E. AQUATIC ENVIRONMENT

Weathering of sedimentary bedrock has created dense dendritic (branched) drainage patterns in most of the Coast Range. Sandstone and siltstone layers generally dip to the west and form a pattern of gentle west-facing slopes and short, steep east-facing slopes. Where volcanic or intrusive bedrock dominates, slopes range from gentle to steep, and are rolling, broken, and uneven with lattice-dendritic patterns. These features are largely a result of ancient massive landslides that rearranged whole mountain slopes. Hard volcanic rocks resistant to erosive forces of sea and intense rainfall are responsible for the ruggedly beautiful headlands along the coast, such as Cape Perpetua and Cascade Head, and most of the higher peaks across the Forest.

Precipitation is abundant. About 5 million acre-feet of precipitation, including minor amounts of snow and fog, falls onto the Coast Range each year. Because most of this precipitation falls in the winter, and because little of it is snow, winter streamflows are high and late summer streamflow ranges from moderate in areas of deep soils and fractured bedrock to very low where soils are shallow over impermeable bedrock.

All watersheds in the Study Area originate in the Coast Range, except for the southernmost watersheds of the Umpqua River basin. Within the boundaries of the Siuslaw National Forest, there are 3,200 miles of perennial streams and about 5,000 miles of intermittent streams. Headwater streams rise and fall quickly as a result of the frequent coastal rainstorms and flow rapidly through V-shaped canyons. The short and steep headwater streams merge into larger streams with gentler gradients and U-shaped or flat flood plains. Most large streams flow into major estuaries that empty into the Pacific Ocean.

The steepness of the upland stream channels and the frequent high flows result in tremendous amount of energy that effectively transports sediment and nutrients into and through stream channels, and creates fish habitat by depositing gravel and carving pools where fallen logs or other features impede streamflow. Conversely, high stream energy can scour away fish spawning gravel and fill pools with sediments where structure is lacking and flow is unimpeded. Sediments can smother eggs and recently-hatched fish in spawning beds.

WATER QUALITY

Water quality becomes an issue when beneficial uses of streams are affected. Primary beneficial uses of forest streams are domestic water supply and production of native anadromous fish. A secondary benefit is the aesthetic value of complex stream channel systems and generally crystal clear water. All of these uses are affected by increases in sediment and water temperature, and contamination by toxic materials, and disease organisms.

Water quality may be degraded by a wide range of human activities. In the non-urban portions of the Study Area, logging, road construction, and farming activities are by far the most likely to reduce water quality.

Effects of Logging

Detrimental effects of timber management on water quality result from road construction and removal of vegetation. These activities exacerbate the inherently erosive slopes and cause accelerated landslides and increased solar radiation on water surfaces:

- Clearcutting - Increases landslides/sediment, channel erosion, and water temperature

- Partial cutting - Increases channel erosion, soil compaction, and water temperature

- Road Construction - Increases landslides/sediment, surface erosion/sediment, and peak flows

Accelerated erosion, stream sedimentation, and elevated water temperatures are pervasive across mountainous portions of the Study Area. Hot spots of sedimentation and high water temperatures are especially prevalent in logged areas in the Northern Interior and Southern Interior Zones.

Four factors work in concert to increase both stream water temperature and landslide erosion rates:

1) Soil and bedrock water-holding capacity.

a) Water Temperature - Areas with low water retention have larger portions of total water at or near the surface during hotter times of the year. This increases the effectiveness of solar radiation on water and decreases the amount of cooling by dilution of cold ground water.

b) Landslides - Shallow soils and impermeable bedrock that must transmit large quanties of water during high intensity storms are more likely to fail and slide downslope. Where soils are deep and bedrock is highly fractured, debris slides are unlikely.

The Southern and Central Interior Zones, and the Valley Margin Zone have the largest areas of shallow to moderately deep soils over impermeable bedrock.

2) Streamside vegetation

a) Water Temperature - Streams in the Interior and Valley Margin Zones are very much dependent upon the shading effects of streamside vegetation to keep water cool. These areas are typically drained by very high densities of shallow, low-volume streams which pick up large amounts of solar radiation if not shaded.

All areas but the Fog Zone are affected equally by presence or absence of streamside vegetation.

b) Landslides - Vegetation at upper or headwater ends of stream systems greatly increase the strength of soils near those streams. These areas (known as headwalls) are the most active erosion surfaces in the Coast Range. During high intensity storms first order and ephemeral streams are more likely to experience debris slides where deep-rooted vegetation is lacking.

3) Fog Zone

a) Water Temperature - The Coastal Fog Zone along the Pacific Coast acts as a temperature buffer for small streams that flow primarily within it. The amount of vegetation near those streams makes little difference in water temperature extremes. However, larger streams flowing through the Fog Zone which originate in interior basins are not measurably cooled by the lower air temperatures of the Coastal Fog Zone because very little of the total volume of stream water is exposed to the cooler air temperatures.

b) Landslides - The conditions present in the Fog Zone have no known effect on landslide rates.

