase in stream length for each stream crossing. Previous investigations found that 200 feet was a rough average distance between the last ditch relief pipe and a stream crossing. The brake between At Risk and Functioning Appropriately would be at about 2.2 % (50 feet either side of a crossing) this rating is based on information presented by Mike Furniss (Watershed Restoration Conference 2001).	GIS analysis of Stream Crossing and earlier data on the average distance between ditch relief pipes and stream crossings. Baseline Appendix Table 4
WATERSHED CONDITIONS	Road Density and Location	Functioning at Risk	1 - 2.4 mi/mi² [13]; some valley bottom roads	The average road density is 2.41miles/square mile and road density in the riparian reserves associated with streams is 1.15 miles/ square mile. The overall road density is high, but there are few segments of valley bottom roads and density stream crossings is relatively low at 0.9 stream crossings per mile of stream.	Analysis of GIS data. Baseline Appendix Table 4

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
WATERSHED CONDITIONS (continued)	Disturbance Regime	Functioning at Unacceptable Risk	Frequent flood or drought producing highly variable flows …. Channel is simplified … little hydrologic complexity … Natural processes are unstable.	A review of the USGS stream gauge data at the Cispus Near Randle (14232500) there have been seven ten year plus floods in since 1970. Although it is not possible to conclude that this represents an elevated frequency of flooding, it does show that relatively large number of substantial floods have occurred in the last 32 years. The floods in 1995 and 1996 certainly dramatically modified the habitat in Greenhorn Creek. The 1980 eruption of Mt St Helens dumped tons of ash into the streams.	USGS stream flow gauge data (# 14232500). Field Observations since 1974
	Disturbance History	Functioning at Unacceptable Risk	>15% ECA (< 85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed and some disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≤15% LSOG in watershed	As a whole the Forest Service lands 6th field watershed are near the 76% for Aggregate Recovered Percentage (ARP). Road density is more moderate at 2.4 miles per square mile with much lower densities in the riparian reserves 0.91 miles per square mile.	ARP values from the Lower Cispus East and Lower Cispus West watershed Analyses. Current ARP Estimated from the percent of the potentially forested stand ≥ 8" in diameter at breast height (DBH). Baseline table Appendix 3
	Riparian Reserves	Functioning at Risk	Moderate loss of connectivity or function (shade, LWD, etc.) …	Approximately 17% of the stream-side riparian on the forest on in the early seral classes. The fires in the early 1900s removed many of the large trees and the large tree class now makes up only 18% of the riparian area. This is well below the reference condition.	GIS analysis of seral classes in the riparian reserves. Baseline Appendix Table 5 Field observations 1999. Baseline Appendix Table 5
SUBPOPULA-TION CHARACTER-ISTICS	Subpopulation Size	No Rating		No rating for all of these indicators. The Forest Service has insufficient data in order to rate these indicators.	
	Growth and Survival	No Rating			
	Life History Diversity and Isolation	No Rating			
	Persistence and Genetic Integrity	No Rating			
SPECIES and HABITAT	Integration of Species and Habitat Conditions	No Rating			

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Appendix IX – Baseline Rating Table Iron Creek

Watershed area evaluated

- The Iron Creek sub-watershed is a 6th field sub-watershed, Hydrologic Unit Code 170800040505. The watershed is located in the Gifford Pinchot National Forest of southwest Washington. The watershed is defined as the 36 square mile drainage including Iron Creek and all of its tributary streams.
- Table 1 contains a list of sub-watersheds in the Iron Creek sub-watershed *before* and *after* the re-delineation in December 2000.

TABLE 1. Crosswalk list of past and present watershed names and numbers contained in the sub-watershed.

Watershed Name	Watershed # as of December 2000	Watershed # Prior to December 2000	Stream
Iron Creek	170800040505	1708000404F	Benham Creek
		1708000404F	Iron Creek
		1708000404G	Big Creek
		1708000404H	Wakepish Creek
		1708000404I	Iron Creek
		1708000404J	Ferrous Creek

Fish habitat evaluated

The Lower Cispus River watershed contains approximately 10.8 miles of Proposed, Endangered, Threatened and Sensitive (PETS) fish species. The streams containing the number of miles of PETS habitat for each stream are listed in Table 2.

TABLE 2. Summary of Threatened, Proposed and candidate fish habitat in the sub-watershed. See Map 1.

6th Field Watershed Number	Stream	Common Name	Habitat Length (Mi)
170800040505	Iron Creek	Coho Salmon	3.3
		Resident Coastal Cutthroat	8.6
		Sea-Run Cutthroat Trout	3.3
		Steelhead	3.3
	Benham Creek	Resident Coastal Cutthroat	0.3
	Ferrous Creek	Resident Coastal Cutthroat	0.3
	Wakepish Creek	Resident Coastal Cutthroat	1.6

Fish species evaluated

- All of the species listed below currently occur in the Iron Creek sub-watershed.
- coho salmon (*Oncorhynchus kisutch*) Threatened
- steelhead (*Oncorhynchus mykiss*) Threatened
- coastal cutthroat trout (*Oncorhynchus clarki clarki)* Sensitive

*****The US Fish and Wildlife Service listed coastal cutthroat as a proposed species and they were removed the Regional Forester's sensitive species list in 2000 because of it elevated status. Since then the USFWS decided not list this species and removed it from the list of proposed species. We now consider this species status to have reverted to a sensitive species.

TABLE 3. Temperature monitoring in the sub-watershed.

Stream Name	Location	Years Monitored	Days >16 ºC	Years >16 ºC	Max 7-day
Iron Creek	Above Wakepish	1999	0	0	11.8
Wakepish Creek	Near confluence with Iron Cr.	1999	0	0	8.7

Iron Creek	Above confluence with Big Cr.	1999, 2001	0	0	13.2
Big Creek	Near confluence with Iron Cr.	1999, 2001	0	0	13.5
Ferrous Creek	Near Iron Creek confluence	1995, 1999	0	0	13.1
Iron Creek	Below Ferrous Cr.	1999	0	0	10.5
Iron Creek	@ 7708067 slide	2001	0	0	14.2
Iron Creek	Above Fourmile cr.	1999	0	0	12.8
Fourmile Creek	@ 2510 rd	2001	0	0	10.1
Fourmile Creek	Nr Iron Confl	1999	0	0	11.9
Iron Creek	Above Benham Creek	2001	0	0	15.1
Benham Creek	Near confluence with Iron Cr.	1999, 2001	0	0	12.6
Iron Creek	@ 2510 Rd Jct	2001	4	1	16
Iron Creek	Near confluence with Cispus R.	1996, 1999-2002	92	5	17.6

Table 4. List of Level II Stream Surveys

Sub-Watershed #	Stream name	Level II Stream [1]SurveyYears
170800040505	Wakepish Creek	1987
	Hemlock Creek	1987
	Big Creek	1987
	Iron Creek	1993

[1] Stream surveys prior to 1991 did not conform to regional guidelines for stream surveys. Guidelines for fish surveys did not exist prior to 1991.

TABLE 5. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the Iron Creek sub-watershed.

		Environmental Baseline Rating[1]		
Pathway	**Indicator(s)**	**Properly Functioning**	**Functioning at Risk**	**Functioning at Unacceptable Risk**
WATER QUALITY	Temperature Bull Trout			X
	Temperature Other Species		X	
	Sediment		X	
	Chemical Contaminants/Nutrients	X		
HABITAT ACCESS	Physical barriers			X
HABITAT ELEMENTS	Substrate in rearing areas		X	
	Large Woody Debris			X
	Pool Frequency and Quality FWS		X	
	Pool Frequency and Quality NMFS		X	
	Large pools		X	
	Off-channel habitat		X	
	Refugia			X
CHANNEL DYNAMICS and CONDITION	Width / Depth Ratio			X
	Streambank condition USFWS		X	
	Streambank condition NMFS		X	
	Floodplain connectivity			X
FLOW / HYDROLOGY	Peak/base flows		X	
	Drainage network		X	
WATERSHED CONDITIONS	Road density and location			X
	Disturbance regime			X
	Disturbance history			X
	Riparian reserves			X

SUBPOPULATION CHARACTERISTICS / SPECIES AND HABITAT	Subpopulation size, Growth and survival, Life history Diversity and isolation, Persistence and genetic integrity, Integration of species and habitat conditions	No Rating. (The Forest Service has insufficient data in order to rate these indicators).

Basis of evaluations

- The "Matrix of Diagnostics / Pathways and Indicators", provided by the US Fish and Wildlife Service, was used to rate 19 fish habitat indicators. Several sources of information were used to determine the ratings[1]:
- Lower Cispus East and Lower Cispus West watershed analyses, Gifford Pinchot National Forest, Randle Ranger Districts.
- Stream Surveys by the Gifford Pinchot National Forest from 1987 through 1993, listed in Table 4.
- Stream temperature monitoring from 1995 through 2001, listed in Table 3.
- Field observations from 1990 through 2002 by employees of the Gifford Pinchot National Forest. These employees included a number of Hydrologists and Fisheries Biologists employed by the Forest Service during that time period.

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[1] The sources of information were reviewed by Ken Meyer (Fisheries Biologist), Terry Lawson (Biological Technician), and Steve Markman (Hydrologist) of the Cowlitz Valley Ranger District.

Table 6. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the sub-watershed.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Bull Trout Temperature Functioning at Unacceptable Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] incubation <1□C or >6□C rearing >15 □C spawning <4 □C or > 10□C also temperatures in areas used by adults during migration regularly exceed 15□C (thermal barriers present)	The lower reach of Iron Creek regularly exceeds 16ºC during the summer rearing period. We have no data for the spawning or incubation periods.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Cutthroat, Stealhead, Chinook, and Coho. Functioning At Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] rearing: 14 - 18□C spawning: 14 - 16□C	The lower reach of Iron Creek regularly exceeds 16ºC during the summer rearing period. We have no data for the spawning or incubation periods. Therefore I chose the Functioning At Risk Rating.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Sediment (in spawning areas)	Functioning at Risk	12-17% fines (<0.85mm) in gravel[4];	We have no data that directly addresses the condition of spawning gravels. The Lower Cispus West watershed analysis, however, indicates that there is an influx of sediments from roads on, upper portion of Iron Creek. Field observations in the upper portion of the watershed confirmed these ratings.	Lower Cispus West WA p 6-18 to 6-25 Observations along, Iron Creek.
	Chemical Contamination / Nutrients	Functioning Appropriately	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches	We have no data with which to address this indicator. There are no homes, ranches, mills, or mines in this watershed, therefore it highly unlikely that there is any chemical contamination or nutrient enrichment in this sub-watershed.	Lower Cispus West WA p 6-5 6-28
HABITAT ACCESS	Physical barriers	Functioning at Unacceptable Risk	one or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows for at least one life history stage	There are several culverts that are likely preventing the free movement of all species and age class up and down the stream. See map	2001 culvert survey (See Map 1, Baseline Appendix Table 1)

