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Lower Cispus West Watershed Analysis

Randle Ranger District
Gifford Pinchot National Forest

March, 1996

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Responsible Official

Harry Cody - District Ranger

Interdisciplinary Team

Document Preparation

Steve Kozlowski - Team Leader
Shannon Donnelly - Writer/Editor

Terrestrial Resources

Barb Behan - Wildlife Biologist
John Colby - Fire and Fuels Planner
Shawn Jones - Geologist
Ron Pfeifer - Silviculturist
Otha Terry - Botanist

Aquatic Resources

Donna Harsch - Hydrologist
Alex Foster - Fish Biologist

Data Management (Maps and Data Queries)

Doug Brown - GIS Leader
John Hawkins - GIS Support
Mike Pitts - GIS Support

Additional Input Given By

Rick McClure - Archeologist
Dave Olson - Recreation Forester
Mark Pistrang - Botanist
Randy Shepard - Packwood District Ranger

* *A special thanks to all those not mentioned above who provided additional information and assistance towards completion of this document!*

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CHAPTER 1

Overview

CHAPTER 1 - OVERVIEW

Purpose of This Watershed Analysis

Watershed analysis is a process which allows for the systematic organization and consideration of ecosystem information at the watershed scale and is one of four components of the Aquatic Conservation Strategy (ACS). The analysis procedure is used to characterize ecosystem elements, including human, aquatic, riparian and terrestrial features, conditions, processes and interactions within the watershed. The Lower Cispus West (LCW) watershed analysis will lead to a greater understanding of the direct, indirect, and cumulative effects associated with management activities within the watershed which can be applied in informing future decisions regarding the type, location, and sequence of appropriate management activities within the watershed. This watershed analysis will facilitate management decision making which conforms to the Northwest Forest Plan Record of Decision (ROD) by illustrating current conditions and potential areas of concern within the Lower Cispus West watershed. Current conditions within the watershed are evaluated for comparison with Aquatic Conservation Strategy (ACS) objectives and the standards and guidelines set forth in the ROD.

Scale of Analysis

The watershed is a tenable unit for the analysis of ecosystem elements. Each watershed encompasses a unique system of features, processes, and dependent plants and animals within a discreet landscape area. Conducting an analysis at the watershed scale generates sufficient information and understanding of specific ecosystem components and capabilities to report results and conclusions, and to make recommendations which can be used as a context for management decision making. Watershed analysis reveals useful information about the larger patterns, conditions, and processes which characterize an area. Analysis at this scale will be used to coordinate site specific decisions within the larger land management context, and will therefore enhance and support the NEPA process. Site specific field review will remain essential in making appropriate decisions, with activities such as wildlife and plant surveys and extensive project visits by specialists remaining integral aspects of the pre-decision process. Final decisions which are informed by this document will better incorporate landscape features as factors for consideration, which will contribute to the quality of the final decisions which are made.

Product Assumptions

The Lower Cispus West Watershed Analysis tests a variety of parameters, particularly the ability of a watershed analysis team to incorporate the best available information into a quality product in a limited amount of time. Key Management Questions and issues to be investigated were developed prior to the analysis period, and preliminary base maps were assembled during a six week process. Next, a four week period was devoted to the assimilation and analysis of data in

the Lower Cispus West Watershed. An emphasis was placed on using existing information, logic, and observation to draw conclusions and develop recommendations. Finally, a comparison of existing watershed conditions to the desired condition, as described in the ROD, was made and recommendations for this watershed were based on maintaining or imporving watershed conditions.

The following outline illustrates five levels of analysis used to produce this document. Analysis at the level of logic and observation tends to be more qualitative than quantitative. Data gaps are noted to clarify what data is missing, the implications of the recognized data gaps, and assumptions made in the absence of data. Measures of confidence have been included in the analysis where appropriate to indicate the level of confidence the resource experts involved in the pilot project have in the accuracy of the professional judgements which have been made.

Levels of Analysis

I. Logic, Observation, and Best Professional Judgement.

II. Reference Existing Documents.

III. Reformat Existing Data.

   A. Qualitative.
   B. Quantitative.

IV. Identify Data Gaps.

V. Gather New Data.

Map Based Product

The Lower Cispus West Watershed Analysis has been compiled as a map-based product, in which key findings are represented graphically. This reporting method was adopted to facilitate the accessibility and applicability of analysis information. Characterization of information and other observations are linked to a series of detailed maps which can be used as references in the management decision making process. The other basic elements of the Lower Cispus West Watershed Analysis document include bullet statements and tables.

The Lower Cispus West Watershed Analysis document consists of seven inter-related components.

Base Maps- These maps are designed to provide the reader with basic information regarding the location of the planning area, the delineation of Watershed Stratification Units (WSU's) and Sixth Field Watershed (6WS) boundaries, as well as information about land allocations, roads, streams, riparian reserves, and hydrologic features within the Lower Cispus West watershed.

Reference and Current Condition Bullet Statements- These concise statements convey relevant information about historic and current conditions within the watershed. Considering both historic and current watershed conditions allows one to develop a sense of how and why ecological conditions within the watershed have changed with time. The bullets provide information to accompany the reference and current condition maps in an accessible form. These bullets are derived from the technical documents prepared as appendices to the watershed analysis document by resource specialists.

Current Condition Maps- These maps illustrate graphically the current conditions which are documented in the current condition bullet statements. The availability of current condition maps allows the reader to observe the spatial distribution of a given condition, as well as to compare the relative distribution of a variety of conditions. A range of current conditions relating to vegetation, wildlife and habitat, and hydrologic and geologic conditions are displayed.

Interpretation, Area of Concern Bullets- These bullets encapsulate the prominent concerns associated with each resource area within the watershed which emerged during the analysis process. Areas of concern may be related to dysfunctional ecological conditions, a failure to fulfill ROD or Aquatic Conservation Strategy objectives, or other departures from Desired Future Conditions (DFC's) in a given area.

ACS Evaluation Tables- Eleven of these tables are included in the Lower Cispus West Watershed Analysis document. Each Sixth Field Watershed (6WS) in the analysis area was evaluated via specific criteria, and given a rating to indicate how well each of the nine ACS objectives are being satisfied within that particular subwatershed. Two additional goals from the ROD, biodiversity and maintenance of late structural habitat, were also rated in the ACS

Tables. Comments are included to clarify the factors contributing to each rating. Team confidence in the accuracy of each rating is also indicated. An ACS Summary Table is included to provide rating information at a glance.

Areas of Concern Maps- These maps represent the areas of concern which are identified in the bullet statements.

Recommendation Tables- A series of tables is provided to give management recommendations at a site specific, subwatershed and landscape scale. Each Sixth Field watershed was evaluated with regard to the propriety of a range of management activities. Management concerns surrounding these activities within the Sixth Field are noted and brief explanatory comments are included.

CHAPTER 2

Watershed Characterization

CHAPTER 2 - WATERSHED CHARACTERIZATION

Management Setting

Management direction for National Forest lands that include the Lower Cispus West Watershed are described in the Gifford Pinchot National Forest Land and Resource Management Plan, 1990 (GPLRMP). The GPLRMP was amended by the Secretary of Agriculture, as documented in the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (the ROD). The ROD, the result of a land management plan initiated by President Clinton in April 1993, is also referred to as the Northwest Forest Plan. The ROD and the companion Standards and Guidelines for Management of Habitat for Late Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl provide extensive land management direction, including a new layer of land allocations. These land allocations provide a comprehensive ecosystem management strategy for the Northern Spotted Owl region.

The ROD does not replace the land allocations or standards and guidelines set forth by the 1990 GPLRMP, rather the ROD overlays those established guides. Management direction results from considering the parameters established by both of the plans and documented as Amendment 11 to the GPLRMP. See Map 4 for the overlayed management allocations.

Biophysical Setting

See Maps 1 through 10 for general watershed locations and characteristics.

Location: The Lower Cispus West Watershed is located in southwest Washington State, south of the town of Randle. The Lower Cispus West planning area is located on the Randle Ranger District of the Gifford Pinchot National Forest. The watershed contains a total of 54,740 acres of land, including National Forest, state, and private lands. National Forest land occupies 44,996 acres of the watershed. The watershed is bordered by Mt. St. Helens National Volcanic Monument in the west, the Lewis River drainage to the south, and an additional portion of the Lower Cispus Watershed to the east. It is significant to note that the southern boundary of the watershed lies in close proximity to the Lewis LSR, while the northwest boundary includes the Quartz and Woods LSR's. The northern boundary of the watershed extends from the mouth of Iron Creek along Kraus Ridge and includes Ames and Woods Creeks. Although most of the large and small private holdings are timberland, there are two rural residential areas located near the 25 Road. Lake Scanewa reservoir created behind the Cowlitz Falls Dam in 1994 inundated a small portion of the planning area.

Climate: The Lower Cispus West watershed ranges in elevation from approximately 840 feet above sea level at the confluence of the Cispus and Cowlitz Rivers, to 5,521 feet above sea level at the crest of Strawberry Mountain. Warm, dry summers and cool, wet winters typify the

seasonal weather patterns of the watershed. Annual precipitation ranges between 60 and 100 inches, with the greater amounts of precipitation falling at the higher elevations.

Geology: Bedrock and accompanying soils within the Lower Cispus West watershed are almost entirely volcanic in origin, representing eruptions from at least 40 million years ago to ash deposits from the 1980 eruption of Mount St. Helens. Bedrock made up of alternating layers of volcanic ash (tuffs and tuff breccia) dips to the east from Strawberry Ridge toward Iron Creek, accounting for the unusually high number of large landslides in the Iron Creek drainage. The landscape has been greatly modified by repeated episodes of glaciation over the past 2 million years; all of the higher ridges and the Cispus River valley have been effected by alpine glaciation. The age and nature of different volcanic deposits, and modification by glacial activity, have had a profound effect on a number of other ecological elements in the watershed such as hydrology, soil development, and vegetation types.

Water: The Lower Cispus West watershed includes the lowest reaches of the Cispus River, including the Cispus arm of the newly established Cowlitz Falls Reservoir. The Cispus River is the largest tributary of the Cowlitz River, and is highly regarded for its scenic attributes and recreational opportunities. The river supports an anadromous fishery, and is a nominee to the National Wild and Scenic River System, Washington's Scenic River program, and Northwest Power Planning Council's Protected Area Program. In addition, a Tier 2 Key Watershed corridor has been established along the river under theNorthwest Forest Plan. Several anadromous streams are located within the watershed. These include Quartz Creek, Iron Creek, Woods and Crystal Creeks. The LCW watershed contains approximately 50 miles of fishbearing streams, of which 22 miles are utilized by anadromous species. Hydrologically, Lower Cispus West is fairly typical of watersheds on the west slope of the Cascade Range, in terms of drainage pattern and density, flow regimes, and run off processes. The exception is the Woods Creek sub-watershed, which exhibits a drainage pattern with an atypically low drainage density.

Vegetation: Approximately 98% of the watershed is forest land. Vegetation zones found within the watershed include the western hemlock, Pacific silver fir, and mountain hemlock zones. Coniferous trees common in the watershed include douglas-fir, western hemlock, and pacific silver fir. Hardwoods found in the Lower Cispus West watershed include red alder, bigleaf maple, and black cottonwood. Non-forested areas include rock outcrops, meadows, shrubland, lakes, ponds, avalanche chutes and similar features.

Wildlife: The unique vegetative communities and habitats available within the watershed potentially support 291 wildlife species (see attached Wildlife Technical Report for species list). It is assumed with the presence of suitable habitat, that the species which potentially occupy those habitats are also present. Special habitats are found in Mosquito Meadows and wetlands where topography, vegetation, and available riparian areas provide a habitat not found elsewhere in the watershed.

CHAPTER 3

Issues and Key Management Questions

CHAPTER 3 - ISSUES AND KEY MANAGEMENT QUESTIONS

INTRODUCTION

The following issues, key management questions, and analysis questions were established by the Randle and Packwood District Rangers to capture information integral to making appropriate management decisions within the Lower Cispus West watershed. The information will aid land managers in making decisions which are consistent with ecological conditions and the objectives of the Northwest Forest Plan.

Four primary issues were identified as being the driving forces behind management within this watershed, and the main motivations for completing this watershed analysis. From each issue, several Key Management Questions were formulated to address specific watershed scale information needs which will guide future land management decisions. A series of Analysis Questions were established to accompany each Key Management Question, identifying specifically what resource information was needed to complete the analysis process. The four primary issues which drive both the key management questions and the analysis questions are:

1) Water Quality
2) Economic Outputs (Timber and Recreation)
3) Threatened, Endangered Species
4) Ecosystem Function

The organization of this watershed analysis does not incorporate enumerated answers to issues, Key Management Questions or analysis questions. Rather, these questions were used as guides in developing the format of the analysis. The answers are incorporated in document elements, including the bullet statements, tables, and maps. Chapter 7 is organized to provide recommendations, addressing each Key Management Question by subwatershed.

Issue 1 - Water Quality

Most of this watershed drains into a "Tier 2 Key Watershed." Under the Northwest Forest Plan, this designation indicates that high water quality is important locally, to the Cispus River Basin, and to the region covered by the Northwest Forest Plan. Fish, amphibians and other aquatic organisms depend on high water quality here as an essential element of suitable habitat. Also, reintroduction of anadromous fish to Upper Cowlitz River is currently underway. Given the above points, maintaining good water quality in this area is essential.

The main water quality issue to be addressed by this document is determining if impacts to vegetation, soils, and aquatic features in the Lower Cispus West area are having dramatic or cumulative impacts on water quality. 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 late structural forest in riparian areas.

Water Quality - Key Management Questions

Are cumulative human impacts preventing the attainment of ACS objectives anywhere in this watershed?

In riparian reserves, are there road crossings needing reconstruction for repair or prevention of flood damage?

Which roads have restoration needs?

Where is restoration of streams needed to improve aquatic habitat?

Water Quality - Analysis Questions

How does the existing landscape compare to the historic landscape with regard to forest vegetation patch sizes, shapes, and distribution?

What is the extent of past construction and use of crossings, campsites, diking, and floodplain isolation in riparian reserves?

Are road crossings impacting the distribution of aquatic species?

What is the history of flooding and changes in peak flows and what is the influence of land use on water available for runoff?

Do forest management activities create or contribute to slope instability in the watershed?

How have channels changed from historic conditions?

How, when, and where have management activities caused or contributed to mass wasting or surface erosion?

What is the erosion potential from roads?

Are sediment levels above historical levels in any streams of the watershed?

How does sediment delivered to streams naturally compare to sediment caused by management activities?

Are PIG desired conditions being met?

Are habitat conditions adequate for resident species of fish?

What are the dominant channel and habitat forming processes in different parts of the channel network?

Issue 2 - Economic Outputs (Timber and Recreation)

The Lower Cispus West watershed plays an important role in supplying timber to the local community, as well as to the populations in Seattle, Portland, and beyond. This watershed and other "matrix" lands of the Gifford Pinchot National Forest have historically supplied large quantities of timber to the nation. Demand for the timber supply from public lands is increasing, as many of the remaining old growth and large trees are found primarily on these lands. There is political pressure to continue sustainable timber harvest, and to help support the local economy which was developed around the wood products industry.

Recreational opportunities are another primary economic resource in the LCW watershed. By car, the Cispus watershed is within three hours of Portland and Seattle, and it lies along the northern access route to Mount St. Helens, which is a significant tourist attraction. Due to factors such as these, Iron Creek campground has become the biggest campground on the Gifford Pinchot National Forest. The Cispus River and adjacent tributaries in this watershed host important areas for camping, hunting, fishing, and hiking, and a variety of other recreation pursuits. Many people camp in these areas while visiting Mt. Saint Helens, or simply to take a break from urban society.

The main economic issues to be addressed by this document include an evaluation of the ability of resource conditions to support the economic demands for timber and recreation. Water quality conditions, existence of TES species, amount and distribution of timber structural stages, and the ability of the ecosystem to function normally will be evaluated to determine where opportunities for timber harvest and recreational developments might exist.

Economic Outputs - Key Management Questions

In riparian reserves, where and under what circumstances is regeneration harvest appropriate in both CHU and non-CHU areas?

In riparian reserves, where and under what circumstances is stocking manipulation, pre-commercial and commercial thinning appropriate?

Outside of riparian reserves, where and under what circumstances is regeneration harvest appropriate in both CHU and non-CHU areas?

Outside of riparian reserves, where and under what circumstances is stocking manipulation, pre-commercial and commercial thinning appropriate?

In riparian reserves, where or under what circumstances can roads or trails be constructed without preventing the attainment of ACS objectives.

What human use sites, dispersed or developed, are preventing attainment of the ACS objectives? How can these be addressed in the short and long term?

Economic Outputs - Analysis Questions

What is the current distribution and amount of Early, Mid, and Late successional forest vegetation types?

What is the Range of Natural Variability (RNV), and are current conditions within that range?

What were the results of past management activities in terms of forest types, spatial distribution, amounts, and temporal distribution?

What is the distribution and amount of non-forest vegetation and non-vegetated areas?

What is the distribution and size of the Forest Vegetation Zones in terms of Potential Natural Vegetation (PNV)?

What are the current stand stocking levels?

Where and under what conditions can habitat be satisfied by stocking levels?

Under what conditions will vegetation management affect the physical integrity of the aquatic system, including shorelines, banks and bottom.

Under what conditions will vegetation management affect water quality, including temperature, turbidity and sediment regime and large woody debris?

Under what conditions will vegetation management affect the sediment regime?

Under what conditions will vegetation management affect in-stream flows?

Where are the wetlands and meadows where vegetation management should be avoided?

Under what conditions can vegetation management be implemented and still maintain structural diversity of riparian area in terms of structural stage?

Under what conditions will vegetation management affect riparian dependant species?

What is the proportion of various riparian reserve types including wetlands, streams, and unstable areas?

Under what conditions will roads and trails affect the physical integrity of the aquatic system, including shorelines, banks and bottom?

Under what conditions will roads and trails affect water quality, including temperature, turbidity, sediment regime and large woody debris?

Under what conditions will roads and trails affect in-stream flows?

Where are the wetlands and meadows that should be avoided in the construction of new roads and trails

Under what conditions can roads and trails be constructed and still maintain structural diversity of riparian area in terms of structural stage?

Under what conditions will roads and trails affect riparian dependant species?

What standards should be developed for human uses in riparian reserves?

Issue 3 - Threatened and Endangered Species

Several species governed by the Endangered Species Act, including the spotted owl, reside within the Lower Cispus West Watershed. Habitat for these species is maintained in accordance with approved conservation plans of the US Fish and Wildlife Service. Many survey and manage species, as designated by the Northwest Forest Plan, also reside within this watershed. Generally, the distribution and abundance of these species locally and regionally is unknown or vague.

A main issue to be addressed by this document is determining whether impacts to vegetation, soils, and aquatic features in the Lower Cispus West area are having cumulative impacts on the habitat for TES species. Resources and processes relevant to evaluating these conditions include population presence, habitat distribution and use, vegetation diversity and continuity, and riparian conditions.

Threatened and Endangered Species - Key Management Question

Is spotted owl and other TES habitat adequately protected in this watershed by matrix standards and guidelines?

Threatened and Endangered Species - Analysis Questions

Where are there habitats present for PETS species in the watershed?

How does the current condition of this habitat affect species viability?

How much NRF habitat exists for spotted owls, and what is its condition?

What are the habitat needs for wildlife and plant species of concern?

How much of the watershed is in dispersal habitat?

Where are the spotted owl, goshawk, and great grey owl centers?

Where is the summer/winter range for the prey species of wolves, grizzly bears, and other forest carnivores?

How well are late structural habitats linked within the watershed?

Where are the known and suspected sites of PETS plants within the watershed?

What are the road densities within the watershed?

What is the current level of course woody debris in the uplands?

What is the RNV for coarse woody debris in the uplands?

Issue 4 - Ecosystem Function

One of the primary issues affecting management within the basin is the necessity of maintaining a properly functioning, self-sustaining ecosystem. This includes ensuring that all plant and animal species are retained, that distribution of the species is adequate, and that suitable habitat is abundant enough to maintain populations. Also, the interrelationships between resources must be in balance, and similar to that which evolved historically.

The fourth main issue to be addressed by this document is determining whether impacts to vegetation, soils, and aquatic features in the Lower Cispus West area are having dramatic or cumulative impact on overall ecosystem functions. Resources and processes relevant to

evaluating these conditions include changes in aquatic condition, loss of populations, presence of riparian and overland migration corridors, amount and frequency of soil disturbance, continuity of late structural forest in riparian areas, and rates of human caused sediment input.

Ecosystem Function - Key Management Questions

Where are there particularly sensitive or special areas which need protection additional to the matrix standards and guidelines?

Does there appear to be a natural cumulative effects problem anywhere in the watershed?

Given adjacent land ownership, what can we assume about future management of private lands within the watershed? What are the unique functions of National Forest lands?

Which riparian corridors need additional protection from road and trail construction, human use, and road maintenance procedures?

Ecosystem Function - Analysis Questions

Are there any particularly sensitive or special areas within the watershed?

Are any Survey and Manage species (C3) present within the watershed? If so, what is the quality and quantity of these species?

Which species, populations and communities are uniquely adapted?

Which riparian areas are critical for fulfilling life history requirements of aquatic and riparian dependant species?

Where are areas of key aquatic habitat in need of protection from human encroachment?

Should this portion of the analysis concentrate only on Quartz Creek?

What is the natural threshold for each particular successional stage?

What were historical peak flows?

Has channel widening occurred?

What past natural conditions would suggest standards and guidelines beyond the new directions?

What past natural conditions would affect management decision space in this Watershed Analysis area?

Where is there evidence of dam-break floods within the watershed?

Is there evidence of mass wasting in the watershed? Where and how often do mass wasting processes occur? What mass wasting processes are active?

What is the hill slope erosion potential?

What are the landscape conditions on adjacent private lands?

What major issues are being faced on adjacent private lands?

What is the current condition of riparian corridors within the watershed on a landscape and local scale? Within the riparian corridors, what is the degree of canopy closure, large woody debris recruitment, shading, and stream bank stability? What is the current distribution of structural stages within reparian corridors, and how does this compare to the range of natural variability?

Currently, how well are riparian corridors functioning with regard to connectivity of late-structural refugia and LSR's?

CHAPTER 4

Reference and Current Conditions Terrestrial System

CHAPTER 4 - REFERENCE AND CURRENT CONDITIONS

INTRODUCTION

Chapter 4 provides information about historic and current conditions and processes in the Lower Cispus West Watershed. Both terrestrial and aquatic systems are discussed, the information being captured in bullet statements relative to each topic considered.

TERRESTRIAL SYSTEM

Seismic Conditions and Volcanic Eruption

See Maps 7, 8, 10, 31, 32.

Mount St. Helens has deposited ash and pumice across the Lower Cispus watershed at least three times over the last 3,500 years; the last two episodes were in 1480 AD and 1980. Mount St. Helens has erupted about once every century for the last 500 years, and is expected to follow a similar pattern into the centuries ahead.

In 1980, the blast effect from the eruption of Mount St. Helens denuded much of the headwaters of Quartz Creek.

Seismic activity in the form of small earthquakes (less than 3.0 magnitude) occurs on the average of approximately 6-10 per decade underneath the planning area, with occassional larger earthquakes of magnitude 4 to 5.

Mass Wasting

The entire Crystal Creek drainage is the site of an ancient landslide. Large parts of this drainage are marginally stable. Site specific investigation will be required to delineate unstable and marginally stable ground.

There are four major landslides in the Iron Creek drainage that occupy a total of four square miles. While these slides are of ancient origin, probably older than 200 years, portions of these slides are currently active. Delineation of active and marginally stable ground will require site specific fieldwork. See Map 10.

Ferrous Creek (04J) has experienced high rates of sediment input by avalanches and debris flows from the ridge on the east side.

Twelvemile Creek (04I) has experienced increased rates of coarse and fine sediment delivery from management caused debris flows between 1959 and 1979.

The lower third of Iron Creek (04F) has received increased levels of coarse and fine sediment from management caused debris flows between 1959 and the present. Primary contributors have included the 7708 and 2510 road systems.

The headwaters of Quartz Creek (04C) have been denuded, and have experienced greatly increased sediment input since 1980, as a result of blast damage from the eruption of Mt. St. Helens.

The middle third of Quartz Creek (04B) has experienced increased input of coarse and fine sediment as a result of road related debris flows on federal land.

Woods Creek (04E) contains two of the largest naturally occurring landslides in the analysis area. Management related sediment delivery has not caused a significant increase over background delivery levels. See Map 10.

Hillslope Erosion

Accelerated hillslope erosion is occurring in the headwaters of Quartz Creek as a result of denudation by the eruption of Mount St. Helens in May, 1980.

Pumice deposits in Quartz and Iron Creeks are highly erodible when vegetative cover is removed; this has been particularly noticable within some clearcut units in the headwaters of Iron Creek.

Road Conditions

Erosion and mass failures associated with roads have been identified as a primary contributor of both coarse and fine sediments above the background (natural) rate to streams in this watershed.

Approximately 225 miles of road currently exist on National Forest land within the watershed; an unknown amount of additional roads are located on private land. There are approximately 400 Red Flag points of concern along the existing road system in the LCW watershed. Many of these sites have been sources of chronic erosion and sediment delivery to streams. Specific roads with concerns are illustrated in Map 31, and are listed by 6th field watershed in Chapter 7 sixth field watershed recommendations.

Effects of Fire on Timber

Data Gaps

Only high severity fires (stand replacement fires) can be mapped. Low to moderate severity fires cannot be traced through stand-age analysis or other methods for this fire regime.

Historic stand vegetation was classified only as early (0-50 years), mid (50-170 years), and late structural condition (170 years and older).

Fire history must be placed in a context of 500 years or more to account for the majority of fire events. Data or research in this context is minimal, and analysis is highly extrapolative by necessity.

Assumptions

Historic large-scale disturbance, such as that caused by fire, is not desired. These effects can only be replicated on small scales.

Potential Natural Vegetation can only be reached in the absence of fire and other disturbances. In most cases the frequency and extent of natural fires precludes the attainment of this potential.

The fire frequencies used in this report are from data collected for the Cowlitz and Riffe Lake Hydrologic Unit Code as reported in 1993. This information is assumed to be more accurate than other Regional estimates.

Historic and Current Conditions

Fire has been the most significant disturbance mechanism in the watershed. Fires are low in frequency but high in severity, and have the potential to be quite large.

Since 1880, it is probable that about 20% , or 10,000 acres, of the watershed has been affected by wildfire. Fire events since 1880 have probably been equally distributed, in terms of acres, between those with natural causes and those which have been caused by human activity.

In general, the Western Hemlock Zone has not been affected by wildfire for at least 170 years. These are lower elevation streamside corridors. In contrast, a large portion of the Pacific Silver Fir and Mountain Hemlock Zones have been affected by wildfire since 1800.

Suppression activities since the 1930's have virtually eliminated natural wildfire effects.

The watershed is currently outside the Range of Natural Variation for fire effects. Past harvest activity in the watershed has been extensive, resulting in the loss of certain structural elements, such as snags, large down coarse woody debris, and possibly duff layers.

The overall successional status of the watershed has been skewed towards an early structural condition.

Stand age spatial patterns and features have been greatly altered.

Effects of Insects on Timber

Assumptions

Insect activity on state and private land is similar to that found on USFS lands, with the possible exception of the Balsam woolley adelgid, an insect associated with tree species not often found on the lower elevation state and private lands.

Historic and Current Conditions

Historically, insects periodically created small openings, usually less than five acres, within the watershed by killing individual trees or groups of trees. The total amount, location, or frequency of this disturbance is unknown, but it is believed to have been very minor, relative to fire disturbance.

Known, documented insect activity within the watershed currently involves only Douglas fir bark beetles attacking Douglas fir, and Balsam woolley adelgid attacking Pacific Silver fir, although it is a certainty that other insect pests reside and are active within the watershed.

Insect outbreaks are infrequent and fairly unpredictable, but are often associated with drought situations or environmental stress. Outbreaks are generally small in size, usually less than five acres, and low to moderate in severity.

Balsam woolley adelgid is a non-native insect introduced into North America in approximately 1900. It probably became a part of this forested ecosystem in the late 1940's or early 1950's.

Effects of Disease on Timber

Assumptions

Disease activity on state and private lands is similar to that found on USFS land, with the possible exception of white pine blister rust, a disease associated with tree species not likely to be found on state and private lands.

Historic and Current Conditions

Historically, disease infections created small to large (one acre to over 10 acre) openings or mosaics within the watershed by killing individual trees or groups of trees. The total amount or location of this disturbance is unknown, but it is believed to be minor relative to fire disturbance.

Currently, known and documented disease in the watershed involves only laminated root rot and Armillaria root disease, although it is certain that other disease agents are present and active.

Currently the existence of these diseases is documented only in young managed stands, although it is certain that they also occur in older stands. A total of 39 young managed stands are known to be infected with one or both of these diseases. It is highly likely that more stands are infected.

The severity of these infections ranges from very low to severe, with most being in the low to moderate range.

All of the documented disease infections on USFS land are in the northern one-third of the watershed (Ames Creek, Woods Creek, Lower Quartz Creek, and Lower Crystal Creek).

Disease infections are usually small in size, less than one acre, but sometimes larger (over 10 acres). Management activities, including timber harvest and planting, have increased the level of root disease infection in some cases.

White pine blister rust is a non-native disease introduced into North America in approximately 1910. The time of its introduction into this forested ecosystem is unknown.

Effects of Blowdown on Timber

Assumptions

A cursory review of past and current aerial photos (1959-1990) is sufficient to draw some conclusions about blowdown activity.

Historic (Pre 1955) and Current Conditions

Historically, strong winds periodically created small to moderately sized openings (less than one acre or greater than 10 acre) or mosaics within the watershed by blowing down individual trees or groups of trees. The total amount, location, or frequency of this disturbance is unknown, but it is believed to have been very minor, relative to fire disturbance.

Current blowdown activity appears to be light.

The majority of the blowdown is directly related to the edge of clearcuts, with most events appearing to be less than 10 acres in size.

VEGETATION

See Maps 11 through 15.

Assumptions

The IVEG database is up-to-date and accurate.

It is assumed that the classification of current vegetation into early-, mid-, and late-structural forest is basically accurate, but it is known that in some cases it is not. The inaccuracies are due to a combination of data error and the inadequately tested method of classification. The time allotted to this analysis does not allow for verification of this classification or the correction of mistakes, known or unknown.

Riparian vegetation is very often different than upland vegetation in size, structure, and species composition, but for the purpose of the analysis, it will be considered the same. Riparian vegetation, unless obviously different on the aerial photo, was not delineated as being different in the IVEG database.

Fire activity before 1880 was caused by lightning or Native Americans and was not controlled.

Before 1880, fire was the most significant disturbance causing stands to revert to an early structural stage.

It is assumed that the classification of historic vegetation into early-, mid-, and late-structural forest is reasonably accurate, but there are undoubtedly errors. The classification method for historic vegetation was different than that used for current vegetation; that is more general, as there is no 1880 vegetation data base to query. The information is based on stand year of origin. Although the dates of fires can be inferred from the stand year of origin, there is no information available regarding what type of stand existed in a particular location prior to a fire setting back its structural stage. There is also a lack of data about how long it took a burned site to develop a new stand.

Vegetation Amount

Historic(1880) and Current Conditions

Historically, mid- (24,816 acres) and late-structural (22,015 acres) forest dominated the watershed, with early-structural forest (7,135 acres) being a relatively minor component.

Currently, early- (18,346 acres), mid- (17,615 acres), and late-structural forest acres (18,067 acres) are roughly equal in the watershed.

The watershed is approximately 98% forest land and 2% non-forest land, which includes rocks, meadows, shrubland, lakes, ponds, avalanche chutes and similar features.

The watershed is composed of three forest zones (Potential Natural Vegetation) in the following amounts: Western Hemlock Zone (23,235 acres or 42%), Pacific Silver Fir Zone (24,217 acres or 44%), and Mountain Hemlock Zone (7,349 acres, or 14%). See Map 13.

Vegetation Pattern

Historic(1880) and Current Conditions

See Maps 11, 12.

The forest vegetation in 1880 was predominantly comprised of large, contiguous blocks. The eastern and northern sections of the watershed (all of Iron Creek, the Cispus River, Ames Creek, and Woods Creek) were dominated by two very large blocks of contiguous mid-structural and late-structural forest. The western portion of the watershed contained smaller forest blocks, somewhat less consolidated and contiguous.

The pattern of forest vegetation in 1880 was more varied and complex in the western portion of the watershed than it was in the eastern and northern portions historically.

Currently, the overall spatial pattern of forest vegetation is varied and complex across much of the watershed, especially in those areas dominated by timber harvest done in small, scattered patches, the exception to that being in the northwest corner of the watershed where a large-scale, contiguous type of stand-replacing regeneration harvest has occurred on private land over the years.

The forest vegetation in Upper Iron Creek (WSU 044S) is highly fragmented; being dominated by relatively small, interspersed patches of early- and late-structural forest. WSU's 044N and 0430 also suffer from fragmentation, but not to the degree of WSU 044S.

The only sizable, relatively contiguous blocks of late-structural forest are located in the area of Lower Crystal Creek, Lower Quartz Creek, Copper Canyon, and Tumwater Mountain (WSU 0443).

The only sizable, relatively contiguous blocks of mid-structural forest are located along the eastern boundary of the watershed (WSU 044N and 044S) near Iron Creek Butte and French Butte; in the central portion of the watershed surrounding Strawberry Mountain (WSU 044N and 0443); and the area north of Goat Mountain (WSU 0443).

The only sizable, relatively contiguous blocks of early-structural forest are located on the private land in the northwest corner of the watershed (WSU 0443 and 0430), and east to northeast of Ryan Lake (WSU 0443).

Vegetation Distribution

Historic (1880) and Current Conditions

See Maps 11, 12.

Historically, the majority of early-structural stage forest was located in WSU 0443, specifically in the area of Lower Quartz Creek, Upper Quartz Creek, Goat Mountain, Crystal Creek, and Strawberry Mountain.

The majority of mid-structural forest was located in WSU 044S historically, although there was a fair representation in WSU 044N and WSU 0443, specifically in the area of Iron Creek, Middle Iron Creek, Strawberry Mountain, Red Spring Creek, Copper Canyon, and Lower Quartz Creek.

The majority of late-structural forest was located in WSU 0430 and WSU 044N, specifically in the area of Ames Creek, Woods Creek, Lower and Middle Iron Creek, and the Cispus River.

Currently, the majority of the early-structural forest is located in WSU 044S (Upper Iron Creek) and in WSU 0443 on the private land and in the volcanic blast zone near Ryan Lake.

The majority of the mid-structural forest is located in WSU 044N and WSU 0443.

The majority of the late-structural forest is located in WSU 0443 and WSU 0430.

Plant Species of Concern

See Map 14. Map not available for public distribution.

The Plant Species of Concern (PSC) within the watershed include threatened, endangered, and sensitive (TES) plant species, as well as survey and manage species.

Threatened, Endangered and Sensitive (TES) Plant Species

Data Gap

No comprehensive surveys were done for this analysis area. All data provided is based on previous project surveys and other existing information.

Assumptions

It is assumed that habitat exists for many TES plant species and it is likely that there are additional sites for TES plant species within the analysis area other than those which are documented.

In many cases TES plant species are confined to special habitats, however, it is assumed that many of the suspected and documented TES plant species are not limited to a single habitat type. Thus, it is difficult to predict where they will occur.

Historic and Current Conditions

There is no information available about historic conditions, but it is assumed that there were viable populations and habitat in the analysis area for plant species that are now considered threatened, endangered or sensitive.

There are 51 TES plant species currently on the Regional Forester's list for the Gifford Pinchot National Forest. Of these species, 31 are potentially found within the analysis area. An additional species, Howellia aquatilis, which was recently listed as threatened federally, also has the potential to occur in the analysis area.

There are currently five documented TES plant species within the analysis area.

These are:

a. Botrychium lanceolatum
b. Botrychium minganense
c. Botrychium pinnatum
d. Cimicifuga elata
e. Pleuricospora fimbriolata.

These five species are distributed among 16 locations within the analysis area. See Map 14.

Almost half of the potential TES plant species are suspected to occur in meadows and wet or moist areas.

Existing data suggests that there are approximately 130 acres of meadows and 398 acres of moist to wet habitat within the analysis area.

These acres can be broken down as follows:

Dry Meadows	23 ac
Moist Meadows	73 ac
Wet Meadows	34 ac
Alder wetlands	49 ac
Moist shrubland	308 ac
Water Covered areas	41 ac

Survey and Manage Species

Data Gaps

There were no inventories conducted for survey and manage species. Because very little inventory or tracking has been done on a regional level, a large data gap exists regarding the actual distribution and location of these species within the watershed.

Assumptions

Of the hundreds of species that are listed as survey and manage in Table C-3 of the Record of Decision (ROD), it is assumed that nine species of bryophytes, 105 species of fungi, 17 species of lichens, and nine species of vascular plant may have suitable habitat within the analysis area.

Current Conditions

There is currently one documented survey and manage plant species within the analysis area.

It is Botrychium minganense.

Some survey and manage species are associated with late-successional forest habitat, thus the pattern of these habitat elements across the landscape plays a part in determining the distribution of these species.

Currently, areas that may provide suitable habitat for survey and manage species within the analysis area can be summarized as follows:

Mountain Hemlock Zone	7,162 ac
Pacific Silver Fir Zone	24,050 ac
Western Hemlock Zone	23,527 ac
Total	**54,739 ac**

Thirty of the survey and manage species are associated with riparian areas, and may be dependent on the designation of riparian buffers for the protection of their habitat.

Noxious Weeds

See Map 15.

Data Gaps

No surveys for noxious weeds have been done in the analysis area.

Assumptions

There are 99 species of noxious weeds on the Washington State noxious weed list. Of these species, approximately 40 may occur within the analysis area.

It is assumed that roads are one of the primary corridors for weed dispersal.

It is assumed that noxious weed spread is correlated with human use in the analysis area.

Current Conditions

There are five primary methods for treating unwanted vegetation: manual, mechanical, prescribed fire, chemical, and biological. Currently there are no control measures in place in the analysis area to combat noxious weeds.

Roads are the primary corridors for noxious weed dispersal within the analysis area.
Other corridors that promote noxious weed dispersal within the Lower Cispus West analysis area and surrounding areas include trails, particularly those used by pack animals, riparian areas and stream channels.

Wind plays a significant role in the spread of noxious weed propagule along corridors in the analysis area.

There is a high probability that Cirsium arvense, Cirsium vulgare, Cytisus scoparius, Hypericum perforatum, Hypochaeris radicata, Leucanthemum vulgare, Senecio jacobaea, and Sonchus arvensus are the primary noxious weed species found along the roads in the analysis area.

Lythrum salicaria is an aggressive noxious weed that may be found wetland and lakeshore habitat in the analysis area.

WILDLIFE

See Maps 21 through 25.

Data Gaps

Lack of most TES, Survey and Manage, and other wildlife species information on historic and current occurrence, distribution, and densities.

Lack of both historic and current wildlife species information on occurrence, distribution, and densities on private and state land within the watershed.

Lack of down log and snag (CWD) densities, size, distribution, and tonnage information.

Only limited surveys have been conducted for survey and manage mollusk species.

Lack of vegetation and habitat condition information on private and state land.

Assumptions

If suitable habitat is currently present, then TES, Survey and Manage, and other wildlife species that can potentially occupy the habitat are present.

