Category 5: What We Have Learned

Monitoring Question/Concern	Cause	Recommended Action
Are the water quality parameters for water temperature within limits established by state water quality standards?	A number of physical and biological factors affect stream temperature.	Continue emphasis on understanding interactions within watersheds.
Do trends in fish habitat indicate about as much habitat by the year 2000?	Level-II stream survey is not the best method for tracking effects of Forest management.	Rely more on other methods of monitoring.
Are fish stocks at risk being maintained?	Coastal lakes systems have unusually good coho salmon populations.	Put more emphasis on restoration of these systems.
Are viable butterfly populations being maintained?	Extensive renovation of habitat is needed to just maintain silverspot butterfly populations, let alone enhance them.	Seek additional funding sources for recovery effort.

III. MONITORING RESULTS

This section presents the results and evaluations of forest management conducted during Fiscal Years 1997 through 2000. Monitoring has been organized into four groups — aquatic, terrestrial, social and other. Monitoring issues and specific evaluation questions are presented by group followed by monitoring actions, results, and recommendations for further action. These results are summarized in Section II of this report.

AQUATIC (FISH)

ISSUE: How is quality of anadromous fish habitat changing?

Question 1: Do trends in fish habitat capability, naturally occurring large woody debris (LWD), and health and survival of streamside conifers indicate about as much habitat by the year 2000?

Monitoring actions:
Habitat capability and large woody debris (LWD): Surveys were conducted on 20.1 miles of stream in 1997, 11 miles in 1998, 8 miles of stream in 1999, and 14.6 miles in 2000 using the Level-II Aquatic Inventory methods, which primarily measure amounts of pools, riffles, and LWD (Table 2).

Table 2. Stream Miles Surveyed in 1997-2000.

Stream	Miles
1997	
Pollard Creek	1.2
Fiddle Creek	3.9
Middle Fork North Fork Smith R.	3.3
Phillips Creek	1.5
Savage Creek	2.7
Canal Creek	7.5
1998	
Cape Creek	5.5
Grant Creek	1.8
Franklin Creek	3.7
1999	
Canal Creek	4.2
Franklin Creek	3.8
2000	
North Fork Schooner Creek	1.4
Austin Creek	3.4
Alder Creek	3.4
Bays Creek	6.4

Streamside conifers: A sample of young planted conifers along Tenmile Creek was tagged and measured in 1996-97, and will be monitored for subsequent growth and survival in 1 to 6 years.

Riparian vegetation: In 1995, forest ecologists established 13 transects in riparian vegetation across low-gradient, moderately-confined and unconfined stream reaches in unmanaged stands on the Siuslaw NF. The transects were established to characterize riparian plant communities and the geomorphic surfaces with which they are associated. Following the floods of 1996, the transects

were revisited. Valley cross-sections were remeasured and 8 transects had new plan view sketches. The data document the effects of frequent disturbance on substrate and growing conditions, which control the compositions of the near-stream plant communities.

Results:
Habitat capability and LWD: The streams surveyed in 1997-2000 are part of a 100-mile network that represents 8% of the Forest streams used by anadromous fish. No intensive analysis of the data has been completed to date, although there appear to be some differences between baseline

surveys done in 1991-93 and those in 1997-98 (e.g., % backwater). The apparent changes in habitat conditions over the years are probably due to mistakenly surveying a few different reaches, but particularly to changes in the Regional protocol for measuring LWD. As a result, many more pieces of LWD were counted as small in 1997-98 surveys, but were tallied as medium or large previously. (Data are maintained in the SMART Database, unpublished data of Region 6 Level-II Aquatic Inventory, Siuslaw NF).

Riparian vegetation: Following the floods of 1996, five of the 13 riparian sites had sediment deposits, 8 sites showed flood effects, 8 were herb-dominated, 4 were in shrub types (salmonberry-dominated), and one was a red alder/vine maple-salmonberry community.

Other: The Forest also assisted with a pilot test of methodology being developed for the Aquatic-Riparian Effectiveness Monitoring Plan (AREMP) by the PNW Research Station. Work consisted of determining the biophysical condition (good, compromised, degraded) for each sixth-field subwatershed in the Nestucca and Siuslaw river basins so that trends and effects of restoration activities can be monitored over time.