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
HABITAT ELEMENTS	Substrate character and embedded-ness (in rearing areas)	Functioning at Risk	gravel and cobble are subdominant, or if dominant, reach embeddedness 20-30%[9,10]	The rationale for this indicator is the same as that used for spawning gravel condition. The Lower Cispus West watershed analysis, however, indicates that there is an influx of sediments from roads on, upper portion of Iron Creek. Field observations in the upper portion of the watershed confirmed these ratings.	Lower Cispus West WA p 6-18 to 6-25 Observations in Iron Creek between 1997 and 2002.
	Large Woody Debris (LWD)	Functioning at Unacceptable Risk	Current levels are being maintained at minimum levels desired for "Func. Appr." but potential sources are lacking to maintain these minimum values.	The stream survey data shows very little woody in any of the surveyed streams.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Pool Frequency and Quality Bull Trout and Cutthroat	Functioning at Risk	pool frequency is similar to values in "functioning appropriately", but pools have inadequate cover/temperature[4], and/or there has been a moderate reduction of pool volume by fine sediment	The pool frequency in Iron Creek is similar the to criteria for functioning appropriately in the most of the reaches. The pool frequency in the tributary streams, however, are lower than the criteria for functioning appropriately. Over all the pool lack depth, cover and temperatures are elevated.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
HABITAT ELEMENTS (continued)	Pool Frequency and Quality Salmon and Steelhead	Functioning at Risk	pool frequency is similar to values in "functioning appropriately", but pools have inadequate cover/temperature[4], and/or there has been a moderate reduction of pool volume by fine sediment	The pool frequency in Iron Creek is similar the to criteria for functioning appropriately in the most of the reaches. The pool frequency in the tributary streams, however, is lower than the criteria for functioning appropriately. Over all the pools lack depth, cover and temperatures are elevated.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Large Pools (in streams with > 3m in wetted width at baseflow)	Functioning at Risk	Reaches have few pools greater than 1 meter in depth.	Only Iron Creek has substantial numbers of pools greater than 3> feet deep.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Off-channel habitat	Functioning at Risk	Some high water velocity refugia such as ponds, oxbows, backwaters …	Iron Creek is not conducive to the formation of off channel habitats.	Stream Survey Data. Observations by the fisheries staff 1993-2002
	Refugia (at 6th to 7th field watershed scale)	Functioning at Unacceptable Risk	adequate habitat refugia do not exist[12]	Some streams have small areas of fully functioning habitat but they are small and disconnected and would not support large populations of fish.	Observations by the fisheries staff 1997-2002

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
CHANNEL CONDITION AND DYNAMICS	Width/Depth Ratio in riffles	Functioning at Unacceptable Risk	W/D ratios and channel types throughout much of the watershed are outside of historic ranges and/or site potentials.	We have very few if any measurements of bankfull width to depth ratios. The watershed analysis reports poor width to depth ratios in Iron Creek and subsurface flows in Wakepish Creek.	Lower Cispus West WA p 6-5 6-28 (Baseline Appendix Table 2)
	Streambank Condition	Function At Risk	50 – 80% of any stream reach has greater than 90% stability.	We do not have direct measurements of streambank stability. Numerous streambanks experienced a high degree of erosion during the 95-96 floods. Many of these are still unstable because of a lack of root strength (eg. Lower portions of, Iron Creek). Some places (lower Iron Creek) have been strengthened by human made structures.	Field Observations by aquatics professionals 1996-to present.
	Streambank Condition	Function At Risk	80-90% stable	We do not have direct measurements of streambank stability. Numerous streambanks experienced a high degree of erosion during the 95-96 floods. Many of these are still unstable because of a lack of root strength (eg. Lower portions of, Iron Creek). Some places (lower Iron Creek) have been strengthened by human made structures.	Field Observations by aquatics professionals 1996-to present.
	Floodplain Connectivity	Functioning at unacceptable Risk	Severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly	Substantial down downcutting of stream channels occurred during the 1995-1996 floods, which removed lower Iron Creek from its flood plain. The same floods remove the riparian vegetation from the banks in this area.	Field Observations by aquatics professional 1996 to present.
FLOW / HYDROLOGY	Change in Peak/Base Flows	Functioning at Risk	Some evidence of altered peak flow, baseflow and /or flow timing relative to an undisturbed watershed of similar size, geology, and geography.	The watershed condition summaries in the Lower Cispus West watershed analysis rated three of the old sixth field watersheds as poor, and two of the old sixth field watersheds as fair. These ratings were based Aggregated Recovered Percentage (ARP) and Water Available for Runoff (WAR) Models and drainage network extension. Given this spilt it is likely that the timing and magnitude of peakflow have been altered.	Lower Cispus West WA p 6-4 Professional Judgment. (Baseline Appendix Table 3)
	Drainage Network Increase	Functioning at Risk	Low to moderate increase in active channel length correlated with human caused disturbance.	On the whole we model a 7.2% increase in the drainage network based on an estimated 200 ft increase in stream length for each stream crossing. Previous investigations found that 200 feet was a rough average distance between the last ditch relief pipe and a stream crossing. The brake between At Risk and Functioning Appropriately would be at about 3.6 % (50 feet either side of a crossing) this rating is based on information presented by Mike Furniss (Watershed Restoration Conference 2001).	GIS analysis of Stream Crossing and earlier data on the average distance between ditch relief pipes and stream crossings. (Baseline Appendix Table 4)

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
WATERSHED CONDITIONS	Road Density and Location	Functioning at Unacceptable Risk	>2.4 mi/mi² some to many valley bottom roads	The average road density is 3.12 miles/square mile and road density in the riparian reserves associated with streams is 2.36 miles/square mile. Although several roads have been decommissioned in the last 5 years the resulting road densities are still relatively high. In addition, there are about 1.9 stream crossings per mile of stream. Many of these are sources of fine sediment during winter storms. Most of these alter the transport of sediment during floods. Most of the culverts do not drain the floodplain, thus the back up water sediment and accelerate flows downstream increasing stream energy.	Analysis of GIS data. (Baseline Appendix Table 4)
WATERSHED CONDITIONS (continued)	Disturbance Regime	Functioning at Unacceptable Risk	Frequent flood or drought producing highly variable flows …. Channel is simplified … little hydrologic complexity … Natural processes are unstable.	A review of the USGS stream gauge data at the Cispus Near Randle (14232500) there have been seven ten year plus floods in since 1970. Although it is not possible to conclude that this represents an elevated frequency of flooding, it does show that relatively large number of substantial floods have occurred in the last 32 years. The floods in 1995 and 1996 certainly dramatically modified the habitat in Iron Creek.	USGS stream flow gauge data (# 14232500). Field Observations since 1974
	Disturbance History	Functioning at Unacceptable Risk	>15% ECA (< 85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed and some disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≤15% LSOG in watershed	As a whole the Forest Service lands 5th field watershed are near the 63% for Aggregate Recovered Percentage (ARP) (see table). When combined with the relatively high road density in riparian reserves the rating is “Functioning at Unacceptable Risk”.	ARP values from the Lower Cispus West watershed Analyses. Current ARP Estimated from the percent of the potentially forested stand ≥ 8” in diameter at breast height (DBH). (Baseline Appendix Table 3, and 4)
	Riparian Reserves	Functioning at Unacceptable Risk	riparian reserve system is fragmented, poorly connected, or provides inadequate protection of habitats for sensitive aquatic species	Approximately 29% of the stream-side riparian on the forest on in the early seral classes. Large trees make up only 38% of the riparian community. The combination of a large amount the riparian area in the grass/pole stage and low amount in the large tree stage lead to the conclusion that the riparian is substantially fragmented. The lack of woody debris and higher stream temperatures also support this conclusion.	GIS analysis of seral classes in the riparian reserves. Aerial photo review along the Cispus River 1999 flight. Field observations 1997 to present. (Baseline Appendix Table 5)
SUBPOPULA-TION CHARACTER-ISTICS	Subpopulation Size	No Rating		No rating for all of these indicators. The Forest Service has insufficient data in order to rate these indicators.	
	Growth and Survival	No Rating			
	Life History Diversity and Isolation	No Rating			

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Persistence and Genetic Integrity	No Rating			
SPECIES and HABITAT	Integration of Species and Habitat Conditions	No Rating			

Appendix X-Baseline Ratings Table Woods Creek

Watershed area evaluated

- The Woods Creek sub-watershed is a 6th field sub-watershed, Hydrologic Unit Code 170800040506. The watershed is located in the Gifford Pinchot National Forest of southwest Washington. The watershed is defined as the 12.5 square mile drainage area including Woods Creek and its tributary streams.
- Table 1 contains a list of sub-watersheds in the Cispus River watershed *before* and *afte*r the re-delineation in December 2000.

TABLE 1. Crosswalk list of past and present watershed names and numbers contained in the sub-watershed.

Watershed Name	Watershed # as of December 2000	Watershed # Prior to December 2000	Stream
Woods Creek	170800040506	1708000404E	Ames Creek
		1708000404E	Woods Creek
		1708000404E	Woods Creek Trib 11
		1708000404E	Woods Creek Trib 8

Fish habitat evaluated

The Lower Cispus River watershed contains approximately 9.8 miles of Proposed, Endangered, Threatened and Sensitive (PETS) fish species. The streams containing the number of miles of PETS habitat for each stream are listed in Table 2.

TABLE 2. Summary of Threatened, Proposed and candidate fish habitat in the sub-watershed. See Map 1.

6th Field Watershed Number	Stream	Common Name	Habitat Length (Mi)
170800040506	Woods Creek	Coho Salmon	4.5
		Resident Coastal Cutthroat	5.5
		Sea-Run Cutthroat Trout	4.5
		Steelhead	3.6
	Ames Creek	Coho Salmon	1.9
		Resident Coastal Cutthroat	2.2
		Sea-Run Cutthroat Trout	2.2
	Woods Creek Trib 8	Coho Salmon	0.4
		Resident Coastal Cutthroat	1.5
		Sea-Run Cutthroat Trout	0.4
	Woods Creek Trib 11	Resident Coastal Cutthroat	0.6

Fish species evaluated

- All of the species listed below currently occur in the Lower Cispus River watershed and are on the Proposed, Endagered, Threatened, or Sensitive (PETS) species list .
- chinook salmon (*Oncorhynchus tshawytscha*) Threatened
- coho salmon (*Oncorhynchus kisutch*) Sensitive
- steelhead (*Oncorhynchus mykiss*) Threatened
- coastal cutthroat trout (*Oncorhynchus clarki clarki)* Sensitive

*****The US Fish and Wildlife Service listed coastal cutthroat as a proposed species and they were removed the Regional Forester's sensitive species list in 2000 because of it elevated status. Since then the USFWS decided not list this species and removed it from the list of proposed species. We now consider this species status to have reverted to a sensitive species.

TABLE 3. Temperature monitoring in the sub- watershed.

Stream Name	Location	Years Monitored	Days > 16 °C	Years > 16 °C	Max 7-day
Woods Creek	Near Forest Boundary	1995, 1997, 1999	0	0	15

Table 4. List of Level II Stream Surveys

Sub-Watershed #	Stream name	Level II Stream[1] SurveyYears
170800040506	Ames Creek	1991, 1999
	Woods Creek	1991,1999

[1] Stream surveys prior to 1991 did not conform to regional guidelines for stream surveys. Guidelines for fish surveys did not exist prior to 1991.