All 291 species that are potentially occupying the watershed were also present prior to European settlement with the exception of several introduced species including the bullfrog, house mouse, and Norway rat. These three species are assumed to have no significant presence historically.

Indigenous people's utilization of wildlife did not limit wildlife populations.

Interior or late-successional habitat dependent species were more abundant historically than currently.

Species dependent on coarse woody debris (CWD) were more abundant historically than currently.

Riparian-associated species were more abundant historically than currently.

Large predators such as grizzly bears, wolves, and wolverines are assumed to have been more abundant historically than currently.

Wildlife distribution is in response to vegetative conditions, unique habitats, and habitat changes resulting from disturbance.

Fire, timber harvest and roading have had the greatest influence on wildlife distribution.

Most wildlife species occur on National Forest land, not private or state land in this watershed due to lack of habitat on state and private lands.

TES species occurred in greater abundance historically than is present currently, and the reason is related to loss or degradation of habitat, and habitat fragmentation.

Designated northern spotted owl critical habitat (WA-38) will be maintained indefinitely by the U.S. Fish and Wildlife Service, and consulted on as appropriate for site-specific projects.

Areas which were harvested prior to implementation of GPLMP are assumed to not meet the current GPLMP or ROD Standards and Guidelines for CWD, and are inadequate to meet species' needs.

Habitat Conditions

Historic and Current Conditions

291 wildlife species are potentially present in the planning area, see the Wildlife Technical Report in the appendix.

The majority of harvest has been in late-successional forest, primarily in the middle to lower half of the watershed. This area is broken up into two primary structural stages, mainly mature forest and seedling stands.

Currently, about 36% of the watershed is late-successional forest.

Currently, 62.4% of riparian habitat is in early to mid-structural stage. The remaining percentage is in the late-successional stage.

Special habitats include Mosquito Meadows, the Ryan Lake area, and wetlands. Due to topography, vegetation, available riparian areas, and elevation, these two areas are unique as wildlife habitat. Mosquito Meadows and Ryan Lake provide a type of habitat not found elsewhere in this watershed, and are important for several wildlife species (designated as "WSA" on Map 24.

Historically (prior to 1950's), human access and timber harvest was limited, and late structural habitat was present in large consolidated blocks except where fires burned. Populations of late structural species are likely to have been higher than what now exists.

Road density on National Forest land is 1.84 mi/sq.mi. in the summer and 1.72 mi/sq.mi. in the winter after seasonal road closures. On private and state land within the watershed, it is assumed

that all roads are open year-round. Open road density on private and state land is 3.89 mi/sq.mi. The average road density for the watershed, including figures for both National Forest and state and private land, is 2.17 mi/sq.mi. in the summer, and 2.07 mi/sq.mi. during the winter months.

Road networks include roads which cross virtually all major streams and creeks in the watershed.

Human presence and activities have increased in riparian areas primarily due to recreational pursuits.

It is assumed that nearly all of late and mid-structural timber has been harvested from private and state lands. Because of this, most viable habitat for the 291 wildlife species in this watershed is restricted to National Forest land.

Wildlife species tend to use habitat along riparian areas and ridgelines as movement corridors. See Map 24.

Late successional habitat has been fragmented and connectivity disrupted between the two Late-Successional Reserves (LSR's) in the watershed analysis area and the LSR adjacent to the southern boundary of this watershed area on Mt. St. Helens. See Maps 4, 22, 24.

Threatened and Endangered (TES) and Survey and Manage Wildlife Species

Historic and Current Conditions

There are 22 TES species that are potentially occupying the watershed, see Wildlife Technical Report.

There are 26 survey and manage species that are potentially occupying the watershed.

There are 14 pairs and 6 territorial single northern spotted owls known to inhabit the watershed.

Of the pairs and territorial single spotted owls known to occur within the watershed, 6 pairs and 1 single to do not yet have acres calculated to determine if they are below threshold acres determined by the U.S. Fish and Wildlife Service as required by the owls to meet their life history needs.

Of the 8 pairs and 5 territorial singles with acres calculated, 8 are known to be below threshold acres within 0.7 or 1.82 mi. of their activity centers.

Marbled murrelet range falls within the watershed and totals about 2,360 acres.

There are three survey and manage species known to occur in the watershed based on 1995 mollusk surveys: Vertigo species, blue-gray taildropper, and papillose taildropper.

AQUATIC SYSTEM

See Maps 16 through 20.

Water Available for Run-off and Peakflow

See Map 16.

Two methods for predicting peakflow sensitivity for the subwatersheds in this area were utilized.

The first, entitled WAR, or Water Available for Runoff, is detailed in the Washington State Watershed Analysis Handbook. This method calculates predicted increases in streamflow with changes in vegetative cover based on rainfall, tree size, temperature, antecedent snow accumulation and elevation. For non-forested areas, including rock outcrops and meadows, this model assumes rapid runoff, and greater snow accumulation and melt.

The other method is entitled ARP, an abbreviation for Aggregate Recovery Percentage. This method is detailed in the Gifford Pinchot Cumulative Assessment Process Final Report. This method calculates a predicted hydrologic recovery for a basin, based on stand year of origin, species, and site class, assuming that a stand is 100% hydrologically recovered once it reaches an average diameter of 8 inches. This method does not rely on rainfall, temperature, or antecedent snow accumulation. For non-forest areas, this model assumes 100% hydrologic recovery.

Neither model accounts for soil compaction, an impediment to infiltration, resulting from such activities as road construction and skid road use, or for the interception of subsurface flow and increased drainage density caused by road construction.

Peakflow Ratings

Thresholds for each model are noted below:

WAR - 10% or greater - possible downstream flood damage and scour damage to fish spawning areas.

ARP - 70% threshold for seeing adverse effects including water quality and stream channel degradation.

Assumptions

Regional flood-frequency regression equations, including their explicit estimates of confidence, provide a reasonable framework for evaluating the effects of forest harvest on peak flows over basin-scale areas.

For the purpose of this analysis, it is assumed that the regression equations predict flows under predominantly hydrologically mature (pre-disturbance) conditions. The equations were based on data collected under a variety of land uses and forest patterns, including undisturbed, disturbed, and mixed conditions. The effects of historically changing forest characteristics on the regional regression equations cannot be evaluated.

It is assumed that the snow regression equation is derived from the measurements representing hydrologically mature conditions. Snow measurements, recorded by Cooperative Snow Survey and the National Weather Service, are made under a variety of forest stands, although the climatic and topographic conditions of most stations are unknown.

The U.S. Army Corp of Engineers snow-melt equation is appropriate for estimation of melt under rain-on-snow conditions.

For the areas of private land, the current condition modeled was immature.

WAR estimates were checked with Aggregate Recovery Percentage (ARP) calculations to determine correlation, and to allow for the calibration of the model with a known indicator of sensitivity.

Current Conditions

See Map 16.

Eight of the subwatersheds are showing a HIGH potential for adverse effects related to peakflow, these are:

04A-Copper Creek	24% increase Peak Flow; 63% ARP
04B-Quartz Creek	16% increase Peak Flow; 68% ARP
04C-Upper Quartz	9% increase Peak Flow; 45% ARP
04D-Crystal Creek	15% increase Peak Flow; ARP not calculated
04E-Woods Creek	16% increase Peak Flow; 74% ARP
04G-Big Creek	10% increase Peak Flow; 59% ARP
04H-Wakepish	10% increase Peak Flow; 61% ARP
04X-Cispus	40% increase Peak Flow; ARP not calculated

Two of the subwatersheds are showing a MODERATE potential for adverse effects related to peakflows, these are:

04I-Upper Iron Creek	7% increase Peak Flow; 69% ARP
04J-Ferrous Creek	9% increase Peak Flow; 98% ARP

One subwatershed is showing a LOW potential for adverse effects related to peakflows, this is:

04F-Lower Iron Creek	5% increasePeak Flow; 83% ARP

Definitions for Ratings

High - All subwatersheds with a HIGH predicted potential for adverse effects are also experiencing a High Concern (channel assessment, Map 17) in many reaches along the mainstem stream. These subwatersheds should be further investigated and management activity carefully scrutinized for potential degradation before further disturbance is allowed.

Moderate - Subwatersheds with a MODERATE predicted potential for adverse effects have stream reaches experiencing some degradation, but to a lesser degree than above, or for more natural reasons. For example, volcanic activity has affected the rating of Quartz Creek. These watersheds should also receive some further investigation before introducing new disturbances.

Low - The subwatershed with a LOW predicted potential for adverse effects, Lower Iron Creek, is experiencing some instream adverse effects. Bank stability is a main concern, and could be connected to upstream adverse effects. Pool, wood, and width to depth ratios are poor, and further analysis is warranted.

Aquatic Organism Distribution

See Map 18.

Assumptions

Historical fishery and habitat information is scarce for this area.

Current habitat conditions are assumed to have changed little since stream surveys were conducted, the oldest surveys were done in 1987.

Fish species and distribution coincides with actual survey or historical sources, a large amount of potential habitat and unknown populations may exist in the watershed.

Historic and Current Conditions

The anadromous barrier is located at rivermile (RM) 2.8 on Quartz Creek, RM 0.8 on Crystal Creek, and RM 2.7 on Iron Creek. The anadromous barrier is undefined on Woods Creek but probably is somewhere near the 2305 road crossing. All anadromous barriers are natural features such as falls, cascades or beaver dams.

Copper Canyon Creek historically flowed into the Cispus River, but now goes subsurface near the Cispus valley wall. Historically, the stream may have been used as coho rearing habitat.

Chinook spawning habitat was identified at the mouth of Copper Canyon Creek in 1962, but now this area is inundated by the Cowlitz Falls reservoir.

Brook trout have not been historically stocked in area streams, thus their distribution is mainly confined to the mainstem Cispus River.

Historically, both fall and spring chinook as well as steelhead, coho and sea-run cutthroat are the primary anadromous fish that had occurred in the watershed. Currently, coho, steelhead and spring chinook will be used in the anadromous reintroduction effort.

Both currently and historically, cutthroat trout are the dominate resident species in most streams, however cutthroat/rainbow hybrids have been reported in Iron Creek, and a non-native westslope race of cutthroat trout occurs in Wakepish Creek.

The origin of rainbow trout in the watershed is unknown but may be the result of past stocking as part of hydroelectric mitigation agreements or residual steelhead in anadromous reaches.

Deep Lake was found to have a unique, self-sustaining population of coastal cutthroat trout which is assumed to be native.

The lowest reach of Ferrous Creek is an important production tributary for trout in Iron Creek.

Coho salmon and steelhead are the dominate anadromous species in Iron, Quartz, Woods and Crystal Creeks. Spring chinook may use Iron and Quartz Creeks for rearing and possibly spawning, but only in the lowest reaches near the Cispus River confluence.

Woods and Ames Creeks are considered atypical for similar valley segment types in this region by displaying silt and sand meanders, it is questionable whether this is a "normal" (historical) condition.

The majority of anadromous spawning habitat in the mainstem Cispus River is located well upstream of Iron Creek. The Cispus River in the watershed area is used mainly for rearing and holding habitats, although spawning use may occur in isolated patches.

None of the road crossings over fish-bearing streams in the watershed appear to be barriers with the possible exception of Forest Road 26 over Crystal Creek.

Two small patches of potential spawning habitat on the Cispus river at or near rivermile 0.5 and 1.0 have been inundated by the Cowlitz Falls reservoir.

A "mitigation" trout fishery is being established in the Cowlitz Falls reservoir.

Riparian Condition/ Recruitment Potential for Large Woody Debris

See Map 20.

Assumptions

Forest structural stage was used to evaluate Large Wood Debris (LWD) recruitment potential, and riparian tree growth rates were based on professional judgement.

Recruitment potential is based on the following:

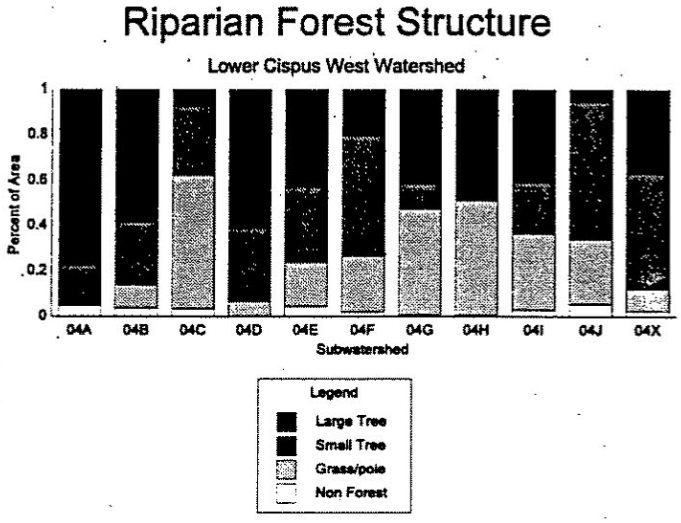
Structure	Size	Recruitment Potential
Non-forest	wetlands, rock, talus, lakes	No foreseeable contribution
Grass/Pole	<9" diameter	No contribution for many decades
Small Tree	9" to 20.9" diameter	Near term, 1 to 7 decades
Large Tree	>21" diameter	Can currently contribute

Current Conditions

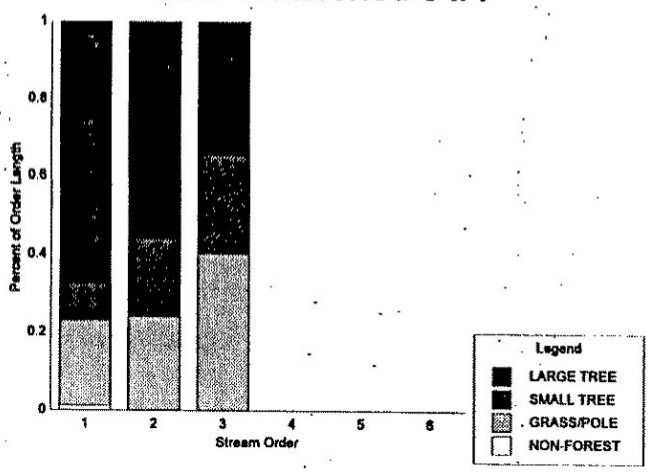
Map 20 (Riparian Connectivity) denotes LWD recruitment potential along streams within the watershed.

It is assumed that historically, riparian corridors in the LCW area were primarily in a large tree structural stage throughout all stream orders, valley forms and elevations. This was based on trends in riparian vegetation patterns found in the previous Upper and Middle Cispus Watershed Analysis. Parameters for this assumption include: Forest Zone coverage, elevation ranges, fire history and predominate valley forms in this area.

Following, please find "Graphs Displaying Forest Structure in Riparian Areas."



Sub Watershed 04A



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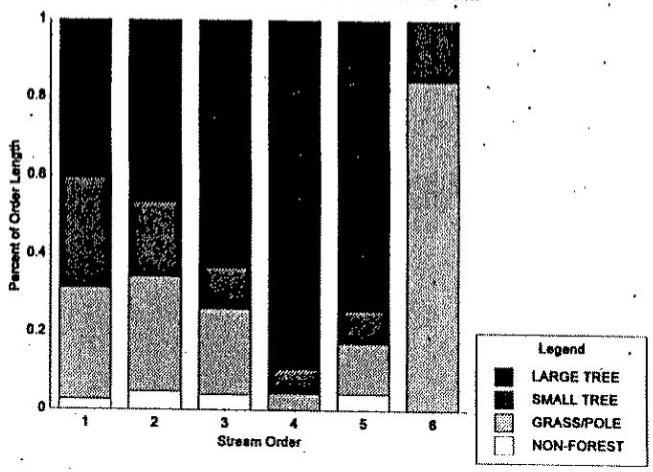
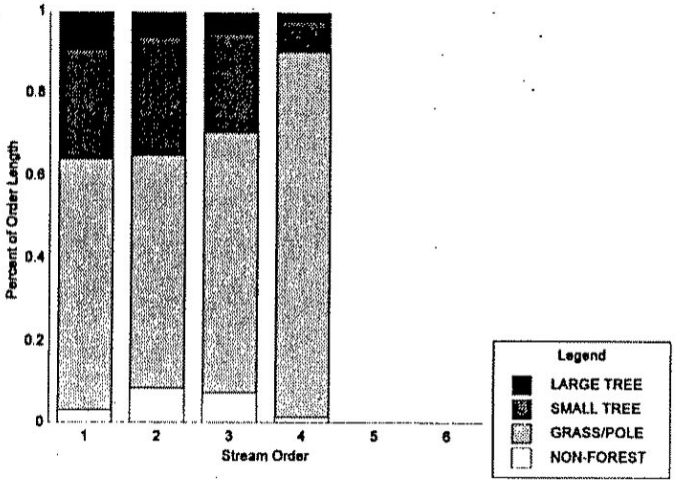


Sub Watershed 04C



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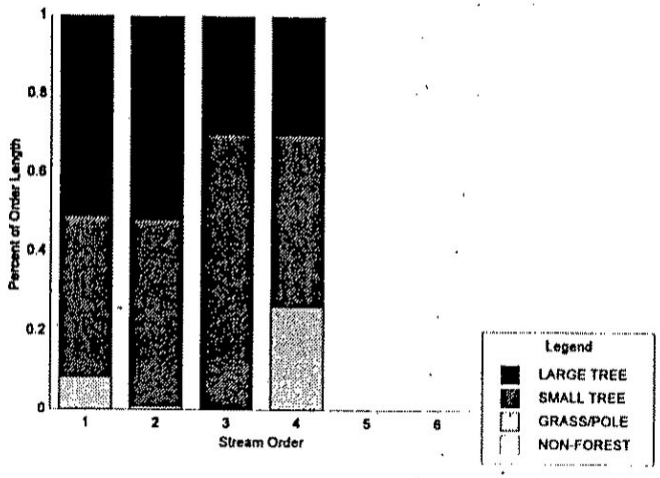

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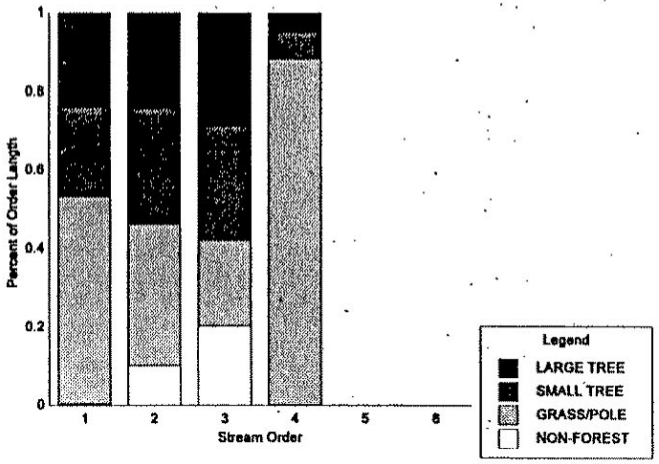

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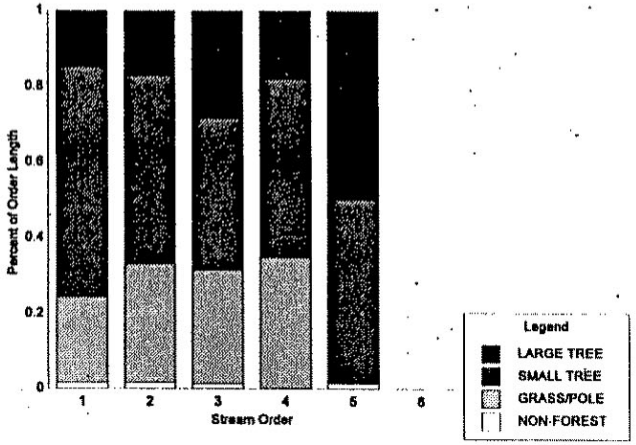

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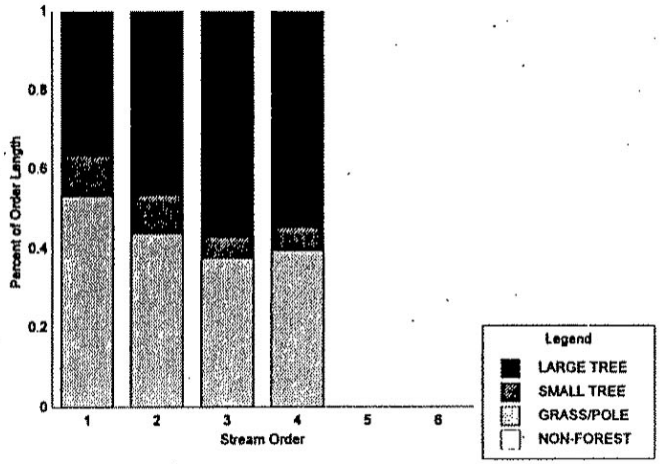
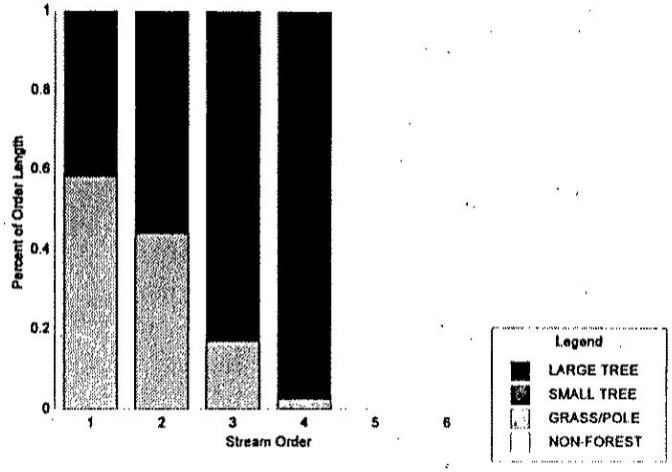
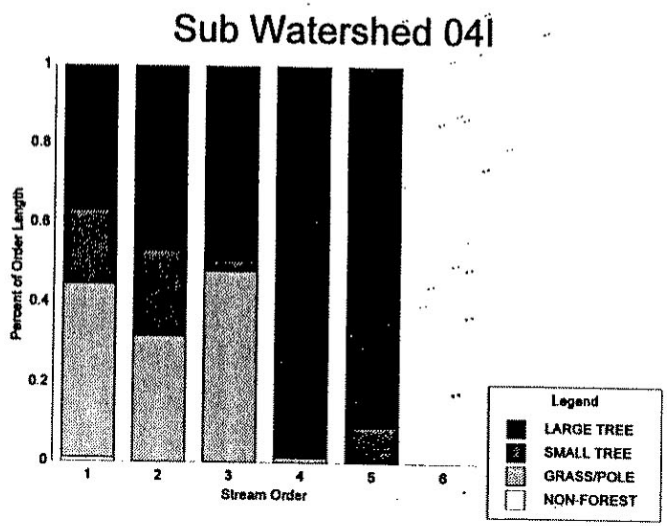
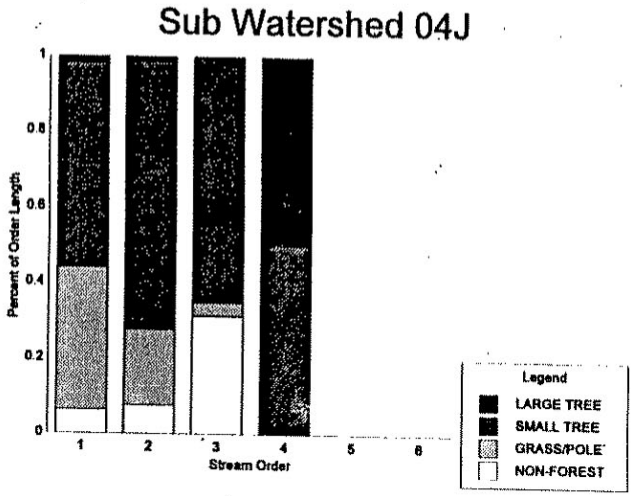
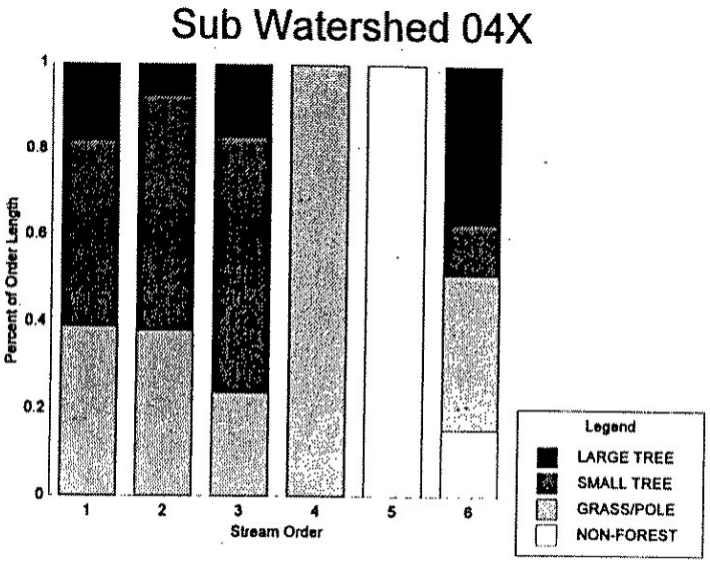


Sub Watershed 4H




Sub Watershed 04I
Percent of Order Length
0
0.2
0.4
0.6
0.8
1
1
2
3
4
5
6
Stream Order
Legend
LARGE TREE
SMALL TREE
GRASS/POLE
NON-FOREST


Sub Watershed 04J
Percent of Order Length
0
0.2
0.4
0.6
0.8
1
1
2
3
4
5
6
Stream Order
Legend
LARGE TREE
SMALL TREE
GRASS/POLE
NON-FOREST


Sub Watershed 04X
Percent of Order Length
0
0.2
0.4
0.6
0.8
1
1
2
3
4
5
6
Stream Order
Legend
LARGE TREE
SMALL TREE
GRASS/POLE
NON-FOREST

Water Temperature

Assumptions

Most of the monitoring stations collecting water temperature data were set up during the summer of 1995. It is assumed that the data does not reflect average conditions since it was a relatively cool year.

Existing stream temperature data is too sparse to address trends.

Historic and Current Conditions

Historically, NRV is between 11 and 19 degrees Celsius (PNW Research Station).

Flooding

Assumptions

The flood data which is used is from the USGS station above the planning area, due the lack of any other data source. This station is approximately 5.5 miles above the first confluence of the planning area.

Historic and Current Conditions

A majority of annual maximum events have occurred between November and February.

Annual maximum floods have ranged from as little as 2,460 cfs (December, 1973) to 21,700 cfs (January 15, 1974).

Four of the top 10 floods occurred in the 1970's. 1974, 1978, 1976, and 1973 in order of magnitude.

Channel Conditions

Historic and Current Conditions

The following codes (ex.. = Q1B3) refers to specific stream locations where Q represents Quartz Creek, 1 represents reach 1, B3 represents the "Rosgen stream channel classification" type.

Quartz Creek
Q1B3- Decrease of 39% (1959-1973) indicates previous widening. Riparian area had been harvested, and road crossing occurred earlier.

An increase of 135% (1973-79) following flood years indicates extreme sensitivity to peak flows following management activities. In 1979-89 stream decreased 61%.

Q2A3- Narrow in 1959, stream increased 42% (1973-79), then narrowed again between 1979-1989. This could be associated with road related failures.

Q3B2- Decrease of 49% (1959-73) indicates previous widening. Increase of 107% (1973-79) during flood years, followed by a narrowing of 23% between 1979 and 1989 likely due to road related failures.

Q4A1- Decrease of 26% (1959-73) indicates previous widening. Increase of 63% (1973-79) during flood years.

Q6B3- Increase of 32% (1959-73) and another increase of 81% (1973-79) indicates a sensitivity to increases in peak flow. Decrease of 55% (1979-89).

Big Creek

IB18C4- Increase of 60% (1959-73) indicates sensitivity to management activities. This may be due to open riparian areas.

Increase of another 56% (1973-79) during flood years. Spur road failures and bank failures contributed to widening.

Decrease of 36% (1979-89) indicates some stability, although very slow recovery. Very high response channel.

Cispus River

C5B- Increase in width of 23% during flood years, decrease of 23% between 1979-89.

C5C- Increase in width of 35% between 1959-74. May have been related to management or to dam break flood in Upper Iron Creek. Has not narrowed much since.

C10C- Increase in width of 27% between flood years 1973 and 1979. A large medial bar is currently shown in the photos. Decrease in 1989 was only 6%.

Iron Creek

I1B2- Increase of 70% (1973-79), decrease of 42% (1979- 89), indicates a sensitivity to flood events, although elastic when not disturbed further.

I2A2- Increase of 68% (1973-79), decrease of 29% (1979-89). Road runs parallel to stream here. Sensitivity to flood events.

I3B2- Increase of 27% (1973-79), decrease of 32% (1979-89). Road still paralleling stream.

I5B2- Increase of 97% (1959-73), decrease of 20% between 1973-79, decrease of 46% between 1979 and 1989. (New Road construction?). This reach was very sensitive to road related failures prior to 1959.

I7B2- Decrease of 42% (1979-89), most likely rebounding from flood events during the 1970's.

HUMAN DIMENSION

See Maps 26 through 32.

Native Americans

Early human occupations within the analysis area are represented by cultural deposits at the Koapk Site (45 LE 209) at Cowlitz Falls. The falls and rapids at the Koapk Site provided prehistoric people an excellent location to trap, net, or spear migrating fish. By 4,300 years ago, camps had been established in the hemlock and cedar forest above Cowlitz Falls for this purpose.

The Smith Creek eruptive phase of Mt. St. Helens significantly disrupted human land use in the area ca. 3,500 years ago.

A late pre-historic occupation is also documented at the Yuyutla Site (45 LE 413), located on the Cispus River at the eastern edge of the analysis area.

During the 19th century, the lower Cispus River lay within the territory of the Taidnapam, or Upper Cowlitz, Indians. Villages were scattered along the Cowlitz River and larger tributaries between Mossyrock and Packwood. The band which resided on the Cispus River were know as the *cicpaclama*.

Ethnographic accounts refer to almost 40 fishing stations throughout Taidnapam territory. Koapk, at Cowlitz Falls, was among the most important Taidnapam fishing sites.

Fishing sites, other camps, and settlements were connected by trails. An important route, known as the "Yakima Trail" or "Yakima-Cowlitz Trail" followed the south side of the Cowlitz River, crossing the Cispus near its mouth.

Use of the analysis area by local prehistoric people was intensive during brief periods, with populations absent from the area for much of the year, given the inferred seasonal round.

Euroamericans

Historic accounts suggest that the earliest non-native visitor to the analysis area was Simon Plamondon of the Northwest Company, who reportedly reached the "Big Bottom" in 1820.

Speculation about a railroad route over the Cascades via the Cowlitz valley spurred initial Euroamerican settlement of the valley in the period ca. 1882 to 1890.

Public lands in the area were set aside as the Pacific Forest Reserve in 1893. The lands came under the jurisdiction of the Forest Service in 1905. The area became a part of the Columbia National Forest in 1933. The name was changed to Gifford Pinchot National Forest in 1949.

Several homesteads were established on timber claims in the analysis area after the establishment of the Forest Reserve.

Mining

Mineral prospecting and small-scale development of mining claims occurred within the analysis area between 1892 and 1940. Claims were located in Copper Canyon, and on Quartz Creek, Sulphur Creek, Moses Creek, and Iron Butte.

At least 158 mining claims were filed in the area, most during 1892 and 1893. Almost 90% of the claims were located along Quartz Creek. None of the prospects reached production-level development.

Several cabins were built by prospectors on or near the Quartz Creek Trail.

Grazing

Two sheep grazing allotments used ca. 1920-1960 included lands in the upper Iron Creek basin that had been burned over by a wildfire in 1902. Approximately 1350 acres within the analysis area fell within the Pinto Rock and Greenhorn sheep allotments.

Logging

Commercial timber harvest within the analysis area began with railroad logging of privately owned lands along the Cispus River in 1939 and 1940. Railroad logging of National Forest lands in the Iron Creek drainage between 1946 and 1952 and marked an important shift in the local economy toward timber resources.

Access

Historic and Current Conditions

Until about 1900, primary access was by Indian trails, including the "Yakima Trail", and another route that followed the Cispus River. Roads were later constructed over these routes. Portions of the current Boundary Trail (#1), important in early Forest Service horseback patrols, may have been an Indian trail.

Prospectors built several trails, including those up Quartz Creek and Strawberry Mountain, between 1890 and 1900 to reach mining claims. The Quartz Creek Trail remained in use until the 1950's as a primary access route to Ryan Lake. Road 26 parallels much of its route. Most of the Strawberry Mountain Trail remains in use as a recreation trail.

Trails to French Butte, the Pinto Rock area, and the upper Iron Creek basin may have initially constructed as sheep driveways to grazing allotments ca. 1920-1925.

Trails built by the Forest Service for fire patrols and other administrative access include Iron Creek Trail (ca. 1925), and Kraus Ridge Trail (ca. 1929). By the late 1950's, trail use shifted to public recreation purposes. Travel was primarily by horse, motorcycle, or foot.

A logging railroad was built along the Cispus River in 1939, and was extended into the Iron Creek drainage in the late 1940's, along portions of what is now the 25 Road. A railroad spur was extended up Woods Creek. The main line reached timber sales as far up the Iron Creek drainage as the current Road 99 junction. Roads replaced the railroad tracks by about 1958.

Roads 25, 26, and 99 were paved after the eruption of Mt. St. Helens in 1980. Increases in passenger and commercial traffic followed the eruption. Currently, traffic is primarily composed of passenger vehicles for all roads in the area.

In recent years, most of the area trails have been reconstructed or relocated with recreation, rather than administrative needs, in mind.

Recreation

Historic and Current Conditions

As roads were built into upper Iron Creek and Quartz Creek, recreational use of the area increased.

Iron Creek Campground was built in the mid-1960's with twelve campsites, expanded to 54 sites in the mid-1970's, and to 100 sites in the 1980's.

Developed camping occurred at Ryan Lake prior to the eruption of Mt. St. Helens.

As with many of the trails in the area, most of the developed facilities are either new, or have been reconstructed to meet current health and water quality standards in recent years.

Developed facilities including Wakepish Snowpark, Quartz Creek Big Trees Trailhead, Woods Creek Information Station, and Bear Meadows Viewpoint were all built following the eruption of Mt. St. Helens.

The Woods Creek Watchable Wildlife Trailhead and Picnic Area were completed in 1994.

Dispersed camping occurs in several cleared areas that were created, in many cases, by timber harvest or road construction. Popular areas occur along Road 2510, lateral roads off of Road 28, and along the miles of road on the east slope of Strawberry Ridge (Roads 2515, 2516, 2517, and 2518).

Recreational and commercial rafting are concentrated on the Cispus River from mid-March to late June.

Roads 2500 and 2600 provide two of the primary access routes into the National Volcanic Monument, which has increased the number of people who visit the area by 10 times.

CHAPTER 5

Interpretation, Areas of Concern Terrestrial System

CHAPTER 5 - INTERPRETATION, AREAS OF CONCERN

INTRODUCTION

Chapter 5 is devoted to the examination of the trends and potential future effects associated with the reference and current conditions presented in Chapter 4. Areas of concern which have emerged through the analysis process are encapsulated as bullet statements within this chapter. Maps illustrating the location and distribution of areas of concern can be found in the map packet attached to the end of the document.

TERRESTRIAL SYSTEM

See Maps 7, 8, 10, 31, 32.

Seismic Conditions and Volcanic Eruption

Earthquakes and volcanic eruptions are natural processes that will take place regardless of human opinions or wishes. The most we can do is be aware of the potential for occurrence, and where possible, try to describe possible consequences. For Lower Cispus West, we need to note that Mount St. Helens has erupted, on average, once per century over the last 500 years, and that at least two of these eruptions have deposited ash and tephra across the watershed. The deposits have contributed to increased (fine) sediment delivery to streams for a period of years to decades after each eruption.

Mass Wasting

Large amounts of sediment are currently being routed into the headwaters of Quartz Creek where the blast of Mount St. Helens denuded the area in 1980. As the roots of the dead trees continue to decay on steep slopes, rapid shallow-landslides are increasing in frequency and extent. This trend is expected to continue until herbaceous vegetation re-establishes itself and root strength is reestablished on steep hillsides within the blast zone.

A number of shallow, rapid landslides have occurred in the lower stretches of Quartz Creek that have been linked to construction of and failure from the 26 Road (see Map 32). Increased levels of coarse and fine sediment have been contributed to the lower stretches of Quartz Creek since the 1960's. The 26 Road is a major travelway for recreational traffic, and is anticipated to be maintained for such traffic into the future. A number of known problem areas on this road system are being addressed so that sedimentation can be reduced and traveller safety can be maintained.

Mass wasting in the form of large landslides has been occurring in the Iron Creek drainage for thousands of years. A number of large, dormant/currently active landslides are located in the Benham Creek, Fourmile Creek, Big Creek, Wakepish Creek, and Twelvemile creek drainages

within this watershed. Portions of these features are stable or marginally stable and not overly sensitive to disturbance by management activities, whereas other areas are. Site specific investigation is required to identify these areas.

A number of human-caused slope failures are also contributing sediment within the Iron Creek drainage; often where roads and timber havest have been implemented on sensitive portions of existing landslides. In particular, roads sytems within the Benham, Fourmile, Wakapish, Twelvemile, and Lower Iron creek streams are in need of reconstruction and/or decommissioning efforts to reduce sedimentation. See Chapter 7, Recommendations, for details.

Hillslope Erosion

Hillslope erosion is a concern in the headwaters of Quartz Creek (blast damage), and in the headwaters of Iron Creek, where clerarcut harvest has removed vegetative cover over deep tephra deposits. See Chapter 7 for detailed locations.

Road Conditions

A number of roads within the watershed have been identified as contributors of elevated sediment levels to streams. In particular, roads in the lower Quartz Creek, and much of the Iron Creek drainages, have been identified. See Chapter 7 for detailed locations and road numbers.

Effects of Fire on Timber

Areas of Concern

There are currently no specific areas of concern where natural or activity fuels have accumulated to an extent which would pose the risk of a catastrophic fire event.

Effects of Insects on Timber

Areas of Concern

Based on the limited information which is available about past and current insect activity, it appears that current insect outbreaks are within the range of natural variability at present, although the limits of that range are unknown, particularly for the non-native Balsam woolley adelgid.

It can be expected that future insect outbreaks will be widely and irregularly distributed in small patches across the portions of the watershed occupied by their respective hosts, with attacks often being associated with hosts under environmental stress.

Effects of Disease on Timber

Areas of Concern

Based on the limited information which is currently available about past and present disease activity, it appears that disease infections are probably within the range of natural variability at present, although the limits of that range are unknown, particularly for the non-native white pine blister rust.

We can expect future disease infections to increase somewhat in size and severity in some of our young managed stands containing host species where past management practices have exacerbated the problem. These problems will most likely increase in the northern one-third of the watershed (Ames Creek, Woods Creek, Lower Iron Creek, Lower Quartz Creek, and Lower Crystal Creek, as well as in the area of private land along the Cispus River).

Effects of Blowdown on Timber

Areas of Concern

The available evidence indicates that timber harvest activities, mainly clearcutting, have increased the amount of blowdown and the number of blowdown events above the level which would naturally occur within this watershed.

We can expect that future blowdown events are likely to occur along the margins of existing clearcuts and future harvest units. Under certain conditions, such as high wind coupled with saturated soils, these events could impact significant acres.