Recommended Action: Continue resurvey of 100-mile Forest Plan stream network. Maintain consistent sampling methods.

Question 2: Are projects included in the Forest's Accelerated Fish/Watershed Restoration Initiative restoring ecosystems in Key Watersheds?

Monitoring actions: Basinwide Level-III stream inventories were completed in both summer and winter of 1997, 1998 and 1999 and used to quantify fish habitat conditions and fish distribution in Tenmile and Cummins Creeks; nine aquatic sites along Tenmile Creek were surveyed for amphibians in August/September of 1997 and 1998; traps for downstream-migrating fish were used to determine smolt output from the Tenmile and Cummins Key Watersheds in 1997-2000. Alluvial and bedrock reaches of Cummins Creek (the control system) were mapped in detail.

Results: Fish populations in 1997 varied compared to the previous six years (Tables 3 and 4). Numbers of coho smolts leaving the systems that spring were relatively low, perhaps because of poor egg survival during the February 96 flood and resultant low numbers of fry the previous summer. On the other hand, the flood appeared to have little effect on numbers of steelhead in 1997, which were relatively good for all age groups. Estimates of steelhead and searun cutthroat trout smolts were higher in spring 1998 than any during the pre-restoration years. This is promising, but additional years of data are needed to see if this trend continues and can be attributed to habitat restoration.

Recommended Action: Continue Tenmile whole-basin restoration monitoring program.

Table 3. Summer Population Estimates of Juvenile Salmonids in Tenmile and Cummins Creeks, 1991-1998.

Stream	Year of Summer Sampling	Coho Salmon	Cutthroat Trout >90mm	Steelhead >90mm	0+ Trout
Cummins Creek	1991	1,292	1,177	2,306	6,467
	1992	1,316	1,591	3,010	8,104
	1993	1,079	1,274	2,946	4,646
	1994	1,015	1,281	2,255	7,998
	1995	913	1,502	3,689	9,383
	1996	1,074	1,545	5,002	8,625
	1997	1,646	2,417	4,798	17,927
	1998	863	2,524	7,171	11,132
Tenmile Creek	1991	8,003	4,023	16,613	79,958
	1992	7,799	3,503	16,324	66,226
	1993	30,663	3,231	18,417	70,664
	1994	3,294	2,540	12,180	54,865
	1995	4,369	2,822	12,818	69,391
	1996	3,783	4,256	19,784	63,193
	1997	4,410	2,412	13,491	59,710
	1998	2,105	2,957	12,204	60,903

Table 4. Estimates of Salmonid Smolt Production in Tenmile and Cummins Creeks, 1992-1998					
Stream	**Year of Spring Sampling**	**Coho Salmon Smolts**	**Cutthroat Trout smolts >160mm**	**Steelhead Smolts >120mm**	**Chinook**
Cummins Creek	1992	1,023	50	786	-
	1993	738	56	1,424	-
	1994	1,435	106	1,623	-
	1995	1,076	40	1,167	-
	1996	475	142	2,303	-
	1997	674	223	2,790	-
	1998	2,215	110	1,816	-
Tenmile Creek	1992	5,442	429	6,312	557[1/]
	1993	5,260	350	7,817	381[1/]
	1994	9,234	259	5,420	527[1/]
	1995	1,729	324	2,342	700[1/]
	1996	2,230	215	4,652	2,773[2/]
	1997	2,952	632	7,334	4,046[2/]
	1998	5,462	813	11,869	4,841[2/]

[1/] Trapping period March 1 - June 30
[2/] Trapping period March 1 - August 15

ISSUE: How is quality of lake fish habitat changing?

Monitoring actions: None

Results: None

Discussion: Virtually all of the acres of lakes on the Forest are on the Oregon Dunes National Recreation Area (ODNRA). During the past three years, emphasis continued on the Tsalila Salmon and Watershed Festival, and the Forest deferred doing lake surveys.

Recommended action: Begin resurvey of the NRA lakes by completing the 100 acres of lake survey scheduled for FY01. The results can be compared with surveys done in 1991 on the same lakes.