TABLE 5. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the Woods Creek sub-watershed.

		Environmental Baseline Rating[1]		
Pathway	**Indicator(s)**	**Properly Functioning**	**Functioning at Risk**	**Functioning at Unacceptable Risk**
	Temperature Bull trout			X
WATER QUALITY	Temperature Other Species		X	
	Sediment		X	
	Chemical Contaminants/Nutrients	X		
HABITAT ACCESS	Physical barriers		X	
HABITAT ELEMENTS	Substrate in rearing areas		X	
	Large Woody Debris			X
	Pool Frequency and Quality FWS		X	
	Pool Frequency and Quality NMFS		X	
	Large pools		X	
	Off-channel habitat	X		
	Refugia			X
CHANNEL DYNAMICS and CONDITION	Width / Depth Ratio		X	
	Streambank condition USFWS			X
	Streambank condition NMFS			X
	Floodplain connectivity		X	
FLOW / HYDROLOGY	Peak/base flows			X
	Drainage network		X	
WATERSHED CONDITIONS	Road density and location			X
	Disturbance regime			X
	Disturbance history			X
	Riparian reserves			X
SUBPOPULATION CHARACTERISTICS / SPECIES AND HABITAT	Subpopulation size, Growth and survival, Life history Diversity and isolation, Persistence and genetic integrity, Integration of species and habitat conditions	No Rating. (The Forest Service has insufficient data in order to rate these indicators).		

Basis of evaluations

- The "Matrix of Diagnostics / Pathways and Indicators", provided by the US Fish and Wildlife Service, was used to rate 19 fish habitat indicators. Several sources of information were used to determine the ratings[1]:
- Lower Cispus East and Lower Cispus West watershed analyses, Gifford Pinchot National Forest, Randle Ranger Districts.
- Stream Surveys by the Gifford Pinchot National Forest from 1999 listed in Table 3.
- Stream temperature monitoring from 1995, 1997, and 1999, listed in Table 3.

- Field observations from 1990 through 2002 by employees of the Gifford Pinchot National Forest. These employees included a number of Hydrologists and Fisheries Biologists employed by the Forest Service during that time period.

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[1] The sources of information were reviewed by Ken Meyer (Fisheries Biologist), Terry Lawson (Biological Technician), and Steve Markman (Hydrologist) of the Cowlitz Valley Ranger District.

Table 6. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the sub-watershed.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Bull Trout Temperature Functioning at Unacceptable Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] incubation <2□C or 6□C rearing <4□C or 13 - 15 □C spawning <4 □C or 10□C also temperatures in areas used by adults during migration sometimes exceeds 15□C	The highest 7 day average max for Woods Creek is 15 □C. We have no data for the spawning season.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Cutthroat, Stealhead, Chinook, and Coho. Functioning At Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] rearing: 14 - 18□C spawning: 14 - 16□C	The highest 7 day average max for Woods Creek is 15 □C. We have no data for the spawning season.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Sediment (in spawning areas)	Functioning at Risk	12-17% fines (<0.85mm) in gravel[4];	We have no measurement of fines in the spawning area. Observations taken during the 1999 surveys found that the amount fine material in the streambed is naturally very high, because the low gradient nature of Woods Creek.	Lower Cispus West WA p 6-15
	Chemical Contamination / Nutrients	Functioning Appropriately	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches	The watershed indicated no concerns in this sub-watershed. There are no residences, ranches, towns, mills, or factories in the sub-watershed.	Lower Cispus West WA p 6-5 6-28
HABITAT ACCESS	Physical barriers	Functioning at Risk	one or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at base/low flows for at least one life history stage	There are several culverts that may prevent the free movement of all species and age class up and down the stream. Coho salmon, however, were observed above most of these potential barriers and cutthroat trout were observed above all of the potential barriers. In addition, a small dam installed to create a pond on woods approximately .20 mile upstream from the 2500057 crossing is currently providing little opportunity for fish passage. Under certain conditions this may block access to a mile of low quality anadromous habitat.	2001 culvert survey. See Map 1. Baseline Appendix Table 1

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Substrate character and embedded-ness (in rearing areas)	Functioning at Risk	gravel and cobble are subdominant, or if dominant, reach embeddedness 20-30%[9,10]	The rationale for this indicator is the same as that used for spawning gravel condition.	Lower Cispus West WA p 6-5 6-28 Observations on Woods Creek, and Ames Creek between 1997 and 2002.
HABITAT ELEMENTS	Large Woody Debris (LWD)	Functioning at Unacceptable Risk	Current levels are being maintained at minimum levels desired for "Func. Appr." but potential sources are lacking to maintain these minimum values.	The stream surveys rarely show woody debris approaching 80 pieces per mile. Most of the woody debris does not meet the criteria for large wood.	Stream Survey Data. Baseline Appendix Table 2 Observations by the fisheries staff 1993-2002
	Pool Frequency and Quality Bull Trout and Cutthroat	Functioning at Risk	Current levels are not at those desired values for "functioning appropriately",	Most of the reaches meet the criteria for the number of pools, however, the pools are often shallow.	Stream Survey Data. Baseline Appendix Table 2 Observations by the fisheries staff 1993-2002
	Pool Frequency and Quality Salmon and Steelhead	Functioning at Risk	pool frequency is considerably lower than values desired for "functioning appropriately"; also cover/temperature is inadequate[4], and there has been a major reduction of pool volume by fine sediment	Most of the reaches meet the criteria for the number of pools, however, the pools are often shallow.	Stream Survey Data. Baseline Appendix Table 2 Observations by the fisheries staff 1993-2002
HABITAT ELEMENTS (continued)	Large Pools (in streams with > 3m in wetted width at baseflow)	Functioning at Risk	Reaches have few pools greater than 1 meter in depth.	There are several beaver dams in the sub-watershed that create pools that are over 3 feet deep. The rest of the pools are generally shallower than 3 feet deep.	Stream Survey Data. Baseline Appendix Table 2 Observations by the fisheries staff 1993-2002
	Off-channel habitat	Functioning Appropriately	watershed has many functional high water velocity refugia such as ponds, oxbows, backwaters, and other off-channel areas with cover; and side-channels are complex, low energy areas[4]	Woods Creek and Ames Creek contain many beaver ponds, which provide good refuge from high flows.	Stream Survey Data. Observations by the fisheries staff 1993-2002
	Refugia (at 6th to 7th field watershed scale)	Functioning at Unacceptable Risk	adequate habitat refugia do not exist[12]	Some areas are fully functioning habitat but they are small and disconnected and would not support large populations of fish.	Observations by the fisheries staff 1997-2002

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
CHANNEL CONDITION AND DYNAMICS	Width/Depth Ratio in riffles	Functioning at Risk	W/D ratios and/or channel types in portions of watershed are outside historic ranges and/or site potentials.	The bankfull width to depth ratios meet the expected values based on Rosgen channel types. The observed types in some reaches mav have changed since the beginning of forest managent in the watershed and observe width to depth ratios are greater than expected in potential channel types for the modified stream reaches. In addition, the lowest reach of Ames Creek flows sub-surface during the summer.	Lower Cispus West WA p 6-4 and 6-15 Baseline Appendix Table 2 Observation of the 1999 stream survey by Ken Meyer.
	Streambank Condition USFWS	Functioning Appropriately	50 - 80% of any stream reach has ≥90% stability[5]	Woods and Ames creek have very few eroding banks, however, where erosion is occurring it is severe. The mass wasting noted in the tributary streams.	1999 stream survey report.
	Streambank Condition NMFS	Functioning Appropriately	80-90% stable	Woods and Ames creek have very few eroding banks, however, where erosion is occurring it is severe. The mass wasting noted in the tributary streams.	1999 stream survey report.
	Floodplain Connectivity	Functioning At Risk	reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation/succession	Woods and Ames creeks are generally well connected to the floodplain; the 2500 closely parallels Woods Creek for a quarter of its length and tributary 8 is deeply down cut in the meadow near the Watch-able Wildlife trail.	Field Observations by aquatics professional 1996 to present.
FLOW / HYDROLOGY	Change in Peak/Base Flows	Functioning at Unacceptable Risk	pronounced changes in peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography	This watershed is mostly in the rain-on-snow zone and the ARP and WAR numbers are indicate moderate to high potential for alteration to peak flows. The Lower Cispus West Watershed Analysis Rated this sub-watershed as poor.	Lower Cispus West WA p 6-4, 6-15 (Baseline Appendix Table 3 Professional Judgment.
	Drainage Network Increase	Functioning at Risk	Low to moderate increase in active channel length correlated with human caused disturbance.	On the whole we modeled a 2.7% increase in the drainage network based on an estimated 200 ft increase in stream length for each stream crossing. Previous investigations found that 200 feet was a rough average distance between the last ditch relief pipe and a stream crossing. The brake between At Risk and Functioning Appropriately would be at about 3.5 % (50 feet either side of a crossing) this rating is based on information presented by Mike Furniss (Watershed Restoration Conference 2001).	GIS analysis of Stream Crossing and earlier data on the average distance between ditch relief pipes and stream crossings. Baseline Appendix Table 4
WATERSHED CONDITIONS	Road Density and Location	Functioning at Unacceptable Risk	>2.4 mi/mi² some to many valley bottom roads	The average road density is 3.9-miles/square mile and road density in the riparian reserves associated with streams is 3.7 miles/square mile.	Analysis of GIS data. Baseline Appendix Table 4

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
WATERSHED CONDITIONS (continued)	Disturbance Regime	Functioning at Unacceptable Risk	Frequent flood or drought producing highly variable flows …. Channel is simplified … little hydrologic complexity … Natural processes are unstable.	A review of the USGS stream gauge data at the Cispus Near Randle (14232500) there have been seven ten year plus floods in since 1970. Although it is not possible to conclude that this represents an elevated frequency of flooding, it does show that relatively large number of substantial floods have occurred in the last 32 years. The 1980 eruption of Mt St Helens dumped tons of ash into the streams in the Woods and Ames creeks	USGS stream flow gauge data (# 14232500). Field Observations since 1974
	Disturbance History	Functioning at Unacceptable Risk	>15% ECA (< 85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed and some disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≤15% LSOG in watershed	The Lower Cispus West Watershed reported the ARP as 74%. There have been some activities in the riparian reserves and unstable areas for example a road density 3.45 miles/square mile in the riparian reserves. The harvest and activities on the private lands primarily in Woods Creek, tip the balance toward the Functioning at Unacceptable Risk side of the scale. There are no large refugia remaining	ARP values Lower Cispus West watershed Analysis. Baseline Appendix Tables 3 and 4)
	Riparian Reserves	Functioning at Unacceptable Risk	riparian reserve system is fragmented, poorly connected, or provides inadequate protection of habitats for sensitive aquatic species	Approximately 34% of the stream-side riparian on the forest on in the early seral classes. Large trees make up only 29% of the riparian community. The combination of a large amount the riparian area in the grass/pole stage and low amount in the large tree stage lead to the conclusion that the riparian is substantially fragmented.	GIS analysis of seral classes in the riparian reserves. Field observations 1997 to present. Baseline Appendix Table 5
SUBPOPULA-TION CHARACTER-ISTICS	Subpopulation Size	No Rating		No rating for all of these indicators. The Forest Service has insufficient data in order to rate these indicators.	
	Growth and Survival	No Rating			
	Life History Diversity and Isolation	No Rating			
	Persistence and Genetic Integrity	No Rating			
SPECIES and HABITAT	Integration of Species and Habitat Conditions	No Rating			

Appendix XI – Baseline Ratings Table Quartz Creek

Watershed area evaluated

- The Quartz Creek sub-watershed is a 6th field sub-watershed, Hydrologic Unit Code 170800040507. The watershed is located in the Gifford Pinchot National Forest of southwest Washington. The watershed is defined as the square mile drainage area that encompasses Quartz Creek and its tributary streams.
- Table 1 contains a list of sub-watersheds in the Quartz Creek watershed *before* and *after* the re-delineation in December 2000.