Blowdown events are most likely to occur during the fall and winter months between November and February.

VEGETATION

See Maps 11 through 15.

The amount, pattern, and distribution of forest vegetation structural stages across this landscape 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 and fire; with insect outbreaks, disease infections, blowdown, and mass wasting playing a less prominent role. These agents of disturbance will tend to create new early-structural habitat and conditions.

Vegetation Amount

Areas of Concern

The calculated range of natural variability for the structural stages across the watershed is as follows:

Early-structural:	2 to 42%
Mid-structural:	27 to 72%
Late structural:	21 to 60%

Currently, all three structural stages of forest vegetation are within their ranges of natural variability for this watershed; with early-structural being in the upper one-third of its range, and mid- and late-structural being within the lower one-third of their range.

From 1880 to 1995, there has been a significant increase of 11,211 net acres in the total amount of early-structural forest, an increase from 13% to 34% of the watershed's productive forest land. That shift was largely the result of clearcut regeneration harvest over the past 50 years.

Between 1880 and 1995 there has been a decrease in net acres of both mid-structural and late-structural forest. Mid-structural forest has decreased by 7,201 net acres, shifting from 46% to 33% of the watershed's productive forest land. Late-structural forest has decreased by 3,948 net acres, shifting from 41% to 33% of the watershed's productive forest land. These shifts were largely due to clearcut regeneration harvest and natural succession.

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 early-structural forest should steadily decrease, with the total amounts of mid- and late-structural forest increasing through natural succession and forest management activities, primarily pre-commercial and commercial thinning. Private lands are not expected to contribute to the amount of future late-structural forest in the watershed because of their relatively short harvest rotations.

Vegetation Pattern

See Maps 11, 12.

Areas of Concern

From 1880 to 1995, there has been a dramatic and significant change in the pattern, size, and shape of forest blocks in this watershed due to regeneration harvest activities.

Between 1880 and 1995, the size of forest blocks has been dramatically reduced from relatively few blocks of thousands of acres each, to a large number of much smaller blocks, most less than 500 acres in size. The loss of large (1,000 acre and larger) blocks of contiguous, interior mid- and late-structural forest blocks has occurred over the last 50 years.

From 1880 to 1995, this watershed has changed from one comprised of large, consolidated, contiguous, connected blocks of forest, to one of largely fragmented , disconnected blocks of forest. WSU's 044S, 044N, and 0430 have gone from being areas of large interior mid- or late-structural forest to being fragmented by small early-structural forest patches, especially WSU 044S. The overall spatial pattern of forest vegetation has become a much more varied and complex mosaic across the watershed. WSU 0443 is the least changed, and has remained the most "natural" of all the WSU's in the watershed in terms of pattern, size, and shape of forest blocks.

Between 1880 and 1995, the shape of many forest blocks has changed from unfragmented, consolidated blocks usually wider than one mile; to generally long, linear, spindly, and narrow blocks usually less than 0.5 mile wide, often less than 0.25 mile wide.

The stand structure of thousands of acres of forest has been simplified over the last 50 years by clearcut regeneration harvest. The acres of early-structural forest created by clearcutting are much less structurally complex than the acres created by wildfire in the past. Clearcutting, in most cases, left no large remnant trees or snags as individuals or in groups, and in most cases, left very little down wood; while wildfires very often left the components of structural diversity behind on some parts of the landscape.

In the next few decades, the pattern, size, and shape of forest blocks will remain much the same as they are now. Only time (natural succession) and well-thought-out, well-planned management activities can restore a more "natural" vegetation pattern to the watershed.

Vegetation Distribution

See Maps 11 through 13.

Areas of Concern

Between 1880 and 1995, there has been a significant change in the distribution of early-structural forest across the watershed. In 1880 almost all of the early-structural forest was located in WSU 0443. In 1995, a significant amount remains in WSU 0443, although its location has shifted to the area northeast and east of Ryan Lake, and to the private land along the Cispus River. A large amount of early structural forest now comprises WSU 044S (Upper Iron Creek). Early-structural forest is now well represented across the entire watershed.

From 1880 to 1995, the distribution of mid-structural forest has made a major shift from being located primarily in WSU 044S (Upper Iron Creek) to being primarily located in WSU 044N (Lower Iron Creek), and WSU 0443, especially central Quartz Creek.

From 1880 to 1995, the distribution of late-structural forest has made a major shift from being located primarily in WSU 0430 (Ames Creek, Woods Creek) and 044N (Lower Iron Creek) to being primarily located in WSU 0443 (Lower Quartz Creek and Lower Crystal Creek), WSU 0430, and WSU 044S (Upper Iron Creek) currently.

Over the next few decades, early-structural forest will tend to be located primarily in WSU 044S (Upper Iron Creek), a high elevation area with most of the recent regeneration harvest. Mid-structural forest will tend to be located primarily in WSU's 0443, 044N, and 0430. Late-structural forest will tend to remain located primarily in WSU's 0443, 0430, and 044S.

Threatened and Endangered Plant Species

See Map 14, filed with the district botanist. (Not available for public distribution)

Areas of Concern

To date, monitoring of the documented TES plant species sites and the population trends for these TES plant species has not been done. Without this information, it is difficult to identify how TES plant species are responding to changes within the watershed.

It is possible that there is a downward trend in viable populations and habitat for TES plant species within the analysis area.

Large patches of suitable habitat may be unusable by TES plant species if those areas of suitable habitat are isolated from a source of propagules.

Using fixed riparian buffer widths in generating prescriptions may not accommodate the habitat needs of TES plant species.

Many of the TES plant species are associated with meadows and moist habitat; future management directives should include schemes that favor meadow habitat in ensuring that quality habitat remains available for these species.

The absence of an intensive inventory of survey and manage species within the watershed is a concern.

Noxious Weeds

See Map 15.

Areas of Concern

The existence of corridors linking pristine areas with areas where noxious weeds are known to occur threatens those pristine patches with colonization by noxious weeds.

The noxious weeds which occur at trailheads, particularly those used by pack animals, along roads, at road and stream crossings, and at recreation areas could potentially be transported to pristine areas within the analysis area by human activities.

Failure by forest users with pack animals to use hay that as been certified free of noxious weeds could contribute to the propagation of noxious weeds within the analysis area..

The utilization of gravel piles with noxious weed populations for road and trail material could promote the spread of those noxious weeds.

Noxious weeds could potentially infest TES plant species habitat and out compete the TES plant species.

Noxious weeds could potentially infest survey and manage habitat and out compete the survey and manage species.

WILDLIFE

See Maps 21 through 25.

Habitat Conditions

Areas of Concern

Some wildlife populations are essentially restricted to National Forest land due to a lack of habitat on private and state land.

Many late-successional, interior, and riparian habitat-dependent wildlife species have experienced a downward trend in abundance within the watershed. This trend on a larger scale has resulted in many species being listed as threatened, endangered, candidates for listing, and sensitive by federal and state agencies.

Species associated with late structural, interior habitat, or riparian habitats will likely experience further population declines in areas designated matrix forest allocation. It is likely that species with small home ranges will be locally extirpated in project areas. Those species with large home ranges and tend to have fewer individuals in populations will also experience further population declines.

Species that require CWD will remain at depressed or non-existent levels in areas where there is a lack of this substrate. With implementation of CWD standards and guidelines in matrix land, populations are expected to remain at stable or reduced levels, depending on silvicultural prescriptions.

Reduced use of riparian areas by wildlife species, especially during seasonal recreational periods, will continue, primarily during the summer and fall.

Species dependent on riparian habitat will likely benefit and remain at stable numbers with implementation of the riparian reserve strategy.

Snags and down wood densities are currently lower in regeneration areas than in the unmanaged stands within the watershed. It may take hundreds of years for the natural development of large snags and down logs to occur in these units. The lack of CWD in these areas has resulted in reduced populations or extirpation for species such as birds, mammals, mollusks, and amphibians that require dead wood substrates to meet all or a portion of their life history needs. This is a particular concern for species having small home ranges.

Natural recruitment of snags and down logs within unmanaged late-successional and some mid-structural stands is expected to continue, and will provide for some species habitat and life history needs. This is dependent upon the size of the unmanaged stand, as small patches or stands may be inadequate for species with large home ranges.

Timber harvest has fragmented or reduced late-successional forest, particularly in the mid to southern portion of the watershed. This results in a reduction and loss of suitable breeding, nesting, foraging habitat, increased risk of predation or human-caused mortality, loss or reduction in dispersal or re-colonization capability, genetic isolation, and increased energy expenditure.

Early structural habitat is now more wide-spread than historically, due primarily to timber harvest, which converted late-successional forest to younger forest. This has resulted in an increase in early structural wildlife species, and a reduction in late-successional and interior-dependent species.

Unfragmented blocks of late-successional habitat can act as refugia for species if the blocks are large enough. Within the watershed area, a large unfragmented block of late structural habitat exists in the Quartz Creek drainage, and a smaller block of mid-structural habitat within and east of Iron Creek drainage.

Prior to the GPLRMP and ROD, riparian areas in harvest units were not afforded any particular protection. Therefore, riparian areas in harvest units do not function as corridors or habitat for species requiring such habitat for migration, dispersal, gene flow, nesting, and other life history needs.

Many streams and creeks have sedimentation problems resulting from past harvest practices and roading, resulting in a decline of water quality, and extirpation of wildlife species. For example, many streams were surveyed for amphibians in the watershed, and those streams with sedimentation problems did not contain amphibians or fish. See Map 23.

Riparian reserves under the ROD are intended to maintain and restore riparian structures and functions for riparian-dependent and associated species, enhance habitat conservation for organisms dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial species, and provide greater connectivity within and between watersheds. Riparian habitat currently in early to mid-structural stand structure totals 62.4%. The remaining percentage, 37.6%, is in late structure stage. The late structural stage riparian habitat is highly fragmented across the landscape.

The following are main creeks that are not functioning at potential as habitat or corridors, since timber harvest has reduced the amount, distribution, and quantity of late-successional habitat. There are also a number of unnamed creeks not functioning as corridors or habitat which are not displayed here. Many are tributaries to these main creeks.

Wakepish	Cabin
Fourmile	Benham
Twelvemile	Iron
Little	Big
Woods	Hemlock
Ames	

Quartz Creek is not functioning as a corridor or as habitat for late or mid-structural species in the southern portion of the watershed. This is due to the volcanic eruption in 1980, rather than timber harvest.

Connectivity between late-successional stands and LSR's is poor as a result of late-successional forest being converted to early structural stages by timber harvest, which simplified the forest structure and disrupted many connections within the watershed. Many streams are connected with narrow bands of late structural habitat or are discontinuous and fragmented by early structural stage vegetation.

There is no effective corridor on private or state land allowing wildlife species on National Forest land to disperse or migrate to the north and west of the watershed area. This prevents gene flow, dispersal, migration, and re-colonization of wildlife species on private land, state land, and National Forest land to the north and west.

There are two main ridgelines within the watershed that could potentially act as corridors for some wildlife species. One is located east of Iron Creek and is a large block of unfragmented mid-structural forest. This forest was fire-regenerated in two separate events earlier in this

century. The southern half is of younger origin than the northern half. This ridgeline, because it is in mid-structural forest, could afford some wildlife species a means of dispersal to the eastern half of the Randle District, though it may limit some late-structural species. Because the block is highly fragmented with early structural habitat at its southern end, near the Randle/Mt. St. Helens boundary, it is ineffective as a dispersal corridor between the Randle and Mt. St. Helens Districts or between LSR's on these two districts.

The ridgeline to the west of Quartz Creek has more late structural forest stands that are better connected on the Randle/Mt. St. Helens boundary. However, about two-thirds is mid-structural stage which will afford some wildlife species a means of dispersal, but may limit some late-structural species.

Iron Creek becomes the only link between the two districts and LSR's, but the amount of late structural habitat is very limited and narrow in many places along this drainage, Additionally, a main road runs through the middle of the habitat. The road and narrowness of the corridor limits its effectiveness as a dispersal corridor for many species.

In the Woods Creek area of the watershed, a similar problem exists linking late-structural habitat. There is no effective late-structural link between the southern and northern portions of Woods Creek. Mid-structural habitat forms the connection, though a main road runs through the middle of it. This forms a barrier for dispersal for some late-successional species, as well as those with small home ranges and micro-habitat needs.

There is virtually no connectivity between the eastern and western halves of the watershed. Connectivity has been disrupted by timber harvest on National Forest and private lands. The only connectivity consists of a 0.25 mile wide band of mid structural habitat. This dispersal corridor is of limited utility, as a very localized land area is served and only species associated with mid structural conditions are able to utilize this corridor. See Map 22.

High road density has caused a reduction of habitat directly by removing habitat, and indirectly by causing species sensitive to human presence or activities to avoid roads and habitat near roads. Increased human access increases mortality for many species by increasing legal and illegal hunting, and increasing accidental mortality. This is a particular concern in the middle to lower portion of the watershed.

Recreational pursuits, such as camping and fishing, often occur in or near riparian areas. Wildlife species tend to avoid or reduce use in riparian areas with human activity, reducing habitat available for some species, altering species behavior and movements, and changing productivity.

Threatened and Endangered (TES) Wildlife Species

Areas of Concern

There have only been limited wildlife and TES species surveys conducted within the watershed. Therefore, it is difficult to predict trends for most of the TES wildlife species since there is little density, distribution, or occurrence information.

Many of the TES species occurring within the watershed are associated with riparian, late-structural, or unique habitats. With implementation of riparian buffers and other standards and guidelines contained within the ROD, it is assumed that most TES species will remain at stable numbers in some areas of the watershed.

Due to the highly fragmented nature of the middle to southern portions of the watershed, little to no dispersal will occur between LSR's, riparian areas, or late-structural habitats for many species. Without dispersal opportunities, some species may become isolated and locally extinct.

Without surveys, it is not known what impacts on marbled murrelets will be from projects planned within their range.

Survey and Manage Wildlife Species

Areas of Concern

Table C-3 in the ROD, and pages C-4 through 6, discuss species and strategies required prior to ground disturbing activities. Only some limited mollusk and amphibian surveys have been conducted within the watershed. Therefore, it is difficult to predict trends for most of the survey and manage wildlife species since there is little density, distribution, or occurrence information.

Many of the survey and manage species occurring within the watershed are associated with riparian, late-structural, or unique habitats. With implementation of riparian buffers and other standards and guidelines contained within the ROD, it is assumed that most survey and manage species will remain at stable numbers in some areas of the watershed.

Due to the highly fragmented nature of the middle to southern portions of the watershed, little to no dispersal will occur between LSR's, riparian areas, or late-structural habitats for many species. Without dispersal opportunities, some species may become isolated and locally extinct.

AQUATIC SYSTEM

See Maps 16 through 20.

Areas of Concern

The greatest likelihood for causing significant, long-term cumulative effects on public resources via alteration of forest hydrologic processes, is through increases in peak flows attributable to the

influence of timber harvest and road construction on winter snow accumulation and melt rates during rain-on-snow events.

Timber harvest has had a profound effect on riparian structure.

Large woody debris recruitment in anadromous fish reaches is poor throughout the watershed and recruitment elsewhere is highly variable.

Quartz Creek

In general, all reaches are still recovering from cumulative effects associated with the Mt. St. Helens event, in one form or another. Common to all reaches are fine sediment deposition, increased peak flows and elevated temperatures. These symptoms are more acute in the actual bast zone and will decrease over time as slopes stabilize and the riparian area recovers. Sediment from the 26 Road will depend on future restoration efforts.

Overall, Quartz Creek showed a sensitivity to peakflows with channel width increases ranging from 42% to 135% during flood events in the 1970's. The first (lowest) reach was the most sensitive, fluctuating between a decrease in width of 40% (1959 - 1973) to an increase of 135% (1973 - 1979). There were many road related failures associated with the channel widening in this stream.

Above the 2608 road, this stream seems to consistently have a maximum temperature from 13°C to 13.5°C in the summer as noted from measurments made in 1981, 1991 and 1995. This is most likely due to the 1980 Mt. St. Helens volcanic activity.

Turbidity was measured following the volcanic blast and has shown a downward trend from 354 NTU's in 1981 to 64 NTU's in 1983. No later data was available for this effort.

All anadromous spawning habitat occurs in reaches Q1 through Q3 in Quartz Creek, however fine sediment and embedded cobble hinder gravel quality. Key resident spawning habitat occurs in reaches Q11 and Q12, fine sediments hinder gravel quality. These conditions are a cumulative result of the Mt. St. Helens event, private activities, and sediment introduction from the 26 Road.

The largest continuous riparian corridor of late structural forest occurs in Lower Quartz Creek (6WS 04B).

The largest continuous riparian corridor of early structural forest occurs in the Upper Quartz Creek (6WS 04C) and is associated with the Mt. St. Helens eruption.

Iron, Big and Wakepish Creeks

Overall, Iron Creek shows a moderate sensitivity to peakflow, with channel width increases ranging from 27% to 70% during the 1970's flood years. To some extent, this is due to roads

paralleling the stream. Reach 4, however, is showing a high sensitivity to management activity (road related failures) with an increase in channel width of 97% before the flood years, and showing a decrease in width during and following the flood years when road related slope failures were less. At the confluence withTwelvemile Creek, this reach experienced a double road washout in the 1970's.

In Iron Creek, at the confluence with Ferrous Creek, the water temperature station averaged 13.2°C in 1976, 13.3°C in 1979, and 13.7°C in 1995. The trend indicates increases in temperature with increased management (road building and timber harvesting). Harvesting during the 1980's in riparian areas is partially responsible for the recent increases.

Overall, the Iron Creek basin is rated at high risk due to excessive road densities. Excess sediment is being exhibited within the channel. Most reaches are well below desired conditions for pool and LWD frequency. Target width to depth ratios are exceeded in most reaches making cumulative effects very apparent. Iron Creek is rated high in the peak flow analysis, which has an effect on habitat attributes.

Reach B11 of Big Creek showed an increase in channel width of 60% during non-flood years from 1959 to 1973. This shows a high sensitivity to management activities. Road building parallel to the stream, road failures and clearcutting the riparian area as well as stream bankcutting all contributed to this increase as well as the very slow recovery this reach is showing. The rest of the mainstem Big Creek was not measured as it did not appear from the photos that there were significant changes in channel width.

Bank stability is a major concern in Big Creek. Mass wasting was noted in almost all reaches, with depositional terraces forming in reaches B3, B4, B5, B7 and B14. Long term LWD recruitment is considered poor overall due to narrow buffer strips which are also subject to periodic windfall.

The most significant feature in Wakepish Creek is that the stream goes subsurface in reaches W4 and W5. This is probably due to a large mass failure.

Most late structural riparian corridors in upper Iron Creek are discontinuous and fragmented.

Most of the above conditions are related to timber management and associated road construction. Trends in these conditions are governed by a relationship between future timber management, restoration efforts, and successional processes.

Cispus River

For the section of the Cispus River flowing through this watershed, there were three reaches which were measured for channel width increases. Reaches six and ten are short reaches and channel width increases were 35% and 27%, respectively. Reach six has continued to increase

and migrate and reclaimed an old side channel. Reach ten has shown extensive lateral migration. Reach nine did not widen extensively, however, a large medial bar is forming in both reaches 9 and 10. This could be due to road construction, timber harvesting, or an upstream dam break flood.

Above the 25 Road, maximum temperatures in the 1980's ranged from 14.5°C to 16.2°C (1980). However, in 1994, when a consecutive temperature recorder was left instream between June and October, there were 33 consecutive days above 16°C , 20 consecutive days above 18°C, and a high of 20°C on 7/22/94. Most likely this is due to conditions of adjacent riparian vegetation and channel changes in the Middle Cispus River.

Typically the Cispus is glacially fed and flows naturally turbid water during spring and summer melt. In the fall and winter, however, the water is naturally clear. Data shows there was some increase noted (85-130 NTU range) following the volcanic eruption. When measuring a large flood event in December of 1995, NTU's were 240, indicating fines moving through the system during large events due to streambank erosion, road failures, and road surface erosion.

Riparian areas have noted changes such as stream channel widening and migrating, streambank failures, and riparian vegetation loss. This is somewhat due to the floods in the 1970's and management activities including roading and timber harvesting. Temperature maximums were exceeded in the Cispus at a monitoring site above Crystal Creek. Temperature duration was not lethal, but could affect anadromous run timing; the extent of this effect is unknown. Trends in this condition are dependant on future activities in adjacent riparian areas, as well as larger scale processes and activities in the watershed.

Woods Creek

Above the 2506 Road, a continuous recorder showed 4 consecutive days above 13°C , and a maximum temperature of 13.7°C on 7/20/95. Stream surveys noted in July, 1991 that temperatures ranged from 11°C to 22°C depending on the reach.
This might be associated with beaver pond activity, however, further investigation is recommended.

Beaver activity has had a profound effect on the morphology of Woods and Ames Creeks. Both Woods and Ames Creeks are considered atypical for similar valley segment types in this region, in that they display silt and sand meanders. It is questionable whether this is a "normal" (historical) condition. Sediment may be affecting spawning gravel quality in reaches W8 and W9. Warm water (13°C to 20°C) is associated with the large beaver ponds near the headwaters of both streams .

In general, as successional processes continue and beaver ponds fill with sediment, channel conditions would be expected to improve. The effects of future management activities would probably delay this successional process.

Copper Canyon Creek

Re-establishment of a perennial flow of this stream to the Cispus confluence is related to the rate of stabilization for coarse sediment sources upstream and successional processes in adjacent forests and riparian areas. The processes mentioned above depend on management activities of adjacent landowners.

Crystal Creek

Overall the stream consists of embedded cobble/gravel substrates which may impede spawning quality. Most pools are shallow and offer little holding, rearing or hiding cover for anadromous fishes. These conditions are probably related to activities of adjacent landowners. Future conditions are also contingent on the activities that transpire on adjacent lands.

HUMAN DIMENSION

See Maps 26 through 30.

Access

Areas of Concern

Decreasing road maintenance budgets and a reduction in commercial maintainence will present a future challenge to recreational access.

Views from visual corridors along Road 25 are becoming limited. Without tree management along some road corridors, viewing scenery will be difficult.

Trails

Areas of Concern

Staffing to maintain the current trail system will become more of a challenge. Partnerships will need to ensure that trail maintenance standards are met.

Some trails lead people to riparian areas (Deep and Deadman's Lake), which may cause problems with regard to lakeshore vegetation.

Additional trail opportunities out of existing developed sites, such as Iron Creek Campground and Wakepish Snowpark, are needed.

Several Road to Trail conversion projects were identified for the area.

Recreation

Areas of Concern

Dispersed sites are not well inventoried in the area. There is not enough information available to evaluate whether sanitation, soil compaction, and/or vegetative conditions are in compliance with ACS objectives.

Closing popular dispersed sites may lead to the establishment of new sites in less suitable areas.

Views along the mid- to upper portions of Road 25 are being occluded, limiting the road's value as a scenic corridor.

Landings with non-merchantable logs and stumps from the post-eruption timber salvage are visible along three miles of Road 26. Continued removal of these landings would help this scenic corridor meet retention standards.

Road 25 has the highest traffic volume and number of visitors of any Forest Road in the area. It provides a unique opportunity to educate a large number of people.

Portions of Iron Creek Trail, such as Iron Creek Falls Trail #91, could provide a unique opportunity for the interpretation of riparian habitat conditions.

The ability to upgrade the water systems at developed sites, such as Iron Creek Campground, may not keep pace with state drinking water standards.

There is a need to develop a strategy to respond to requests by permitted commercial rafting outfitters for the removal of downed trees from the Cispus River.

CHAPTER 6

Aquatic Conservation Strategy Evaluation

CHAPTER 6 - AQUATIC CONSERVATION STRATEGY EVALUATION

Objectives from the Northwest Forest Plan

The Northwest Forest Plan, along with the Standards and Guidelines, advances specific goals for the management of ecosystems on federal lands. These are:

> "restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands, including the riparian areas found along the margins of lakes and streams."
>
> "maintain late-successional and old-growth species habitat and ecosystems on federal lands."
>
> "maintain biological diversity associated with native species and ecosystems in accordance with laws and regulations."

The first goal noted above is drawn from the Aquatic Conservation Strategy (ACS), one of the key elements of the Northwest Forest Plan. The Northwest Forest Plan provides specific guidance regarding compliance with ACS objectives, and the crucial role watershed analysis plays in this process (ROD, p. B10). Based on ROD direction, the nine ACS objectives were analyzed individually during the Lower Cispus West Watershed Analysis. For the purposes of this watershed analysis, the maintenance of late successional habitat and biological diversity have been included as factors for evaluation along with the ACS objectives, in keeping with the goals of the Northwest Forest Plan.

Two tables were developed to display information about compliance with ACS objectives within the Lower Cispus West Watershed. The **Summary ACS Table** depicts the general rating for each subwatershed, relative to each objective, while the **ACS Tables**, of which there are eleven, display the ratings, as well as background information to support each designation and a rating of team confidence in the accuracy of the designation.

Within the document, a discussion of the evaluation criteria used in rating each objective, and underlying assumptions, is presented immediately following the ACS Tables. This narrative further clarifies the rationale behind the ratings.

Aquatic Conservation Strategy Objectives

Forest Service and BLM-administered lands within the range of the northern spotted owl will be managed to **maintain** (the Existing Condition) **or restore** (to the Range of Natural Variability):

1. ...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.

2. ...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.

3. ...the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

4. ...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

5. ...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.

6. ...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.

7. ...the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

8. ...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.

9. ...habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

LS[1] "maintain late-successional and old-growth species habitat and ecosystems on federal lands."

BD[1] "maintain biological diversity associated with native species and ecosystems in accordance with laws and regulations."

[1]These additional objectives are not part of the Aquatic Conservation Strategy. Rather, they are additional objectives of the Northwest Forest Plan and have been included here to ensure a more comprehensive evaluation of conditions.

Resource Conditions and Aquatic Conservation Strategy Summary Table

Rating Legend
G - Good. The 6WS satisfies the ACS objective for the most part, with minor exceptions.
F - Fair. The 6WS is near the margin of satisfying the ACS objective.
P - Poor. The 6WS does not satisfy the ACS objective.
D - Data gap. Not enough information available to assign rating.

ACS OBJECTIVES WSU 6WS	0443 04A	0443 04B	0443 O4C	0443 04D	0430 04E	044N 04F	044S 04G	044S 04H	044S 04I	044S 04J	0430 04X
Creek Name	Copper Canyon	Lower Quartz	Upper Quartz	Crystal	Woods Ames	Lower Iron	Big Little	Wakepish	Upper Iron	Ferrous	Cispus
1. Existence of landscape scale aquatic features	F	F	G	G	G	G	G	G	G	G	G
2. Connectivity between watersheds	P	F	P	F	F	P	P	P	P	F	P
3. Integrity of aquatic systems	D	P	P	D	D	P	P	P	P	D	F
4. Water quality for healthy ecosystems	D	F	P	D	P	F	P	P	F	D	P
5. Appropriate sediment regime	P	P	P	F	P	P	P	P	P	D	D
6. Instream flow	F	F	P	D	P	F	P	P	F	P	D
7. Floodplain function	D	D	D	D	D	D	D	D	D	D	D
8. Diversity of plant species	D	F	P	D	P	P	P	P	P	D	D
9. Well distributed riparian habitat	F	F	P	F	F	P	P	P	P	F	P
Biodiversity	D	F	F	D	F	D	D	P	D	D	P
Late successional habitat	G	F	P	G	F	P	P	P	P	P	F

Sixth Field Watershed (6WS) 04A - Copper Canyon Creek
WSU 0443

Evaluation Standards:

G - Good. Most of the 6WS meets the ACS objective with only minor exceptions.
F - Fair. Near the margin in satisfying ACS objective.
P - Does not meet ACS objective.
D - Data gaps. Not enough information available to assign a rating.

Confidence Rating:

H - High confidence that the assigned rating is accurate.
M - Moderate confidence that assigned rating is accurate.
L - Low confidence in the accuracy of rating.

ACS Objective	Rating	Confidence	Comments
1) Existence of aquatic features at landscape scale.	F	H	See Assumption on pages following ACS tables Loss of a perennial stream (Copper Canyon Creek). The lower 300 feet of Copper Creek has been inundated by the waters of the Cowlitz Falls reservior. Private land has a large number of roads, which increases the drainage network.
2) Connectivity between watersheds	P	M	Road density on federal land is 1.4mi/sq.mi., unknown for private land. National Forest land is nearly all late structural, while private land is almost all early structural. Copper Creek goes subsurface at the valley wall. This did not occur historically. Copper Creek is disconnected from Cispus River. Data gaps: Stream crossing information. Stream survey information.
3) Integrity of aquatic systems	D	L	Copper Creek goes subsurface at valley wall, likely due to increased bedload.
4) Water quality for healthy ecosystems	D	L	Tailed frogs found on mainstem of Crystal Creek on NFS ground. Usually need clean, cool, fast-running water. Presence of Hypotheria vamosa (lichen) suspected, usually associated with clear, cool, pristine waters. Stream goes subsurface at valley wall. Late structural forest on NFS land, unknown on private. Assumption: Private land in poor condition due to extensive management activities. Data gaps: No chemical data. Need stream survey, species occurance data, hydro graph, and turbidity and temperature data.
5) Appropriate sediment regime	P	H	Road failure on Champion land, the estimated deposit is several thousand cubic yards. There are several road related failure. Sediment routed from roads is aprox. 26 tons/year. This is in addition to background rates. Copper Creek goes subsurface on private land just downstream from valley floor, likely due to increased bedload. Data gaps: Stream survey data indicates that sediment character is needed. Hillslope erosion data exists, but was unavailable for use as of 9/27/95.
6) In stream flow	F	M	24% WAR. 63% ARP.

7) Floodplain Function	D	L	See Assumptions on pages following ACS tables. Data gaps: Need 1939 aerial photos. Need Army Corps of Engineers map of the floodplain created prior to dam construction in the 1940's
8) Diversity of plant communities	D	M	See Assumptions on pages following ACS tables. Structural stage on NFS land is predominantly late structural. Private land is primarily early and mid structural stage. Data gaps: Stream survey. Species occurance. Plant survey.
9) Well distributed riparian habitat	F	H	Large block of late structural forest on USFS land. Private land largely early-structural habitat. Data gaps: Wildlife and plant occurrence data.
Biodiversity	D	L	There is late structural habitat and the potential for high biological diversity. No survey or species occurrence data available. Data gaps: Need wildlife surveys to determine presence, absence and densities of animal species. Need plant surveys.
Late structural habitat	G	H	Most of the watershed is late structural habitat on National Forest land. There is no habitat fragmentation. The corridor is intact to Mt. St. Helens, but not to private land. 44% early, 9% mid, and 47% late structural habitat in the 6WS, including National Forest and private land, assuming that the PMR information is correct. Data gaps: CWD inventory. Species occurrence information.

Sixth Field Watershed (6WS) 04B - Lower Quartz Creek
WSU 0443

Evaluation Standards:

G - Good. Most of the 6WS meets the ACS objective with only minor exceptions.
F - Fair. Near the margin in satisfying ACS objective.
P - Does not meet ACS objective.
D - Data gaps. Not enough information available to assign a rating.

Confidence Rating:

H - High confidence that the assigned rating is accurate.
M - Moderate confidence that assigned rating is accurate.
L - Low confidence in the accuracy of rating. Data gaps were given a confidence of (L), "low confidence".

ACS Objective	Rating	Confidence	Comments
1) Existence of aquatic features at landscape scale.	F	H	See Assumptions on pages following ACS tables. Conditions are different on the private lands of the Cispus River. There has been some increase of intermittent streams from road interception. Roads along Cispus River have probably influenced the floodplain. It is possible that wetlands along the Cispus River have been lost. The creation of Cowlitz Falls Reservoir inundates a previously existing channel. Data gaps: Reference conditions.
2) Connectivity between watersheds	F	M	Lower Quartz Creek has a poor rating due to sedimentation, temperatures, and channel widening. There are poor pools and some areas of poor wood. 10% in grass and pole, 59% large tree, and 28% mid structural. In the headwaters, 50% is in late structural, 30% mid, and 20% early. All of the upper reaches are in early structural, some mid in the middle reaches. Four reaches are in late structural, two are in early, and the rest are mixed. Two riparian areas are fragmented, and disconnected from the mainstem of Quartz Creek. There are two areas of sedimentation problems (Red Spring Creek and an unnamed tributary). Road density is 1.6mi/sq.mi. Data gaps: Stream crossing information.
3) Integrity of aquatic systems	P	H	Stream widening and channel migration in response reaches. Fine sediments originating from Red Spring Creek. Numerous road failures on 26 Road. Upper bank instability. Poor width to depth ratio in several reaches.

4) Water quality for healthy ecosystems	F	H	The Cispus River has experienced a change in water quality (temperature, sediment regime, turbidity, food base, species assemblages, and chemical processes) as a result of the reservoir associated with Cowlitz Falls Dam. Sedimentation and absence of species in the tributaries of Upper Quartz Creek (pts. 144 and 132). Mollusks and amphibians found in late structural riparian areas along tributaries to Quartz Creek reaches Q3-Q13. Temperature is not a concern for cutthroat trout at this time. Steelhead, an introduced species, require pristine conditions. Temperature and substrate conditions have degraded too far to support Bull trout. Structural stage is late to patchy. Quartz Creek temperature is outside of RNV, elevated and noted during stream survey. Turbidity peaks noted following eruption of Mt. St. Helens. Fine and coarse sediments noted in lower reaches of mainstem. Suspended sediments noted at site 132. No biological life observed in Red Spring Creek. Data gaps: No chemical data. Long-term temperature data. Metals test of nearby mine. Plant survey. Turbidity below roads during storm events.
5) Appropriate sediment regime	P	M	Background rate includes several natural avalanche chutes. The May, 1980 eruption deposited a large volume of ash.. Denudation led to increased erosion and mass wasting upstream in 6WS 04C. There were numerous failures along the 26 Road between 1959 and 1979 in the lower reaches of Quartz Creek. Upper bank instability, stream channel widening, and migration have been noted in the response reaches. 497 tons/year of road erosion, primarily fine sediment, is routed to streams. Red Spring Creek is routing a lot of fine sediments into Quartz Creek for unknown reasons.
6) In stream flow	F	H	16% WAR. 68% ARP.
7) Floodplain Function	D	L	See Assumptions on pages following These ACS tables.
8) Diversity of plant communities	F	H	See Assumptions pages following These ACS tables. NFS land is in early structural stage in Upper Quartz Creek, primarily late structural in Lower Quartz Creek. Private land is patchy early to mid structural. Clearcuts and mid structural are not structurally diverse. Data gaps: CWD surveys for wildlife. Plant associations. Riparian data.
9) Well distributed riparian habitat	F	M	50% late structural, 30% mid structural, and 20% early structural composition in the headwaters of all streams. In riparian areas the distribution is 59% late, 31% mid, and 10% early structural forest. There are two fragmented riparian areas. Data gaps: Wildlife and plant species occurrence information.

Biodiversity	F	H	A number of species associated with late structural are known to occur in the 6WS. Two sensitive plant species are known to occur in the 6WS. There is a potential for high biological diversity because there is well connected late structural habitat. Data gaps: Require Survey and Manage species and bird surveys, as well as additional amphibian surveys in streams with sedimentation problems. Lack of species occurrence information. Need sensitive plant surveys.
Late structural habitat	F	H	Though there is some fragmentation along Quartz Creek, most all of the 6WS is in late structural to mid structural condition. Connectivity is maintained to the east, though late structural is fragmented across Quartz Creek. A large block of late structural is well connected between the three 6WS it spans. There are two sensitive plant species within the late structural forest. Including National Forest and private land, 30% is in early structural, 31% in mid, and 39% is in late structural. Data gaps: CWD inventory (is within LSR).

Sixth Field Watershed (6WS) 04C - Upper Quartz Creek
WSU 0443

Evaluation Standards:

G - Good. Most of the 6WS meets the ACS objective with only minor exceptions.
F - Fair. Near the margin in satisfying ACS objective.
P - Does not meet ACS objective.
D - Data gaps. Not enough information available to assign a rating.

Confidence Rating:

H - High confidence that the assigned rating is accurate.
M - Moderate confidence that assigned rating is accurate.
L - Low confidence in the accuracy of rating. Data gaps were given a confidence of (L), "low confidence".

ACS Objective	Rating	Confidence	Comments
1) Existence of aquatic features at landscape scale.	G	H	See Assumptions on pages following These ACS tables. Given the documented assumptions, virtually all aquatic features are still extant.
2) Connectivity between watersheds	P	H	Road density of 2.0mi../sq.mi. 59% grass and pole, 30% small tree, 8% large tree. Poor rating for streams- high temperatures, no shade, poor woody debris, poor pools, sediment delivery from 26 Road. 85% early structural in headwaters, 15% late or mid structural. No riparian connectivity to other watersheds to the south or east. Data gaps: Information about the number and type of stream crossings (exists, but not available as of 9/26/95).
3) Integrity of aquatic systems	P	H	Poor width to depth ratio. Upper bank instability. Increase in fine sediment. Some reaches are braiding. Fine sediments in upper tributaries. High number of road red flags (surface erosion, cracked fills) on all roads. High peakflows.
4) Water quality for healthy ecosystems	P	H	Ryan Lake- Many pond-breeding amphibian species observed. Tailed frogs found in blast zone near reaches Q14 and Q15. Amphibians absent in tributaries above Q13 and Q14 due to sedimentation. Very poor conditions for cutthroat trout. Stream temperature and substrate too degraded to support Bull trout. Temperatures above threshold on mainstem, although cooler upstream. Fine sediments in all reaches and most tributaries. Temperature thresholds exceeded for all fish species (cutthroat and bull trout), and plant species including Hydrothermia vamosa and Corydailis. Data gaps: No chemical data.
5) Appropriate sediment regime	P	H	Mass wasting background rate includes several avalanche chutes. 1980 eruption of Mt. St. Helens caused denudation, which has led to increased erosion and mass wasting. 176 tons/year of road erosion routed to streams. It is noted that stream banks have poor width to depth ratio, and upper bank instability. There is braiding noted in some reaches. Increased fine sediment noted where amphibians are absent.

6) In stream flow	P	H	9% WAR. 45% ARP.
7) Floodplain Function	D	L	See Assumptions on pages following These ACS tables.
8) Diversity of plant communities	P	H	See Assumptions on pages following These ACS tables. Primarily in early structural stage. LWD and pools are rated as poor. Data gaps: Plant associations in riparian areas.
9) Well distributed riparian habitat	P	H	85% of the headwaters is in early structural forest, 15% is in late or mid structural. Riparian areas contain 62% early structural, 30% mid structural, and 8% late structural forest. There is very little connectivity within the 6WS or with adjacent 6WS's. Data gaps: Wildlife and plant occurrence data.
Biodiversity	F	H	Elk and other early structural species are known to occur in the 6WS. Ryan Lake attracts a number of amphibian and bird species. There is lack of late structural habitat, and late structural species information. Data gaps: Wildlife and plant species.
Late structural habitat	P	H	Less than 10% of the 6WS is in late structural. Most of the standing timber is in early and mid structural. Early structural is due to volcanic eruption. Two streams are known to have sedimentation problems due to lack of suitable habitat (late structural habitat is fragmented).