4) Roads

a) Water Temperature - Roads have no measurable effect on water temperatures.

b) Landslides - Roads change surface and groundwater transmittance rates and routes. They also weaken slopes by undercutting soils and bedrock, and overloading slopes with sidecast and fill materials. The combination of these effects results in greatly increased rates of landslides where roads exist.

Current Conditions

Preliminary stream temperature monitoring over the past several years indicates some widespread stream temperature problems in the Study Area. Most streams within basins that had clearcut-harvest levels typical of the 1980s are today showing 7-day average summer temperatures that are above the state minimum water quality standard of 62°F. Streams within Wildernesses and streams entirely or mostly within the Coastal Fog Zone have not exceeded the state standard.

The areas most likely to suffer increased stream temperatures as a result of additional harvest are the Central and Southern Interior Zones and the Valley Margin Zone. High soil and bedrock water-holding capacities in the Northern Interior Zone, and cool summer air temperatures in the Coastal Fog Zone make these areas least likely to experience elevated water temperatures following harvest activities.

Landslide activity associated with harvest and road construction has been most prevalent in the Central and Southern Interior Zones, and within the steeper areas of the volcanic headlands in the Coastal Fog Zone. Future harvest in these zones will be most likely to result in accelerated landslides on steep headwalls.

Effects of Farming

Detrimental effects of farming activities result from heavy equipment traffic, spreading of petroleum-based fertilizers, and concentrated numbers of farm animal, especially on stream banks.

- Dairy, Pasture, Grazing -	Increases channel bank erosion/sediment, nitrate pollution, water temperature, and soil compaction
- Row Crop -	Increases soil compaction, surface erosion/sediment, pollution from fertilizers (nitrate/sulfate/phosphate pollution)

Detrimental resource effects are most likely in areas of extensive dairy farming north of the Yaquina River in the Northern Interior and northern half of the Coastal Fog zones and in areas of pasture/crop farming in the Valley Margin zone.

Interagency Coordination Opportunities

The Environmental Protection Agency (EPA) Office in Seattle has proposed some rivers and lakes in the Oregon Coast Range Province be identified (listed) for regulation under the Clean Water Act, Section 303(D). This section of the Act allows States to identify waters for which effluent limitations, including thermal discharges and pollutants, required by Section 301 are not stringent enough to assure protection and propagation of a balanced indigenous population

of shellfish, fish and wildlife. The proposed rivers are primarily lower mainstems running through private lands. See Map E.2 (Waters Proposed for CWA, Sec. 303(d) Listing).

Rivers	Lakes
Miami (lower portion)	Devils
Kilchis (lower half)	Siltcoos
Wilson (lower portion)	Tahkenitch
Trask (lower half)	Mercer
Tillamook	Woahink
Nestucca (lower half)	Munsel
Salmon (lower 1/3)	Clear
Yaquina (lower half)	
Alsea (middle portion)	
Siuslaw (lower 1/3)	
Smith (entire)	

The Forest may have an opportunity to work with the EPA to identify appropriate maximum loading and recommend management practices to reduce effluents, high temperatures or both affecting those water bodies. The EPA, in turn, is in a position to give Forest personnel technical assistance on water quality matters.

WATER QUANTITY

Demands for municipal, agricultural, and industrial water from the Forest will come primarily from communities in the Coastal Fog zone (LTAs 2B, 2M, 2M1, 2N, 2Q, 2P2, 2T, 2Z, 3A, 3M, 3T, 3Z, 4A, 4X) and the Valley Margin zone (LTAs 2H, 2S 2Y, 3H, 3S, 3W, 4J). These areas contain most population centers and agricultural lands. They also contain virtually all of the present and future economically-feasible groundwater supplies in the Central Coast Range. All of the larger water users are under state of Oregon water user permit. A few of the smaller water users are neither under state permit nor inventoried by any federal agencies.

The Interior zones have many single and small domestic-use water withdrawals. Municipal water users are few, though significant. They include the Cities of Toledo, Alsea, and Mapleton. As in the Fog and Valley Margin Zones, many smaller water users are neither permitted by the state nor inventoried by any federal agencies. See Map E.3 (Water user inventory).

Currently, commercial and domestic uses of surface water in the central Coast Range has not reduced instream flows below those needed by anadromous fish, nor have any detrimental effects on other aquatic life been attributed to surface water withdrawals.

Extensive deep-well withdrawal of ground water from sand dunes in the southern portion of the Oregon Dunes National Recreation Area (in LTA 4X) for industrial and municipal uses continues to be the primary area where use of water from federal lands is controversial. Drawdown of several small lakes in the dunal sheet near the sites of deep municipal/industrial wells may be linked. Studies of the groundwater response to deep well drawdown are being made by both local municipalities and the US Geological Survey.

Interagency Management Opportunities

The Oregon State Department of Water Resources (DWR) maintains county maps and data on surface and ground water supplies, instream and out-of-stream water rights, minimum flows, scenic waterways, and Department of Environmental Quality designations (Ron Campbell, DWR, personal communications). These data may be useful in assessing current and future water demand and availability through watershed analyses.