TABLE 1. Crosswalk list of past and present watershed names and numbers contained in the sub-watershed.

Watershed Name	Watershed # as of December 2000	Watershed # Prior to December 2000	Stream
Quartz Creek	170800040508	1708000404B	Quartz Creek
		1708000404C	

Fish habitat evaluated

The Lower Cispus River watershed contains approximately 12.05 miles of Proposed, Endangered, Threatened and Sensitive (PETS) fish species. The streams containing the number of miles of PETS habitat for each stream are listed in Table 2.

TABLE 2. Summary of Threatened, Proposed and candidate fish habitat in the sub-watershed. See Map 1.

Watershed Number	Location	Common Name	Habitat Length (miles)
170800040507	Quartz Creek	Coho Salmon	2.8
170800040507	Quartz Creek	Resident Coastal Cutthroat	6.2
170800040507	Quartz Creek	Sea-Run Cutthroat Trout	2.8
170800040507	Quartz Creek	Steelhead	2.8
170800040507	Red Springs Creek	Resident Coastal Cutthroat	1.7

Fish species evaluated

All of the species listed below are listed as Threatened under the Endangered Species Act or on the Regional Forester Sensitive Species list.

- coho salmon (*Oncorhynchus kisutch*) Sensitive
- steelhead (*Oncorhynchus mykiss*) Threatened
- coastal cutthroat trout (*Oncorhynchus clarki clarki)* Sensitive *

*The US Fish and Wildlife Service listed coastal cutthroat as a proposed species and they were removed the Regional Forester's sensitive species list in 2000 because of it elevated status. Since then the USFWS decided not list this species and removed it from the list of proposed species. We now consider this species status to have reverted to a sensitive species.

Table 3. Temperature monitoring in the sub-watershed.

Stream Name	Location	Years Monitored	Days >16 °C	Years > 16 °C	Max 7-day
Quartz Creek	At road 2608 Crossing	1995	0	0	13.3
Quartz Creek	Near Forest Boundary	1999, 2001	3	1	15.9

Table 4. List of Level II Stream Surveys

Sub-Watershed #	Stream name	Level II Stream Survey Years
170800040507	Quartz Creek	1990

TABLE 5. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the Cispus River Camp Creek sub-watershed.

		Environmental Baseline Rating[1]		
Pathway	**Indicator(s)**	**Properly Functioning**	**Functioning at Risk**	**Functioning at Unacceptable Risk**
WATER QUALITY	Temperature Bull trout			X
	Temperature Other Species		X	
	Sediment			X
	Chemical Contaminants/Nutrients		X	
HABITAT ACCESS	Physical barriers	X		
HABITAT ELEMENTS	Substrate in rearing areas		X	
	Large Woody Debris			X
	Pool Frequency and Quality FWS			X
	Pool Frequency and Quality NMFS			X
	Large pools	X		
	Off-channel habitat		X	
	Refugia			X
CHANNEL DYNAMICS and CONDITION	Width / Depth Ratio			X
	Streambank condition USFWS			X
	Streambank condition NMFS		X	
	Floodplain connectivity	X		
FLOW / HYDROLOGY	Peak/base flows			X
	Drainage network		X	
WATERSHED CONDITIONS	Road density and location		X	
	Disturbance regime			X
	Disturbance history			X
	Riparian reserves		X	
SUBPOPULATION CHARACTERISTICS / SPECIES AND HABITAT	Subpopulation size, Growth and survival, Life history Diversity and isolation, Persistence and genetic integrity, Integration of species and habitat conditions	No Rating. (The Forest Service has insufficient data in order to rate these indicators).		

Basis of evaluations

- The "Matrix of Diagnostics / Pathways and Indicators", provided by the US Fish and Wildlife Service, was used to rate 19 fish habitat indicators. Several sources of information were used to determine the ratings[1]:
- Lower Cispus East, Gifford Pinchot National Forest, Randle Ranger District.
- Stream Surveys by the Gifford Pinchot National Forest from 1987 through 2000, listed in Table 3.
- Stream temperature monitoring from 1994 through 2000, listed in Table 3.
- Field observations from 1990 through 2002 by employees of the Gifford Pinchot National Forest. These employees included a number of Hydrologists and Fisheries Biologists employed by the Forest Service during that time period.

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[1] The sources of information were reviewed by Ken Meyer (Fisheries Biologist), Terry Lawson (Biological Technician), and Steve Markman (Hydrologist) of the Cowlitz Valley Ranger District.

Table 6. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the sub-watershed.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Bull Trout Temperature Functioning at Unacceptable Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] incubation <1°C or >6°C rearing >15 °C spawning <4 °C or > 10°C also temperatures in areas used by adults during migration regularly exceed 15°C (thermal barriers present)	The lowest part of Quartz Creek exceeded 15 ºC. We have no data with which to address spawning or incubation temperatures.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Cutthroat, Steelhead, Chinook, and Coho. Functioning At Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] rearing: 14 - 18°C spawning: 14 - 16°C	The lowest part of Quartz Creek exceeded 15 ºC. We have no data with which to address spawning or incubation temperatures.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Sediment (in spawning areas)	Functioning at Unacceptable Risk	>17% fines (<0.85mm) in gravel[4];	We have no data that directly addresses the condition of spawning gravels. The Lower Cispus West Watershed Analysis reports that the amount of fine sediment is elevated. The principle source is Mt St Helens blast-zone. When Mt St Helens erupted in 1980 it denuded close to 1/3 of the watershed. This area is slow recovering, but the floods of 1995 and 1996 set the recovery back. The WA also reports that Red Springs Creek is a source of fine sediments.	Lower Cispus West WA p 6-8 and 6-10
	Chemical Contamination / Nutrients	Functioning At Risk		We have no data with which to address this indicator. However, Red Springs Creek may be polluted with acid rock drainage. It has the typical color of stream with this problem. The Lower Cispus West reported no life in this stream, however, earlier surveys had reported both cutthroat and sculpin.	Lower Cispus West WAp6-8
HABITAT ACCESS	Physical barriers	Properly Functioning	human-made barriers present in watershed allow upstream and downstream fish passage at all flows for all life history stages	All of the culverts on Quartz Creek within fish habitat washed out in the 1995/1996 floods. Where needed they will be replaced with structures that allow for fish passage.	2001 culvert survey See Map 1and Baseline Appendix Table 1.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Substrate character and embedded-ness (in rearing areas)	Functioning at Risk	gravel and cobble are subdominant, or if dominant, reach embeddedness 20-30%[9,10]	The rationale for this indicator is the same as that used for spawning gravel condition.	Lower Cispus West WA p 6-8 and 6-10
HABITAT ELEMENTS	Large Woody Debris (LWD)	Functioning at Unacceptable Risk	current levels are being maintained at minimum levels desired for "functioning appropriately", but potential sources for long term woody debris recruitment are lacking to maintain these minimum values	Ten out the 16 reaches surveyed are well under the desired 80 pieces per mile. The other reaches indicate there is a lot of wood, however, this appears to be an artifact of short reaches, and the methods used count wood in logjams and definition of woody debris at the time of the survey. It is inconceivable that any reach would have nearly 3,000 pieces of wood per mile. The best explanation is that a large logjam was defined as a reach. This does not fit with current survey practices or methods of habitat evaluation.	Stream Survey Data. (Baseline Appendix Table 2)
	Pool Frequency and Quality Bull Trout and Cutthroat	Functioning at Unacceptable Risk	current levels are not at those desired values for "functioning appropriately",	Only 6 of the 16 reaches meet the criteria for Properly Functioning. One of those reaches was extremely short (360 feet) so the pool frequency was inflated.	Stream Survey Data. (Baseline Appendix Table 2)
HABITAT ELEMENTS (continued)	Pool Frequency and Quality Salmon and Steelhead	Functioning at Unacceptable Risk	pool frequency is considerably lower than values desired for "functioning appropriately"; also cover/temperature is inadequate[4], and there has been a major reduction of pool volume by fine sediment	Only 3 of the 16 reaches meet the criteria for Properly Functioning. One of those reaches was extremely short (360 feet) so the pool frequency was inflated.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Large Pools (in streams with > 3m in wetted width at base flow)	Properly Functioning	Reaches have few pools greater than 1 meter in depth.	A little over half of the existing pools would qualify as deep pools.	Stream Survey Data. (Baseline Appendix Table 2) Observations by the fisheries staff 1993-2002
	Off-channel habitat	Functioning at Risk	watershed has some functional high water velocity refugia such as ponds, oxbows, backwaters, and other off-channel areas with cover; but side-channels are generally high energy areas[4]	Quartz Creek in general is not conducive to the formation of off channel habitats. These habitat are rare in the lower end of watershed where the potential is high.	Stream Survey Data. Observations by the fisheries staff 1993-2002

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Refugia (at 6th to 7th field watershed scale)	Functioning at Unacceptable Risk	adequate habitat refugia do not exist[12]	Some streams have small areas of fully functioning habitat but they small and disconnected and would not support large populations of fish.	Observations by the fisheries staff 1997-2002 Stream survey data.
CHANNEL CONDITION AND DYNAMICS	Width/Depth Ratio in riffles	Functioning at Unacceptable Risk	W/D ratios and channel types throughout much of the watershed are outside of historic ranges and/or site potentials.	The 1990 stream survey measured width to depth ratios at pools. This data is not comparable to data used for the evaluation. The Lower Cispus West Watershed Analysis reports channel widening and poor width to depth ratios.	Lower Cispus West 6-7 through 6-10. (Baseline Appendix Table 2)
	Streambank Condition	Function At Unacceptable Risk	50 – 80% of any stream reach has greater than 90% stability.	We do not have direct measurements of streambank stability. The streambanks in the blast zone were denuded in 1980 and are slowly recovering. The banks in the lower watershed are relatively stable. There are several areas of mass wasting from the 26 road in the lower watershed.	Field Observations by aquatics professionals 1996-to present. 1990 stream survey map.
	Streambank Condition	Function At Risk	80-90% stable	We do not have direct measurements of streambank stability.	Field Observations by aquatics professionals 1996-to present.
	Floodplain Connectivity	Properly Functioning	off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	The channel is well connected to the floodplain. There are few roads or trails in the floodplain. Although the road density in the riparian reserve is moderately high, these roads are outside of the floodplain.	Field Observations by aquatics professional 1996 to present.
FLOW / HYDROLOGY	Change in Peak/Base Flows	Functioning at Unacceptable Risk	pronounced changes in peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography	The eruption of Mt St Helens in 1980 denuded close to 1/3 of the watershed. Timber harvest has added to increased risk for peak flows. The overall ARP and WAR for this watershed are 63 and 14 respectively.	Lower Cispus West WA p 6-8 and 6-11 Professional Judgment. (Baseline Appendix Table 3)
FLOW / HYDROLOGY	Drainage Network Increase	Functioning at Risk	Low to moderate increase in active channel length correlated with human caused disturbance.	We calculated the increase in the drainage network to be about 5.7%. Most of this increase comes from crossing of tributaries streams on the 26 road. Under ideal condition with the same road system the increase would be approximately 1.5%.	GIS analysis of Stream Crossing and earlier data on the average distance between ditch relief pipes and stream crossings. (Baseline Appendix Table 4)