Sixth Field Watershed (6WS) 04D - Crystal Creek
WSU 0443

Evaluation Standards:

G - Good. Most of the 6WS meets the ACS objective with only minor exceptions.
F - Fair. Near the margin in satisfying ACS objective.
P - Does not meet ACS objective.
D - Data gaps. Not enough information available to assign a rating.

Confidence Rating:

H - High confidence that the assigned rating is accurate.
M - Moderate confidence that assigned rating is accurate.
L - Low confidence in the accuracy of rating. Data gaps were given a confidence of (L), "low confidence".

ACS Objective	Rating	Confidence	Comments
1) Existence of aquatic features at landscape scale.	G	H	See Assumptions on pages following These ACS tables.
2) Connectivity between watersheds	F	M	Nearly all National Forest land in Crystal Creek is mid or late structural, while all riparian areas on private land are in early structural 70% of headwaters is in mid- or late structural, while lower mile is in early (hardwoods). Late structural in riparian areas is well connected and relatively unfragmented, except on private land. 26 Road is a barrier to fish. Road density is 2.8mi../sq.mi. On National Forest land, 38% is small tree, 61% is large tree. Data gaps: Information on stream crossings (exists, but not available for use as of 9/26/95). Stream survey information concerning sediment, barriers, and related information.
3) Integrity of aquatic systems	D	L	Increase in coarse and fine sediments. Some downcutting in coarse sediment streambed. Stream goes subsurface at the upper end of the first reach. Data gaps: Stream survey information for entire stream. Field verification of sediment source.
4) Water quality for healthy ecosystems	D	L	Cutthroat and steelhead found in Crystal Creek. Private land is dominated by hardwoods. Structural stage is late in lower and mid structural in upper. Stream goes subsurface near the end of Reach 1. Fine sediments found in Reach 1. Suspected temperature elevation. Data gaps: Turbidity and temperature data. Stream survey for NFS land. Species occurrence and plant survey data.
5) Appropriate sediment regime	F	L	Several road-related debris flows noted in addition to background rates. 71 tons/year of road erosion noted from roads on National Forest land, in addition to unknown quantities from private land. Stream bank survey completed on private land indicates increases in coarse and fine sediment. The upper end of Crystal Creek goes subsurface.
6) In stream flow	P	H	15% increase in Peakflow, WAR
7) Floodplain Function	D	L	See Assumptions on pages following These ACS tables.

8) Diversity of plant communities	D	H	See Assumptions on pages following These ACS tables. 70% of the 6WS is NFS land. Half of NFS land is in late structural, and half is in mid structural. 30% of the 6WS is private land, which is primarily in early structural conditions. Poor WD and LWD. Crystal Creek goes subsurface at the end of Reach 1. Data gaps: Need vegetation survey.
9) Well distributed riparian habitat	F	H	On National Forest land, the structural stage distribution is 61% late and 31% mid structural. On private land the composition is primarily early structural. Late structural forest is well connected and relatively unfragmented. Data gaps: Wildlife and plant species occurrence data.
Biodiversity	D	L	No survey or species occurrence data available except for spotted owl. Lack of sensitive plant information. There is a potential for high biological diversity because there is well connected late structural habitat. Data gaps: Require plant and wildlife surveys to determine the presence or absence and densities of species.
Late structural habitat	G	H	The northern half of the 6WS is in late structural condition. The southern half is primarily mid structural. Late structural connectivity is to the west; the mid structural is well connected. There is no habitat fragmentation. Assuming that the PMR information is correct, including National Forest and private land, 25% of the 6Ws is in early structural, 35% mid, and 40% late structural.

Sixth Field Watershed (6WS) 04E - Woods and Ames Creeks
WSU 0430

Evaluation Standards:

G - Good. Most of the 6WS meets the ACS objective with only minor exceptions.
F - Fair. Near the margin in satisfying ACS objective.
P - Does not meet ACS objective.
D - Data gaps. Not enough information available to assign a rating.

Confidence Rating:

H - High confidence that the assigned rating is accurate.
M - Moderate confidence that assigned rating is accurate.
L - Low confidence in the accuracy of rating. Data gaps were given a confidence of (L), "low confidence".

ACS Objective	Rating	Confidence	Comments
1) Existence of aquatic features at landscape scale.	G	H	See Assumptions on pages following These ACS tables. Probably fewer perennial streams because soils have become more abundant and deeper. Roads interrupt surface flow. In this 6WS the flow is quickly reabsorbed without increasing channelization. An increase in wetlands is noted, likely due to beaver ponds and harvest and roading activities. Ponds have increased due to beaver dams.
2) Connectivity between watersheds	F	H	Two locations along Ames Creek with fragmented late structural habitat and riparian corridors. Woods Creek and Ames Creek have high sedimentation. Woods Creek rated poor in channel conditions. There is a lack of amphibians in some locations. Temperature concerns due to sun in wetlands. Beaver ponds may not have been present historically. Road density of 3.2miles/sq.mi. interferes with subsurface flow. Lower Woods Creek is in early structural condition. Data gaps: Comprehensive wetlands inventory. CWD inventory.
3) Integrity of aquatic systems	D	L	Stream cutting into some old landslides. Fine sediment originating from road erosion. Data gaps: Percent of channel in bars, number of side channels, channel migration information, information about the natural streambed. Field verification. Stream survey is difficult to determine, as sediment regime is atypical for area streams.

4) Water quality for healthy ecosystems	P	H	Healthy populations of pond-breeding amphibians, but poor populations of stream-breeding amphibians in Ames and Woods Creek, due to silty, warm water (13.5-14.5 oC). Cutthroat found in both Woods and Ames Creeks. Tall bugbane is found in one location on Woods Creek in mid structural forest. Conditions are moist sandy woods, stream terrace, and moist wetlands. Fine sediment found throughout all reaches. Temperature concerns noted on stream survey. Temperature readings as high as 22oC. High temperatures persisted throughout survey period (mid July). High Peakflow response. Data gaps. Long-term temperature data essential. Turbidity, particularly during storm events, cross section and pebble count. Plant surveys.
5) Appropriate sediment regime	P	H	Background mass wasting rates are primarily due to stream bank erosion at the toes of two ancient landslides. Two small road-related failures are noted, although human caused mass wasting is minimal. 349 tons/year of road erosion is routed to streams. Fine sediment noted as a problem throughout the 6WS. Ames Creek exhibiting channel migration. Ames Creek goes subsurface in the lower reaches.
6) In stream flow	P	M	16% WAR. 74% ARP. Rain-on snow area is dominant. Road density is 3.2mi./sq.mi. Data gaps: ARP vs. WAR interpretation.
7) Floodplain Function	D	L	See Assumptions on pages following These ACS tables.
8) Diversity of plant communities	P	H	See Assumptions on pages following These ACS tables. Salvaged mixed structural end early structural in the lower mainstem provide summer and winter thermal regulation. Fine sediments dominate the substrate. A lack of CWD is noted. Pools are rated as fair to poor. Temperature problems have been noted. Data gaps: Plant associations in riparian areas. Field verification.
9) Well distributed riparian habitat	F	H	Riparian corridors and late structural habitat are fragmented. There is a lack of amphibians in some places. Data gaps: Lack of a comprehensive wetlands inventory. CWD inventory.
Biodiversity	F	H	Lack of late structural species such as spotted owls, but there are many early and mid structural and riparian dependant species due to the presence of wetlands. Late structural habitat is available. There are two locations with sensitive plant species. There is a potential for high biological diversity, although there is a lack of CWD.

Late structural habitat	F	H	Fragmented late structural habitat interspersed with early structural patches. Late structural habitat is poorly connected across Road 25, which limits late structural and riparian-dependent species such as mollusks. There are sedimentation problems in Woods and Ames Creeks. There are two sensitive plant species in the 6WS, one is associated with riparian areas, and the other with late structural forest. 30% early, 25% mid, and 45% late. Data gaps: CWD inventory (is within LSR).

Sixth Field Watershed (6WS) 04F - Middle Iron Creek
WSU 044N

Evaluation Standards:

G - Good. Most of the 6WS meets the ACS objective with only minor exceptions.
F - Fair. Near the margin in satisfying ACS objective.
P - Does not meet ACS objective.
D - Data gaps. Not enough information available to assign a rating.

Confidence Rating:

H - High confidence that the assigned rating is accurate.
M - Moderate confidence that assigned rating is accurate.
L - Low confidence in the accuracy of rating. Data gaps were given a confidence of (L), "low confidence".

ACS Objective	Rating	Confidence	Comments
1) Existence of aquatic features at landscape scale.	G	H	See Assumptions on pages following These ACS tables.
2) Connectivity between watersheds	P	H	Noted problems with riparian connectivity in six major areas as a result of timber harvest. Also five areas noted with sedimentation problems and no amphibian presence. There are 38 miles of road, not all stream crossings permit amphibian movement. Road density is 2.6mi./sq.mi., this bears an impact on subsurface flow. 2510 Road and others are located within floodplain. Instream deposits are present and suspected to be high. This may result in poor channel connectivity. Data gaps: Number of stream crossings by road and the associated information. Specific instream deposit information is lacking.
3) Integrity of aquatic systems	P	H	Poor width to depth ratio. Bank stability problems indicated in all stream reaches. Low or concern peak flow related effects. Channel widening noted in three of five reaches. Low pool to mile ratio. Poor rating on LWD, which is important to maintain physical integrity in these valley segment types. Fine sediment found in tributaries, relative to absent amphibians. High frequency of debris torrents and road red flags. Data gaps: Percentage of channel in bars, pebble count, v*.
4) Water quality for healthy ecosystems	F	M	Fairly good amphibian stream populations. Steelhead fry, which require pristine conditions present. Cutthroat trout, an indicator, are present. Three species of Botrycium found in the 6WS. One is found in riparian areas with old growth and talus slopes, while two are associated with moist/wet areas found at higher elevations. Channel widening noted in the lower reaches. Fine sediments noted, related to bank stability concerns. Roads may be a contributing factor. Moderate peakflow response. Data gaps: No chemical data. Plant survey data. Temperature and turbidity information, particularly during storm events. Percentage of bars instream.

5) Appropriate sediment regime	P	H	Background rate of mass wasting includes a few avalanche chutes, as well as stream erosion of the toes of two large landslides and two smaller ones. Numerous debris torrents from roads to streams. Lower reaches of Iron Creek show channel widening, bank stability problems, and a high width to depth ratio, which indicates increased sediment loading.
6) In stream flow	F	H	5% WAR. 83% ARP. Road density is 2.6 mi/sq.mi.
7) Floodplain Function	D	L	See Assumptions on pages following These ACS tables.
8) Diversity of plant communities	P	H	See Assumptions on pages following These ACS tables. Structural stage is mixed, primarily mid. Channel widening and bank instability have been noted. Poor LWD, pools, and width to depth ratio.
9) Well distributed riparian habitat	P	H	There are problems with riparian connectivity in six major areas. There is a lack of late structural forest in riparian areas. Data gaps: Wildlife and plant species occurrence information.
Biodiversity	D	H	Aside from spotted owl and amphibian information, little wildlife occurrence data is available. There is information available about early structural species such as elk and deer. Sensitive plant species are known to occur in this 6WS. Data gaps: Require additional wildlife and plant surveys to determine presence, absence, and densities.
Late structural habitat	P	H	Late structural connectivity is poor. Late structural habitat is fragmented and limited, especially along Iron Creek and Road 26. There is a large block of mid structural habitat east of Iron Creek. A number of streams have sedimentation problems. There are three species of sensitive plants in the 6WS. Assuming that PMR information is correct, 26% early, 55% mid, and 19% late.

Sixth Field Watershed (6WS) 04G - Big and Little Creeks
WSU 044S

Evaluation Standards:

G - Good. Most of the 6WS meets the ACS objective with only minor exceptions.
F - Fair. Near the margin in satisfying ACS objective.
P - Does not meet ACS objective.
D - Data gaps. Not enough information available to assign a rating.

Confidence Rating:

H - High confidence that the assigned rating is accurate.
M - Moderate confidence that assigned rating is accurate.
L - Low confidence in the accuracy of rating. Data gaps were given a confidence of (L), "low confidence".

ACS Objective	Rating	Confidence	Comments
1) Existence of aquatic features at landscape scale.	G	H	See Assumptions on pages following These ACS tables.
2) Connectivity between watersheds	P	H	Twelve major areas of riparian fragmentation which are highly fragmented. Five major areas of stream sedimentation concern. 47% in early, 11% in mid, and 42% late structural. A high number of depositional terraces. 70% early, 30% late structural habitat in headwaters. Based on incomplete information, the calculated road density is 3.5mi../sq.mi. Data gaps: Information about road crossings exists, but unavailable for use as of 9/26/95.
3) Integrity of aquatic systems	P	H	Coarse sediment noted. Bank cutting and instability. Depositional terraces. Creek is cutting into the toe of several landslides. Many road red flags, including those related to culverts, surface erosion, and cracked fills.
4) Water quality for healthy ecosystems	P	H	No cutthroat trout observed. No occurance of amphibians in some area with roads, clearcuts, and sedimentation. No biological life observed in those areas. Some cc's and late-tailed frogs observed. Rycotritron (forest salamander) not observed.. Rainbow trout observed instream, no cutthroat observed. Also noted in stream adjacent to cc. Coarse and fine sediment in lower reaches. Peakflow high response. Data gaps: No chemical data. Temperature and turbidity data during storm events. Fish sampling. Plant surveys.
5) Appropriate sediment regime	P	M	Background rate includes several avalanches, as well as erosion from toes of several natural landslides. A few road related failures are also noted. Road erosion is at least 289tons/year., although data is incomplete. Coarser sediment deposition is noted, as well as bank cutting and instability.

6) In stream flow	P	H	10% WAR. 59% ARP. Road density is 3.5mi./sq.mi.
7) Floodplain Function	D	H	See Assumptions on pages following These ACS tables.
8) Diversity of plant communities	P	H	See Assumptions on pages following These ACS tables. This 6WS is almost all early structural, with a small portion in mid structural condition. There is a considerable amount of bank erosion. Pools are rated as poor. LWD is sufficient. CW- terraces. The relationship between sediment and lack of amphibians noted.
9) Well distributed riparian habitat	P	H	There are twelve major areas of riparian fragmentation. The distribution of structural stages in riparian areas is 47% early, 11% mid, and 42% late. The distribution of structural stages in the headwaters is 70% early and 30% late. Data gaps: Wildlife and plant species occurrence information.
Biodiversity	D	L	Aside from Spotted Owl and amphibian data, very little wildlife occurrence data is available. Data is available about early structural species, such as elk and deer. There are no Spotted Owls known in the area. Data gaps: Require plant and wildlife surveys to determine the presence, absence, and densities of species.
Late structural habitat	P	H	A number of streams have sedimentation problems, as well fragmented riparian corridors and fragmented late structural. There is very little mid structural within the 6WS, and that which exists is highly fragmented. National Forest and private land considered together, 50% of the land is in early structural, 13% mid, and 37% late structural.

Sixth Field Watershed (6WS) 04H - Wakepish Creek
WSU 044S

Evaluation Standards:

G - Good. Most of the 6WS meets the ACS objective with only minor exceptions.
F - Fair. Near the margin in satisfying ACS objective.
P - Does not meet ACS objective.
D - Data gaps. Not enough information available to assign a rating.

Confidence Rating:

H - High confidence that the assigned rating is accurate.
M - Moderate confidence that assigned rating is accurate.
L - Low confidence in the accuracy of rating. Data gaps were given a confidence of (L), "low confidence".

ACS Objective	Rating	Confidence	Comments
1) Existence of aquatic features at landscape scale.	G	H	See Assumptions on pages following These ACS tables.
2) Connectivity between watersheds	P	H	Based on incomplete information, the estimated road density is 4.2mi../sq.mi. There are four major areas of riparian fragmentation, including Wakepish. There is one major area of sediment concern north of Wakepish. Connectivity is poor. Fragmentation of late structural habitat is high. 60% early and 40% late structural in the headwaters. There is an absence of mid structural habitat. A portion of Wakepish goes subsurface, this may be associated with an active landslide. Data gaps: Stream crossing information.
3) Integrity of aquatic systems	P	H	Stream goes subsurface in two reaches. Coarse and fine sediments are problems. Bank stability is a concern in two reaches. High peakflow. Many road red flags, including those related to culverts, surface erosion, and cracked fills.
4) Water quality for healthy ecosystems	P	M	Non-native populations of cutthroat present (not an indicator). Most amphibians and all mollusks found are associated with late structural stage. No amphibians or mollusks found in areas with high sediment. Stream goes subsurface for two reaches, due to lack of flow. Cool water stream. Fine sediment and bank stability problems noted? Data gaps: No chemical data. Need storm event temperature and turbidity data. Plant surveys.
5) Appropriate sediment regime	P	H	Road erosion is at least 335tons/year. All reaches of Wakepish Creek show bank erosion, and the middle reach goes subsurface. This reach is influenced by an active natural landslide that may have been affected by roading and timber harvest. Coarse and fine sediments are noted concerns.
6) In stream flow	P	H	10% WAR. 61% ARP. Road density of 2.4mi../sq.mi.

7) Floodplain Function	D	H	See Assumptions on pages following These ACS tables.
8) Diversity of plant communities	P	H	See Assumptions on pages following These ACS tables. Almost all of the southern portion of the 6WS is in late structural conditions, broken late structural in he north. All of the tributaries flow through broken late structural conditions. Pools are rated fair to poor. Bank erosion and stability problems are indicated by the presence of fine sediments. Stream goes subsurface in two reaches. Lack of amphibians associated with sedimentation.
9) Well distributed riparian habitat	P	H	There a four major areas of riparian fragmentation with poor connectivity. The distribution of structural stages in the headwaters is 60% early and 40% late. Data gaps: Wildlife and plant species occurrence information.
Biodiversity	P	H	Some mollusk, amphibian, and Spotted Owl information is available. Fragmentation limits late structural species. There is a lack of other species and plant information. Data gaps: Require plant and wildlife surveys to determine the presence, absence, and densities.
Late structural habitat	P	H	Riparian corridors and late structural habitat are highly fragmented. There are sedimentation problems in one area. There is no mid structural habitat within the 6WS. 52% early, 4% mid, and 48% late.

Sixth Field Watershed (6WS) 04I - Upper Iron Creek
WSU 044S

Evaluation Standards:

G - Good. Most of the 6WS meets the ACS objective with only minor exceptions.
F - Fair. Near the margin in satisfying ACS objective.
P - Does not meet ACS objective.
D - Data gaps. Not enough information available to assign a rating.

Confidence Rating:

H - High confidence that the assigned rating is accurate.
M - Moderate confidence that assigned rating is accurate.
L - Low confidence in the accuracy of rating. Data gaps were given a confidence of (L), "low confidence".

ACS Objective	Rating	Confidence	Comments
1) Existence of aquatic features at landscape scale.	G	H	See Assumptions on pages following These ACS tables.
2) Connectivity between watersheds	P	H	At least six major riparian corridors are highly fragmented, with a combination of early and late structural. Twelvemile Creek has sedimentation problems. 34% of the riparian area is in early structural. 22% of the riparian area is in small tree. 41% of the riparian area is in large tree. The headwaters consist of 45% early, approximately 15% mid, and 40% late structural. Most harvest has been concentrated in the headwaters. Data gaps: Road density information. Stream crossing information. Road 7708 velocity information.
3) Integrity of aquatic systems	P	H	High width to depth ratio. High percentage of fine sediments in streambed, related to roads. Poor pool frequency in areas that are expected to be high. A few road related failures. Peakflow could be a concern.
4) Water quality for healthy ecosystems	F	H	Indicator cutthroat trout present. Rainbow trout present. Most streams have buffers, amphibians found. One area noted with a sandy bed. Fine sedimentsnoted relative to roads. Moderate peakflow response. Data gaps: Storm temperature and turbidity information. Plant surveys. Electrofishing survey.
5) Appropriate sediment regime	P	H	Several road related failures delivered sediment to Twelvemile Creek. Road erosion is 646tons/year. High levels of fine sediment are noted. High width to depth ratio noted on Iron Creek. Data gaps: Field investigation of field conditions that are unclear from available data.
6) In stream flow	F	H	7% WAR. 69% ARP. Road density is 2.6mi./sq.mi.
7) Floodplain Function	D	L	SeeAssumptions on pages following These ACS tables.

8) Diversity of plant communities	P	M	See Assumptions on pages following These ACS tables. Riparian areas are in a condition of mixed early and late structural, as is the Iron Creek mainstem. Poor width to depth ratio. Fair to good LWD. Poor to fair pools. Some sedimentation was noted in amphibian surveys. Data gaps: Need bank and coarse sediment information.
9) Well distributed riparian habitat	P	H	At least six major riparian corridors are highly fragmented. Structural stage distribution in riparian area is 34% early, 22% mid, and 41% late. Structural stage distribution in the headwaters is 45% early, 15% mid, and 40% late. Data gaps: Wildlife and plant species occurrence data.
Biodiversity	D	L	Only amphibian data is available. No other species information is available. Data gaps: Require wildlife and plant surveys to determine presence, absence, and densities.
Late structural habitat	P	H	Late structural habitat is highly fragmented, with a small amount of mid structural habitat. Riparian corridors are highly fragmented. Late structural occurs in small patches and is poorly connected. Mid structural habitat is poorly connected to late structural, though well connected as a part of a larger mid structural block. 44% early, 18% mid, 38% late.

Sixth Field Watershed (6WS) 04J - Ferrous Creek
WSU 044S

Evaluation Standards:

G - Good. Most of the 6WS meets the ACS objective with only minor exceptions.
F - Fair. Near the margin in satisfying ACS objective.
P - Does not meet ACS objective.
D - Data gaps. Not enough information available to assign a rating.

Confidence Rating:

H - High confidence that the assigned rating is accurate.
M - Moderate confidence that assigned rating is accurate.
L - Low confidence in the accuracy of rating. Data gaps were given a confidence of (L), "low confidence".

ACS Objective	Rating	Confidence	Comments
1) Existence of aquatic features at landscape scale.	G	H	See Assumptions on pages following These ACS tables.
2) Connectivity between watersheds	F	H	Large block of mid-structural habitat; small patches of late structural are isolated, not connected with adjacent watersheds by upslope or riparian areas. Mid-structural is well connected. 60% mid structural in the headwaters, with 40% early-structural, mostly mid-structural downstream. Road density of 1.2 miles/sq. mi. 7706 Road a velocity barrier to amphibians. Early structural is not the historical condition of Ferrous Creek headwaters, or any other creek. Data gap: Lack of long-term fire history.
3) Integrity of aquatic systems	D	L	Data gaps: Stream survey needed.
4) Water quality for healthy ecosystems	D	L	Indicator cutthroat trout found in lower reaches. No information available for amphibians. Two species of Botrycium found in seasonally moist and wet areas. Stream data indicates that stream temperatures stay at 13.2oC in July on a typical cool year. This could indicate a problem. Data gaps: No chemical data. Storm temperature and turbidity data. Plant, fish, and species occurrence surveys. Macroinvertibrate survey.
5) Appropriate sediment regime	D	H	There are natural avalanches from high ridges. Road erosion is 108 tons/year. Data gaps: No stream survey information is available.
6) In stream flow	P	M	9% WAR. 98% ARP. Road density is 1.2mi../sq.mi. Data gaps: Need to research the discrepancy between WAR and ARP.
7) Floodplain Function	D	L	See Assumptions on pages following These ACS tables.

8) Diversity of plant communities	D	L	See Assumptions on pages following These ACS tables. The 6WS is primarily in mid structural condition. Wildlife presence is fair, based on assumptions. Data gaps: Stream surveys. CWD information. Field verification.
9) Well distributed riparian habitat	F	H	There is very little late structural forest. There is a large block of well connected mid structural. 7708 Road is a barrier to amphibians. The distribution of structural stages in the headwaters is 40% early and 60% mid. Data gaps: Wildlife and plant species occurrence information.
Biodiversity	D	L	TES plant species known to occur at five locations. No other plant or wildlife information is available. Data gaps: Require wildlife and plant surveys to determine presence, absence, and densities.
Late structural habitat	P	H	There is very little late structural habitat, although there is a large block of mid structural habitat. There is no connectivity of late structural with other watersheds, although the mid structural is well connected to a larger block. There are five sensitive plant species in the 6WS. 30% early, 66% mid, and 4% late.

Sixth Field Watershed (6WS) 04X - Cispus River
WSU 0430

Evaluation Standards:

G - Good. Most of the 6WS meets the ACS objective with only minor exceptions.
F - Fair. Near the margin in satisfying ACS objective.
P - Does not meet ACS objective.
D - Data gaps. Not enough information available to assign a rating.

Confidence Rating:

H - High confidence that the assigned rating is accurate.
M - Moderate confidence that assigned rating is accurate.
L - Low confidence in the accuracy of rating. Data gaps were given a confidence of (L), "low confidence".

ACS Objective	Rating	Confidence	Comments
1) Existence of aquatic features at landscape scale.	G	H	See Assumptions on pages following These ACS tables.
2) Connectivity between watersheds	P	H	Extensive timber harvest on private land, which comprises a large percentage of the 6WS. Fragmented late structural on National Forest land. Some channel widening- lack of other channel information. Fragmented riparian corridors due to extensive harvest on private lands. Most of the watershed has been harvested. Extremely high road densities. 4.2 miles/mi on NFS, much higher on private land. Roads exist in floodplains. Diking on Crystal Creek? Data gaps: Road crossings and associated information. Lack of channel information.
3) Integrity of aquatic systems	F	M	Channel response is a function of upstream and upstream tributary management activities. Channel widening was noted in the C-type channels of the Cispus River in this 6WS. Tier 2 Key Watershed corridor. Data gaps: Need peakflow information to address spawning velocity concern. Stream survey- percentage of bars, estimates of fines in pools, and substrate information.

4) Water quality for healthy ecosystems	P	H	Little amphibian data is available. No indicator fish species present. Temperature may affect run timing and emergence. Other effects unknown. Some channel widening noted. High temperature of 20oC noted on 7/22/94. 1994- twenty days with temperatures above 18oC. 1994- Thirtythree consecutive days above 16oC, followed by a break and 13 more days of elevated temperatures. In the 1980's some relatively high temperatures were noted, between 14.5 and 16oC. Turbidity is noted as high, 240 on 12/4/75. This was not glacially related (time of year), but flood related (occurred during fifth largest flood). Roads and harvest may have been contributing factors. Flood related peak of 53 NTV on 2/24/86. Monitored following eruption (85-130) February through July. Data gaps: No chemical data. Species occurance, plant surveys, fish surveys. Storm temperature and turbidity data essential.
5) Appropriate sediment regime	D	L	Natural background rate includes toe erosion of the Crystal Creek slide. Several road related failures have contributed coarse sediment to Iron Creek and the Cispus River. Delivery of road erosion to streams is 248 tons/year. Coarse sediment deposition and channel widening are noted. Data gaps: No stream survey information, particularly sediment character information.
6) In stream flow	P	H	40 % increase Peak Flow, WAR
7) Floodplain Function	D	L	See Assumptions on pages following These ACS tables.
8) Diversity of plant communities	D	L	See Assumptions on pages following These ACS tables. Tier 1 Key Watershed corridor. Primarily in early structural conditions. Problem with high temperatures noted. Coarse sediment in response reaches. 30% of the land is NFS, while 70% is held privately. Data gaps: Stream survey field verification.
9) Well distributed riparian habitat	P	H	Riparian areas are broken and fragmented. Most of the watershed has been harvested. Road density is extremely high, especially on private land. Road density on National Forest land is 4.2mi./sq.mi. There is fragmented late structural habitat on National Forest land. Data gaps: Wildlife and plant species occurrence information.
Biodiversity	P	H	Few late structural species are known to occur in this 6WS. There are three populations of sensitive plant species in this 6WS. Data gaps: Need additional wildlife and plant species.
Late structural habitat	F	H	Very little late structural habitat. Mid structural patch is well connected to other 6WS. There are two populations of sensitive plants in the late structural zone. Late structural comprises less than 20% of the 6WS. Late structural is moderately fragmented in the Iron Creek area. Data gaps: Updated private land vegetation classification. Sensitive plant species surveys on private land.

Aquatic Conservation Strategy Evaluation Criteria and Assumptions

Evaluation Criteria to Accompany ACS Objective 1.

Examine variety of aquatic features, Comparing Historic and Current conditions.

a. Perenial Streams:
b. Intermittent Streams:
c. Wetlands:
d. Lakes and Ponds:

Assumptions for ACS Objective 1:

This ACS objective speaks to the continued physical existence of the variety of aquatic features from historic times to the present. It does not address the quality of aquatic conditions, these are addressed in the other ACS objectives.

Note: There were differences of opinion concerning the interpretation of this ACS objective. Two concerns arise about the assumption as stated above. The first is that considering only the continued existence of aquatic features from historic to present times does not address the condition of those aquatic features or their ability to "ensure protection" of the species and communities which inhabit them. Secondly, in some cases, it is unknown whether an aquatic condition existed historically, as it was not possible to review historic air photos from a period prior to the initiation of major management activities.

Perennial streams - The majority of perennial streams that existed prior to 1940, which signaled the onset of management, still exist today. This assumption is based on the presence of incised stream channels that took thousands of years to develop. One exception to this is the major impoundment of water behind Cowlitz Falls Dam.

Intermittent streams - The majority of intermittent streams that existed historically also exist today. It is acknowledged that the timing and volume of flow in those channels may have changed (See ACS obj. 6). Also, it is believed that the overall drainage network has increased where roads have been built, as roads intercept groundwater and increase the network of channels carrying water. In addition, new intermittent streams have been created where cross drains on roads flow onto ground where channels did not previously exist.

Wetlands - There is very little information available about the existence of current wetlands, and there is virtually none about the historic existence.

Lakes and Ponds - It is assumed that the existence of these features has not changed. A review of 1939 aerial photos would clarify this point.

Good (G)	Variety of current aquatic features essentially the same as historic conditions, well within the Range of Natural Variability (RNV).
Fair (F)	These features have been changed somewhat, current conditions are near the limits of RNV.
Poor (P)	Definite changes, a loss of variety of aquatic features, well outside of RNV.

Evaluation Criteria to Accompany ACS Objective 2.
Examine spatial and temporal connectivity of Aquatic and Riparian systems, comparing Historic and Current conditions.

Floodplains to Wetlands to Upslope to Headwater Tribs. to Intact Refugia

Human influences that could affect these connections include:
a. Hydroelectric facilities
b. Road Crossings of Streams
c. Roads built along floodplains and wetlands
d. Sediment deposits instream (gravel bars) or flow routed subsurface

Evaluation Criteria to Accompany ACS Objective 3.
Examine the physical integrity of aquatic systems, comparing Historic and Current conditions.

a. Shorelines (lakes and ponds)
b. Stream Banks
c. Bottom Configurations

Evaluation Criteria to Accompany ACS Objective 4.
Examine water quality of Aquatic, Riparian, and Wetland ecosystems, comparing Historic and Current conditions.

a. Biological
b. Physical
c. Chemical

Evaluation Criteria to Accompany ACS Objective 5.
Examine elements of the sediment regime (input - storage - transport), comparing Historic and Current conditions.

a. Timing
b. Volume
c. Rate
d. Character of Sediment

Evaluation Criteria to Accompany ACS Objective 6.
Examine the ability of in-stream flows to create and sustain riparian, aquatic, and wetland habitats, comparing Historic and Current conditions.

a. Timing
b. Magnitude
c. Duration
d. Spatial Distribution

Assumptions for ACS Objective 6:

ARP counts all "non-forest" as fully recovered, where WAR assumes rapid run-off and greater snow accumulation.

Evaluation Criteria to Accompany ACS Objective 7.
Examine floodplain innundation and the elevation of water tables in meadows and wetlands, comparing Historic and Current conditions.

a. timing
b. variability
c. duration

Assumptions for ACS Objective 7:

There is no information available about the Cispus floodplain at this time.
A majority of inventoried wetlands are associated with either high ridges and talus slopes or floodplains adjacent to streams.
A majority of wetlands under the forest canopy are not inventoried.
Some areas were noted as having small forested wetlands, such as Benham Creek, Crystal Creek, and Big Trees along Quartz Creek.
There is a suspected increase in water table elevation in Woods Creek following the removal of old growth trees, currently in transition.
From Strawberry Ridge to Iron Creek layers of weak bed rock are tilted toward the creek. These layers of tuffaceous bedrock store a lot of water.

Evaluation Criteria to Accompany ACS Objective 8.
Compare the species composition and structural diversity of plant communities in riparian areas, comparing Historic and Current conditions.

a. Thermal Regulation (summer and winter)
b. Nutrient Filtering
c. Rates of Surface and Bank erosion, and Channel Migration
d. Amount and Distribution of Coarse Woody Debris

Assumptions for ACS Objective 8:

Only applied when information was available.
Late structural habitat provides required complexity (horizontal and vertical diversity within plant communities) for wildlife.
Mid structural provides moderate wildlife habitat.
Early structural provides poor wildlife habitat.
The condition of channel complexity is directly related to the adjacent riparian area.
Private land classified as late structural is equivalent to mid structural NFS land.

Evaluation Criteria to Accompany ACS Objective 9.
Examine the species composition and structural diversity of plant communities in riparian areas using Historic and Current conditions

a. Native Plant
b. Native Invertebrates
c. Native Vertebrates

CHAPTER 7

Recommendations

CHAPTER 7 - RECOMMENDATIONS

Landscape-Scale Summary of ACS Conditions and Recommendations

ACS 1-Aquatic Features

Summary of Conditions: The current existence of aquatic features through most of the watershed is considered to be virtually the same as in historic times. This includes the presence of all streams and wetlands. By flooding the rapids and habitat associated with the confluence of the Cowlitz and Cispus rivers, the construction of the Cowlitz Falls dam has caused the greatest physical change in aquatic features. The network of roads in the Lower Cispus West watershed has greatly increased the effective drainage network in the study area, as well as modifying channel characteristics.

Recommendations: Reduce road densities in the watershed where applicable. Review opportunities to modify the location of roads that are in floodplains, and those which confine natural channels.

ACS 2- Riparian Connectivity

Summary of Conditions: Riparian corridors have been disrupted in most subwatersheds by construction of roads across and along streams, and by regeneration harvest in riparian zones.

Recommendations: Regeneration harvest is not recommended in riparian reserves. Incorporate new road construction techniques which allow the passage of components such as large woody debris and sediment, which are essential to wildlife, fish, and aquatic system function. Review opportunities to decommission roads which hinder connectivity.

ACS 3- Physical Integrity of Aquatic Systems

Summary of Conditions: The physical components of the aquatic system (shorelines, banks, and bottom configurations) have been changed in most subwatersheds where information is available. The removal of riparian vegetation through timber harvest, road construction, and volcanic eruption has decreased channel stability. Upslope vegetation removal, by the same agents of change, has increased peakflows. Increased peakflows have caused changes in channel morphology, such as channel widening and bank erosion.

Recommendations: No regeneration harvest in riparian reserves. Net decrease in number of roads in riparian reserves. Net decrease in number of roads in upslope areas to minimize the overall drainage network. Schedule activities in upslope areas to maintain peakflows that are within the recommended thresholds of ARP (70%) and WAR (10%) within subwatersheds. An overall threshold should be derived for the 5th Field watershed. This has not been done at this time.

ACS 4- Water Quality

Summary of Conditions: Based on the assessment of temperature, chemical quality, and turbidity, water quality in the watershed is marginal to support dependant uses, as a whole. Conditions vary from fair to poor, with several unknowns. Conditions to support organisms are generally a concern, or close to being a problem, where data exists. Riparian vegetation removal as a result of timber harvest, road construction, and volcanic eruption, has altered water quality. Loss of riparian shading above disturbances has lead to increased water temperatures in some areas.

Recommendations: No regeneration harvest in riparian reserves. Net decrease of roads in riparian reserves. Precommercial thinning, planting, and underplanting in riparian zones to increase shading is recommended. Where a concern, reduce delivery of fine sediment from roads to streams using sediment traps, filters, erosion control blankets, and by minimizing the use of fine materials in constructing stream crossings.

ACS 5- Sediment Regime

Summary of Conditions: Overall, the sediment rating is poor throughout most of the watershed, with some areas of insufficient data. In all areas with roading, there is an increase in the delivery of fine sediment to streams. In addition, some areas have experienced increases in coarse sediment delivery by mass wasting processes from the road system. Two natural processes that influence sediment delivery are occurring. These are the erosion of pumice deposits from Mt. St. Helens, and the effects of streams cutting the toes of naturally occurring landslides. Some accelerated erosion is occurring along streambanks due to increases in peakflows.

Recommendations: Net decrease of roads in riparian reserves. Net decrease of roads in upslope areas to minimize the overall drainage network. Schedule activities in upslope areas to maintain peakflows within recommended thresholds of ARP (70%) and WAR (10%) within subwatersheds. Lower peakflow events should result in lower rates of bank erosion. Where a concern, reduce delivery of fine sediment from roads to streams using sediment traps, filters, erosion control blankets, and by minimizing the use of fine sediments in the construction of stream crossings. In addition, reconstruct stream crossings and stabilize road shoulders and landings that have been identified as red flag areas of concern. Review opportunities to modify road locations in floodplains, and those which confine natural channels.

ACS 6- Instream Flow

Summary of Conditions: Overall, peakflows in most of the subwatersheds are above the reference thresholds established by both Washington State and the Gifford Pinchot National Forest. Increased peakflows are primarily due to regeneration harvest and the extension of the drainage network by the existing road system. Decreased summer flows are also associated with increased peakflows. This is contributing to the loss of water in streams in late summer, and has related adverse affects on aquatic biota. While it is the lower watershed which may be rated as Low or Moderate in terms of instream flow

conditions, the channel peakflows maybe a result of vegetation removal upstream or upslope. This is noted in Iron Creek, particularly.

Recommendations: Net decrease of roads in upslope areas to minimize the overall drainage network. Schedule activities in upslope areas to maintain peakflows within recommended thresholds of ARP (70%) and WAR (10%) within subwatersheds. Vegetation plays an important role in mediating peakflows, and there is a significant benefit to retaining trees.

ACS 7- Floodplain Function

Summary of Conditions: This is a significant data gap.

There is no information available about the Cispus floodplain at this time, and very little information about the types and number of wetlands elsewhere in the watershed. It is suspected that increases in local wetland water tables have occurred due to adjacent vegetation removal. Specifically, this is a possibility at Woods Creek.

Recommendations: No regeneration harvest or road building activities should be allowed in riparian areas surrounding wetlands until more information is obtained, such as data related to wetland and floodplain conditions. Review opportunities to modify road locations in floodplains and wetlands.

ACS 8- Diversity of Plant Species in Riparian Areas.

Summary of Conditions: Species composition and structural diversity of riparian plant communities is generally poor across this landscape. Late structural habitat, which has the highest potential for plant diversity and LWD recruitment, has been highly fragmented in most riparian reserves.

Recommendations: No regeneration harvest in riparian reserves. Protect existing late structural stands within riparian reserves. Late structural corridors inside and outside of riparian reserves have been identified (see Map 22) for both retention and development. Manage early and mid structural stands within riparian reserves to develop late structural characteristics such as large woody debris.

ACS 9 - Well Distributed Riparian Habitat

Summary of Conditions: Habitat for riparian dependant plant and animal species ranges from fair to poor, and is a concern at the landscape level. Riparian corridors have been disrupted in most subwatersheds by construction of roads across and along streams, and by regeneration harvest in riparian zones.