Counties beginning their "Periodic Review" process (i.e., a periodic updating of their comprehensive land-use plans) are being supplied by DWR with water availability maps. Counties have been encouraged to update and improve their inventories of current and projected water needs and identify possible problems. There should be good opportunities at that time to work with the state and counties on a joint assessment of future water needs and potential conflicts with the Aquatic Conservation Strategy.

FISH DISTRIBUTION

Distribution and status of fish populations in streams on federal lands in the Oregon Coast Province have been documented and discussed in great detail in a plethora of recent reports (House 1992, Nickelson et al. 1992, Beidler and Westfall 1993, Stewart et al. 1993; USFS 1993a, 1993b, 1994a, 1994b; USFS et al. 1994; many others). The primary reasons for this flurry of interest has been the well-known recent crisis of anadromous salmonid runs (Nehlsen et al. 1991; Nickelson et al. 1992; Pacific Rivers Council 1992) and subsequent development of the Northwest Forest Plan (USFS and BLM 1994a), itself in large part a response to that crisis in the Pacific Northwest. See the above reports for more details.

Nehlsen et al. (1991) listed 28 anadromous salmonid stocks at risk of extinction or of concern on the Siuslaw NF alone. In 1994, all cutthroat trout life-history phases in the Umpqua River were recommended for listing as endangered by the National Marine Fisheries Service. Recently, in July 1995, the coho salmon was proposed for listing as a threatened species throughout the Oregon and northern California coasts. Petitions have also been filed to list steelhead as endangered coastwide. Because of these actions and a host of similar concerns, the National Marine Fisheries Service has initiated a status review of all anadromous salmonid runs throughout the Pacific Northwest. Fall chinook runs appear to be the only salmonid stocks in generally healthy condition in the Coast Range (USFS et al. 1994).

Salmonid fishes are found in virtually all perennial streams in every river basin in the Study Area (map E.4). On the Siuslaw NF, anadromous fish run into 1,200 miles of large, mostly low-gradient streams low in each basin, with only resident cutthroat trout found in 2,000 miles of small, high-gradient perennial tributaries. Some of the Forest's 5,000 miles of intermittent streams are undoubtedly used for spawning during high water, but the extent is unknown.

Steelhead tend to ascend the systems farther than do coho and chinook salmon. Sea-run cutthroat trout undoubtedly are found throughout much of the range of steelhead and salmon, although exactly how far they go is not clear because of difficulty in distinguishing sea-run and resident forms of the species. Chum salmon only inhabit reaches just upstream from tidewater in coastal estuaries.

The following is mostly summarized from USFS (1994b). Steelhead spawn in upper portions of river mainstems and throughout all tributaries accessible to anadromous fish. They generally prefer smaller and steeper streams than do either coho or chinook salmon. Chinook tend to spawn in mainstems and low portions of large tributaries, and they are often absent from small, coastal streams. Coho generally spawn in small, shallow streams that are widely distributed throughout upper mainstems and most relatively low-gradient tributaries. Cutthroat trout are generally distributed throughout all accessible areas. Although sea-run cutthroat are smaller tham other anadromous salmonids and thus could spawn in headwater streams and tributaries that are even smaller or steeper than those used by steelhead, their distribution may be more similar to that of coho (USFS et al. 1994). Chum salmon spawn very low in scattered basins with large estuaries.

Although habitat requirements of salmonid species differ markedly, fish distibution maps (for salmon, steelhead, and trout) only indicate presence or absence of each species (Maps E.5 and E.6). For example, short coastal streams in the basaltic area between Cape Perpetua and Heceta Head tend to have higher gradients and more riffles than streams in surrounding sedimentary areas. As such, they are more favorable to steelhead than to coho salmon. Yet the distribution maps show only that steelhead and coho are present in these streams, and do not reflect greater abundance of steelhead compared to coho there.

Most downstream reaches of watersheds are typically privately owned and would contain any anadromous species known to run farther upstream (Map E.4). Relative distribution of anadromous salmonids in streams on BLM, state, and private land upstream and inland from the Siuslaw NF is similar to that on the Forest, except that chum salmon are absent.

In general, fall chinook and coho salmon, winter steelhead, and resident and sea-run cutthroat trout have the widespread, homogeneous distribution patterns described above in both large river basins and small watersheds. Notable differences among basins are mostly limited to the spotty occurrence of chum salmon around the Study Area; increased abundance of chum salmon in the Nestucca basin; presence of spring chinook salmon and hatchery summer steelhead in the Nestucca basin; presence of wild spring chinook and summer steelhead in the Siletz basin; and a small spring chinook run in Drift Creek of the Alsea River. Adult spring chinook and summer steelhead enter freshwater much earlier in the year, so they are found only in streams with deep, cool pools in which to hold during the summer.