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
WATERSHED CONDITIONS WATERSHED CONDITIONS (continued)	Road Density and Location	Functioning at Risk	1 - 2.4 mi/mi² [13]; some valley bottom roads	The average road density is 1.70-miles/square mile and road density in the riparian reserves associated with streams is miles/square mile. Although several roads have been 1.52 decommissioned in the last 5 years the resulting road densities are still moderately high. In addition, there are about 1.1 stream crossings per mile of stream. Many of these are sources of fine sediment during winter storms. This is especially true in the blast zone where the stability is still low flowing the eruption of Mt St Helens. Many roads even those outside of the blast zone are on unstable to marginally stable ground. The are several areas in the lower watershed with seated landslides. Most of these alter the transport of sediment during floods. Most of the culverts do not drain the floodplain, thus the back up water sediment and accelerate flows downstream increasing stream energy.	Analysis of GIS data. Lower Cispus West watershed Analysis p 6-8 (Baseline Appendix Table 4)
	Disturbance Regime	Functioning at Unacceptable Risk	Frequent flood or drought producing highly variable flows …. Channel is simplified … little hydrologic complexity … Natural processes are unstable.	The eruption of Mt St Helens in 1980 plus past timber harvest practices have left this watershed in state where is it vulnerable to rain on snow events. As a result the stream channel is fairly simple and lacking structure. This condition is likely to improve as the blast zone area slowly recovers and improvement are made to road system. Private land owners in the lower watershed are attempting to improve the structure of the stream by reintroducing woody debris.	USGS stream flow gauge data (# 14232500). Field Observations since 1974
	Disturbance History	Functioning at Unacceptable Risk	>15% ECA (< 85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed and some disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≤15% LSOG in watershed	As a whole the Forest Service lands 5th field watershed are near the 65% for Aggregate Recovered Percentage (ARP) (see table). The major problem is that the eruption of Mt St Helens denuded a large portion of the upper sub-watershed. There have been some activities in the riparian reserves and unstable areas. . There are no large function refugia remaining in the sub-watershed.	
	Riparian Reserves	Functioning at Unacceptable Risk	Moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian reserve system; or incomplete protection of habitats and refugia for sensitive aquatic species…	Approximately 28% of the stream-side riparian on the forest on in the early seral classes. Large trees make up only 43% of the riparian community. This watershed appears to be improving over historic conditions, however, the historic conditions were relatively poor. The eruption of Mt. St Helens in 1980 damage a large portion of the upper watershed. Harvest on private timber lands is also remove trees from riparian zones of intermittent streams.	GIS analysis of seral classes in the riparian reserves. Field observations 1997 to present. Baseline Appendix Table 5

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
SUBPOPULA-TION CHARACTER-ISTICS	Subpopulation Size	No Rating		No rating for all of these indicators. The Forest Service has insufficient data in order to rate these indicators.	
	Growth and Survival	No Rating			
	Life History Diversity and Isolation	No Rating			
	Persistence and Genetic Integrity	No Rating			
SPECIES and HABITAT	Integration of Species and Habitat Conditions	No Rating			

Appendix XII – Baseline Ratings Table Lower Cispus River Frontal

Watershed area evaluated

- The Lower Cispus River Frontal sub-watershed is a 6th field sub-watershed, Hydrologic Unit Code 170800040508. The watershed is located in the Gifford Pinchot National Forest of southwest Washington. The watershed is defined as the 23 square mile drainage area downstream from the confluence of the Cispus River and Greenhorn Creek and includes all of the small tributaries (including Crystal and Copper Canyon Creeks) to the Cispus River in that area.
- Table 1 contains a list of sub-watersheds in the Cispus River watershed *before* and *afte*r the re-delineation in December 2000.

TABLE 1. Crosswalk list of past and present watershed names and numbers contained in the sub-watershed.

Watershed Name	Watershed # as of December 2000	Watershed # Prior to December 2000	Stream
Lower Cispus River Frontal	170800040508	1708000404D	Crystal Creek
		1708000404M	Nash Creek
		1708000404X	Cispus River
		1708000404X	Falls Creek
		1708000404B	Cispus River
		1708000404A	Copper Canyon Creek

Fish habitat evaluated

The Lower Cispus River watershed contains approximately 13.5 miles of Proposed, Endangered, Threatened and Sensitive (PETS) fish species. The streams containing the number of miles of PETS habitat for each stream are listed in Table 2.

TABLE 2. Summary of Threatened, Proposed and candidate fish habitat in the sub-watershed. See Map 1.

6th Field Watershed Number	Stream	Common Name	Habitat Length (Mi)
170800040508	Cispus River	Chinook Salmon	12.3
		Coho Salmon	12.3
		Resident Coastal Cutthroat	12.3
		Sea-Run Cutthroat Trout	12.3
		Steelhead	12.3
	Crystal Creek	Coho Salmon	1.1
		Resident Coastal Cutthroat	0.1
		Steelhead	1.1

Fish species evaluated

- All of the species listed below currently occur in the Lower Cispus River watershed and are on the Proposed, Endagered, Threatened, or Sensitive (PETS) species list .
- chinook salmon (*Oncorhynchus tshawytscha*) Threatened
- coho salmon (*Oncorhynchus kisutch*) Sensitive
- steelhead (*Oncorhynchus mykiss*) Threatened
- coastal cutthroat trout (*Oncorhynchus clarki clarki)* Sensitive

*****The US Fish and Wildlife Service listed coastal cutthroat as a proposed species and they were removed the Regional Forester's sensitive species list in 2000 because of it elevated status. Since then the USFWS decided not list this species and removed it from the list of proposed species. We now consider this species status to have reverted to a sensitive species.

TABLE 3. Temperature monitoring in the sub-watershed.

Stream Name	Location	Years Monitored	Days > 16 ºC	Years > 16 ºC	Max 7-day
Cispus River	Just below confluence with Greenhorn Cr.	2000	6	1	15.8
Cispus River	Above Iron Creek	2000	19	1	17.1
Cispus River	Near Forest Boundary	1991-1992, 1996-2002	197	7	17.9
Crystal Creek	At Forest Boundary	1997	0	0	12.7

Table 4. List of Level II Stream Surveys

Sub-Watershed #	Stream name	Level II Stream Survey Years
170800040508	Crystal Creek	1994

TABLE 5. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the Lower Cispus River Frontal sub-watershed.

		Environmental Baseline Rating[1]		
Pathway	**Indicator(s)**	**Properly Functioning**	**Functioning at Risk**	**Functioning at Unacceptable Risk**
WATER QUALITY	Temperature Bull Trout			X
	Temperature Other Species		X	
	Sediment		X	
	Chemical Contaminants/Nutrients	X		
HABITAT ACCESS	Physical barriers			X
HABITAT ELEMENTS	Substrate in rearing areas		X	
	Large Woody Debris			X
	Pool Frequency and Quality FWS			X
	Pool Frequency and Quality NMFS			X
	Large pools		X	
	Off-channel habitat		X	
	Refugia			X
CHANNEL DYNAMICS and CONDITION	Width / Depth Ratio			X
	Streambank condition USFWS		X	
	Streambank condition NMFS		X	
	Floodplain connectivity			X
FLOW / HYDROLOGY	Peak/base flows		X	
	Drainage network		X	
WATERSHED CONDITIONS	Road density and location			X
	Disturbance regime			X
	Disturbance history			X
	Riparian reserves			X
SUBPOPULATION CHARACTERISTICS / SPECIES AND HABITAT	Subpopulation size, Growth and survival, Life history Diversity and isolation, Persistence and genetic integrity, Integration of species and habitat conditions	No Rating. (The Forest Service has insufficient data in order to rate these indicators).		

Basis of evaluations

- The "Matrix of Diagnostics / Pathways and Indicators", provided by the US Fish and Wildlife Service, was used to rate 19 fish habitat indicators. Several sources of information were used to determine the ratings[1]:
- Lower Cispus East and Lower Cispus West watershed analyses, Gifford Pinchot National Forest, Randle Ranger Districts.
- Stream Surveys by the Gifford Pinchot National Forest from 1987 through 2000, listed in Table 3.
- Stream temperature monitoring from 1994 through 2000, listed in Table 3.

- Field observations from 1990 through 2002 by employees of the Gifford Pinchot National Forest. These employees included a number of Hydrologists and Fisheries Biologists employed by the Forest Service during that time period.

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[1] The sources of information were reviewed by Ken Meyer (Fisheries Biologist), Terry Lawson (Biological Technician), and Steve Markman (Hydrologist) of the Cowlitz Valley Ranger District.

Table 6. Checklist for documenting anadromous fish habitat environmental baseline conditions in 2001 for the sub-watershed.