Recommendations: Regeneration harvest is not recommended in riparian reserves. Incorporate new road construction techniques which allow passage of components such as large woody debris and sediment which are essential to wildlife, fish, and aquatic system function. Review opportunities to decommission roads which hinder connectivity.

Biodiversity

Summary of Conditions: Conditions vary from fair to poor, with many unknowns. Biodiversity, assessed on the basis of habitat effectiveness and presence of late structural species, is marginal as a whole. Conditions to support late structural dependant organisms are a concern, or approaching problem stage, where data exists. Late structural habitat has been highly fragmented inside and outside of riparian reserves.

Recommendations: Acquire additional wildlife and plant species occurrence information to determine presence, absence, and densities. Late structural corridors have been identified (see Map 22) for both retention and development. Protect existing late structural stands within the identified corridor. Manage early and mid- structural stands within and outside of the identified corridors to improve corridor effectiveness and continuity across the landscape.

Late Structural Habitat

Summary of Conditions: Overall, amounts of late structural habitat are within the estimated range of natural variability. However, distribution and effectiveness of late structural habitat is generally poor at a landscape scale, with only two subwatersheds having large blocks of connected late structural vegetation. Late structural habitat has been highly fragmented inside and outside of riparian reserves.

Recommendations: Late structural corridors have been identified (see Map 22) for both retention and development. Protect existing late structural stands within the identified corridor. Manage early and mid structural stands within and outside of the identified corridors to improve corridor effectiveness and continuity across the landscape. Provide for future biological and ecological flows which sustain late structural species across the landscape. Opportunities exist to develop large late structural blocks from current mid-structural vegetation adjacent to late structural corridors.

Blanket Recommendations

Following is a list of "Blanket Recommendations" which apply to all subwatersheds in the Lower Cispus West area. Specific recommendations regarding opportunities within each subwatershed are located in the table following Blanket Recommendations.

Boundary Changes of Riparian Reserves.

This watershed analysis does not support site specific or blanket changes in riparian reserve boundaries. We accept the interim riparian reserves, as they exist, based on our evaluation of ACS objectives 2 through 9. With the completion of this watershed analysis, riparian reserves can be changed if an ID team comprised of a hydrologist, soil scientist, botanist, wildlife biologist, and fisheries biologist conducts on-the-ground reviews and determines that such a change will not affect the maintenance of the Aquatic Conservation Strategy objectives. Changes to riparian reserve boundaries will be documented as part of a NEPA decision.

Harvest Activities within Riparian Reserves

Harvest activities, including salvage, might occur in rare instances within the riparian reserves, when the harvest activities are specifically designed to improve the aquatic conditions and/or develop late structural corridors. In the event of such activity, original reserve buffers should be maintained on the ground, and activities within the buffer should be implemented more conservatively than outside the buffer. Site specific review by an appropriate IDT should occur, and recommendations to minimize soil, vegetation, and aquatic disturbance should be implemented. The need for these activities is primarily in early and mid structural stands where late structural conditions are desired. The ROD gives examples of activities which may be acceptable within riparian reserves on page C32.

Timber Stand Improvement Inside and Outside of Riparian Reserves (PCT, Fertilization, Pruning, Release)

Hydrology, wildlife, silviculture, and botany, at a minimum, should develop joint proposals for Timber Stand Improvement inside and outside of riparian reserves. Within riparian reserves proposals should be designed to improve aquatic conditions and promote the Aquatic Conservation Strategy objectives. It is recommended that the multidisciplinary team visits representative sites before approval. Given this scenario, it is expected that PCT opportunities will be widely available.

Dispersed Recreation

Dispersed sites should be inventoried and evaluated throughout the analysis area. An IDT should meet to determine the basic elements of the inventory, and develop criteria for evaluating conditions. This information should be used to prioritize restoration sites. Site specific field review should occur by a recreation staff. Representative sites would

be visited by hydrology, soils, botany, and silviculture specialists, at a minimum. If necessary, move sites away from streams to minimize disturbance.

Roads

Minimize roads and landing locations in riparian reserves. Seek net decrease of road densities in and out of riparian reserves. Reduce road densities in the watershed where applicable. Review opportunities to modify road locations in floodplains and those which confine natural channels.

Developed Recreation and Trails

Most trails within this area have been recently constructed or re-constructed to meet ROD guidelines. Minimal concerns are present except as noted within specific subwatershed recommendations.

Additional Comments

Harvest Activities Outside of Riparian Reserves

An integrated resource approach should be utilized to ensure attainment of the Aquatic Conservation Strategy objectives. In CHU, the desired future condition is late successional habitat.

Subwatershed Recommendations

Sixth Field Watershed (6WS) 04A - Copper Canyon Creek
WSU 0443

Legend

LSR RR- Riparian Reserves in Late Successional Reserve
RR- Riparian Reserves
Non RR- Areas Outside of Riparian Reserves

Rationale for recommendations drawn from ACS Evaluation Tables.

Management Activities	Management Concerns
Regeneration Harvest	**LSR RR-** ROD direction prohibits Regeneration Harvest. Entire subwatershed in LSR. **RR-** All private land. **Non RR-** See above.
Commercial Thinning	**LSR RR-** Mostly late structural forest. Most stands older than 80 years. Commercial thinning not appropriate according to ROD direction. Few if any opportunities. **RR-** All private land. **Non RR-** See above.
Roads	**LSR RR-** Sedimentation from roads is a problem, recommend net decrease in roads in this 6WS. Restoration opportunities may be available on the following roads: FSR 2472. **RR-** All private land. **Non RR-** See above.
Other Restoration	**LSR RR-** Not needed **RR-** Establish conifer component along hardwood dominated streams (mostly private land). **Non RR-** Mass failure stabilization, road related on private land.
Recreation	**LSR RR-** No recommendations. **RR-** No recommendations. **Non RR-** No recommendations.
Trails	**LSR RR-** No recommendations. **RR-** All private land. **Non RR-** No recommendations.
Special and Sensitive Areas	Subwatershed occurs within the range of the Marbled Murrelet. Lake Scanewa is a dominant feature in this subwatershed.
Landscape Summary	Peakflow modeling shows a 24% increase using state module, and 63% ARP. This indicates extreme peakflow conditions. Copper Creek goes subsurface between federal land and Cispus confluence. This 6WS has been greatly impacted by cumulative effects. Opportunities for timber harvest in this subwatershed are minimal.

WSU 0443
Sixth Field Watershed (6WS) 04B - Lower Quartz Creek

Legend

LSR RR- Riparian Reserves in Late Successional Reserve
RR- Riparian Reserves Outside of LSR
Non RR- Areas Outside of Riparian Reserves

Rationale for recommendations drawn from ACS Evaluation Tables.

Management Activities	Management Concerns
Regeneration Harvest	**LSR RR-** ROD direction prohibits Regeneration Harvest. **RR-** No Regeneration Harvest. **Non RR-** Minimal opportunity because subwatershed is mostly LSR. CHU and late structural corridors make up remaining allocation.
Commercial Thinning	**LSR RR-** Some opportunities in early and mid-structure forest with the exception of reaches Q1 through Q6 and Q9. Commercial thinning not appropriate in stands over 80 years in LSR portion of subwatershed. Do not thin on Red Spring Creek until existing sediment problems investigated. **RR-** See above. **Non RR-** See above. Avoid thinning in identified late successional corridors. (See Map 23)
Roads	**LSR RR-** Sedimentation from roads is a problem. Recommend net decrease in roads in this 6WS. Restoration opportunities are available on the following roads: FSR 26, 2608. These roads are the highest priority in this subwatershed. **RR-** See above. **Non RR-** See above.
Other Restoration	**LSR RR-** Some opportunities aimed at restoring conifer component in lower reaches. Opportunities to improve anadromous rearing habitat in reaches Q1 and Q2. Identify and correct sedimentation problem on Red Spring Creek. **RR-** Establish conifer component along hardwood dominated streams (mostly private land). Bank stabilization in reaches with channel widening. **Non RR-** Mass failure stabilization.
Recreation	**LSR RR-** No recommendations. **RR-** No recommendations. **Non RR-** Expand trail and interpretive opportunities in Quartz Creek Big Trees.
Trails	**LSR RR-** No recommendations. **RR-** All private land. **Non RR-** Relocate northern portions of Trail 220 off of private land. Convert Roads 2608 and 2608016 from roads to trails.

Special and Sensitive Areas	A portion of this subwatershed occurs within the range of the Marbled Murrelet. Retain the identified late successional corridors. Reaches Q1 and Q2 important for anadromous production. Quartz Creek Big Trees is an important recreation and wildlife habitat area. Two sensitive plant species located in the subwatershed. Limit access to Deep Lake to protect native cutthroat trout population from fishing pressure.
Landscape Summary	Integrity of aquatic systems, appropriate sediment regime and instream peakflow are rated poor in ACS table. The other ACS ratings were rated fair, indicating that this is perhaps one of the healthiest watersheds in Lower Cispus West. This subwatershed has the largest unfragmented block of late structure forest in Lower Cispus West area. This 6WS has been greatly impacted by cumulative effects. Opportunities for timber harvest in this subwatershed are minimal.

WSU 0443
Sixth Field Watershed (6WS) 04C - Upper Quartz Creek

Legend

LSR RR- Riparian Reserves in Late Successional Reserve
RR- Riparian Reserves Outside of LSR
Non RR- Areas Outside of Riparian Reserves

Rationale for recommendations drawn from ACS Evaluation Tables.

Management Activities	Management Concerns
Regeneration Harvest	**LSR RR-** ROD direction prohibits Regeneration Harvest. **RR-** No Regeneration Harvest because of poor aquatic conditions and poor late structural connectivity. **Non RR-** Minimal opportunity because subwatershed has poor aquatic conditions, and there is need to maintain existing late structural connectivity.
Commercial Thinning	**LSR RR-** Some opportunities in mid-structural forest along tributaries. Avoid thinning along reaches Q14 through Q17 of Quartz Creek. Commercial thinning not appropriate in stands over 80 years in LSR portion of subwatershed. **RR-** See above. **Non RR-** See above.
Roads	**LSR RR-** Some sedimentation from roads is occurring. Restoration opportunities are available on the following roads: FSR 2600-130, -131, and 2516-074 (conversion to trail). **RR-** See above. **Non RR-** See above.
Other Restoration	**LSR RR-** Some opportunities aimed at restoring conifer component in lower reaches. Opportunities to improve anadromous rearing habitat in reaches Q1 and Q2. Identify and correct sedimentation problem on Red Spring creek. **RR-** Riparian planting for shading a high priority. Bank stabilization in reaches with channel widening. Structures to dissipate stream flow energy. **Non RR-** Erosion control and mass failure stabilization needed.
Recreation	**LSR RR-** No recommendations. **RR-** No recommendations. **Non RR-** No recommendations.
Trails	**LSR RR-** No recommendations. **RR-** No recommendations. **Non RR-** 2516-074 Road proposed for conversion to trail, and 260041 proposed for trailhead.
Special and Sensitive Areas	Ryan Lake - Allow succession to occur naturally.
Landscape Summary	Integrity of aquatic systems has been severely impacted by eruption of Mt. St. Helens. This 6WS has been greatly impacted by cumulative effects. Opportunities for timber harvest in this subwatershed are minimal.

WSU 0443
Sixth Field Watershed (6WS) 04D - Crystal Creek

Legend

LSR RR- Riparian Reserves in Late Successional Reserve
RR- Riparian Reserves Outside of LSR
Non RR- Areas Outside of Riparian Reserves

Rationale for recommendations drawn from ACS Evaluation Tables.

Management Activities	Management Concerns
Regeneration Harvest	**LSR RR-** No LSR present. **RR -** No Regeneration Harvest due to poor aquatic conditions and poor late structural connectivity. **Non RR-** Minimal opportunity because subwatershed has poor aquatic conditions and there is a need to maintain existing late structural connectivity. WAR is beyond threshold at 15%.
Commercial Thinning	**LSR RR-** No LSR present. **RR-** Some possibility to develop future late structural corridors in habitat which is currently mid-structure forest (upper subwatershed). **Non RR-** See above. An important late successional corridor has been identified for protection, opportunities for timber harvest may exist outside of this corridor.
Roads	Some sedimentation from roads is occurring. Restoration opportunities are available on the following roads: FSR 2600-041, -045, and unnumbered extensions of the 2511 road. Evaluate fish migration barrier (culvert) on 26 road crossing of Crystal Creek.
Other Restoration	**LSR RR-** No LSR present. **RR-** Some opportunities aimed at restoring conifer component in lower reaches, as well as evaluate fish access at confluence with Cispus (possible partnership opportunities). Opportunities to improve anadromous spawning habitat in reach CR1. Full length stream inventory important on federal land. **Non RR-** See Roads above.
Recreation	**LSR RR-** No LSR present. **RR-** No recommendations. **Non RR-** No recommendations.
Trails	**LSR RR-** No LSR present. **RR-** No recommendations. **Non RR-** No recommendations.
Special and Sensitive Areas	Retain the identified late successional corridor. Coho plants and spawning habitat on private lands.
Landscape Summary	Many data gaps in this subwatershed concerning aquatic conditions, road density, wildlife and plant species occurrence.

WSU 0430
Sixth Field Watershed (6WS) 04E - Woods and Ames Creeks

Legend

LSR RR- Riparian Reserves in Late Successional Reserve
RR- Riparian Reserves Outside of LSR
Non RR- Areas Outside of Riparian Reserves

Rationale for recommendations drawn from ACS Evaluation Tables.

Management Activities	Management Concerns
Regeneration Harvest	**LSR RR-** ROD direction prohibits Regeneration Harvest. Entire subwatershed in LSR. **RR-** See above. **Non RR-** See above.
Commercial Thinning	**LSR RR-** No opportunities in reaches W13-W16, and A5-A8 because of temperature and sedimentation problems. Minimal opportunities in other reaches where timber is less than 80 years old. **RR-** All riparian reserves in LSR, see above. **Non RR-** Commercial thinning available primarily in older plantations.
Roads	Some sedimentation from roads is occurring. Restoration opportunities are available on the following roads: FSR 2505, 2505-022. Consider reduction of road densities in this subwatershed.
Other Restoration	**LSR RR-** No LSR present. **RR-**Consider the sedimentation problem as a cumulative effects problem needing further investigation. The actual causes are unknown. Good opportunities for restoring conifer component in upper reaches of Ames and Woods Creeks. See reach numbers above. Opportunities to improve anadromous spawning habitat in reaches W8 - W10. Stream bank stabilization at toe of Huffaker Mountain slides. **Non RR-** No recommendations.
Recreation	**LSR RR-** No recommendations. **RR-** No recommendations. **Non RR-** No recommendations.
Trails	**LSR RR-** No recommendations. **RR-** No recommendations. **Non RR-**Trail conversion of Road 2306-685 to Trail 275. Also Roads to Trails conversion for 2506025 and 2506056.
Special and Sensitive Areas	Shortage of coarse woody debris due to past salvage operations. Recommend coarse woody debris inventory and creation. Shortage impacting late successional habitat effectiveness. Reaches listed above important to anadromous production. Numerous ponds have a special significance for many varieties of wildlife and plant species.
Landscape Summary	16% increase in peakflow exceeds thresholds. Overall, Ames and Woods Creeks are atypical for similar valley type segments in this region because of silt and sand meanders, as well as the influence of beaver on channel character.

WSU 044N
Sixth Field Watershed (6WS) 04F - Lower Iron Creek

Legend

LSR RR- Riparian Reserves in Late Successional Reserve
RR- Riparian Reserves Outside of LSR
Non RR- Areas Outside of Riparian Reserves

Rationale for recommendations drawn from ACS Evaluation Tables.

Management Activities	Management Concerns
Regeneration Harvest	**LSR RR-** ROD direction prohibits Regeneration Harvest in these areas. **RR-** No Regeneration Harvest recommended. **Non RR-** Minor opportunities due to limited late structural vegetation.
Commercial Thinning	**LSR RR-** Commercial thinning not appropriate in stands over 80 years in LSR portion of subwatershed. **RR-** Delay thinning in riparian areas identified as having sedimentation problems and lack of amphibians (See wildlife Map 23) until concerns are investigated and problems are resolved. Possibilities to commercially thin to enhance future woody debris recruitment. Use techniques which minimize ground disturbance. **Non RR-** Opportunities outside the identified late successional corridors. Within the corridors, opportunities to improve the effectiveness of the corridors exist in early and mid-structural forest . Special focus should be given to the early successional forest located between the two isolated patches of private land, in an effort to speed development of a late structural link between the east and west portions of the 5th Field Watershed. Protect the late structural habitat within the corridors.
Roads	Sedimentation from roads is a problem. Recommend net decrease of roads in this 6WS. Restoration opportunities are available on the following roads: FSR 2510, -033, 2513-608, 2515, -042, 7708, -067, 7600--014. Portions of the 2510 road are in the floodplain of Iron Creek- review ATM plan for possible decommissioning.
Other Restoration	**LSR RR-** Improve rearing habitat and retain gravel with addition of wood into stream channel. Stabilize banks. **RR-** See above. **Non RR-** No recommendations. Several large, active landslides in the area. There may be some opportunities for erosion control. Effectiveness of these measures should be reviewed with geologist because of high soil movement rates.
Recreation	**LSR RR-** Expand trail and interpretive opportunities adjacent to Iron Creek campground. High density of dispersed sites along 2510 Rd. in Iron Creek and Fourmile Creek. High priority for inventory and review. **RR-** See above. **Non RR-** No recommendations.
Trails	**LSR RR-** See Recreation above. **RR-** No recommendations. **Non RR-**No recommendations.

Special and Sensitive Areas	Reaches I1 and I2 are degraded. These reaches are important to anadromous fisheries. Retain the identified late successional corridors.
Landscape Summary	Reaches I1, I2, and I4 (Iron Creek) have cumulative aquatic concerns, including heavy bank erosion, channel widening, low pools, and low woody debris. Late successional corridors identified to function as a link between the Mt. St. Helens LSR, the Woods Creek LSR, and Quartz Creek LSR. Peak Flow increases low, WAR 5% and ARP 83% indicate cumulative impacts from upper watershed.

WSU 044S
Sixth Field Watershed (6WS) 04G - Big and Little Creeks

Legend

LSR RR- Riparian Reserves in Late Successional Reserve
RR- Riparian Reserves Outside of LSR
Non RR- Areas Outside of Riparian Reserves

Rationale for recommendations drawn from ACS Evaluation Tables.

Management Activities	Management Concerns
Regeneration Harvest	**LSR RR-** No LSR present. **RR-** No Regeneration Harvest recommended. **Non RR-** Opportunities exist outside of late structural corridor which is identified for protection.
Commercial Thinning	**LSR RR-** No LSR present. **RR-**No commercial thinning on Big Creek reaches B1, B2, B6, B8, B9, B11, B13 because of frequent bank failure and presence of larger landslides. Delay thinning in riparian areas identified as having sedimentation problems and lack of amphibians (See wildlife Map 23) until concerns are investigated and problems are resolved. See Roads also. **Non RR -** Opportunities outside the identified late successional corridor. Within the corridor, opportunities to improve the effectiveness of the late structural corridor within the early and mid structure forest . Protect the late structural habitat within the corridor.
Roads	Sedimentation from roads is a problem. Recommend net decrease in roads in this 6WS. Restoration opportunities are available on the following roads: FSR 9900-055*, 2500-201 and Big Creek Quarry, 2516*, -055*, -040, 2517, -017, -035, -046*. (* indicates road crossings of streams where sedimentation and absence of amphibians were noted).
Other Restoration	**LSR RR-** No LSR present. **RR-** Stream bank stabilization in reaches identified as high concern. See Map 17. **Non RR-** Hillslope erosion in past regeneration units is occurring. Needs further investigation to determine how this compares to road impacts in terms of significance.
Recreation	**LSR RR-** No LSR present. **RR-** Moderate density of dispersed sites in Big Creek and Little Creek needing inventory and review. **Non RR-** No recommendations.
Trails	**LSR RR-** No LSR present. **RR-** No recommendations. **Non RR-** No recommendations.
Special and Sensitive Areas	Retain the identified late successional corridor. Reaches B6 and B8 important for fisheries production.

Landscape Summary	Late successional corridor identified to function as a link between the Mt. St. Helens LSR, the Woods Creek LSR and Quartz Creek LSR. Peak Flow increases high, WAR 10% and ARP 59%. Channel widening and channel degradation indicate cumulative effects due to past management activities and two large landslides in upper Big Creek.

WSU 044S
Sixth Field Watershed (6WS) 04H - Wakepish Creek

Legend

LSR RR- Riparian Reserves in Late Successional Reserve
RR- Riparian Reserves
Non RR- Areas Outside of Riparian Reserves

Rationale for recommendations drawn from ACS Evaluation Tables.

Management Activities	Management Concerns
Regeneration Harvest	**LSR RR-** No LSR present. **RR-** No Regeneration Harvest. **Non RR-** The threshold for cumulative effects has been exceeded. Key late successional corridors have been identified for protection, opportunities for timber harvest may exist outside of these corridors.
Commercial Thinning	**LSR RR-** No LSR present. **RR-** Not recommended on mainstem of Wakepish. There may be potential opportunities in early structural stands on tributaries. **Non RR-** The threshold for cumulative effects has been exceeded. Key late successional corridors have been identified for protection, opportunities for timber harvest may exist outside of these corridors.
Roads	**LSR RR-** No LSR present. **RR-** Recommend net decrease in roads in this 6WS, based on high road density and sedimentation associated with roading. Restoration opportunities may be available on the following roads: 9900-056 and 059, 9900-646, 9900-036 and 041. **Non RR-** Same as above.
Other Restoration	**LSR RR-** No LSR present. **RR-** Opportunity for slope or bank stabilization project on reaches W-4 and W-5. Recommend bank stabilization in reach W-2. For further information on aquatic restoration opportunities additional site specific recommendations later in this chapter. **Non RR-** There may be an opportunity for a hydro-erosion control project for a slide on reaches W-4 and W-5 on Wakepish.
Recreation	**LSR RR-** No LSR present. **RR-** This 6WS should be one of the highest priorities for inventory and review of dispersed sites. **Non RR-** Expand trail, interpretive, and camping opportunities at Wakepish Snowpark.
Trails	**LSR RR-** No LSR present. **RR-** No recommendations. **Non RR-** No recommendations.

Special and Sensitive Areas	Retain Pileated Woodpecker Area 511 and the identified late successional corridors. Reaches W-1 and W-2 are critical for trout production.
Landscape Summary	This 6WS has been greatly impacted by cumulative effects. Opportunities for timber harvest in this subwatershed are minimal. Wakepish makes a small contribution to the Iron Creek trout population. The identified late successional corridors provide an important link between the Mt. St. Helens LSR to the south and the Woods and Quartz LSR's to the north.

WSU 044S
Sixth Field Watershed (6WS) 04I - Upper Iron Creek

Legend

LSR RR- Riparian Reserves in Late Successional Reserve
RR- Riparian Reserves Outside of LSR
Non RR- Areas Outside of Riparian Reserves

Rationale for recommendations drawn from ACS Evaluation Tables.

Management Activities	Management Concerns
Regeneration Harvest	**LSR RR-** No LSR present. **RR-** No Regeneration Harvest recommended. **Non RR-** Opportunities exist outside of the late structural corridor which has been identified for protection.
Commercial Thinning	**LSR RR-** No LSR present. **RR-** No commercial thinning on Twelvemile creek until source and implications of high sedimentation are evaluated. Similarly, reaches I6 - I9 (Iron Ck.) exhibiting significant channel widening, indicating cumulative impacts. Site specific review needed to determine if activities are possible. Potential opportunities in early and mid-structural forest on tributaries of Iron Creek. **Non RR-** Opportunities outside the identified late successional corridor. Within the corridor, opportunities to improve the effectiveness of the late structural corridor within the early and mid- structural forest exist. Protect the late structural habitat within the corridor.
Roads	Sedimentation from roads is a problem. Recommend net decrease in roads in this 6WS. Restoration opportunities are available on the following roads: FSR 2500-210, -224, 2800-662, 2817, 2817-016, 2818.
Other Restoration	**LSR RR-** No LSR present. **RR-**No recommendations **Non RR-** Hillslope erosion in past regeneration units is occurring. Need further investigation to determine how this compares to road impacts in terms of significance.
Recreation	**LSR RR-**No LSR present. **RR-** High density of dispersed sites in Twelvemile Creek. Higher priority for inventory and review. Minimize dispersed sites along reach I7 because of conflicts with fisheries production. **Non RR-** No recommendations.
Trails	**LSR RR-** No LSR Present. **RR-** No recommendations. **Non RR-** No recommendations.
Special and Sensitive Areas	Reach I7 identified as important for trout production, also see recreation. Retain Marten area 512 and the identified late successional corridor. Mosquito Meadows important for wildlife habitat diversity.

Landscape Summary	Late successional corridor identified to function as a link between the Mt. St. Helens LSR and the Woods Creek LSR. Peak Flow increases moderate, WAR 7% and ARP 69%. Channel widening and channel degradation indicate cumulative effects in upper watershed. Specific causes undetermined. Deposits from eruptions of Mt. St. Helens are deeper in headwaters of Iron Creek. Thus, natural rates of erosion may be greater than elsewhere in the watershed, and this area may be more susceptible to disturbance by management activities.

WSU 044S
Sixth Field Watershed (6WS) 04J - Ferrous Creek

Legend

LSR RR- Riparian Reserves in Late Successional Reserve
RR- Riparian Reserves Outside of LSR
Non RR- Areas Outside of Riparian Reserves

Rationale for recommendations drawn from ACS Evaluation Tables.

Management Activities	Management Concerns
Regeneration Harvest	**LSR RR-** No LSR present. **RR-** No Regeneration Harvest recommended. **Non RR-** No opportunities. Existing late structural forest is within the late structural corridor identified for protection.
Commercial Thinning	**LSR RR-** No LSR Present. **RR-** No information collected about Ferrous Creek and tributaries. Thinning is a possibility but lack of data limits recommendations. **Non RR-** Opportunities outside the identified late successional corridor. Within the corridor, opportunities to improve the effectiveness of the corridor exist in early and mid structure forest . Protect the late structural habitat within the corridor.
Roads	Sedimentation from roads is a minor problem. Restoration opportunities are available on the following roads: FSR 7700-224. This subwatershed has the highest drainage density of all subwatersheds in LCW. Limit future road construction because of the high number of stream crossings involved.
Other Restoration	**LSR RR-** No LSR present. **RR-** Unknown opportunities, no recommendations. **Non RR-** Unknown opportunities, no recommendations.
Recreation	**LSR RR-** No LSR present **RR-** No recommendations. **Non RR-** No recommendations.
Trails	**LSR RR-** No LSR present. **RR-** No recommendations. **Non RR-** No recommendations
Special and Sensitive Areas	Confluence area of Ferrous Creek important for trout production in Iron Creek. Retain the identified late structural corridor.
Landscape Summary	Large data gaps. Late structural corridor identified to function as a link between the Mt. St. Helens LSR and the Woods Creek LSR. Peak Flow increases high, WAR 9% and ARP 98%.

WSU 0430
Sixth Field Watershed (6WS) 04X - Cispus River

Legend
LSR RR- Riparian Reserves in Late Structural Reserve
RR- Riparian Reserves Outside of LSR
Non RR- Areas Outside of Riparian Reserves

Rationale for recommendations drawn from ACS Evaluation Tables.

Management Activities	Management Concerns
Regeneration Harvest	**LSR RR-** ROD direction prohibits Regeneration Harvest in these areas. **RR-** Not recommended because the portion that is not LSR is identified for development as a late structural corridor. **Non RR-** See above.
Commercial Thinning	**LSR RR-** Opportunities exist where timber is less than 80 years old. **RR-** Opportunities exist in the future, however, no activities will occur in the identified late structural corridor until late structural habitat has developed in subwatershed 04F. **Non RR-** Commercial thinning available mostly in older plantations.
Roads	Some sedimentation from roads is occurring. Restoration opportunities are available on the following roads: FSR 2508, 2511. Consider reduction of road densities with priority on those within the floodplain of the Cispus. Many roads on private land.
Other Restoration	**LSR RR-** No recommendations. **RR-** Stabilize banks with riparian planting and bioengineering. Maintain and enhance existing woody debris. Survey the Cispus mainstem (data gap). **Non RR-** No recommendations.
Recreation	**LSR RR-** No recommendations. **RR-** No recommendations. **Non RR-** No recommendations.
Trails	**LSR RR-** No recommendations **RR-** No recommendations. **Non RR-** No recommendations
Special and Sensitive Areas	Identified late structural corridor provides a critical link between the two LSR's occurring in this 5th field watershed, and between the East and West halves of this 5th field watershed. Without it there will be no effective link between the LSR's or within this 5th field watershed. This is a tier 2 key watershed.
Landscape Summary	Elevated temperatures and high winter turbidity events are an effect of upstream cumulative effects. Many data gaps for aquatic ad terrestrial resources.

Additional Site-Specific Recommendations

Desired Condition	Management Opportunities	Geographic Location	Monitoring/Inventory Needs
Balanced Sediment Regime			
-Balance of Spawning Gravels and Pool Habitat	upslope stabilization road maintenance, upgrade and/or decommisioning slope/riparian revegetation in-channel structures	Iron I1 WKPish W1,2,5 Big B1,6,8 Quartz Q1,2,11,12 Woods W10,12,13,15,16,17 Ames A1,4	stream surveys pebble counts
-Clean, Well Distributed Spawning Gravels	same as above	Iron I1,2,7 WkPish W1,2,4,5 Big B1,6 Quartz Q1,2,11,12 WoodsW8,9,13,15,16,17 Ames A1,2,4,6 Crystal CR1	stream surveys pebble counts channel x-sections McNeil samples smolt trap macroinvertebrate samples spawner/redd counts
-Abundant, Deep, Well Distributed Pools	same as above	Iron I1,2,3,4,7,8,9 WKPish W3 Big B1,3,4,7,8,9,10,11,12,13,14 Quartz Q1,2,5,6,7,12,13,14,15,16,17,18,19,20,21 Woods W1,2,3,4,5,6,7,8,9,10,11 Ames A1,2,5,6,7,8 Crystal CR1	stream surveys

Desired Condition	Management Opportunities	Geographic Location	Monitoring/Inventory Needs
Riparian Areas/ Stream Channels			
-Low/ No LWD Recruitment Potential	no treatment riparian planting timber stand improvement bank stabilization and/or in-channel structures	Iron I1,2,3,4,7,8,9 WkPish W3 Big B1,3,4,7,8,9,10,11,12,13,14 Quartz Q1,2,5,6,7,12,13,14,15,16,17,18,19,20,21 Woods W1,2,3,4,5,6,7,8,9,10,11, Ames A1,2,5,6,7,8 Crystal CR1	aerial photo interp Solar Pathfinder/shade analysis photo point
-Lacking Instream LWD	in-channel structures	Iron I1,2,3,5,6 WkPish W2 Big B1,2,5,9,12 Quartz Q1,2,6,7,9,14,15,16,17,18,19,20,21 Woods W1,2,3,4,10,11,12,13,14 Crystal CR1	stream survey photo point
Water Quality			
- Water Temperature	restore canopy riparian planting timber stand improvement	Quartz Q16,17,18,19,20,21 Woods W6,7,8,9,10,11,12,13,14,15,16,17 Ames A5,6,7,8,	thermograph Solar Pathfinder/shade analysis aerial photo interp photo point

Desired Condition	Management Opportunities	Geographic Location	Monitoring/Inventory Needs
Tier 2 Key Watershed Corridor			
Protect/enhance anadromous fish Stocks	Cooperative efforts/fundiing w/ BPA, Champion Int., FOC,WDFW, TAC and other goups and agencies		
spring chinook	spawning and rearing habitats - flow regimes - redd scour, protect riparian area	Cispus All reaches	track WAR analysis thresholds (all areas Cispus basin) track discharge peaks, duration, response,timing Coordinate activities among landowners
coho	create/improve side channel and rearing habitats	Iron I1,2 Quartz Q1,2,3 Crystal CR1	Cooperative projects, inventories
coho and steelhead	sediment fouling spawning reaches - improve condition	Iron I1,2,3 Woods W8,9 Quartz Q1,2,3,4,5,6 Crystal CR1	Same as described for clean spawning gravels.
coho and steelhead	critical temperatures reached; see water quality, temperature section	Woods W1-10	Same as described for water quality, temperature.

Desired Condition	Management Opportunities	Geographic Location	Monitoring/Inventory Needs
Road Access			
-Maintaining a minimum, safe road system that meets public and administrative needs.	- establish trailhead on NF lands along Rd 2600	- Strawberry Ridge Trail #220, northend and Road 26	
- Maintain road system at desired ATM levels.	- maintain roads to ATM maintenance standards, respond to changes in public needs	- Road 2516 to viewpoint a challenge	- Implement ATM - Review annual road mntc plan
-Eliminating roads from system that are no longer identified for future use.	- pre sign roads proposed for closure on ground to notify existing road users	- All roads proposed for closure or decommissioning	
	- continue to remove landing piles along roadways	- Road 2600	
Maintain scenic road corridors to provide of variety of vegetative conditions	- open up stands along roadways to provides viewing variety	- Road 2500	

Desired Condition	Management Opportunities	Geographic Location	Monitoring/Inventory Needs
Developed Recreation -Clean, safe, attractive facilities in adequate number to meet public expectations and demands. -Providing facilities meeting ADA, ethnically diverse public, and modern vehicle needs. -Providing a spectrum of recreational opportunities, ranging from primitive to rural. -Adequate parking at river and trail access points.	- continue to improve and replace existing facilities - provide group camping opportunities that help fund facility maintenance - expand trail and interpretive oppt. adjacent to existing developed facilities - formalize river access points and provide santitation facilities	all - Wakepish Snowpark (04H) - Iron Creek Cmpd (04F), Wakepish Snowpark (04H), Quartz Creek Big Trees (04B)	- annual facilities inventory - Infrastructure database
Dispersed Recreation - Unmanaged setting, freedom of choice and site protection -Meeting human sanitation needs. -Site management to minimize site degradation. -Meeting WSR River standards -Providing a variety of recreation opportunities.	-- complete inventory on dispersed campsites - define acceptable standards - harden informal roads and parking - continue to provide dispersed and devoloped recreation opportunities that meet ACS and WSR FP standards prevent	- all sites - where needed to continue to allow dispersed camping that will meet ACS and FP objectives - Cispus River	- using road condition surveys and volunteers

Desired Condition	Management Opportunities	Geographic Location	Monitoring/Inventory Needs
Trails Maintaining trails to standard for public expectations, safety, and resource protection. -Providing a range of trail opportunities including barrier-free, mt. bike, motorcycle, stock cross country and snowmobile.	- continue and expand partnerships and volunteer efforts to maintain and restore trails - implement ATM roads to trails projects - expands trail system adjacent to existing developed sites	- all - Road 2608, 2608016, 2600041(trailhead), 2516074, 2506025, 2506056, 2306685 - Iron Creek Cmpd, Wakepish Snowpark, Quartz Creek Big Trees	- every five years complete trail condition surveys - ensure annual water drainage maintenance
Special Uses and Lands -Ade3quate responses to requests. Providing for general public benefit, not individuals'. Wild and Scenic Rivers. Acquiring lands within Forest Boundary to meet desired conditions.	-Formalize river access for permitted commercial and recreational rafting. -Develop strategy for the removal of downed trees across the Cispus River that interfere with commercial and recreational rafting.	-Cispus River	

APPENDIX A

Index to Creeks and Sixth Field Watersheds

Lower Cispus West Watershed Analysis

Index to Creeks and Sixth Field Watershed Designations
Appendix A

Lower Cispus West Watershed Analysis

See Maps 2 and 3.

Major Creeks in Sixth Field Watershed	Sixth Field Watershed (6WS)	Watershed Stratification Units (WSU)	Prior Designation (May apply in Technical Reports).
Copper Canyon.	04A	WSU 0443	WSU 0443
Lower and Middle Quartz, Sulphur, Big Tree, Red Spring, Moses.	04B	WSU 0443	WSU 0443
Upper Quartz.	04C	WSU 0443	WSU 0443
Upper and Lower Crystal.	04D	WSU 0443	WSU 0443
Ames; Upper, Middle, and Lower Woods.	04E	WSU 0430	WSU 0430
Lower and Middle Iron, Benham, Fourmile, Nash.	04F	WSU 044N	WSU 0442N
Upper and Lower Big, Little.	04G	WSU 044S	WSU 0442S
Hemlock, Wakepish.	04H	WSU 044S	WSU 0442S
Upper Iron, Cabin, Twelvemile.	04I	WSU 044S	WSU 0442S
Ferrous.	04J	WSU 044S5	WSU 0442S
Lower Cispus.	04X	WSU 0430	WSU PVT.