FISH HABITAT

That the most critical components of fish habitat in the short, steep streams in the Coast Range are large woody debris and the deep pools that result has been well documented (USFS 1990). This debris creates a stair-step effect that provides places for hiding and rearing, retains spawning gravels, and holds and slowly releases sediment and nutrients.

In general, instream fish habitat throughout the Study Area generally appears to be in marginal to poor condition (Baker et al. 1986; House 1992; USFS 1993a, 1993b, 1994a, 1994b; USFS et al. 1994). A fundamental problem seems to be that stream channels have lost most large woody debris and have become narrowly confined and disconnected from their valley floors (Dewberry 1994). Mean and median numbers of all types of pools per mile in the Umpqua, Siuslaw, Alsea, and Nestucca basins (21-39) all fall below the lower limit of historical conditions for this important habitat component (40 pools/mile for reaches 10- to 30-feet mean width; data used for USFS 1993a).

Also, less than 4% of stream segments surveyed in the North Fork Siuslaw River have enough complexity (both depth and cover) to meet a combination of objectives from PACFISH (USFS and BLM 1994b), the State of Washington, and Oregon Department of Fish and Wildlife (objectives vary by mean width and gradient of the stream segment; USFS 1994b). Fully 90% of the stream miles surveyed in the Nestucca River basin do not come within 75% of PACFISH (USFS and BLM 1994b) standards for large wood (USFS et al. 1994). The stream

inventories from which Table E.1 is derived were also used for several of the above reports, so Table E.1 tends to corroborate what is already known.

Lumping data from large and small streams is generally inappropriate, and doing so for 5th-field watersheds in this analysis could give an inaccurate picture of habitat conditions. Also, not segregating data by location within a given watershed, and combining data from streams above and below private land is problematical.

Nevertheless, little real relative difference has been found among 5th-field watersheds in terms of large woody debris, even though the average number of pieces per mile varies over 10-fold (Table E.1). This absence of differences is because, with the exception of Three Rivers, large woody debris is in short supply in all basins compared to PACFISH objectives (USFS and BLM 1994b). This finding is not surprising because these are averages for extensive, heavily impacted areas that mask any better conditions in limited local areas that were not logged or stream-cleaned.

Relative condition of deep-pool habitat is highly variable because of the way criteria were set up, and it is strongly related to size of the stream (Table E.1). Mean widths of streams on the Siuslaw NF cluster around 10 feet, which is the dividing line for small and moderate-size streams. Thus, relative condition of streams less than 10 feet wide is based on percentage of pools that are more than 1.5 feet deep, while for streams more than 10 feet wide it is based on percentage of pools more than 3 feet deep. Reeves et al. (1989) found that pools deeper than 3 feet were excellent winter rearing habitat for coho salmon, and even pools 1.5 to 3 feet deep were more suitable habitat than shallower areas.

In streams less than 10 feet average width, the percentage of pools greater than 1.5 feet deep is consistently greater then the 20% minimum for good conditions, but in streams more than 10 feet average width, the percentage of pools greater than 3 feet deep is consistently less than 20%. Many of the smaller streams that appear to provide good deep-pool habitat (Marys Peak, Fall Creek, and Berry Creek) may in reality be just the opposite. The percentage of surface area in these streams that is comprised of pools is so low (11-21%) that it just means the few pools found happened to be deep ones.

Only 4 of 27 watersheds (15%) - the Little Nestucca River, Yaquina/Big Elk system, Big/Rock/Cape creeks, and North Fork Siuslaw River - do not have a poor rating in one of the three categories (percentage surface in pools, percentage of deep pools, and large woody debris/mile). As noted above, the North Fork Siuslaw rates poorly on a more site-specific basis. This site information suggests Table E.1 may even overestimate condition of the habitat. Indeed, if the width of the North Fork Siuslaw streams had averaged 10 feet instead of 9.9 (certainly possible given sampling error), relative abundance of deep pools would rate poor because only 6% of the pools were 3 feet or deeper.