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
	Bull Trout Temperature Functioning at Unacceptable Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] incubation <1°C or >6°C rearing >15 °C spawning <4 °C or > 10°C also temperatures in areas used by adults during migration regularly exceed 15°C (thermal barriers present)	The lower portion of the Cispus River regularly exceeds15ºC during the summer rearing period. We have no data for the spawning or incubation periods.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Cutthroat, Stealhead, Chinook, and Coho. Functioning At Risk	7 day average maximum temperature in a reach during the following life history stages:	7 day average maximum temperature in a reach during the following life history stages:[1, 3] rearing: 14 - 18°C spawning: 14 - 16°C	The lower portion of the Cispus River regularly exceeds 16ºC during the summer rearing period and may exceed 18 ºC on private lands. Crystal Creek has temperatures that suitable for rearing, however it contains less than 10% of the available habitat. Only chinook salmon spawn during the monitoring period. Only the Cispus River contains the typical spawning habitats of chinook salmon. This stream has cooler water refuges upstream from the monitoring sites. Therefore I chose the Functioning At Risk Rating.	District stream temperature monitoring records. Table 3 gives a brief summary of this data.
	Sediment (in spawning areas)	Functioning at Risk	12-17% fines (<0.85mm) in gravel[4];	We have no data that directly addresses the condition of spawning gravels. We have no information on fine sediment in the main river. Observations along the Cispus River and its tributaries indicate that the condition of spawning gravel ranges from functioning appropriately to functioning at unacceptable risk.	Lower Cispus West WA p 6-5 6-28 Lower Cispus East WA p 6-6 to 6-20 Field Observations
	Chemical Contamination / Nutrients	Functioning Appropriately	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches	We have no data with which to address this indicator. There are no residences, ranches, towns, mills, or factories in the sub-watershed.	Lower Cispus West WA p 6-5 6-28
HABITAT ACCESS	Physical barriers	Functioning at Unacceptable Risk	one or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows for at least one life history stage	There is only one potential barrier culvert, the 2600000 at Crystal Creek. Stream flows typically go sub-surface below and above this point during the summer and this culvert is not a major concern.	2001 culvert survey. See Map 1. Baseline Appendix Table 1

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
HABITAT ELEMENTS	Substrate character and embedded-ness (in rearing areas)	Functioning at Risk	gravel and cobble are subdominant, or if dominant, reach embeddedness 20-30%[9,10]	The rationale for this indicator is the same as that used for spawning gravel condition. Observations along the Cispus River and its tributaries indicate that the condition of substrate ranges from functioning appropriately to functioning at unacceptable risk.	Lower Cispus West WA p 6-5 6-28 Field Observations
	Large Woody Debris (LWD)	Functioning at Unacceptable Risk	Current levels are being maintained at minimum levels desired for "Func. Appr." but potential sources are lacking to maintain these minimum values.	The 1994 survey of Crystal Creek found 16 pieces of wood per mile. Woody debris is limited to margin of the main Cispus River, however, this section is not conducive collecting woody debris.	Stream Survey Data. Baseline Appendix Table 2 Observations by the fisheries staff 1993-2002
	Pool Frequency and Quality Bull Trout and Cutthroat	Functioning at Unacceptable Risk	Current levels are not at those desired values for "functioning appropriately",	The one surveyed stream, Crystal Creek does not meet the criteria for pools per mile. We have no information on the number of pools in the main Cispus River.	Stream Survey Data. Baseline Appendix Table 2 Observations by the fisheries staff 1993-2002
HABITAT ELEMENTS (continued)	Pool Frequency and Quality Salmon and Steelhead	Functioning at Unacceptable Risk	pool frequency is considerably lower than values desired for "functioning appropriately"; also cover/temperature is inadequate[4], and there has been a major reduction of pool volume by fine sediment	The one surveyed stream, Crystal Creek does not meet the criteria for pools per mile. We have no information on the number of pools in the main Cispus River.	Stream Survey Data. Baseline Appendix Table 2 Observations by the fisheries staff 1993-2002
	Large Pools (in streams with > 3m in wetted width at baseflow)	Functioning at Risk	Reaches have few pools greater than 1 meter in depth.	The existing pools in the Cispus River are greater than 3 feet deep, but so are many of the riffles and runs in this section of the river. Thus the pools are not necessarily any deeper than the other habitats or creating special microhabitats. Crystal Creek had only 1 pool greater than 3 feet deep.	Stream Survey Data. Baseline Appendix Table 2 Observations by the fisheries staff 1993-2002
	Off-channel habitat	Functioning at Risk	Some high water velocity refugia such as ponds, oxbows, backwaters …	There are relatively off-channel habitats in this sub-watershed; however, the valley configuration in this sub-watershed is not conducive to the formation of off channel habitats, because the valley is narrow and steep sided.	Stream Survey Data. Observations by the fisheries staff 1993-2002
	Refugia (at 6th to 7th field watershed scale)	Functioning at Unacceptable Risk	adequate habitat refugia do not exist[12]	Some streams have small areas of fully functioning habitat but they small and disconnected and would not support large populations of fish.	Observations by the fisheries staff 1997-2002

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
CHANNEL CONDITION AND DYNAMICS	Width/Depth Ratio in riffles	Functioning at Unacceptable Risk	W/D ratios and channel types throughout much of the watershed are outside of historic ranges and/or site potentials.	There is relatively little data for width to depth ratios. The watershed analyses report channel widening in the Cispus River.	Lower Cispus West WA p 6-5 6-28 Lower Cispus East WA p 6-6 to 6-20 Baseline Appendix Table 2
	Streambank Condition USFWS	Function At Risk	50 – 80% of any stream reach has greater than 90% stability.	We do not have direct measurements of streambank stability. Numerous streambanks experienced a high degree of erosion during the 95-96 floods. Many of these are still unstable because of a lack of root strength Some stability is slowly returning naturally and other places have been strengthened by human made structures (rock work along the 76 road)	Field Observations by aquatics professionals 1996-to present.
	Streambank Condition NMFS	Function At Risk	80-90% stable.	We do not have direct measurements of streambank stability. Numerous streambanks experienced a high degree of erosion during the 95-96 floods. Many of these are still unstable because of a lack of root strength Some stability is slowly returning naturally and other places have been strengthened by human made structures (rock work along the 76 road)	Field Observations by aquatics professionals 1996-to present.
	Floodplain Connectivity	Functioning at unacceptable Risk	Severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly	Substantial downcutting of stream channels occurred during the 1995-1996 floods, which removed some streams from their flood plain. Roads have also cutoff stream channel floodplains, and some areas have been rip-rapped in an attempt to halt lateral channel migration (to protect the 76). Although most streams can still access their floodplains, the aforementioned actions are deemed substantial enough to rate these indicators as Functioning at Unacceptable Risk.	Field Observations by aquatics professional 1996 to present.
FLOW / HYDROLOGY	Change in Peak/Base Flows	Functioning at Risk	Some evidence of altered peak flow, baseflow and /or flow timing relative to an undisturbed watershed of similar size, geology, and geography.	All of the Aggregated Recovered Percentage (ARP) and Water Available for Runoff (WAR) values indicate a potential for increased peakflow and magnitude.	Lower Cispus West WA p 6-5, 6-12, and 6-28 Lower Cispus East WA p 6-8 Professional Judgment.
	Drainage Network Increase	Functioning at Risk	Low to moderate increase in active channel length correlated with human caused disturbance.	On the whole we model an 8.6% increase in the drainage network based on an estimated 200 ft increase in stream length for each stream crossing. Previous investigations found that 200 feet was a rough average distance between the last ditch relief pipe and a stream crossing. The brake between At Risk and Functioning Appropriately would be at about 4.3% (50 feet either side of a crossing) this rating is based on information presented by Mike Furniss (Watershed Restoration Conference 2001).	GIS analysis of Stream Crossing and earlier data on the average distance between ditch relief pipes and stream crossings. Baseline Appendix Table 4

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
WATERSHED CONDITIONS	Road Density and Location	Functioning at Unacceptable Risk	>2.4 mi/mi² some to many valley bottom roads	The average road density is 3.4 miles/square mile and road density in the riparian reserves associated with streams is 3.63 miles/square mile. In addition, there are about 2.3 stream crossings per mile of stream. Many of these are sources of fine sediment during winter storms. Most of these alter the transport of sediment during floods. Most of the culverts do not drain the floodplain, thus the back up water sediment and accelerate flows downstream increasing stream energy.	Analysis of GIS data. Baseline Appendix Table 4
WATERSHED CONDITIONS (continued)	Disturbance Regime	Functioning at Unacceptable Risk	Frequent flood or drought producing highly variable flows …. Channel is simplified … little hydrologic complexity … Natural processes are unstable.	A review of the USGS stream gauge data at the Cispus Near Randle (14232500) there have been seven ten year plus floods in since 1970. Although it is not possible to conclude that this represents an elevated frequency of flooding, it does show that relatively large number of substantial floods have occurred in the last 32 years. The 1980 eruption of Mt St Helens dumped tons of ash into the streams in the other sub-watersheds.	USGS stream flow gauge data (# 14232500). Field Observations since 1974
	Disturbance History	Functioning at Unacceptable Risk	>15% ECA (< 85% Aggregate Recovery Percentage [ARP] or Hydrologic Recovery Percentage [HRP]) of entire watershed and some disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; ≤15% LSOG in watershed	Because 50% of this watershed is private land we do not have the data to fully address this question. Aerial photography along the Cispus River analysis and observations suggest that harvest rates (particularly regeneration harvest) have been much higher than on adjacent Forest service managed lands. In addition the density and location of roads are also an indicator of relatively high disturbance rates in this sub-watershed.	Aerial photography of the Cispus River corridor, observations and road density analysis.
	Riparian Reserves	Functioning at Unacceptable Risk	riparian reserve system is fragmented, poorly connected, or provides inadequate protection of habitats for sensitive aquatic species (<70% previously unmanaged), including from grazing impacts; percent similarity of riparian vegetation to the potential natural community/composition and structure <25%[15]	Harvest on the private lands has deeply fragmented the riparian reserves. The location of 76 road has also contributed to the fragmentation of the riparian reserves. Approximately 35% of the stream-side riparian on the forest on in the early seral classes. Large trees make up only 30% of the riparian community. The combination of a large amount the riparian area in the grass/pole stage and low amount in the large tree stage lead to the conclusion that the riparian is substantially fragmented.	GIS analysis of seral classes in the riparian reserves. Aerial photo review along the Cispus River 1999 flight. Field observations 1997 to present. Baseline Appendix Table 5
	Subpopulation Size	No Rating		No rating for all of these indicators. The Forest Service has insufficient data in order to rate these indicators.	

Pathway	Indicator	Rating	Definition of Rating	Information used to make rating	Sources of information
SUBPOPULA-TION CHARACTER-ISTICS	Growth and Survival	No Rating			
	Life History Diversity and Isolation	No Rating			
	Persistence and Genetic Integrity	No Rating			
SPECIES and HABITAT	Integration of Species and Habitat Conditions	No Rating			

Appendix XIII Stream Survey Data

The Appendix XIII map which follows the tables displays the reaches that have been surveyed.