APPENDIX B

Map List

Lower Cispus West Watershed Analysis

Map List
Appendix B

Lower Cispus West Watershed Analysis

General Maps

Base Map	Base Map
Map 1	Vicinity Map - Local
Map 2	Sixth Field Watersheds (6WS)
Map 3	Watershed Stratification Units (WSU's)
Map 4	Forest Plan Allocations (Gifford Pinchot and Northwest Forest Plan)
Map 5	Stream Classes (classes 1 - 4)
Map 6	Riparian Reserves (Northwest Forest Plan)
Map 7	Roads
Map 8	Erosion Potential
Map 9	CHU, LSR, and Special Areas
Map 10	***Mass Wasting***[1]

Vegetation

Map 11	Current Vegetation Structure
Map 12	Historic Vegetation Structure
Map 13	Forest Zones (Potential Vegetation)
Map 14	***Botany Threatened Endangered/Survey and Manage Species***[2]
Map 15	Potential Noxious Weed Locations

Aquatic

Map 16	Peak Flow Areas of Concern
Map 17	Channel Assessment, Fish Habitat Ratings
Map 18	Current and Historic Fish Distribution
Map 19	Fisheries Critical Areas
Map 20	Riparian Connectivity

Wildlife

Map 21	Riparian Fragmentation
Map 22	Unfragmented Vegetation Blocks
Map 23	Amphibian Surveys
Map 24	Wildlife Conditions
Map 25	Areas with High Road Density

Human Use

Map 26	Past Disturbance and Management Activities
Map 27	Historic Access Routes
Map 28	Railroad Logging
Map 29	Recreation Sites
Map 30	Recreation Road and Trail Concerns
Map 31	"Red Flag" Areas (Road Concerns)
Map 32	Human Caused Mass Wasting

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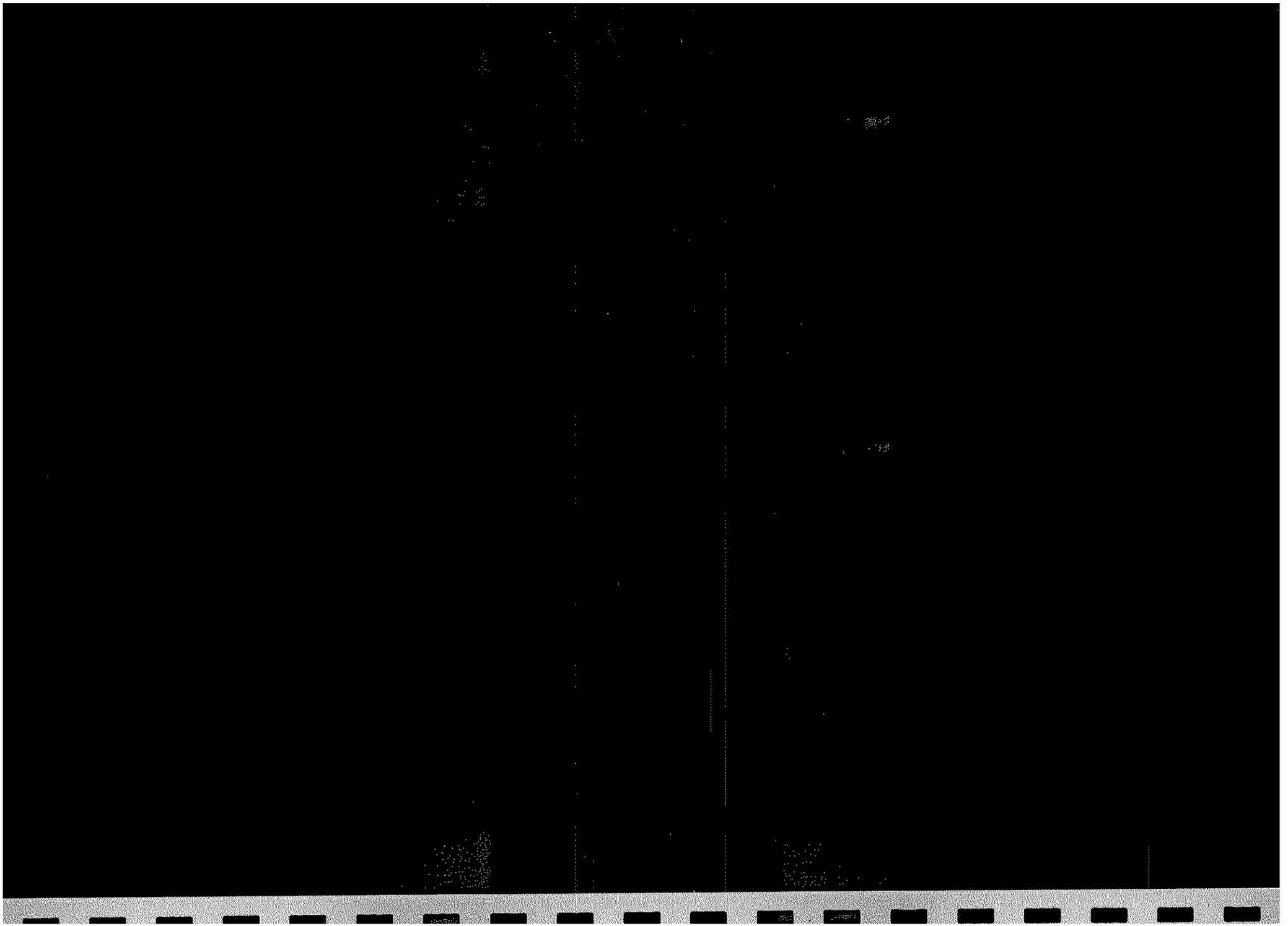
[1] Not available at this time.

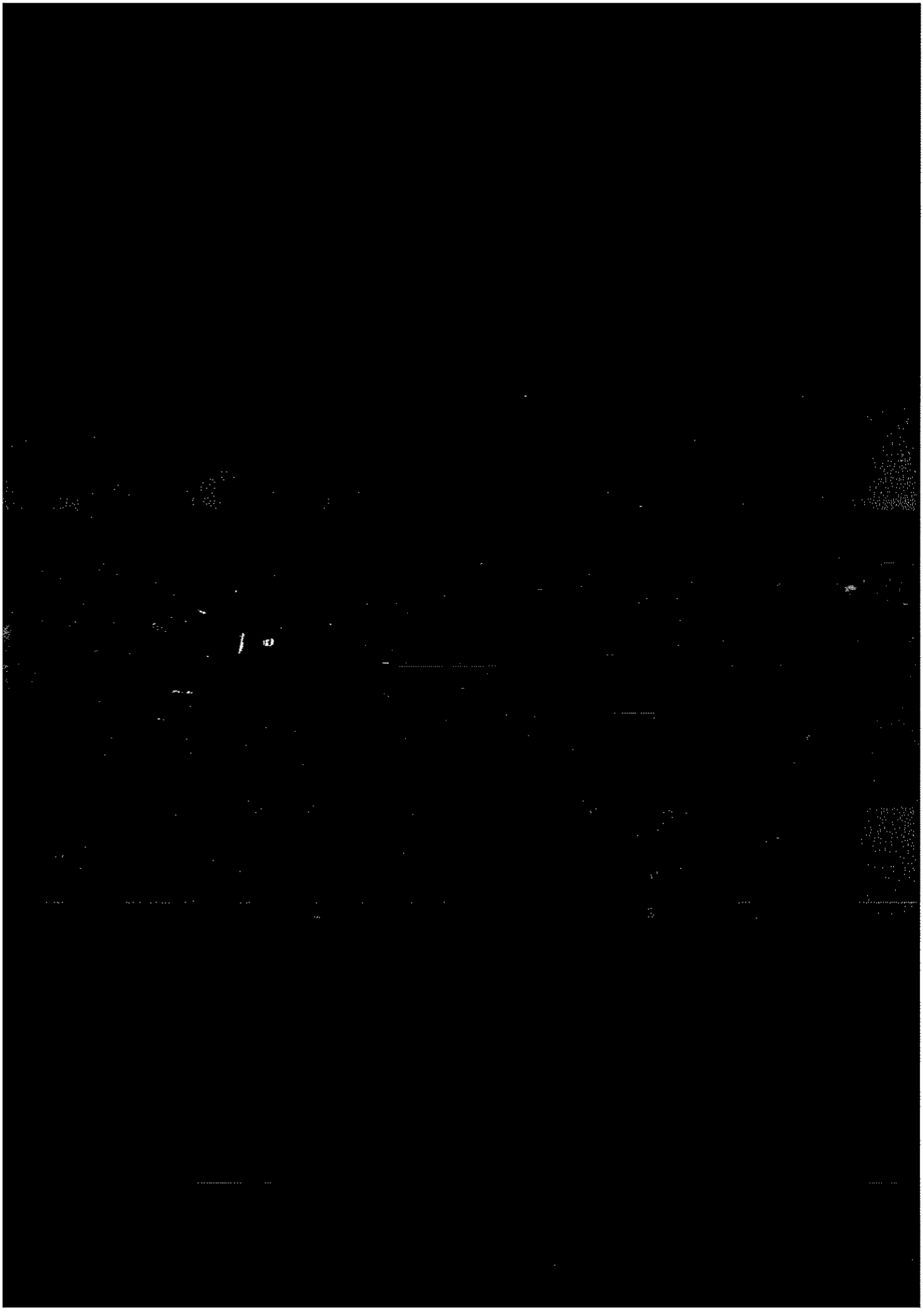
[2] Sensitive Information. Map filed with District Botanist.

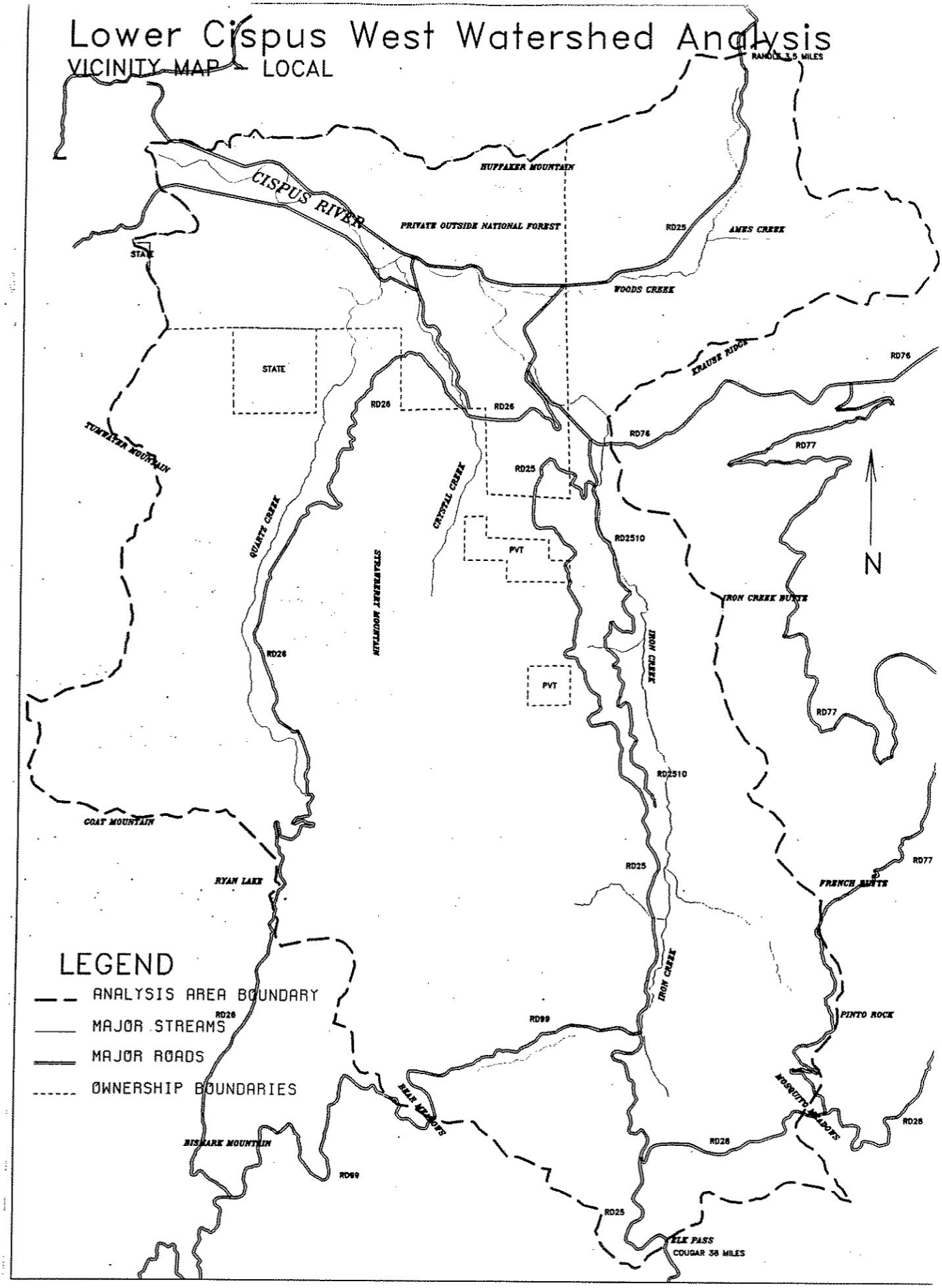
APPENDIX C

MAPS

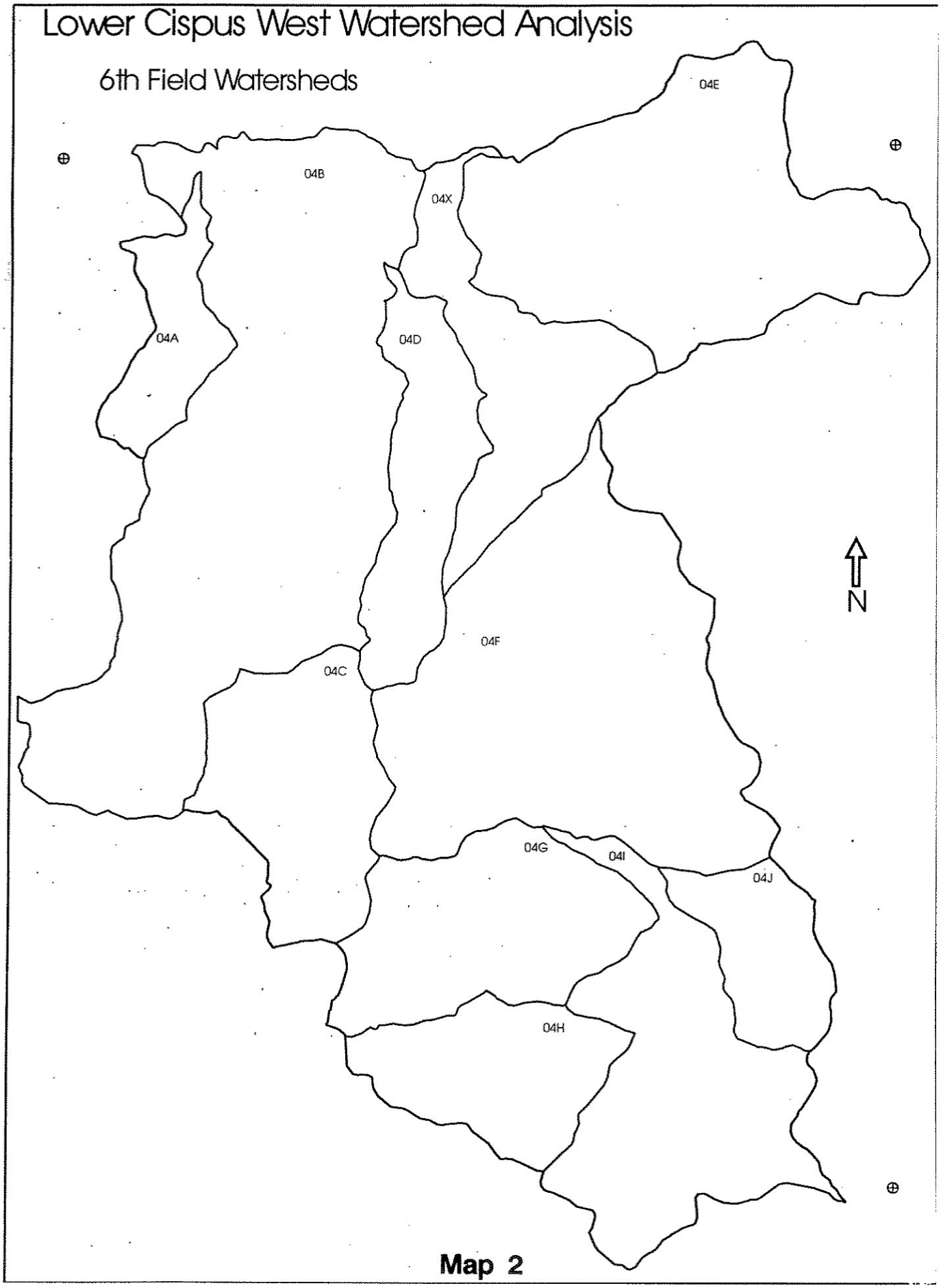
Lower Cispus West Watershed Analysis






Lower Cispus West Watershed Analysis
VICINITY MAP - LOCAL
RANDLE 3.5 MILES
HUFFAKER MOUNTAIN
CISPUS RIVER
PRIVATE OUTSIDE NATIONAL FOREST
RD25
AMES CREEK
STATE
WOODS CREEK
STATE
KRAUSE RIDGE
RD76
RD26
RD26
RD76
RD77
TUMWATER MOUNTAIN
RD25
CRYSTAL CREEK
QUARTZ CREEK
STRAWBERRY MOUNTAIN
RD2510
PVT
N
IRON CREEK BUTTE
RD26
IRON CREEK
PVT
RD77
RD2510
COAT MOUNTAIN
RD25
RD77
RYAN LAKE
FRENCH BUTTE
IRON CREEK
LEGEND
ANALYSIS AREA BOUNDARY
MAJOR STREAMS
MAJOR ROADS
OWNERSHIP BOUNDARIES
RD26
RD99
PINTO ROCK
ELK MEADOWS
SHOOTING MEADOWS
RD28
BISMARK MOUNTAIN
RD28
RD99
RD25
ELK PASS
COUGAR 38 MILES

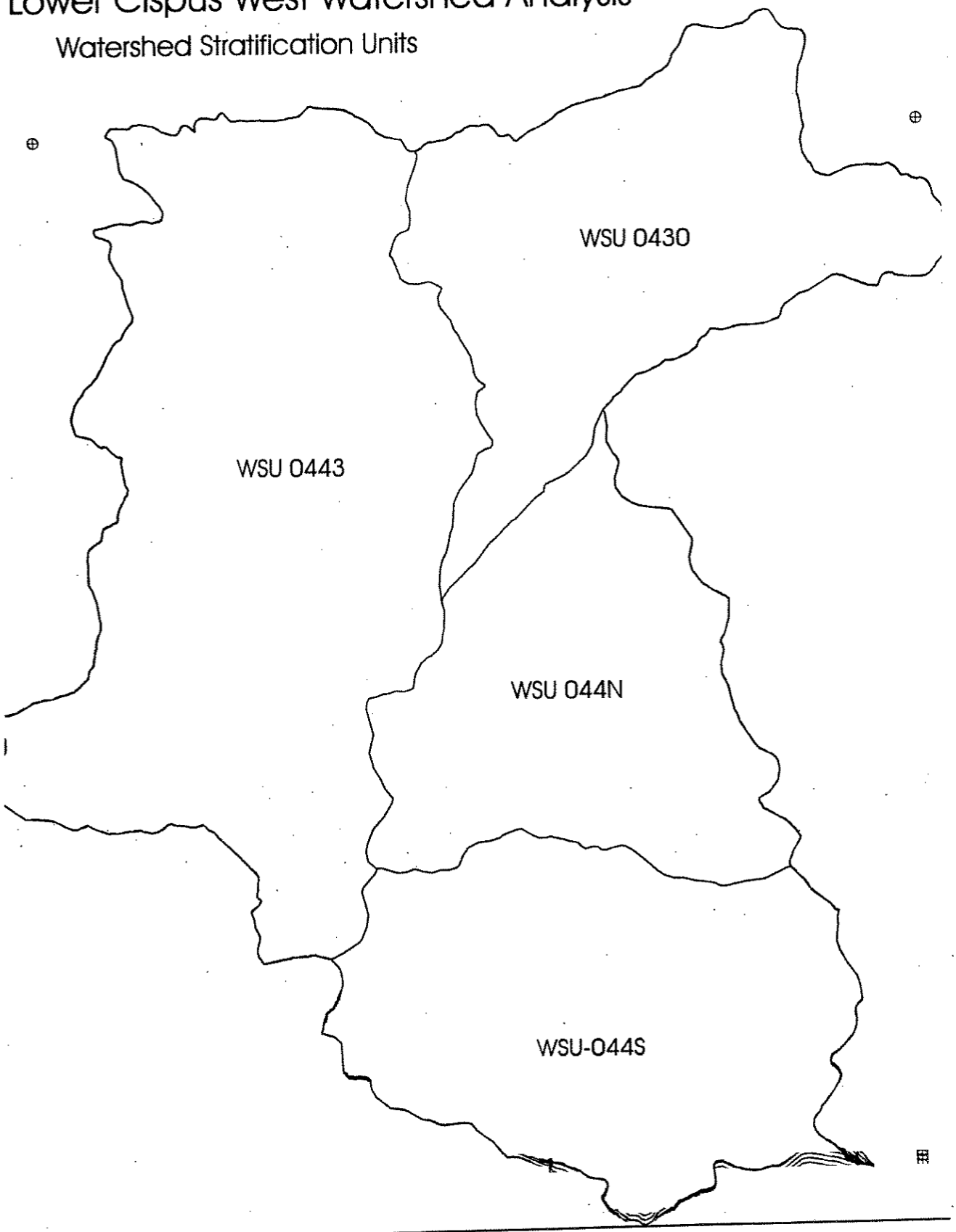
Map 1


Lower Cispus West Watershed Analysis
6th Field Watersheds
04E
04B
04X
04A
04D
04F
04C
04G
04I
04J
04H
N

Map 2

Lower Cispus West Watershed Analysis

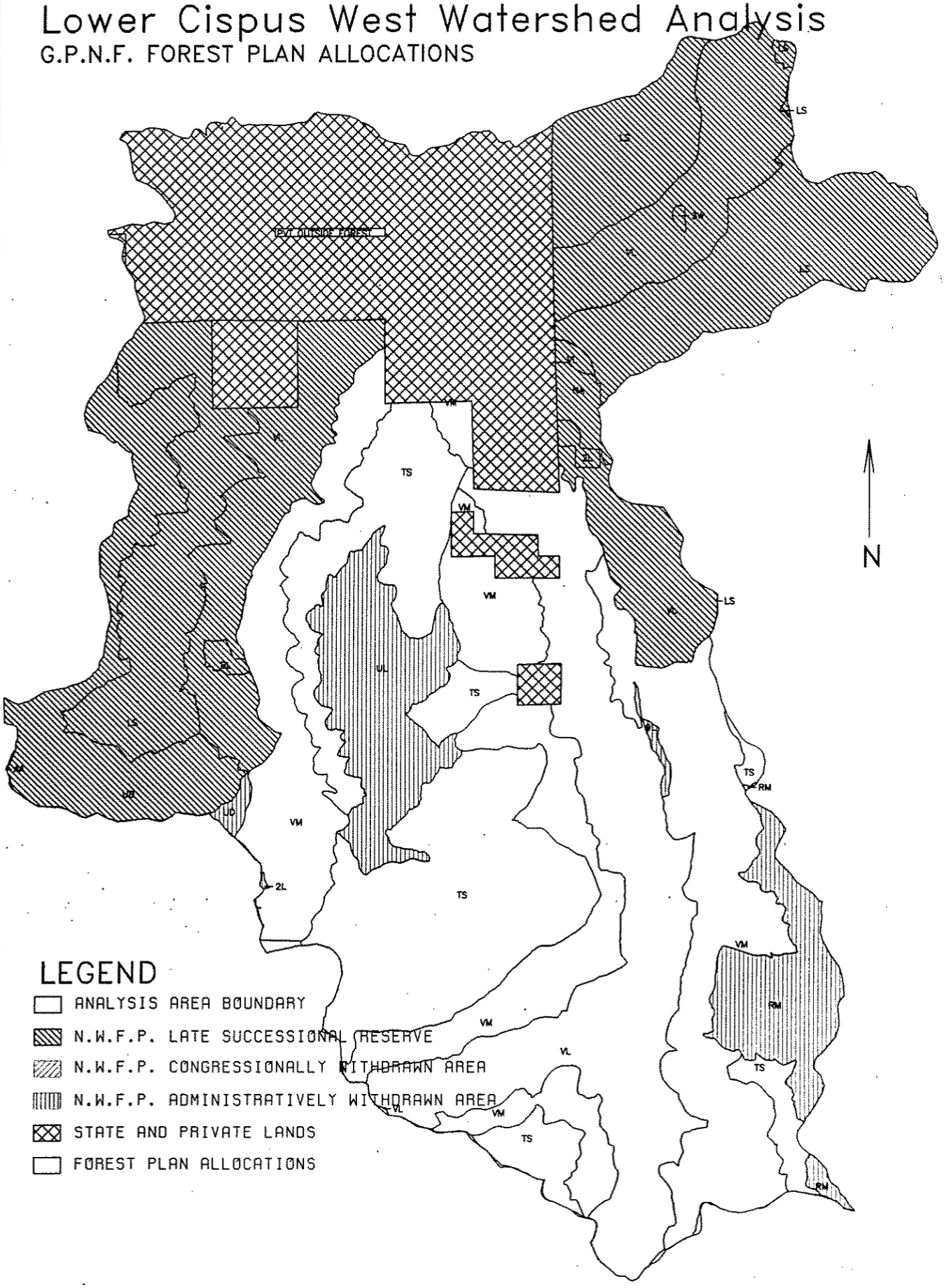
Watershed Stratification Units



Map 3

Lower Cispus West Watershed Analysis

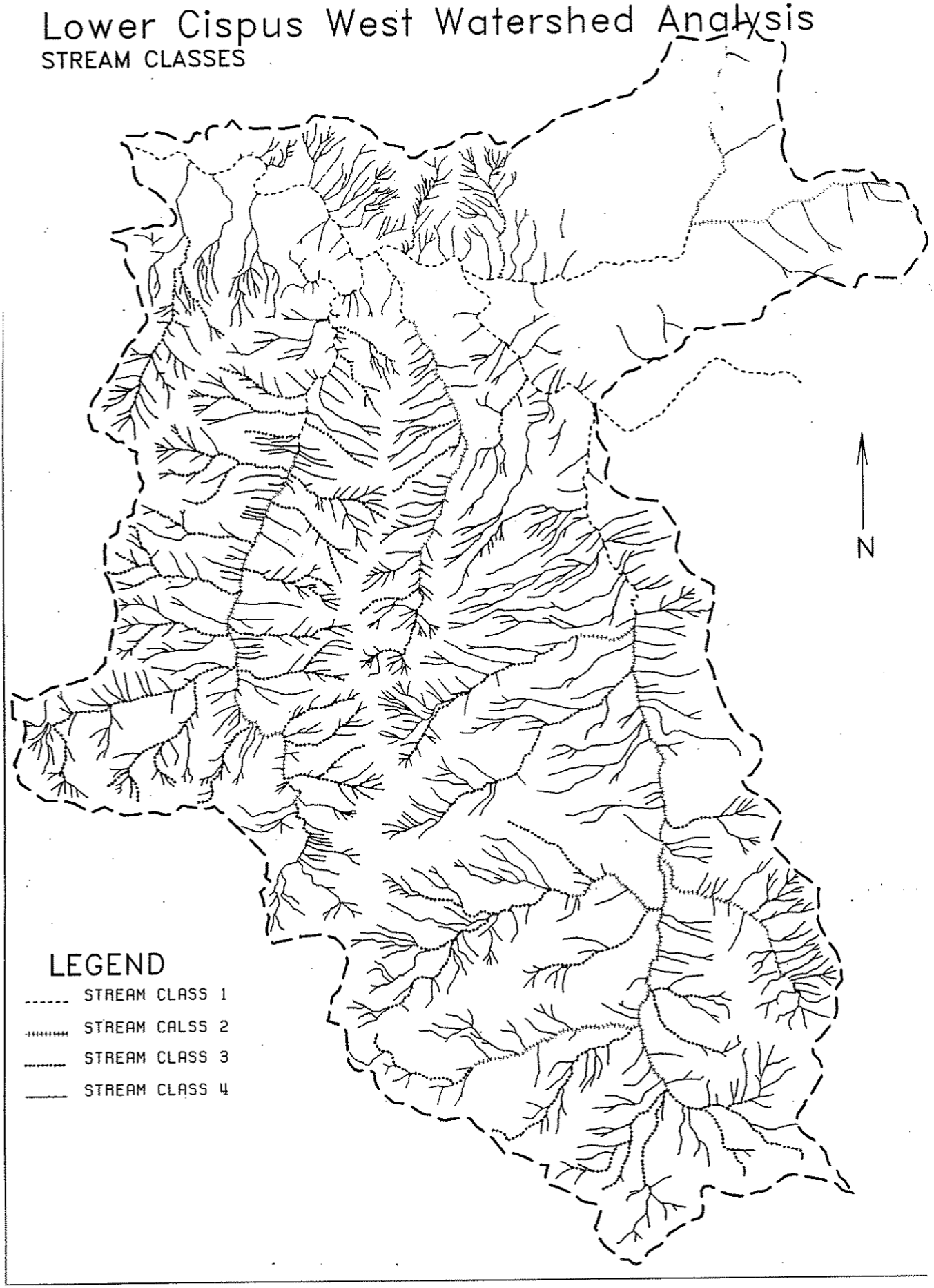
G.P.N.F. FOREST PLAN ALLOCATIONS



Map 4

Lower Cispus West Watershed Analysis

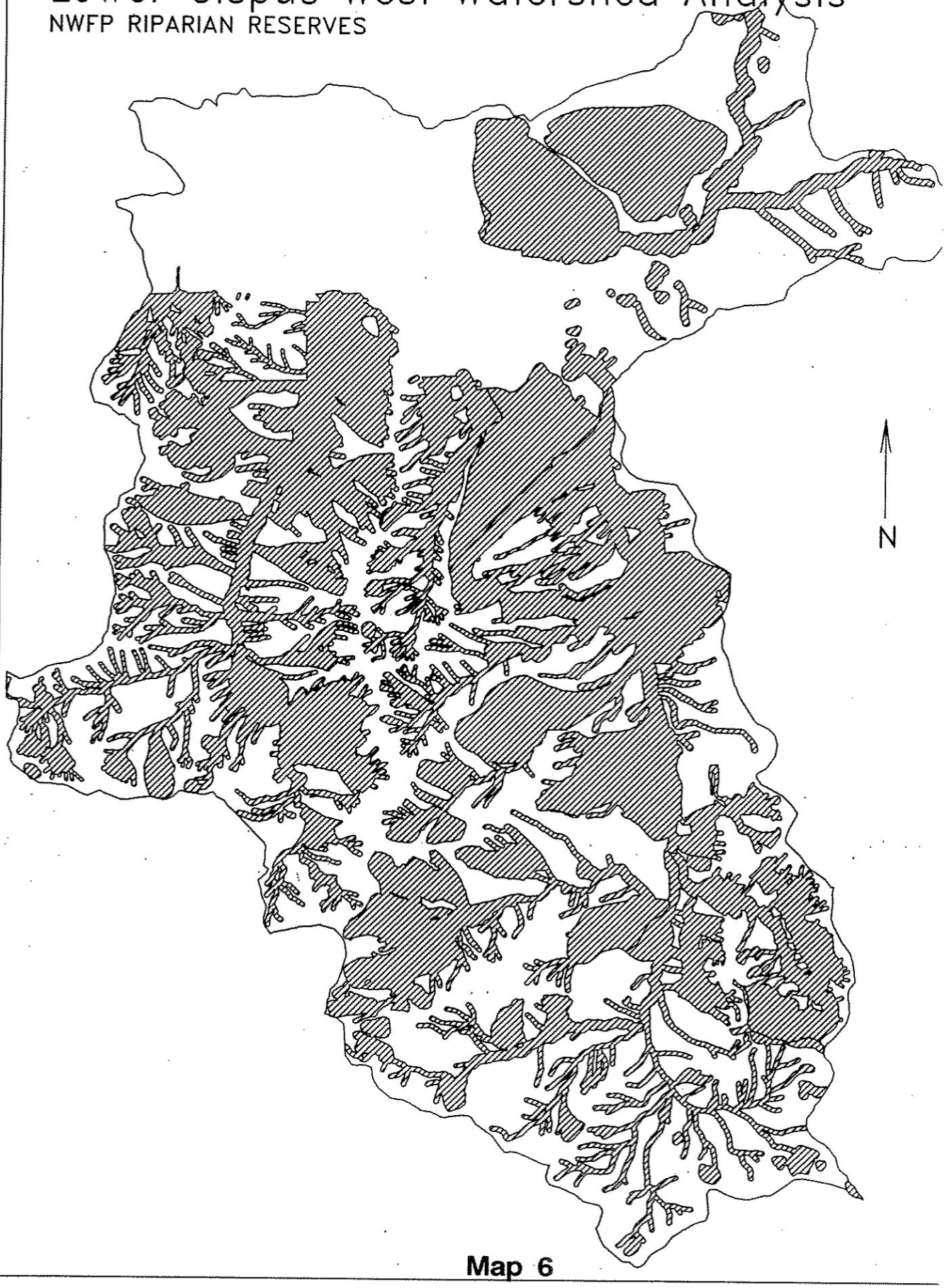
STREAM CLASSES



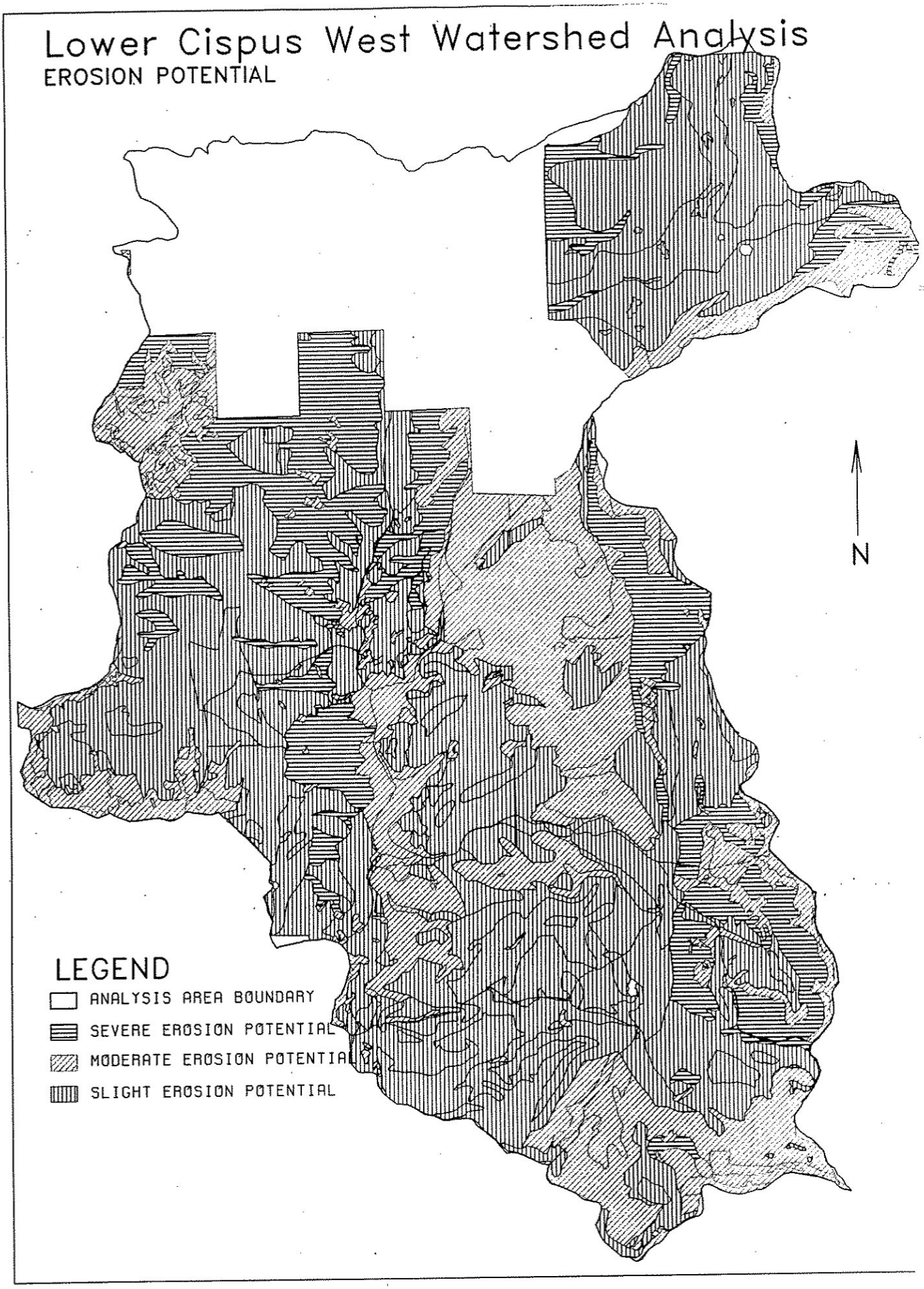
Map 5

Lower Cispus West Watershed Analysis

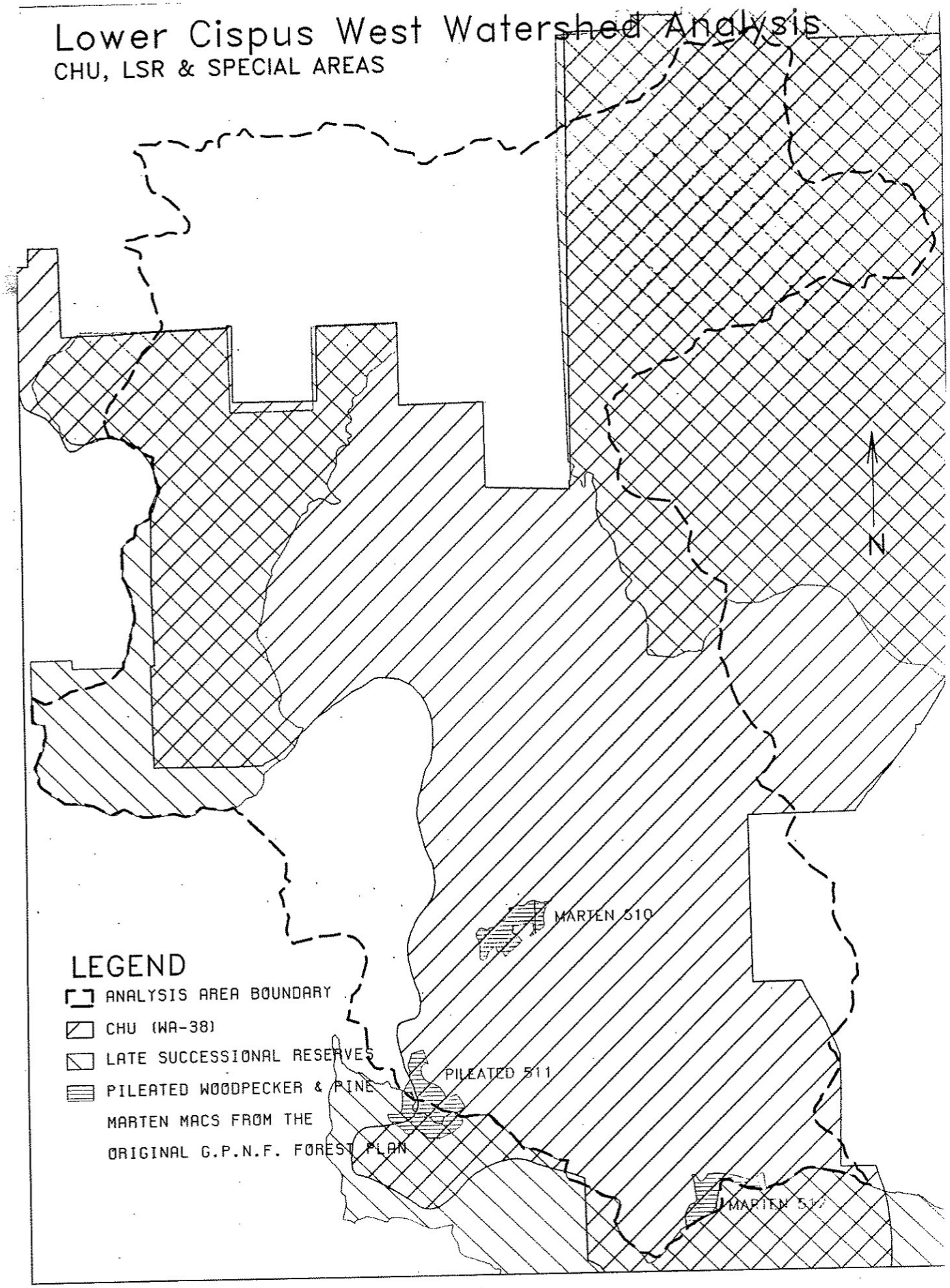
NWFP RIPARIAN RESERVES



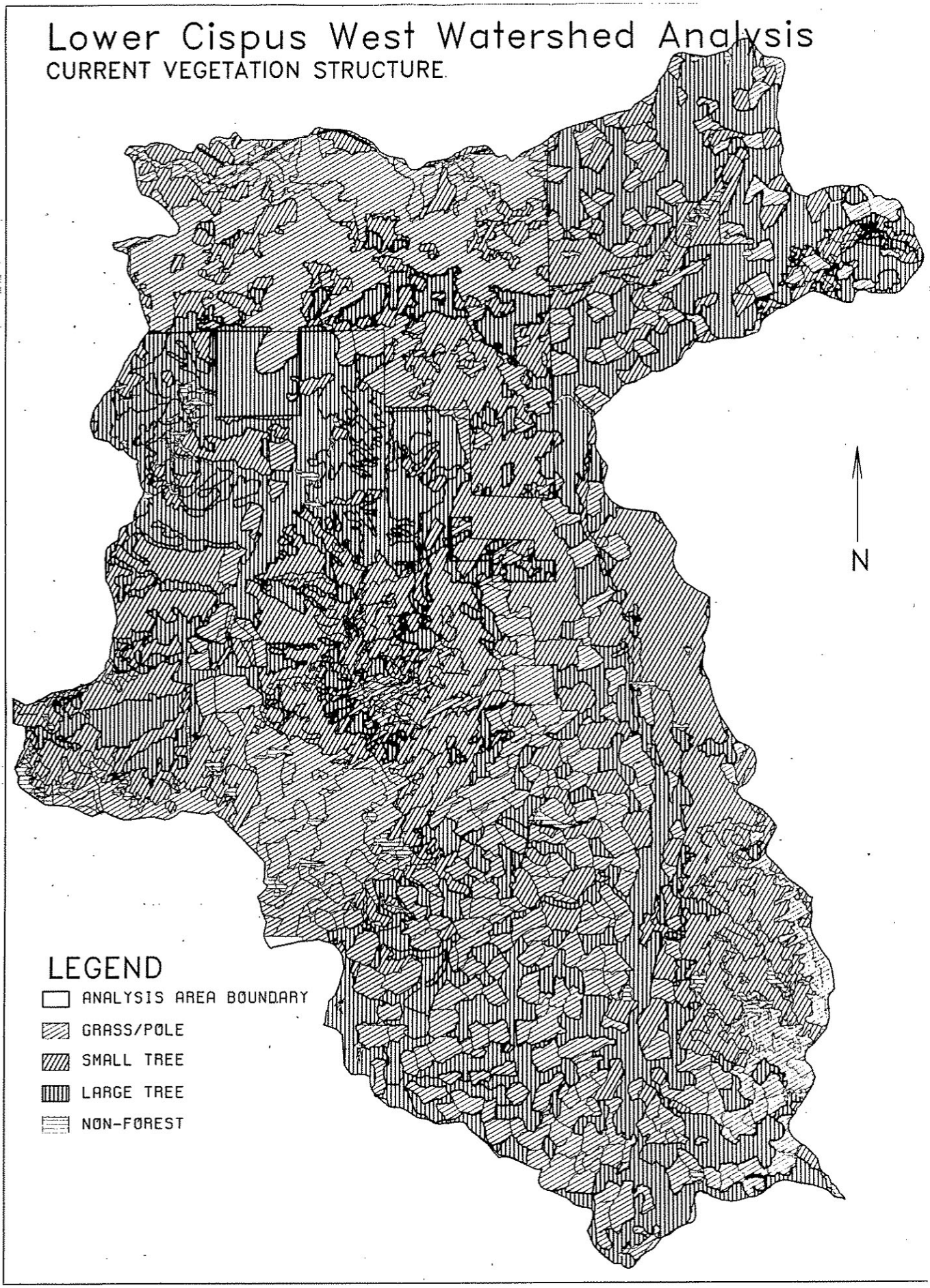
Map 6


Lower Cispus West Watershed Analysis
EROSION POTENTIAL
N
LEGEND
ANALYSIS AREA BOUNDARY
SEVERE EROSION POTENTIAL
MODERATE EROSION POTENTIAL
SLIGHT EROSION POTENTIAL