Table E.1 Fish habitat conditions of inventoried streams

Watershed	Miles surv.	Avg. wid. ft.	Pool %	Rel. cond	Pools >1.5' %	Rel. cond	Pools >3 ft %	Rel. cond	LWD/ mile	Rel. cond	Riparian %Hard dom.	Riparian %Con dom
Wilson-Trask RB												
Little Nestucca	14.2	8.4'	40	fair	27	good	-	-	55	fair	47	43
Lower Nestucca	41.6	11.1'	22	poor	-	-	8	poor	58	fair	66	26
Neskowin	6.7	7.9'	22	poor	16	fair	-	-	17	poor	35	48
Three Riv.	2.5	11.4'	16	poor	-	-	1	poor	86	good	69	16
Siletz-Yaquina RB												
Schooner /Drift	24.1	16.2'	44	good	-	-	17	fair	31	poor	33	64
Siletz R.	0.1	5.8'	4	poor	0	poor	-	-	16	poor	57	41
Yaquina/ Big Elk	9.3	8.7'	52	good	45	good	-	-	44	fair	42	36
Upper Willam. RB												
Marys Peak	4.1	7.4'	21	poor	32	good	-	-	40	fair	22	76
Alsea RB												
Berry Cr.	1.3	8.6'	20	poor	40	good	-	-	50	fair	32	47
Big/Rock/ Cape	40.2	15.9'	32	fair	-	-	11	fair	48	fair	39	60
Five Riv.	61.0	10.2'	67	good	-	-	13	fair	19	poor	55	32
Lobster Cr	1.7	7.3'	51	good	31	good	-	-	13	poor	56	40
Fall Creek	11.8	9.3'	11	poor	100	good	-	-	58	fair	45	51
Alsea (03)	17.4	10.5'	41	good	-	-	7	poor	28	poor	18	65
Alsea (05)	16.6	12.7'	52	good	-	-	12	fair	16	poor	18	65
Drift (03)	20.2	8.0'	81	good	36	good	-	-	9	poor	31	63
Drift (05)	9.3	11.2'	53	good	-	-	8	poor	51	fair	31	63
Mercer Cr.	5.0	11.0'	60	good	-	-	18	fair	4	poor	39	28
Tenmile/ Cummins	22.3	19.2'	27	poor	-	-	19	fair	31	poor	39	52
Yachats R.	33.9	10.7'	61	good	-	-	6	poor	16	poor	46	35

Table E.1 (cont.)

Watershed	Miles Surv.	Ave. Wid	% Pool	Rel. Cond	%Pool >1.5'	Rel. Cond	%Pool >3'	Rel. Cond	LWD/ Mile	Rel. Cond	Riparian %Hard Dom.	Riparian %Con Dom
Siuslaw RB												
Deadwood (02)	4.3	12.1'	78	good	-	-	13	fair	13	poor	36	60
Deadwood (03)	2.7	11.6'	86	good	-	-	23	good	34	poor	36	60
N Fk Siu	56.1	9.9'	47	good	46	good	-	-	39	fair	38	51
Indian Cr	27.5	10.6'	57	good	-	-	14	fair	22	poor	37	55
Umpqua RB												
Low.Umpqua	4.2	10.6'	77	good	-	-	11	fair	14	poor	38	50
N.Fk.Smith	3.3	23.8'	80	good	-	-	7	poor	42	fair	30	45
Siltcoos RB												
Siltcoos R	4.4	8.8'	54	good	40	good	-	-	26	poor	42	38

Note: Data based on streams surveyed between 1991 and 1994. See Map E.7 (Fish-bearing Streams by Year Surveyed).
Standards used to assess relative condition of habitat in Table E.1 are:
Percent of stream made up of pools: <30% - poor; 30-40% - fair; >40% - good.
Percent of pools that are deep: <10% - poor; 10-20% - fair; >20% - good.
Pieces of LWD per mile: <40% - poor; 40-80% - fair; >80% - good.

Despite the generally marginal condition of the habitat, the most intact watersheds can serve as refugia on which to base recovery of depleted fish runs, and have been given special recognition and protection as key watersheds (USFS 1993b) (Table B.4, map E.4). This concept is supported by more site-specific watershed analyses which indicate that the best remaining fish habitat is mostly in pristine streams in the Cummins Creek and Rock Creek Wildernesses (USFS 1994a) and in the partially roadless Niagara Creek complex key watershed of the Nestucca River basin (USFS et al. 1994). Also, virtually all the habitat in the North Fork Siuslaw River system that is in fair or better condition is in the five subwatersheds that constitute the key watershed there (USFS 1994b).

Most potential for production of fish historically was in large, low-gradient streams. Most of the volume of water (habitat quantity) is found there, and the low gradients (habitat quality) provide more capacity for fish to feed, rear, and survive high water velocities, particularly during winter storms. At the scale of the present analysis, areas with such streams generally equate to lower reaches of river mainstems, which were ideal for early homesteads and are still almost exclusively privately owned. Therefore, the private lands strung up river valleys (see maps) generally contain those stream reaches in the Coast Range with the most intrinsic capacity for fish. Most of this habitat is now

severely degraded by farming, logging, and other development, however, and much potential has been lost because of entrenchment of the channels (USFS et al. 1994).