Part A Summary of General Stream Survey Data

Watershed	Stream Survey [1]	Surveyed Length	Reach	Large [2] Wood	Pools/Mile	Ave. Bankful Width	Ave.Riffle Width	Bank Full Width to Depth	Gradient	Rosgen
170800040501	04 BADGER CREEK 90	0.13	1	15	23	19	20	ND	5	B
		0.18	2	167	6	ND	22	ND	11	A
	04 PINTO CREEK 00	2.25	1	12	16	35	24	25	6	A
		0.91	2	9	22	26	16	28	6	A
	04 PINTO CREEK 89	0.10	9	0	64	ND	8	ND	1	C
		0.57	10	81	16	19	18	ND	2	C
		0.51	11	39	4	ND	14	ND	2	C
		0.35	12	106	23	ND	14	ND	8	B
		0.29	13	67	6	ND	15	ND	4	B
		0.26	14	23	8	ND	14	ND	4	B
		0.24	15	108	4	ND	8	ND	6	B
	04 YELLOWJACKET 01	2.48	1	11	8	82	47	25	1	C
		1.17	2	8	11	96	81	32	2	B
		1.76	3	6	13	66	46	16	3	B
		1.88	4	24	19	64	37	22	3	B
		1.23	5	16	15	55	42	16	2	B
		2.23	6	60	14	38	28	19	2	B
		1.67	7	36	18	61	30	40	4	B
		2.6	8	50	29	30	18	13	2	B
170800040502	04 MCCOY CREEK 01	1.32	1	1	29	59	30	28	5	A
		1.56	2	19	27	41	25	19	3	B
		1.37	3	22	15	42	22	21	3	B
		1.05	4	37	20	39	19	21	3	B
		2.07	5	64	27	39	18	35	3	B

Part A Summary of General Stream Survey Data										
Watershed	**Stream Survey [1]**	**Surveyed Length**	**Reach**	**Large [2] Wood**	**Pools/Mile**	**Ave. Bankful Width**	**Ave.Riffle Width**	**Bank Full Width to Depth**	**Gradient**	**Rosgen**
		1.58	6	60	27	27	14	22	1	B
170800040503	04 CAMP CREEK 92	0.47	1	75	19	ND	17	ND	6	C
170800040503	04 CAMP CREEK 92	0.63	2	575	57	41	16	ND[3]	10	B
		0.3	3	836	30	22	13	ND	10	A
		0.26	4	2170	34	24	16	ND	10	A
		0.54	5	1238	28	14	13	ND	10	A
		0.44	6	367	34	20	7	ND	15	B
		0.38	7	2104	56	28	11	ND	5	B
		1.04	8	2651	21	18	9	ND	15	A
170800040504	04 GREENHORN CR 89	0.65	1	19	2	ND	17	ND	3	B
		0.87	2	11	12	35	18	ND	6	B
		0.56	3	31	7	ND	20	ND	5	A
		0.19	4	83	16	54	15	ND	7	A
		0.25	5	16	16	ND	14	ND	5	A
		0.19	6	53	16	ND	15	ND	6	A
		0.12	7	133	26	26	12	ND	10	A
		0.2	8	72	0	ND	12	ND	10	A
		0.16	9	6	24	ND	13	ND	13	A
		0.49	10	14	2	ND	12	ND	7	A
		0.14	11	73	<1	ND	14	ND	12	A
		0.45	12	96	9	ND	14	ND	7	A
		0.14	13	100	9	ND	9	ND	7	A
		0.38	14	50	21	ND	9	ND	5	A
		0.75	15	33	0	ND	10	ND	4	A
		0.13	16	0	0	ND	7	ND	14	A
		0.24	17	8	0	ND	6	ND	2	C
		0.34	18	52	0	ND	4	ND	2	C

Part A Summary of General Stream Survey Data										
Watershed	**Stream Survey [1]**	**Surveyed Length**	**Reach**	**Large [2] Wood**	**Pools/Mile**	**Ave. Bankful Width**	**Ave.Riffle Width**	**Bank Full Width to Depth**	**Gradient**	**Rosgen**
	04 SOLDIER CREEK 89	0.2	1	91	ND	ND	13	ND	12	A
		0.29	2	57	4	ND	14	ND	6	A
170800040504	04 SOLDIER CREEK 89	0.12	3	34	ND	ND	31	ND	3	A
		0.25	4	10	ND	ND	10	ND	4	A
		1.38	5	12	ND	ND	7	ND	4	A
170800040505	04 BIG CREEK 87	0.17	1	ND	24	ND	14	ND	3	ND
		0.30	2	ND	20	ND	15	ND	2	ND
		0.34	3	ND	24	ND	21	ND	4	ND
		1.28	4	ND	29	ND	17	ND	2	ND
		0.11	5	ND	58	ND	16	ND	7	ND
		0.16	6	ND	18	ND	20	ND	2	ND
		0.52	7	ND	25	ND	13	ND	2	ND
		0.07	8	ND	16	ND	13	ND	1	ND
		0.15	9	ND	7	ND	13	ND	6	ND
		0.14	10	ND	36	ND	19	ND	7	ND
		0.19	11	ND	8	ND	17	ND	2	ND
		0.23	12	ND	5	ND	14	ND	2	ND
		0.30	13	ND	11	ND	12	ND	2	ND
		0.27	14	ND	19	ND	12	ND	2	ND
	04 IRON CREEK 93	0.44	1	3	2	68	45	ND	2	B/G
		1.67	2	23	13	58	43	ND	4	B/D
		0.63	3	11	24	48	35	ND	7	A
		1.16	4	26	17	35	32	ND	3	B
		1.57	5	9	21	43	28	ND	7	A
		1.43	6	15	27	40	35	ND	3	B
		0.53	7	93	34	67	29	ND	2	C/D
		0.5	8	57	28	29	33	ND	2	B

Part A Summary of General Stream Survey Data										
Watershed	**Stream Survey [1]**	**Surveyed Length**	**Reach**	**Large [2] Wood**	**Pools/Mile**	**Ave. Bankful Width**	**Ave.Riffle Width**	**Bank Full Width to Depth**	**Gradient**	**Rosgen**
		1.09	9	72	24	39	21	ND	3	B
	04 WAKEPISH CREEK 87	0.46	1	ND	18	ND	10	ND	3	ND
		0.51	2	ND	20	ND	13	ND	2	ND
		0.34	3	ND	39	ND	11	ND	4	ND
		0.08	4	ND	50	ND	9	ND	6	ND
		0.40	5	ND	18	ND	11	ND	6	ND
		0.37	6	0	11	ND	10	ND	6	ND
170800040506	04 AMES CREEK 99	0.46	1	2	11	5	1	9	5	C
		1.8	2	28	149	10	3	14	2	C
	04 WOODS CREEK 99	0.52	1	0	66	27	15	18	1	B
		2.45	2	4	54	19	8	11	1	E
		0.56	3	0	76	15	9	9	2	B
		0.44	4	2	96	11	4	5	1	B
		0.96	5	8	88	12	4	10	1	E
		0.28	6	11	217	4	2	7	3	B
	04 WOODS CREEK T#11 99	0.9	1	31	184	5	2	9	7	B
	04 WOODS CREEK T#8 99	0.35	1	9	188	9	3	17	6	B
	04 WOODS CREEK T#8 99	1.1	2	25	204	8	3	17	8	B
170800040507	04 QUARTZ CREEK 90	0.3	1	4	7	33	34	ND	4	B
		0.65	2	7	8	42	27	ND	3	B
		0.54	3	15	11	23	34	ND	3	B
		0.29	4	0	21	19	23	ND	3	A
		0.07	5	4544	76	66	25	ND	5	A
		0.91	6	31	14	27	28	ND	4	B
		0.4	7	180	30	26	24	ND	3	B
		0.3	8	275	44	26	24	ND	5	B
		0.3	9	30	27	29	23	ND	4	B

Part A Summary of General Stream Survey Data										
Watershed	**Stream Survey [1]**	**Surveyed Length**	**Reach**	**Large [2] Wood**	**Pools/Mile**	**Ave. Bankful Width**	**Ave.Riffle Width**	**Bank Full Width to Depth**	**Gradient**	**Rosgen**
		0.63	10	31	24	29	24	ND	4	B
		0.55	11	360	2	ND	19	ND	3	B
		0.28	12	170	21	27	23	ND	4	B
		0.46	13	627	6	30	24	ND	4	B
		0.73	14	18	4	23	17	ND	4	B
		0.10	15	29	39	ND	19	ND	5	B
		0.36	16	33	6	36	12	ND	3	B
170800040507	04 QUARTZ CREEK 90	0.15	17	11	18	ND	13	ND	3	B
		0.15	18	13	20	ND	10	ND	4	B
		0.84	19	25	0	ND	16	ND	3	B
		0.19	20	0	0	ND	19	ND	3	A
		1.17	21	8	8	21	17	ND	4	A
170800040508	04 CRYSTAL CREEK 94	1.20	1	9	22	16	10	17	5	B

ND = Data not collected
NA = Not Applicable
The frequency of woody debris on Camp Creek and Quartz are highly suspect. Numerous (over 10) visits to Camp Creek in the since 1999 have failed to find the density of woody debris reported in the data base.

Part B Pool Quality Summary							
Watershed	Survey	Reach	Pools/Mile	Pools 1or More Pieces of Wood ^{2}/Mile	Pools >3 ft deep/mile	Ave Max Pool Depth	Ave Residual Pool depth
170800040501	04 BADGER CREEK 90	1	23	ND	8	3.0	2.3
	04 PINTO CREEK 00	1	16	1	8	4.9	3.9
		2	22	1	4	3.3	2.6
	04 PINTO CREEK 89	10	16	5	9	4.2	3.6
		11	4	2	0	1.8	1.5
		12	23	11	6	2.9	2.5
		14	8	0	4	3.0	2.7
		15	4	0	0	2.5	2.1
	04 YELLOWJACKET 01	1	8	0	7	6.7	5.7
		2	11	0	9	6.2	4.9
		3	13	0	12	8.9	7.5
		4	19	6	13	5.1	3.9
		5	15	4	13	4.9	4.0
		6	14	5	6	3.7	2.9
		7	18	5	7	3.5	2.6
		8	29	14	8	2.8	2.3
170800040502	04 MCCOY CREEK 01	1	30	1	21	5.9	4.8
		2	27	5	12	4.7	3.7
		3	15	5	2	3.2	2.2
		4	20	6	5	3.1	2.2
		5	27	20	6	3.1	2.4
		6	27	15	4	2.8	2.2
170800040503	04 CAMP CREEK 92	1	19	9	0	1.6	1.0
		2	57	17	22	3.6	3.2
		3	30	0	3	2.3	1.9
		4	34	23	0	2.4	2.0
		5	28	18	4	2.2	1.8
		6	34	5	0	2.3	2.0
		7	56	29	3	2.0	1.7
		8	21	8	0	1.2	0.9

Part B Pool Quality Summary							
Watershed	Survey	Reach	Pools/Mile	Pools 1or More Pieces of Wood ^{2}/Mile	Pools >3 ft deep/mile	Ave Max Pool Depth	Ave Residual Pool depth
170800040504	04 GREENHORN CR 89	1	2	0	0	2.3	1.5
		2	12	2	0	2.6	1.7
		3	7	0	2	2.3	2.1
		4	16	11	5	3.5	3.0
		5	16	4	8	10.0	9.0
		6	16	5	11	3.9	3.2
		7	26	9	9	3.4	2.8
		8	0	0	0	ND	ND
		9	24	0	18	3.5	2.9
		10	2	0	0	2.0	1.5
		12	9	7	0	2.6	2.3
		14	21	16	0	2.1	2.1
		15	0	0	0	ND	ND
		16	0	0	0	ND	ND
170800040505	04 BIG CREEK 87	1	24	ND	ND	2.7	ND
		3	24	ND	ND	2.1	ND
		10	35	ND	ND	2.9	ND
	04 IRON CREEK 93	1	2	0	0	2.5	1.7
		2	13	0	5	4.0	2.8
		3	24	0	11	5.7	3.0
		4	17	3	9	4.5	3.1
		5	21	0	10	6.4	4.7
		6	27	1	10	3.8	2.7
		7	34	11	15	3.5	2.9
		8	28	2	10	3.9	3.4
		9	24	4	4	2.4	2.0
	04 WAKEPISH CREEK 87	3	39	ND	ND	1.7	ND
		4	50	ND	ND	1.3	ND
		5	18	ND	ND	2.4	ND
		6	11	ND	ND	2.5	ND
170800040506	04 AMES CREEK 99	1	11	ND	ND	0.8	0.8