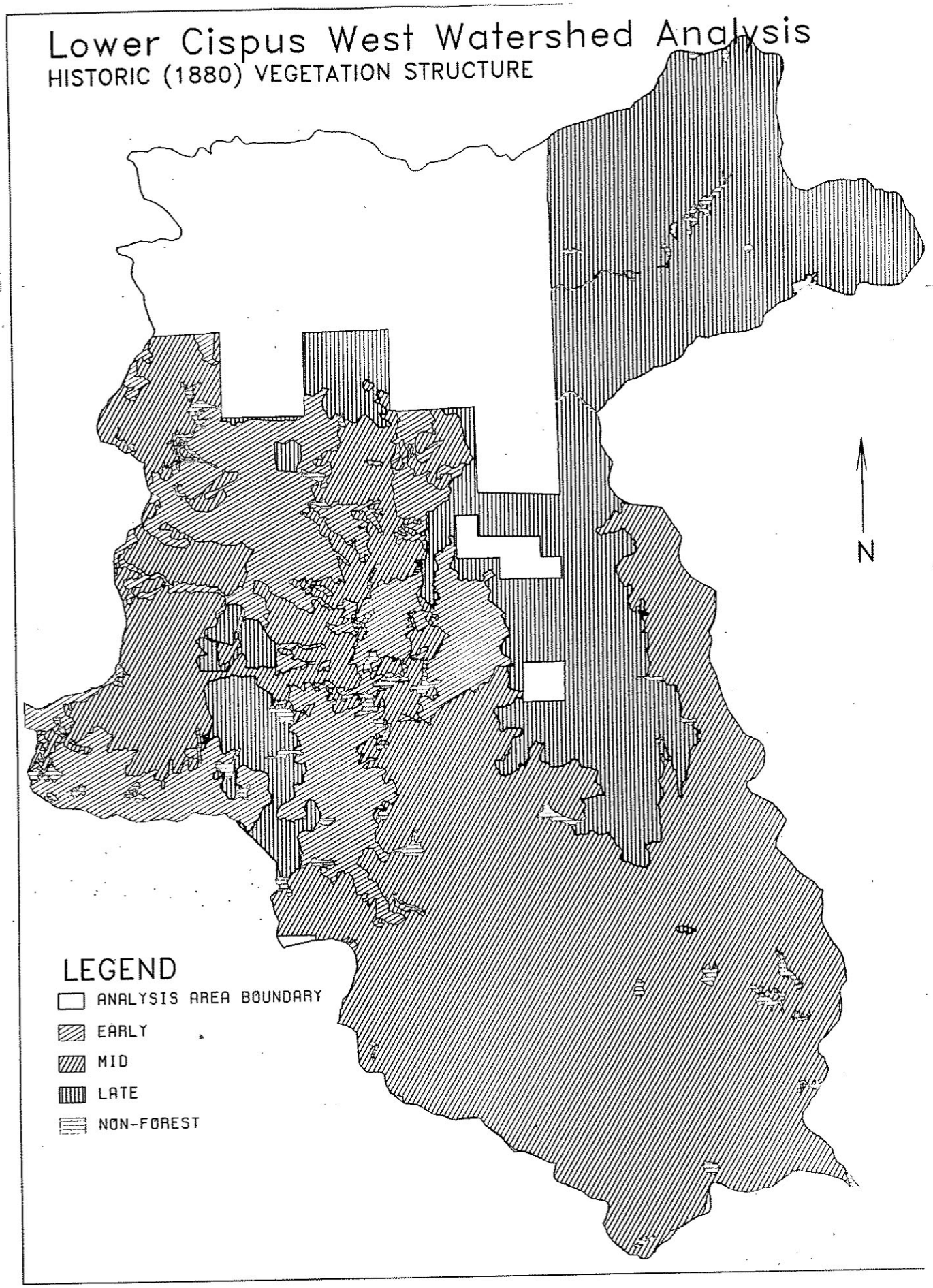
Map 8


Lower Cispus West Watershed Analysis
CHU, LSR & SPECIAL AREAS
N
MARTEN 510
PILEATED 511
MARTEN 512
LEGEND
ANALYSIS AREA BOUNDARY
CHU (WA-38)
LATE SUCCESSIONAL RESERVES
PILEATED WOODPECKER & PINE MARTEN MACS FROM THE ORIGINAL G.P.N.F. FOREST PLAN

Map 9


Lower Cispus West Watershed Analysis
CURRENT VEGETATION STRUCTURE
N
LEGEND
ANALYSIS AREA BOUNDARY
GRASS/POLE
SMALL TREE
LARGE TREE
NON-FOREST

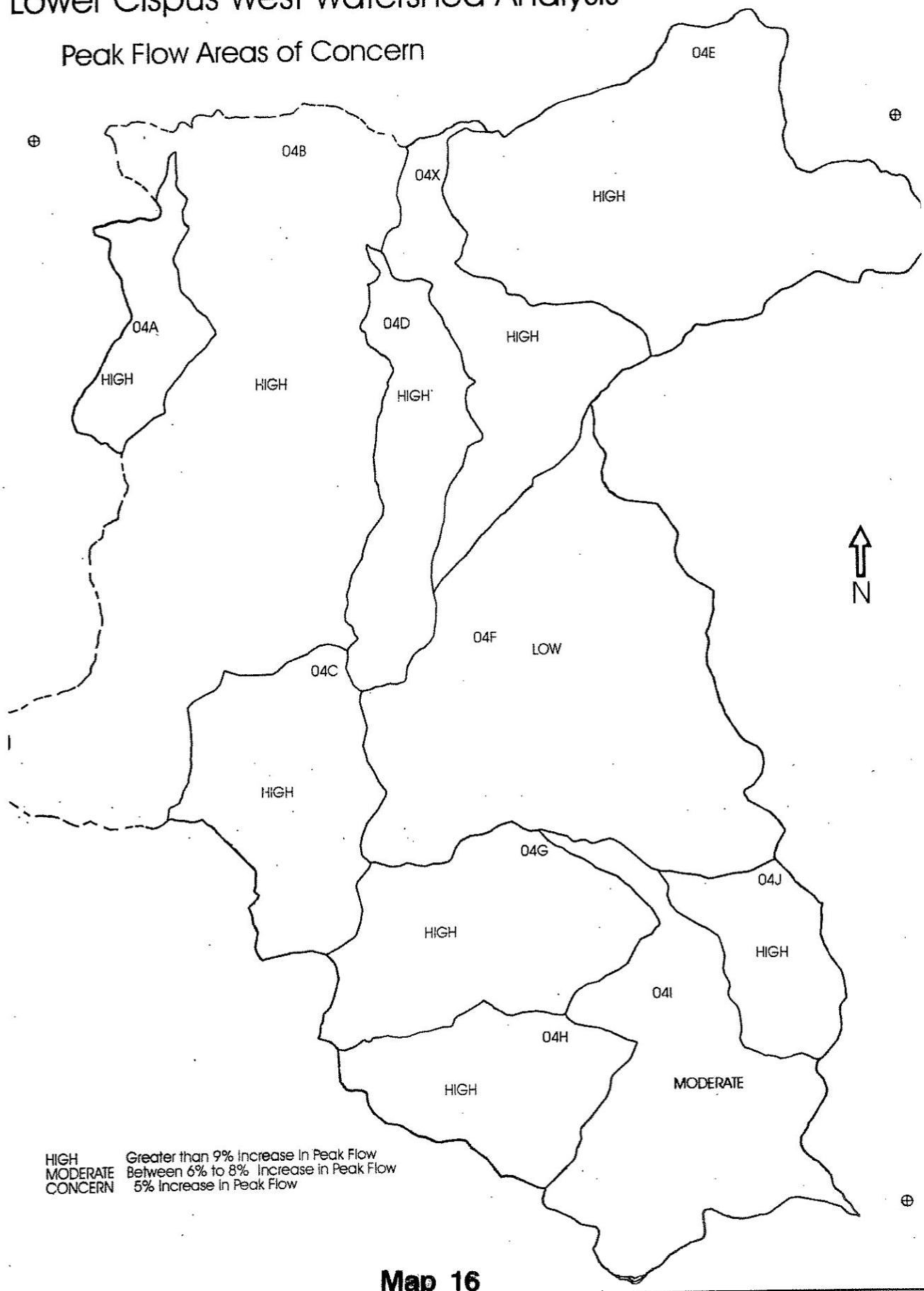
Map 11


Lower Cispus West Watershed Analysis
HISTORIC (1880) VEGETATION STRUCTURE
N
LEGEND
ANALYSIS AREA BOUNDARY
EARLY
MID
LATE
NON-FOREST

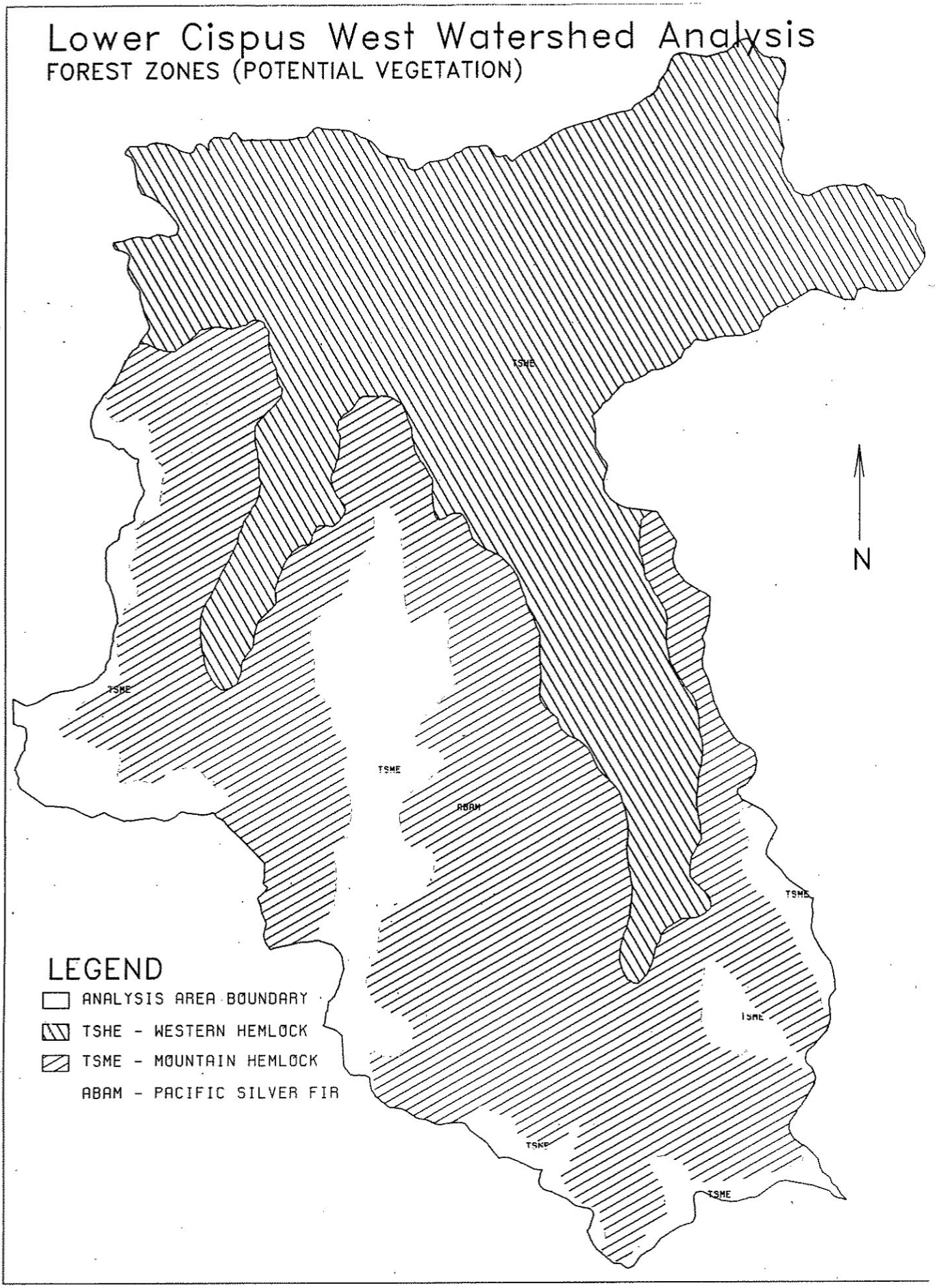
Map 12

Lower Cispus West Watershed Analysis

Peak Flow Areas of Concern



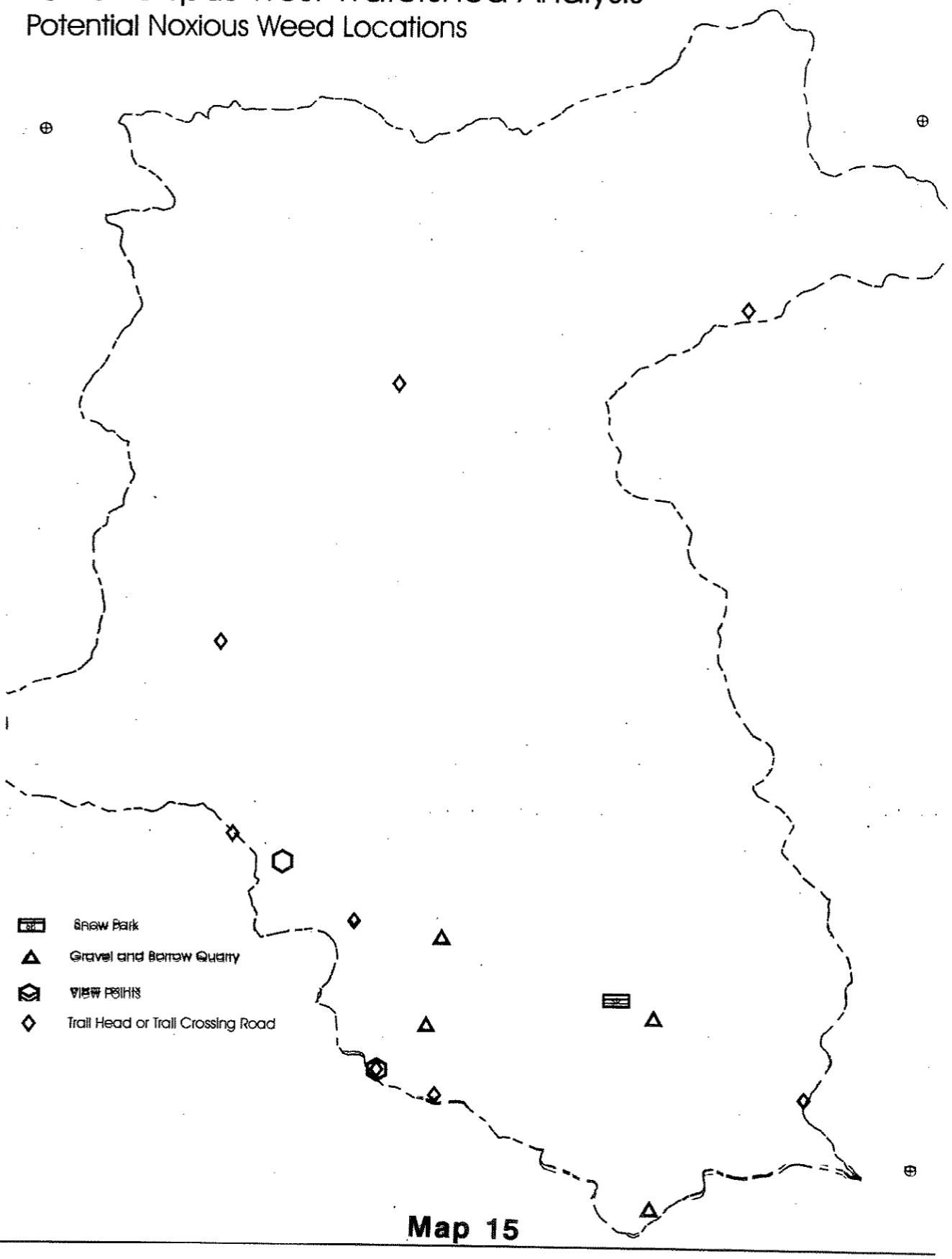
Map 16


Lower Cispus West Watershed Analysis
FOREST ZONES (POTENTIAL VEGETATION)
TSHE
TSME
ABAM
N
LEGEND
ANALYSIS AREA BOUNDARY
TSHE - WESTERN HEMLOCK
TSME - MOUNTAIN HEMLOCK
ABAM - PACIFIC SILVER FIR

Map 13

Lower Cispus West Watershed Analysis

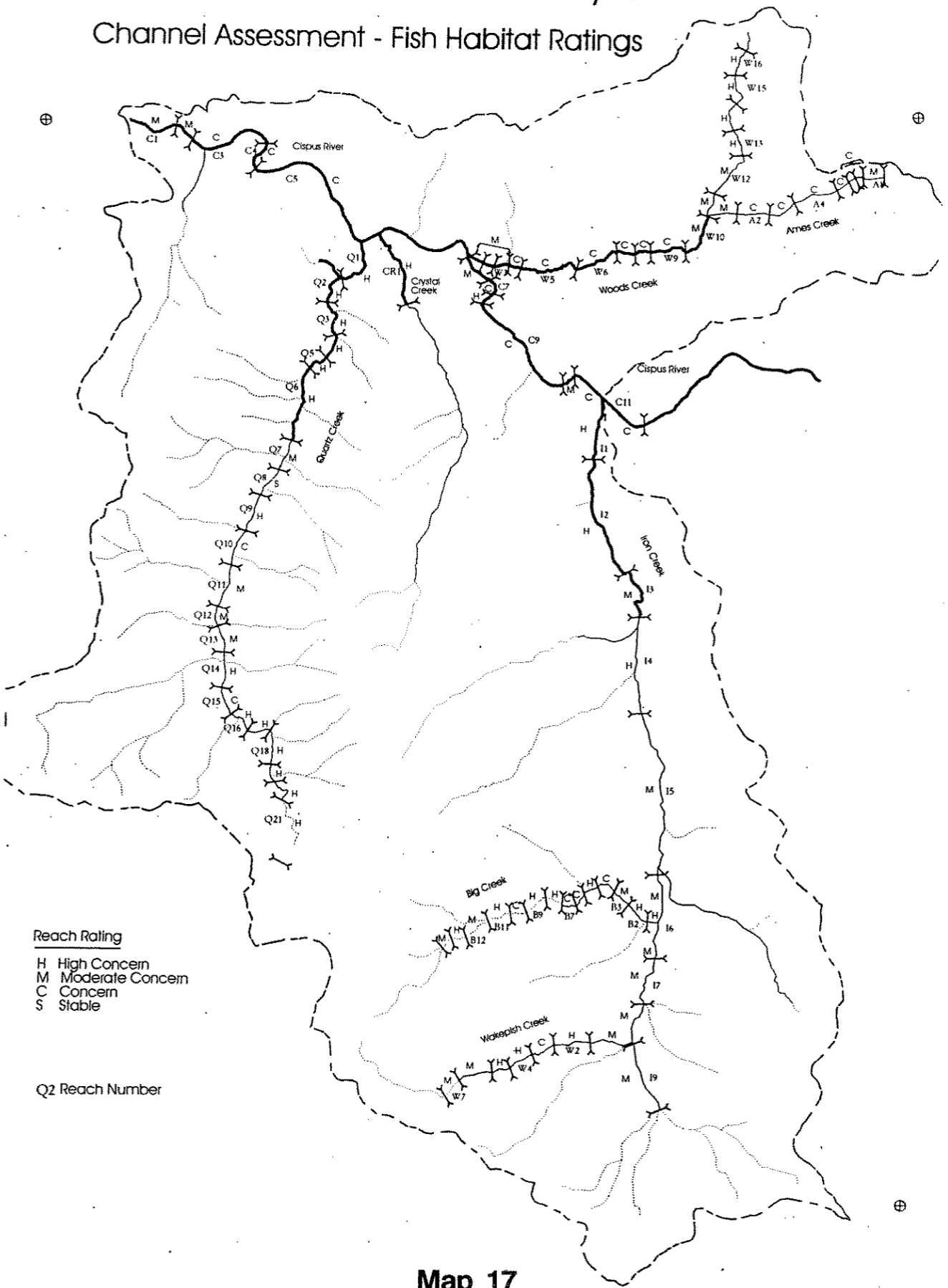
Potential Noxious Weed Locations



Map 15

Lower Cispus West Watershed Analysis

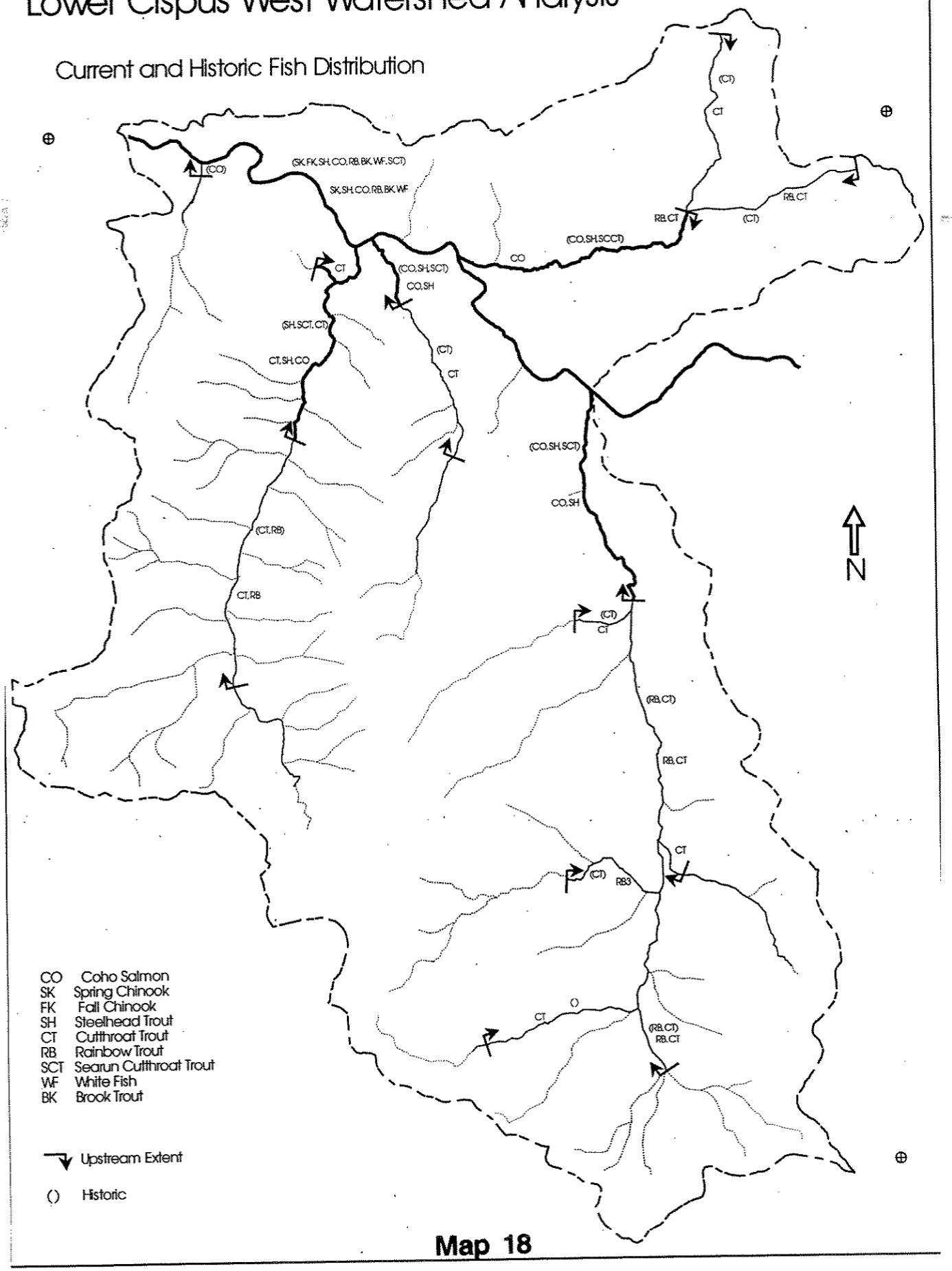
Channel Assessment - Fish Habitat Ratings



Map 17

Lower Cispus West Watershed Analysis

Current and Historic Fish Distribution



CO Coho Salmon
SK Spring Chinook
FK Fall Chinook
SH Steelhead Trout
CT Cutthroat Trout
RB Rainbow Trout
SCT Searun Cutthroat Trout
WF White Fish
BK Brook Trout