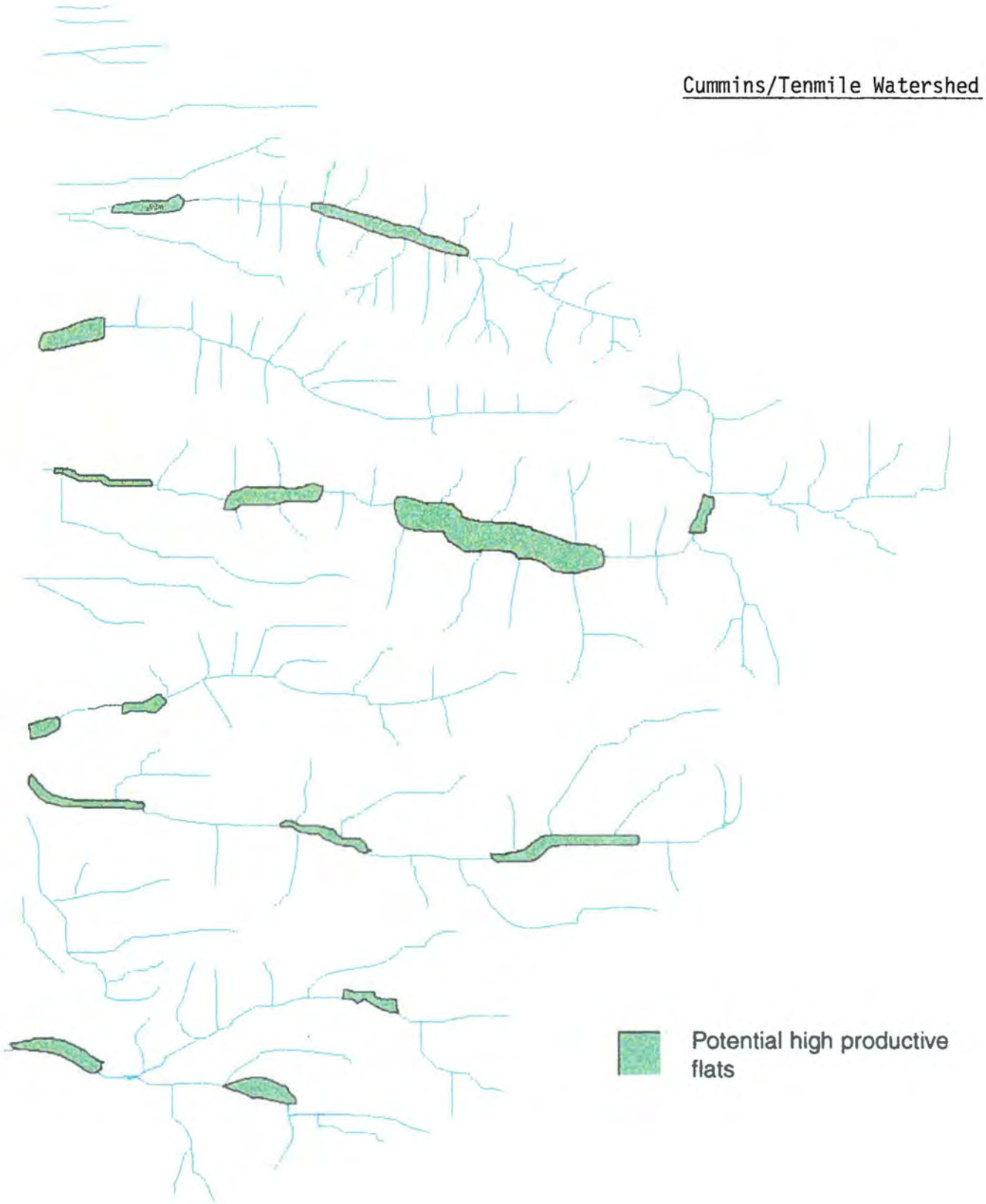
Some discontinuous low-gradient areas with increased potential for fish habitat exist upstream on steeper federal lands, however. These areas, commonly called "productive flats", consist of localized, wide flood plains across which main and side channels of streams are free to meander, recruit large logs and form debris jams, and otherwise create deep pools and other prime habitat (Reeves 1988). Because productive flats cannot be shown on maps with scales appropriate to a provincial analysis, more site-specific maps of flats and historical fish habitat potential in individual 5th-field watersheds from Dewberry (1994), USFS (1994a and 1994b), and USFS et al. (1994) are included (Figs. E.1 and E.2).

The Siuslaw NF has a written strategy for restoring whole watersheds, with a primary objective of improving stream habitats (USFS 1993b). Efforts are focused on identifying and securing the best remaining habitat within key watersheds (see maps for their location), and special emphasis is given to projects that directly benefit anadromous salmonids. Additional emphasis is on habitats either contiguous with the best remaining habitats, or in key "nodal" positions downstream (PRC 1993). These concepts apply at various scales from 5th-field watersheds down to stream reaches.