Part B Pool Quality Summary							
Watershed	Survey	Reach	Pools/Mile	Pools 1or More Pieces of Wood ^{2}/Mile	Pools >3 ft deep/mile	Ave Max Pool Depth	Ave Residual Pool depth
		2	149	18	2	0.8	0.7
	04 WOODS CREEK 99	1	66	0	0	1.7	1.1
		2	54	4	7	2.2	1.8
		3	76	0	0	1.2	0.9
		4	96	2	2	1.5	1.2
		5	87	5	3	1.1	1.0
		6	217	7	0	0.5	0.4
	04 WOODS CREEK T#8 99	1	188	6	0	0.8	0.7
		2	205	8	0	0.6	0.5
	04 WOODS CREEK T10 99	1	184	19	0	0.8	0.7
170800040507	04 QUARTZ CREEK 90	1	7	0	7	4.5	3.3
		2	8	0	2	3.8	2.3
		3	11	4	9	4.3	3.4
		4	21	0	10	4.3	2.6
		5	76	15	46	4.0	2.7
		6	14	1	5	3.8	2.8
		7	30	2	5	3.0	1.8
		8	44	3	13	3.6	2.6
		9	27	7	20	4.6	3.6
		10	24	8	10	3.8	2.9
		11	2	2	2	4.0	3.7
		12	21	11	4	3.0	2.2
		13	6	4	4	3.4	2.9
		14	4	1	1	2.7	2.0
		15	39	10	19	3.5	2.6
		16	6	3	0	2.4	1.8
		18	20	0	0	2.8	2.1
		19	0	ND	ND	ND	ND
		20	0	ND	ND	ND	ND
		21	8	0	1	2.1	1.6
170800040508	04 CRYSTAL CREEK 94	1	22	2	1	1.9	1.4

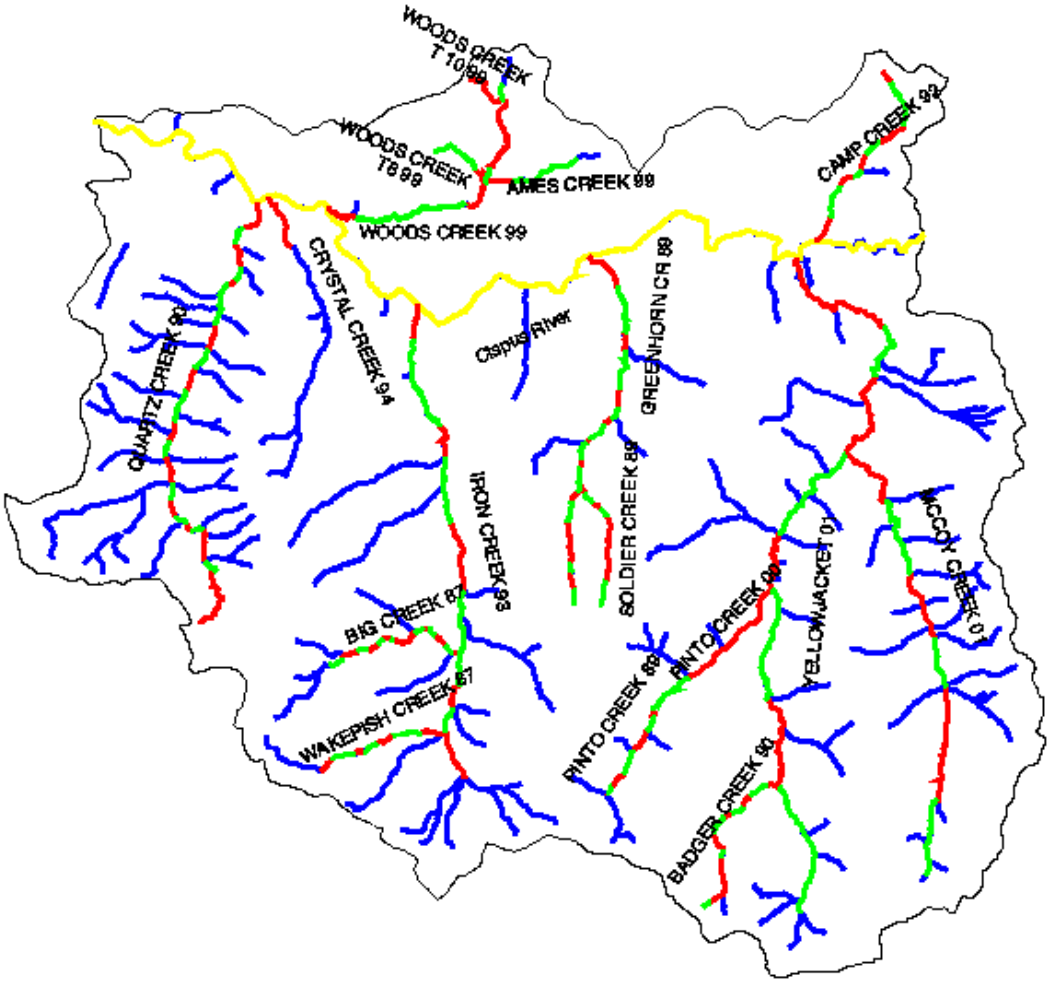
1-The last two digits in the survey name designate the year of the survey. Forest Survey employees conducted the surveys from 1987 to 1999, the 2001 surveys were conducted by Clearwater Biostudies.
2- A piece of wood must be at least 24 inches in diameter in order to be counted as a large piece of wood, except this rule was not followed for the Camp Creek 92 survey. The survey data from this survey does not allow me to determine the size of the wood.
3- Insufficient data to determine a value.

Fish Appendix XIII

LOWER CISPUS WATERSHED ANALYSIS

Surveyed Stream Reaches

1 0 1 2 Miles



11/20/02 /cv_gis/wa/up/cispus/watdmgt.apr bgr

APPENDIX XIV. Summary of Restoration Activities

Restoration has occurred throughout the Lower Cispus watershed. Since the 1996 flood, habitat complexity has been restored to 4.8 stream miles (Table 1). These projects were located along Iron Creek, Yellowjacket Creek, and the mainstem Cispus River (Figure 1). Streambank stabilization and revegetation projects were accomplished within the Iron Creek, Greenhorn Creek and Yellowjacket Creek subwatersheds. Twenty-three miles of road were decommissioned while thirty-one miles of road were storm-proofed. Road repairs and road improvements occurred on 76.5 miles of road (see map).

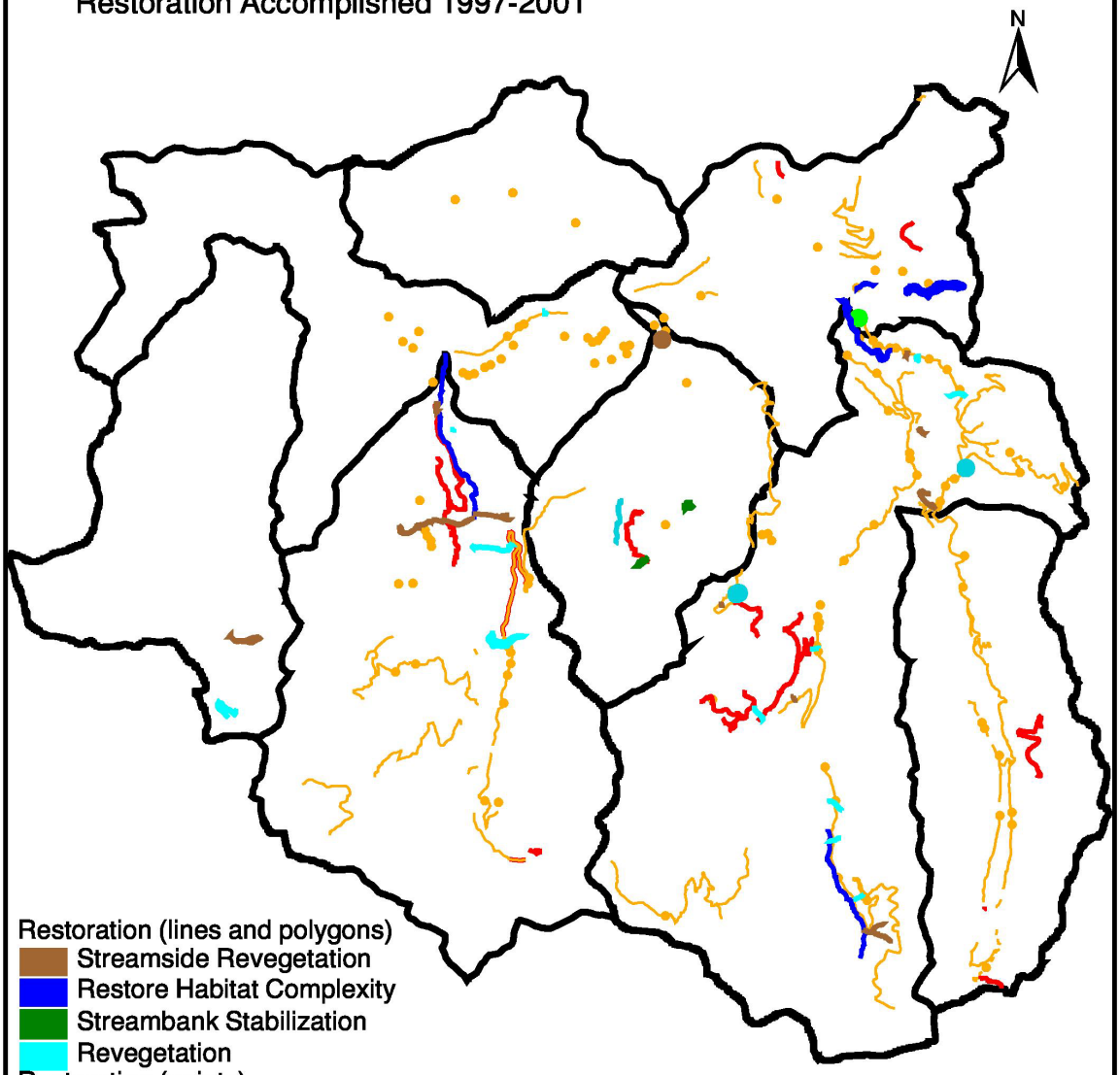
Table 1- Restoration projects completed from 1997–2001 in the Lower Cispus Watershed.

Restoration Type	Quantity Accomplished
Habitat Complexity Restored	4.8 miles
Streambank Stability Improved	3 acres
Streamside Revegetation	12 acres
Revegetation	26 acres
Road Decommission	23.4 miles
Road Storm Proof	31.2 miles
Road Repair	21.5 miles
Road Improvements	55.2 miles

Figure 1- Engineered log jams along the mainstem Cispus River just upstream of Road 28 bridge (Tom Music Bridge) completed in Fall, 2001.

LOWER CISPUS WATERSHED ANALYSIS

Restoration Accomplished 1997-2001



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