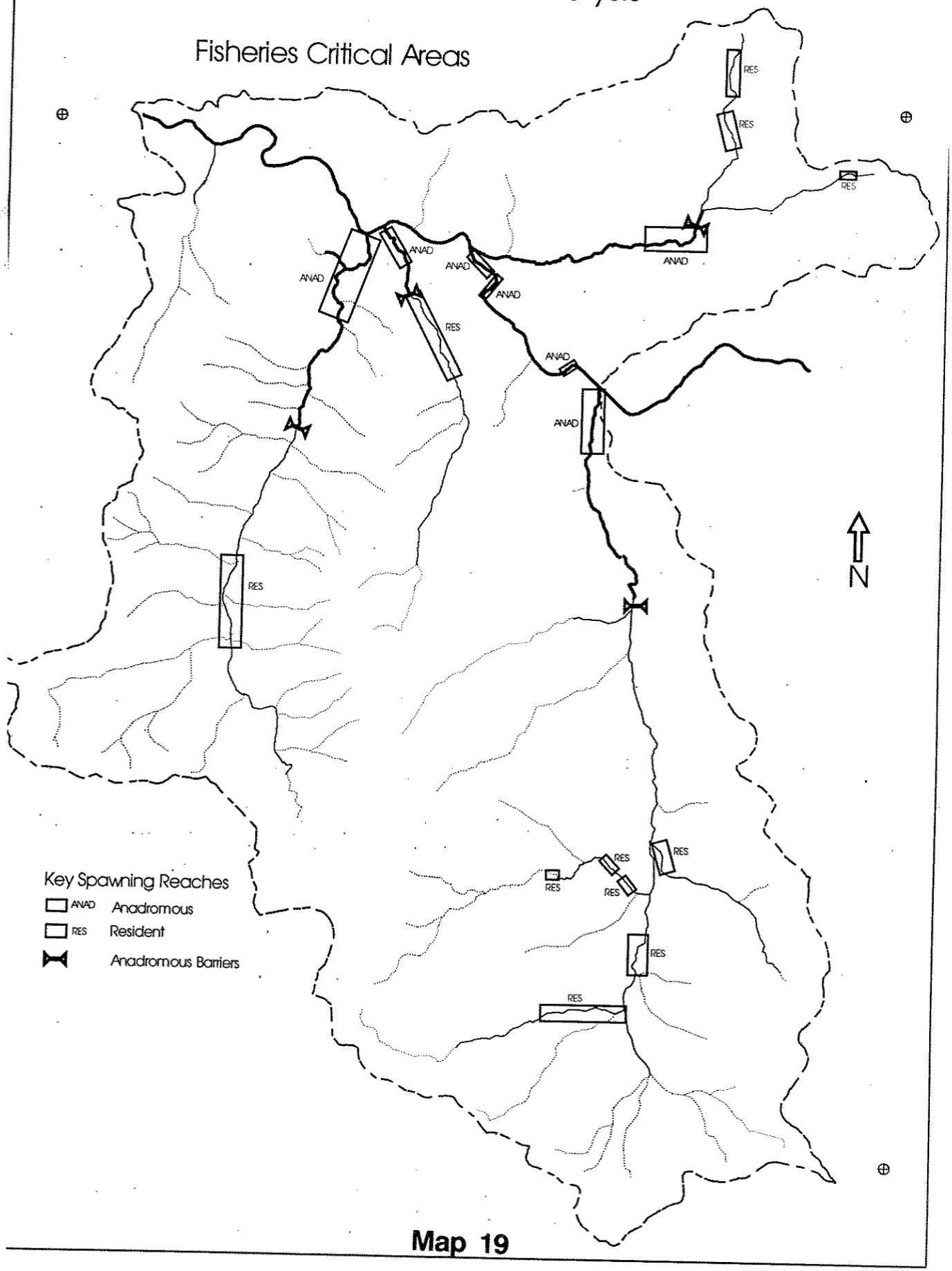
Upstream Extent

() Historic

Map 18

Lower Cispus West Watershed Analysis

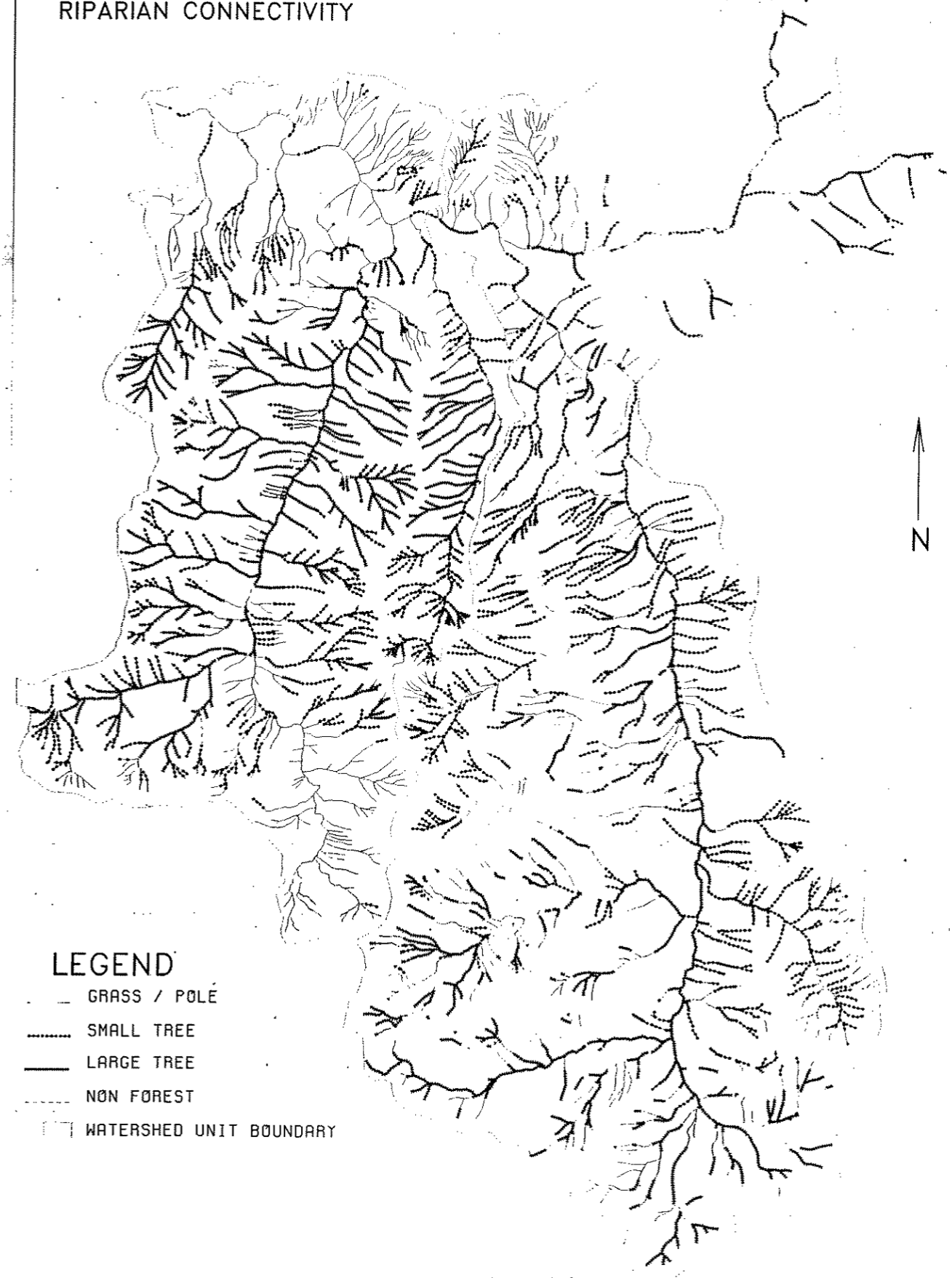
Fisheries Critical Areas



Map 19

Lower Cispus West Watershed Analysis

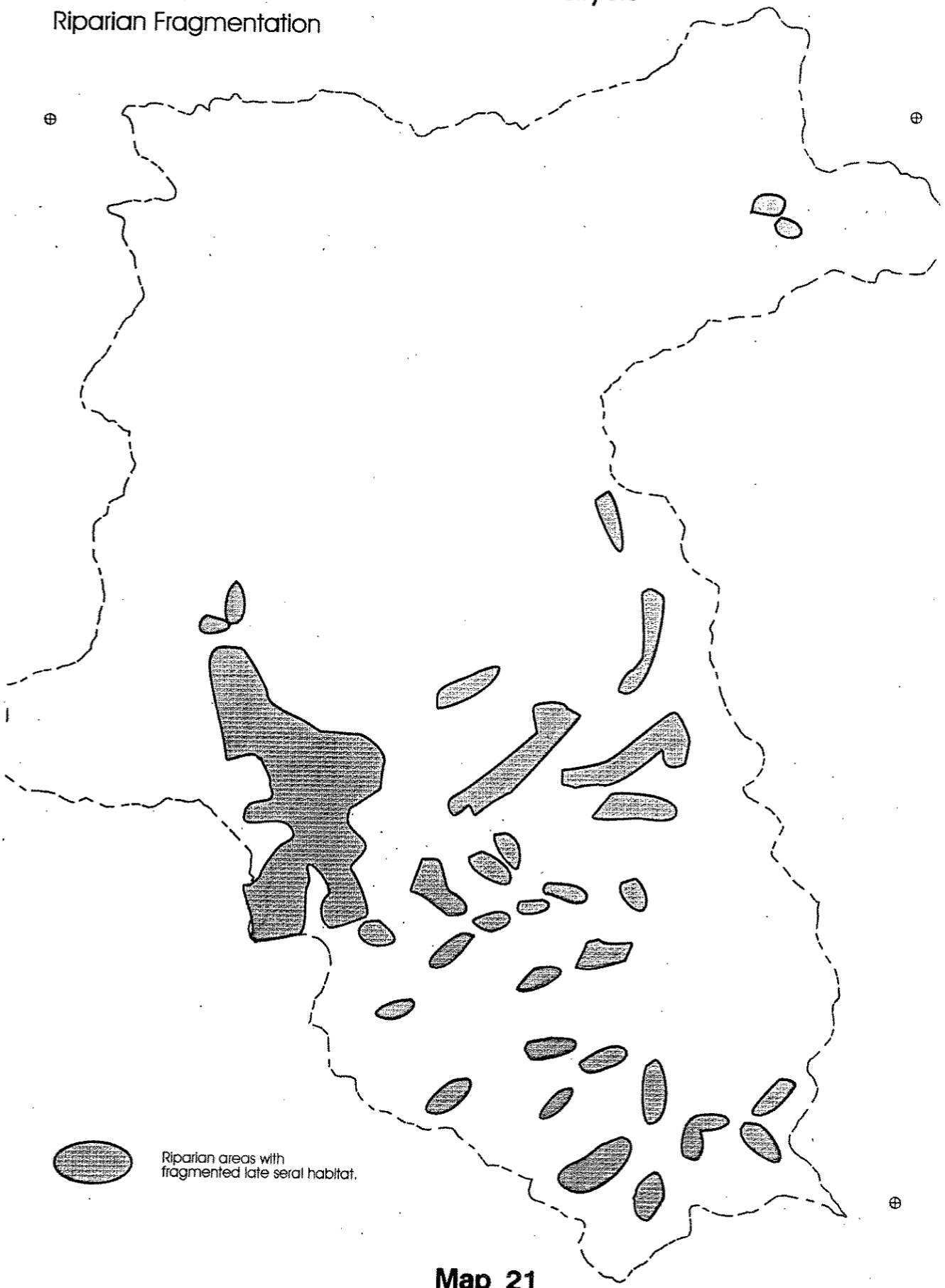
RIPARIAN CONNECTIVITY



Map 20

Lower Cispus West Watershed Analysis

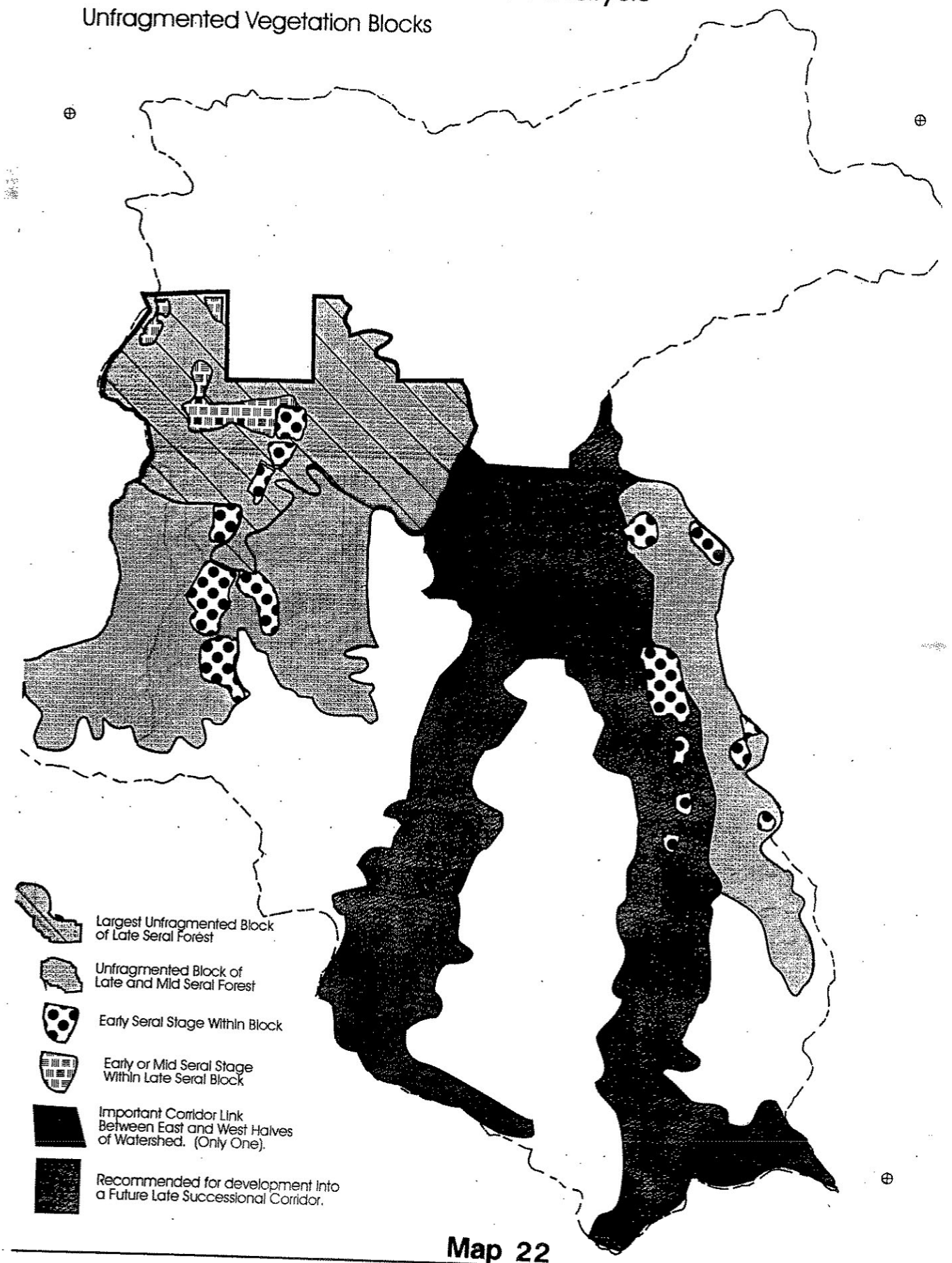
Riparian Fragmentation



Map 21

Lower Cispus West Watershed Analysis

Unfragmented Vegetation Blocks



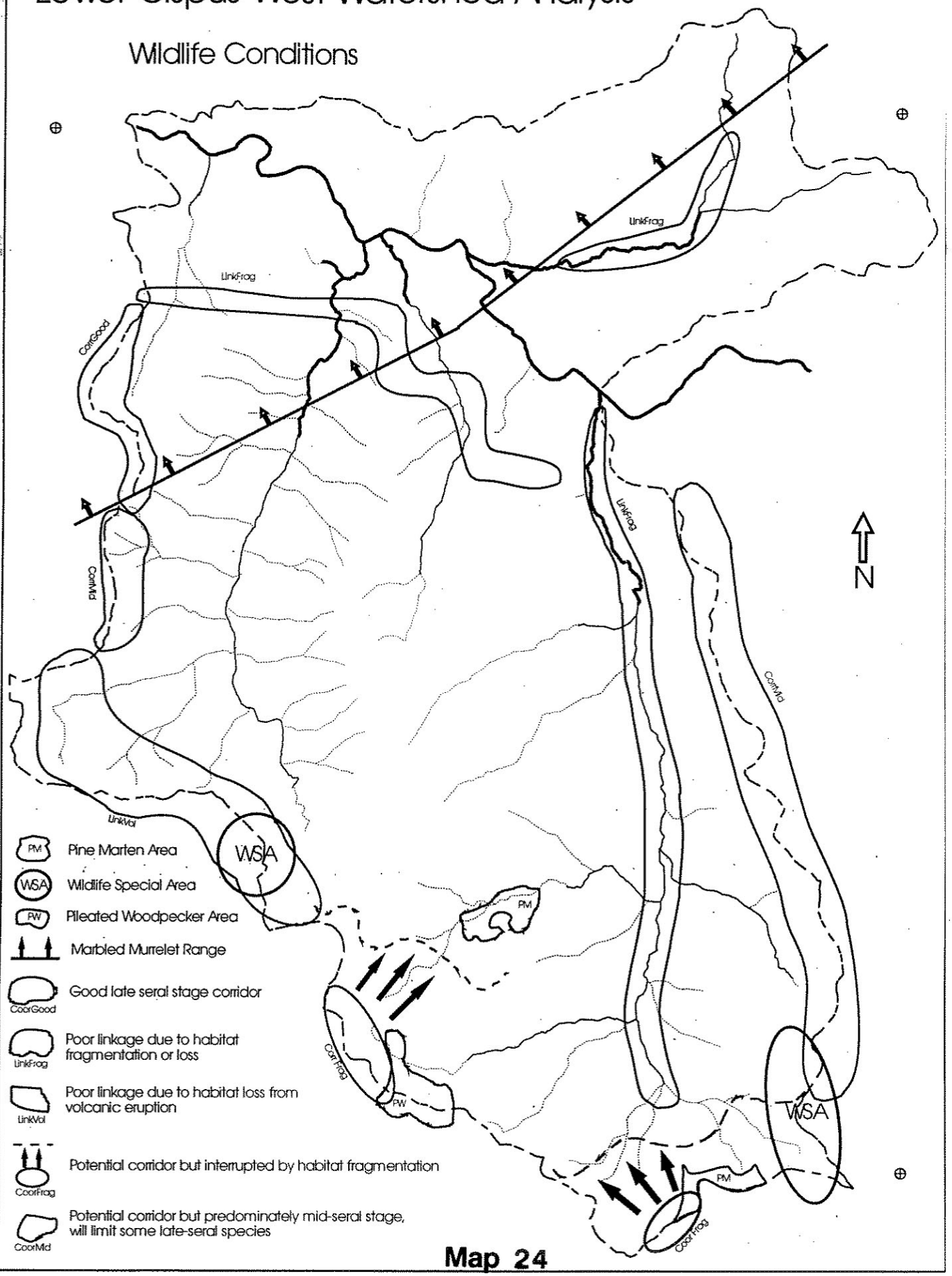
Map 22

Lower Cispus West Watershed Analysis
Amphibian Surveys

Map 23

Lower Cispus West Watershed Analysis

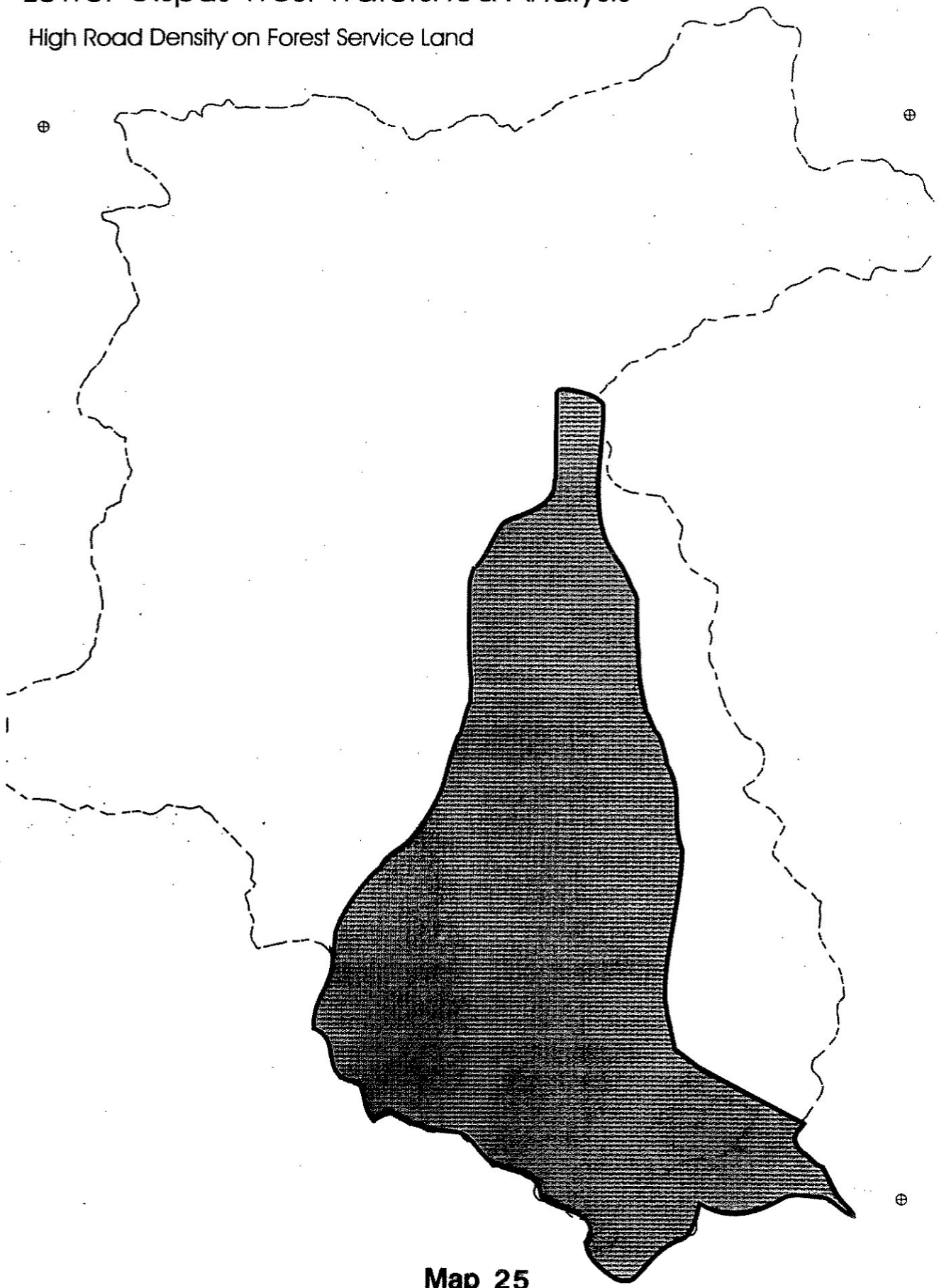
Wildlife Conditions



Map 24

Lower Cispus West Watershed Analysis

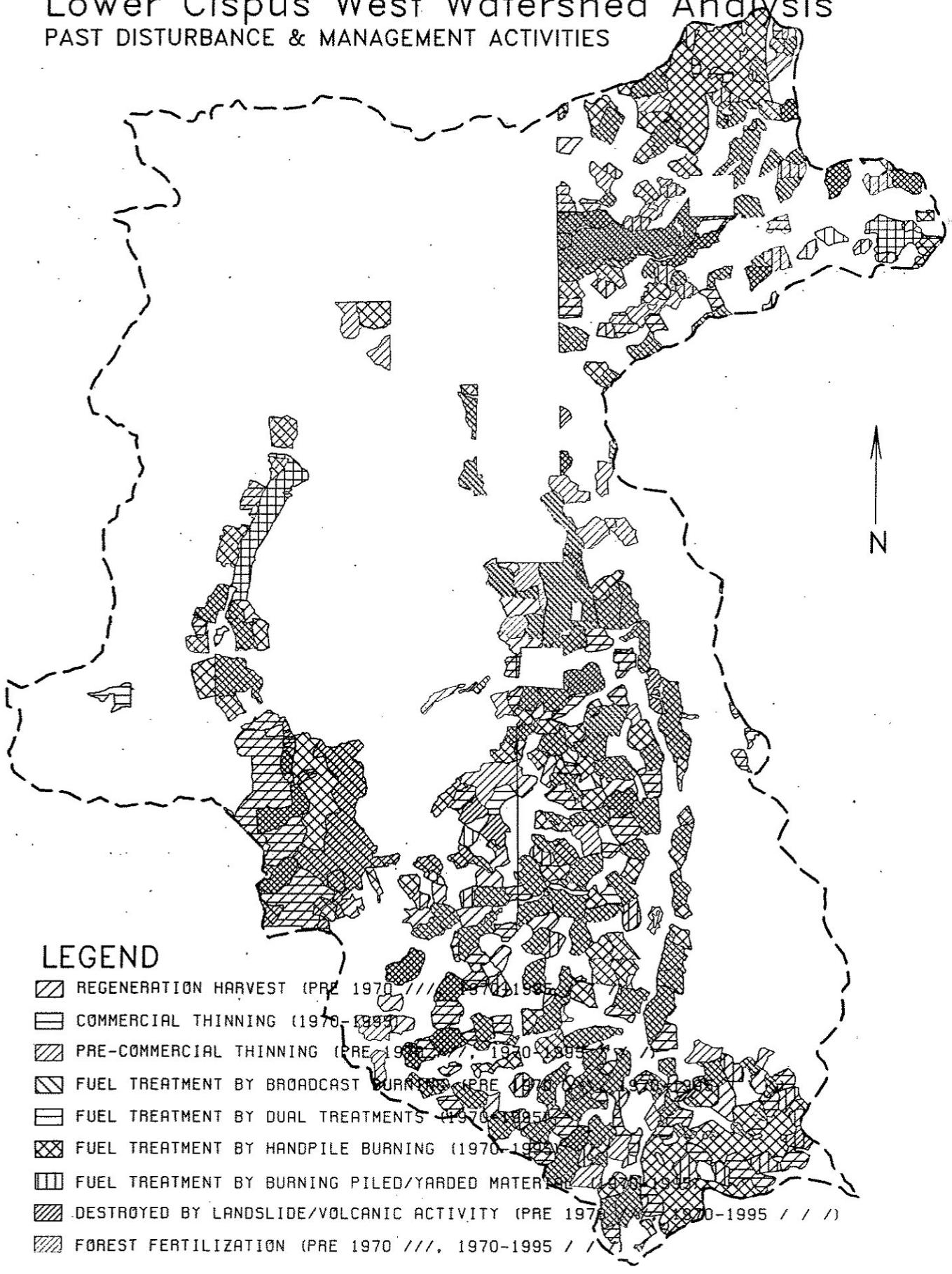
High Road Density on Forest Service Land

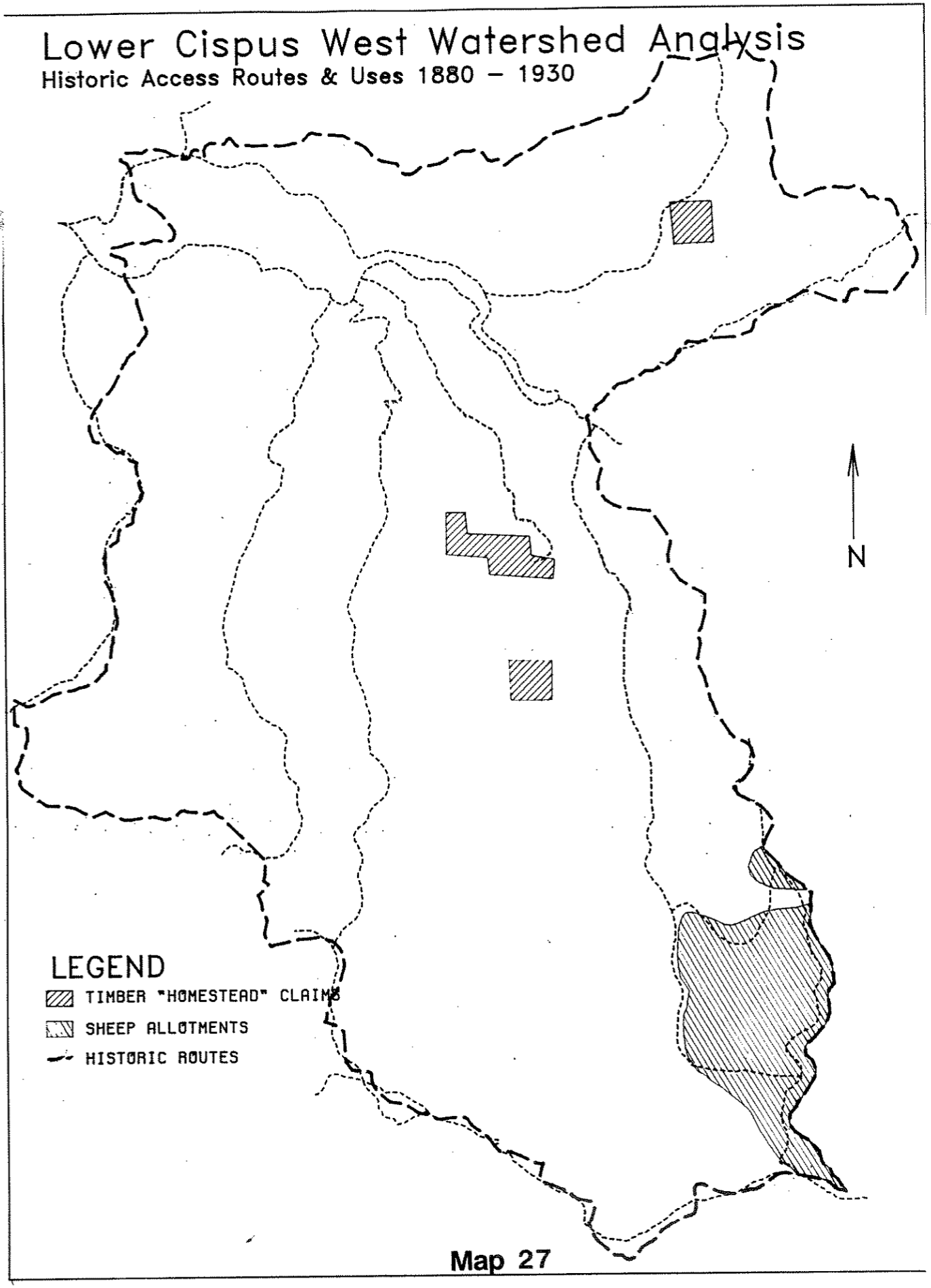


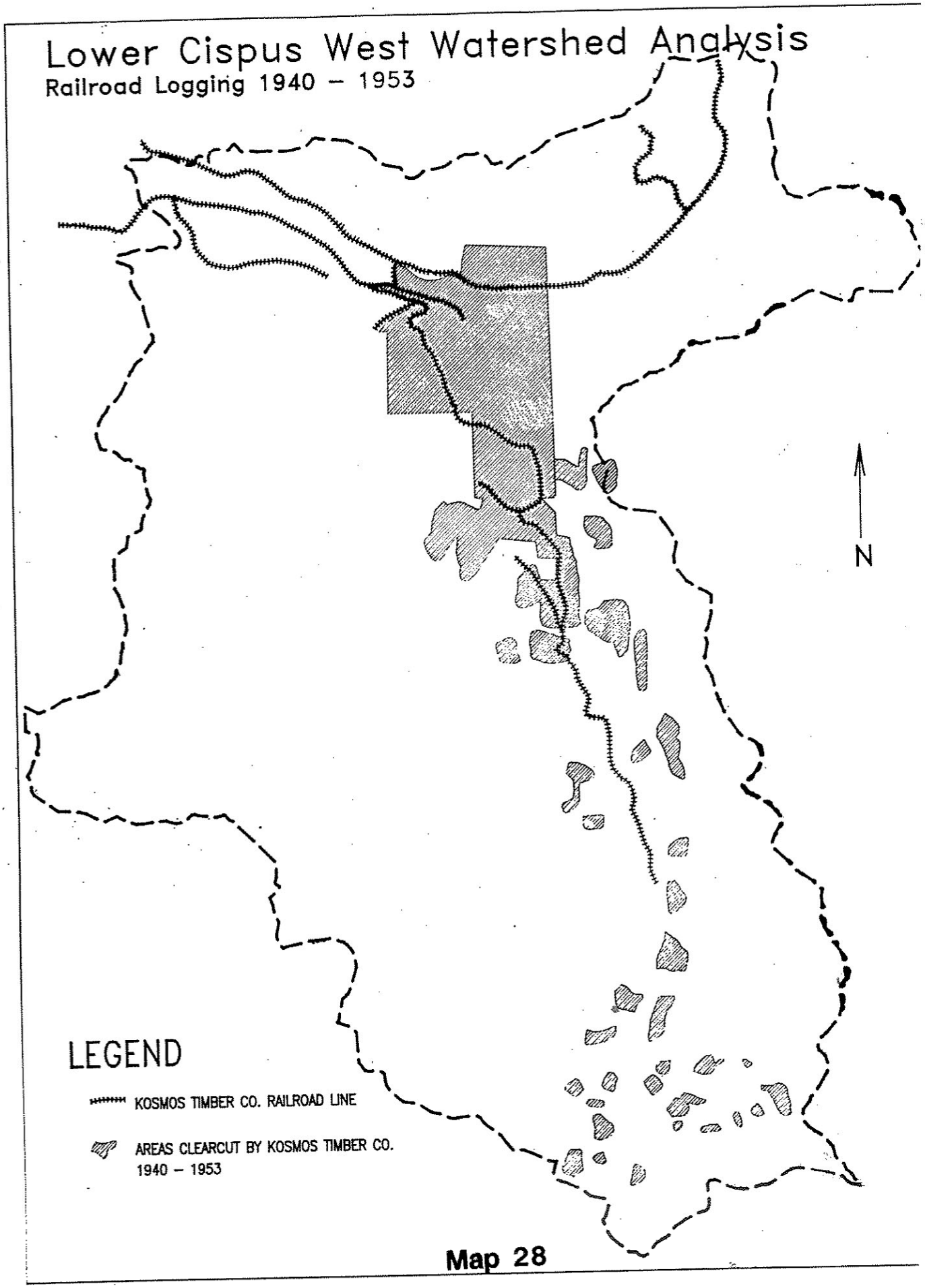
Map 25

Lower Cispus West Watershed Analysis

PAST DISTURBANCE & MANAGEMENT ACTIVITIES



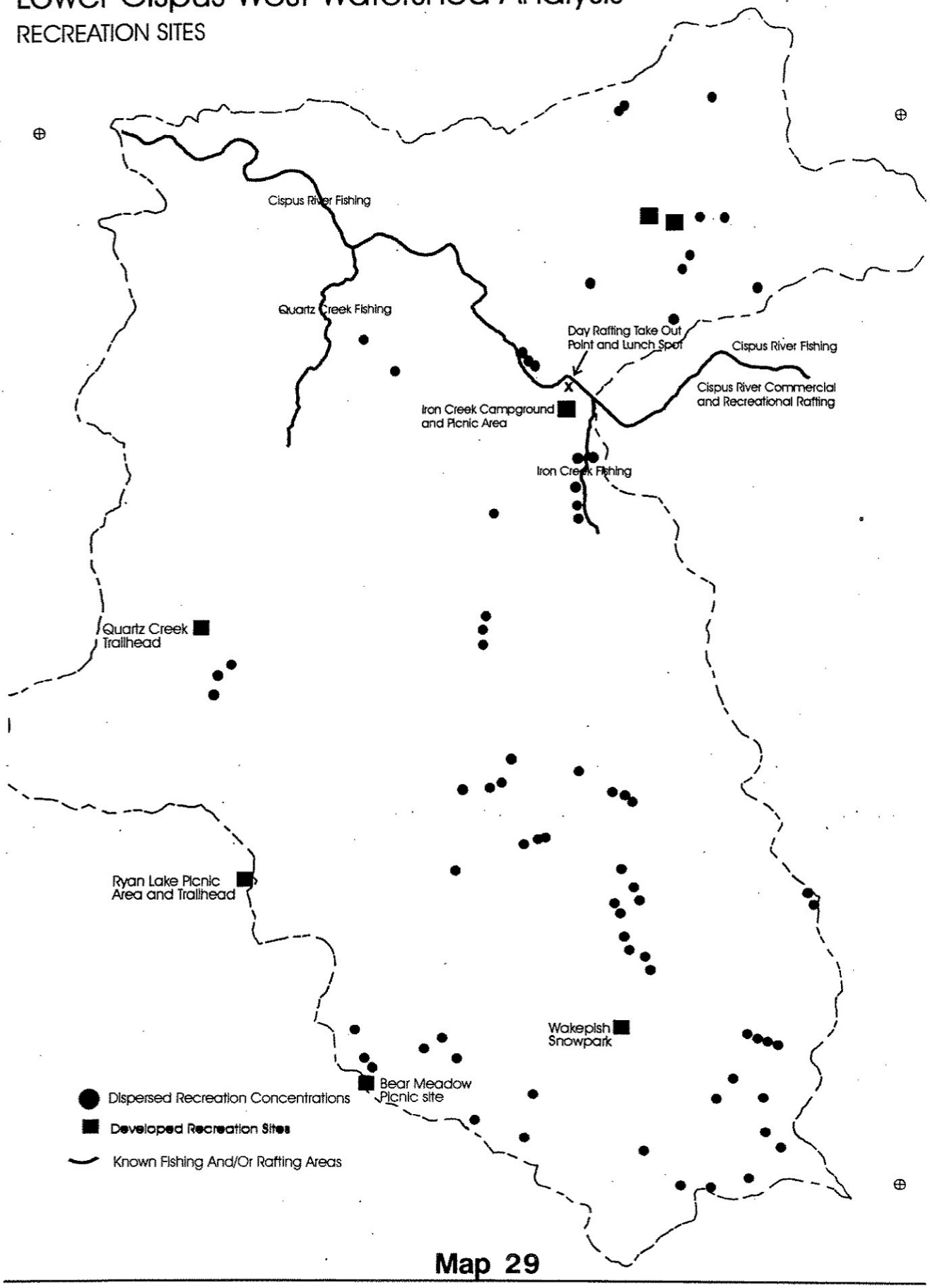

Lower Cispus West Watershed Analysis
Historic Access Routes & Uses 1880 – 1930
N
LEGEND
TIMBER "HOMESTEAD" CLAIMS
SHEEP ALLOTMENTS
HISTORIC ROUTES
Map 27


Lower Cispus West Watershed Analysis
Railroad Logging 1940 – 1953
N
LEGEND
KOSMOS TIMBER CO. RAILROAD LINE
AREAS CLEARCUT BY KOSMOS TIMBER CO.
1940 – 1953

Map 28

Lower Cispus West Watershed Analysis

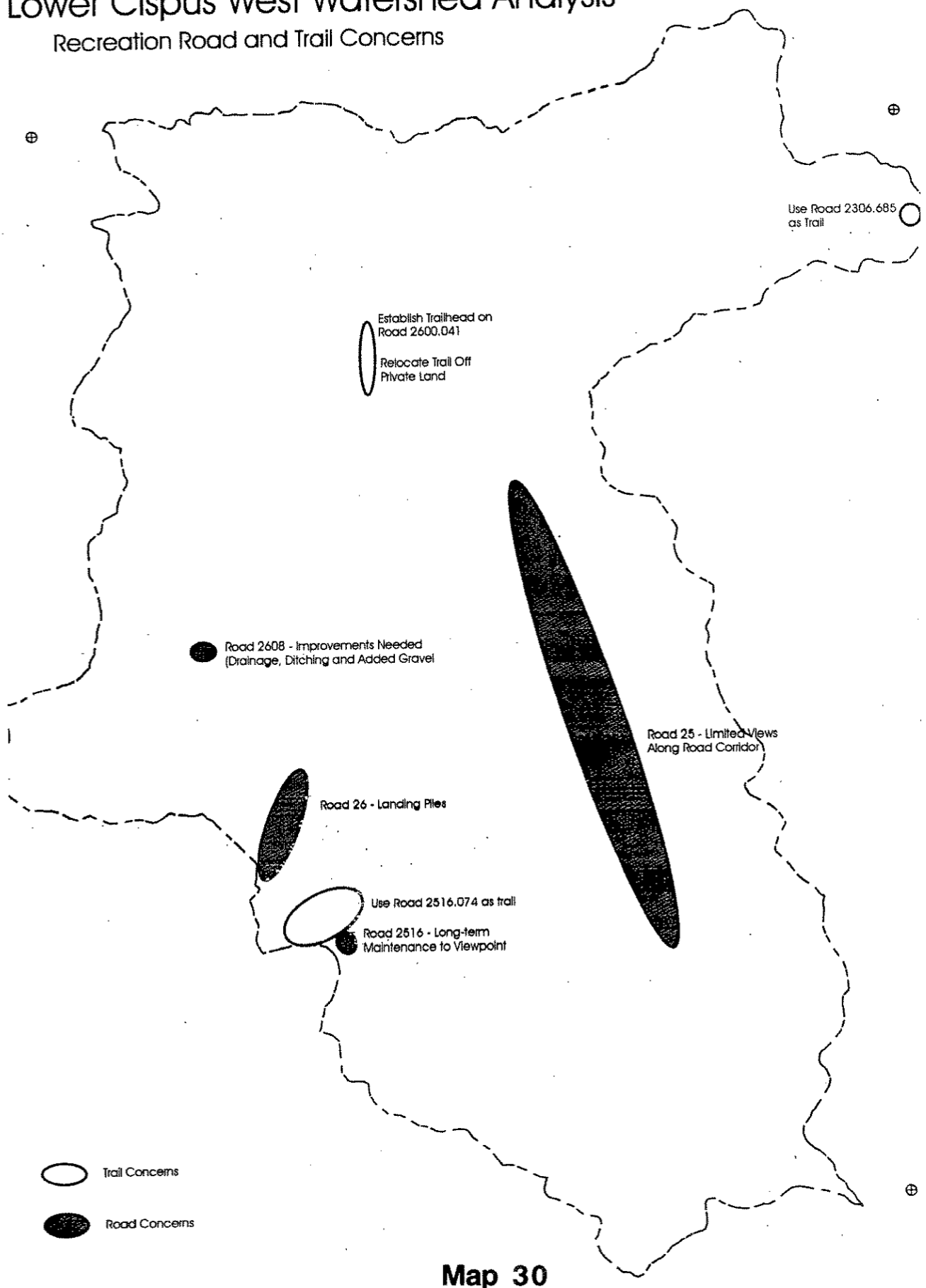
RECREATION SITES



Map 29

Lower Cispus West Watershed Analysis

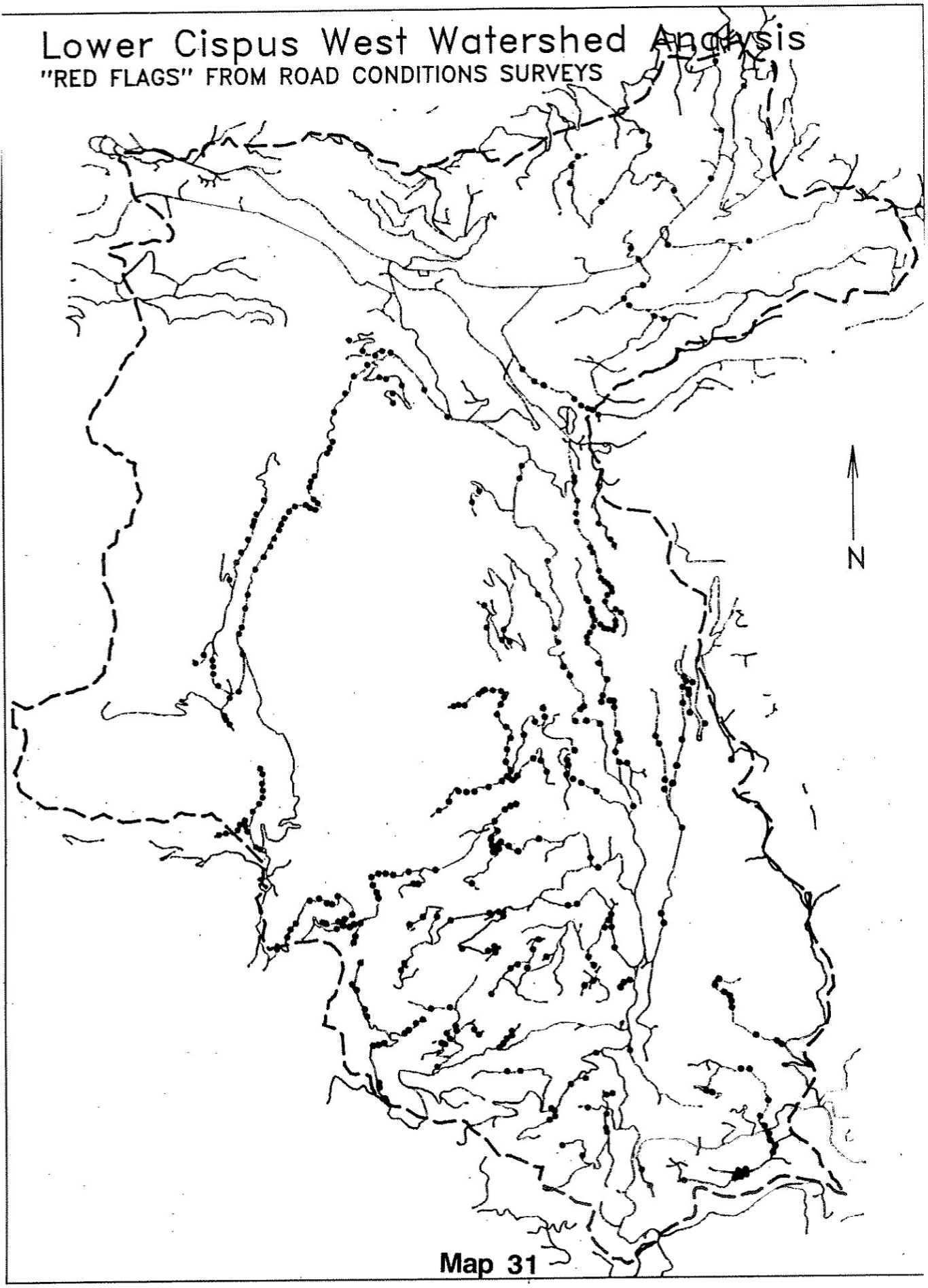
Recreation Road and Trail Concerns



Map 30

Lower Cispus West Watershed Analysis

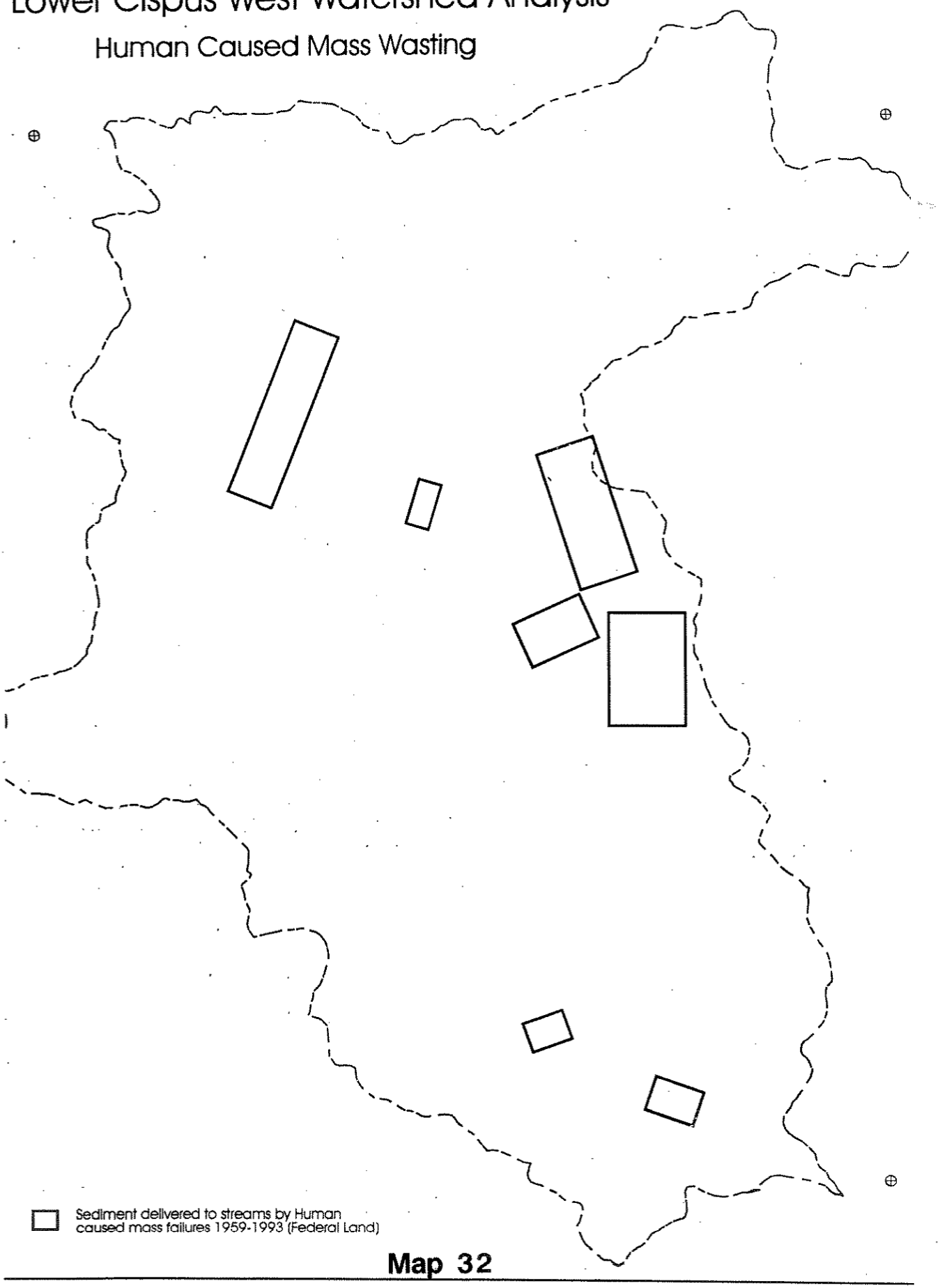
"RED FLAGS" FROM ROAD CONDITIONS SURVEYS



Map 31

Lower Cispus West Watershed Analysis

Human Caused Mass Wasting



Sediment delivered to streams by Human caused mass failures 1959-1993 (Federal Land)

Map 32