Riparian Conditions

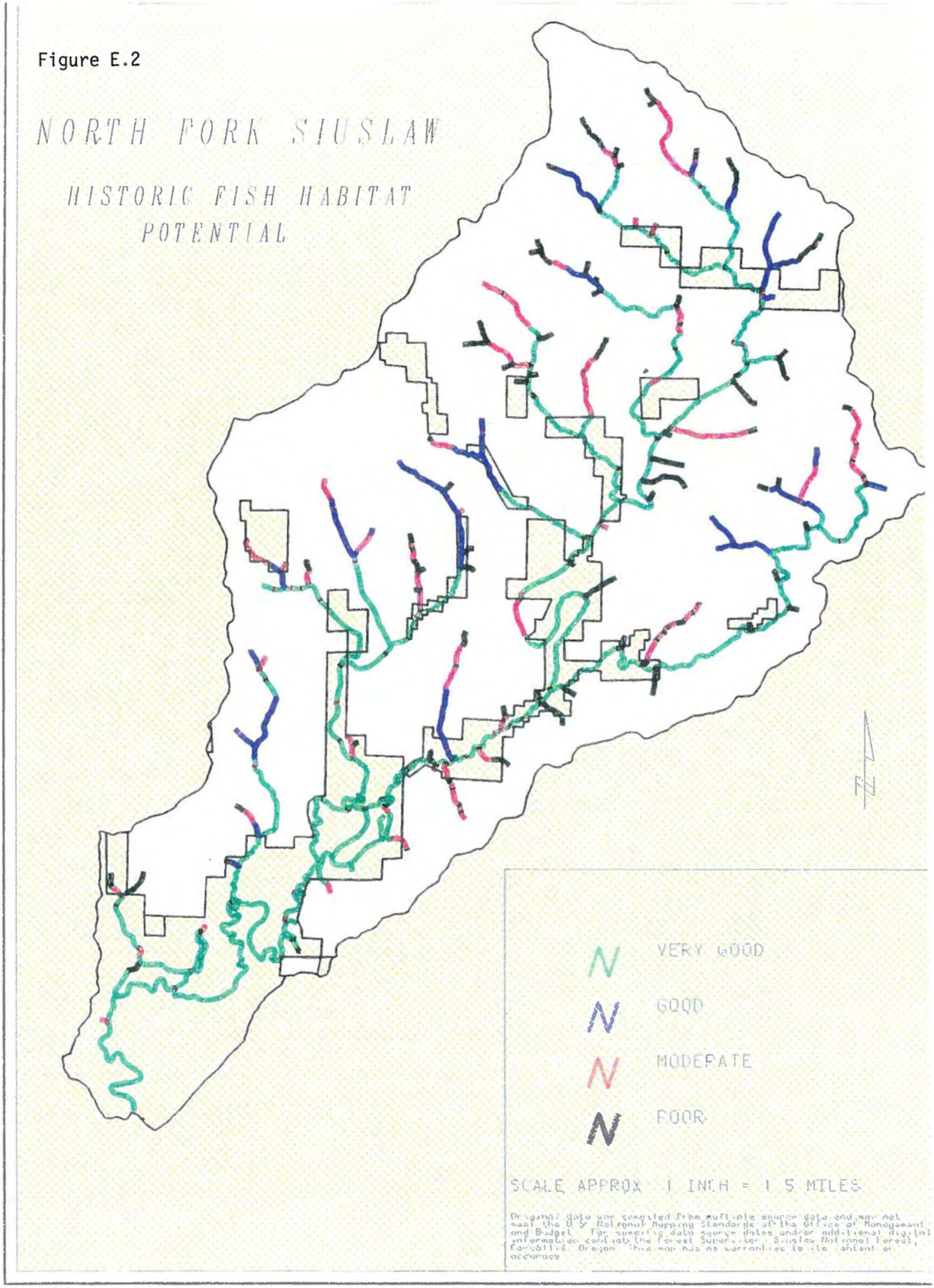
Hardwood trees are far less resistent to decay than are conifers and serve as critical habitat-forming instream structure for a relatively short time. Therefore, much of the current shortage of large woody debris in streams and adjacent areas has been attributed to conversion of riparian stands dominated by large conifers to shrubs and red alder (USFS 1990, 1994a, 1994b; USFS et al. 1994; many others). The percentage of federal land within 100 feet of streams (riparian area) dominated by hardwoods and conifers is shown in Table E.1.

Comparison of general instream habitat conditions in 5th-field watersheds (percentage of reach in pools, percentage of deep pools, and abundance of large wood) with riparian vegetation in those watersheds does not indicate any significant relations (Spearman Rank Correlations of 0.08-0.27 for various comparisons). This lack of cause-and-effect suggests that valid comparisons on the large scales appropriate to this assessment are difficult because strong correlations between deep pools/LWD and relative abundance of structure-forming riparian conifers in more localized areas are to be expected. Any broad relations for a watershed could easily be destroyed by removal of large woody debris from channels during logging and stream cleanout activities in a portion of the basin. Also, current vegetation typing for riparian areas is often based on more extensive adjacent upland conditions, which may or may not be representative.



FigureE:1Location of potential hot spots (high productive flats) in the study area. Data partially from field work by T.C. Dewberry and J. Sleeper. Rest of data from work by J. Sleeper. Redrawn from original map by J. Sleeper.

Figure E.2


NORTH FORK SIUSLAW
HISTORIC FISH HABITAT POTENTIAL
VERY GOOD
GOOD
MODERATE
POOR
SCALE APPROX 1 INCH = 1.5 MILES

Fish Habitat Needs Within Late-Successional Reserves

Shortages of conifers in riparian areas and resultant large woody debris in streams have been clearly identified as major factors limiting production of anadromous salmonids in the Coast Range. One short-term solution to this situation is construction of instream structures by using boulders and logs. Studies have shown that large, complex log structures provide deep pools and good cover. Thus, large, standing conifer trees within 100 feet or so of streams have great innate value as habitat to assist in recovery of depleted anadromous salmonid runs. Dewberry (1994) points out that, in a productive flat area, just a couple of large conifers are needed to reconnect the stream channel with its floodplain, and create complex pools and side channels.

If conifers are abundant in the riparian area, and the trees are not needed as habitat for Threatened and Endangered wildlife species, consideration should be given to making these surplus trees available for falling for instream structure projects. Outside streamside areas, hazard trees, blowdown, and other conifers that are not needed as downed large woody debris should be considered for transport and use for instream structures. On the Siuslaw NF, the total number of large conifers needed for this purpose would not exceed 50 per year (12 per district).

ODFW Objectives

The Oregon Department of Fish and Wildlife advises federal land management agencies on habitat issues, and coordinates fish management activities such as stocking fish on federal land. The Department is preparing plans to manage fish resources in most basins within the boundary of the Siuslaw NF: i.e., the Salmon, Siletz, Yaquina, Alsea, Yachats, Siuslaw, and Umpqua rivers and mid-Coast small ocean tributary streams. These basin plans contain specific goals for various habitat components (stream conditions, instream flows, water temperature, channel complexity, sedimentation, nutrient recycling, water quality, and fish passage), but they are currently in draft form and available for internal review only, so details are not included here.

In general, though, the intent of The Department's basin plans is highly complementary to the Forest's intent to manage fish habitat in watersheds under the direction in the Forest strategy (USFS 1993b) and the Northwest Forest Plan (USFS and BLM 1994a). Oregon's objective to manage for self-sustaining fish assemblages native to the basin, rather than individual fish populations, mirrors the Forest Service's emphasis on ecosystem management and wild populations. Other complementary policies and objectives are emphasizing habitat protection over habitat restoration and enhancement; restoring and maintaining viable populations of all species of native salmonids; focusing restoration attempts on coho salmon, if single-species management is appropriate; reversing the declining condition of habitat so that measurable improvements or stabilization can be achieved in key aspects of watershed conditions reflective of a basin's capacity to produce fish; and preserving the best fish habitat that still exists so that these key watersheds will serve as refuges for fish to repopulate more degraded habitats as they recover.

Management Implications

For many years, the Siuslaw NF spent $200,000-$300,000 annually on fish habitat enhancement and restoration projects such as instream structures and planting conifers in riparian areas. In the last 2 years, this work has taken the form of a broader, $1-2 million program of watershed restoration activities. Most work in the near future is expected to focus on watershed restoration.

In recent years, the Forest has also been developing a strategy to guide protection and restoration of fish habitats and populations (USFS 1993b). Basic components of the comprehensive, integrated strategy are protecting existing conditions, identifying key watersheds, developing watershed plans and partnerships with others, and increasing public understanding and participation, all leading untimately to restoring whole watersheds. All these components have analogous counterparts in the Aquatic Conservation Strategy, i.e., riparian reserves, key watersheds, watershed analysis, and watershed restoration (USFS and BLM 1994), so Forest efforts to benefit fish are continuing uninterrupted under the Northwest Forest Plan.

Because the Forest's long-term strategy for fish and watersheds is so similar to the intent of the Aquatic Conservation Strategy, no major conflicts in philosophy or direction currently exist. Problems are more logistical and suggest the following major recommendations:

Make more of the Threatened and Endangered species budget available for projects benefiting listed fish species and to support efforts to keep other fish from being listed;

Provide more time for adequate up-front planning and scoping of habitat and restoration projects by prioritizing work loads more rigorously;

Provide adequate support funds with the jobs-in-the-woods restoration program;

Look for ways to improve the process of contracting stream surveys; and,

Support more monitoring of site-specific effects of fish habitat structures.

Although tenets of the watershed and fish habitat restoration strategy are sound and widely supported by outside groups and the academic community, long-term effectiveness of many restoration activities like road stabilization, precommercial thinning, and riparian planting are relatively untested. Thus, monitoring of whole watershed restoration efforts is a high priority, and the Forest is one of four in the Region that is developing a program to do so in cooperation with the PNW Research Station. The Umpqua River basin, which includes three key watersheds and one roadless area where fish habitat is extensively protected and enhanced, is of special concern because the cutthroat trout in this basin have been proposed for listing as endangered.

As a result of fragmented and intermingled land ownership patterns in the Coast Range, those stream reaches with the lowest gradient and greatest potential to produce fish are mostly on private land (Fish Habitat section). Thus, federal

agencies have limited ability to unilaterally restore fish habitat and runs on a large scale, and ultimate recovery of anadromous fish stocks in coastal streams depends on heavy participation by other landowners and groups. Such cooperative efforts would appear to be a major challenge in basins with a large number of individual owners. Basins that offer the most promise could be those where non-federal lands are largely owned by major timber corporations, such as Drift Creek of the Alsea, Wassen and Knowles creeks, and streams draining into Tahkenitch, Siltcoos, and Tenmile Lakes.