ISSUE: How are anadromous fish populations changing?

Question 1: Are fish stocks at risk (and viable populations of Management Indicator Species) being maintained?

Monitoring actions: A fish biologist reviewed recent threatened and endangered (T&E) listings, and status reports from the Oregon Department of Fish and Wildlife (ODFW) and National Marine Fisheries Service (NMFS) on health of anadromous salmonid stocks on the Forest.

Results: Runs of most anadromous fish stocks at risk, except for fall chinook salmon on the Coast, continue to decline or remain at depressed levels. The coho salmon has been listed as threatened from Cape Blanco north, and the steelhead and spring chinook salmon have similar status in the Willamette Basin portion of the Forest. Runs of coho salmon (the Management Indicator Species for the Siuslaw NF) continue to be particularly low on the Forest. Total coho abundance in the winters of 1997-98 and 1998-99 on the northern Oregon Coast was the lowest in the 50 years that records have been kept. However, total coho abundance in the winters of 1999-00 and 2000-01 on the northern Oregon Coast was up 100% or more from very low levels in 1997-99.

One noted exception is the 15 miles of coastal lake systems defined by the Siltcoos River, Tahkenitch Creek, and Tenmile Creek, which found the healthiest coho runs in the state. A tributary of Tahkenitch Lake, Leitel Creek, currently has the highest spawning escapement counts of any stream in Oregon. During 1997-2000, peak spawning counts of coho were 410, 538, 847, and 410 fish per mile, respectively.

Discussion: The low number of the coho prompted the 1996 Governor's Coastal Salmon Restoration Initiative, which was later expanded by Executive Order into an Oregon Plan for Salmon and Watersheds. One of the cornerstones of the Plan is ongoing federal watershed restoration actions formulated under the Northwest Forest Plan.

Recommended Action: Continue to cooperate with other agencies and groups to expand the Forest's restoration, monitoring, and environmental education programs to non-federal lands, and otherwise integrate our activities into the Oregon Plan.

AQUATIC (WATER QUALITY)

ISSUE: Is the water quality of perennial streams, as measured by changes in water temperature, being maintained as predicted?

Question 1: Are the water quality parameters for water temperature within limits established by state water quality standards?

Monitoring actions:

Water temperature is the only water quality parameter that has been consistently and methodically monitored on the Siuslaw National Forest. Between 1994 and 2000, 297 stream temperature sites have been monitored, using continuous recording thermographs (Onset Hobo Stowaways and Tidbits). These sites have been monitored for one to six years. Both key and non-key watersheds have been monitored. Most sites have only one year of data.

Stream temperature sites were classified as complying with Oregon Dept. of Environmental Quality (DEQ) standards, not complying, or variable. The variable sites had more than one

year of data, and fluctuated around the DEQ standard. DEQ set an upper limit of 64F for the 7-day average of maximum daily temperatures.

Results, What we have learned:

1. The more years a site is monitored, the more likely it is to be variable. In other words, it meets the standard of 64F some years and not others. The 7-day average maximum temperature can vary from 2 to 5 or 6 degrees at one site, depending on the year that is monitored. For sites that were monitored for only one year, approximately half met the standard and half didn't. For sites that were monitored 5 years, no sites consistently met the DEQ standard, 29% did not meet the standard, and 71% were variable, i.e., they met the standard some years and not others.

Table 5. Actual Number Of Sites That Comply Or Don't Comply With DEQ Water Temperature Standards.

Number of years monitored	Number of sites that comply with standard	Number of sites that do not comply with standard	Variable sites	Total number
1	92	91	4	187
2	21	25	14	60
3	11	6	13	30
4	1	2	6	9
5	0	2	5	7
6	1	1	2	4

Table 6. Percentage Of Sites That Comply Or Don't Comply With DEQ Water Temperature Standards.

Number of years monitored	% of sites that comply with standard	% of sites that do not comply with standard	% Variable sites
1	49	49	2
2	35	42	23
3	37	20	43
4	11	22	67
5	0	29	71
6	25	25	50

2. Stream temperatures in the Coast Range follow air temperatures, although air temperatures have greater diurnal fluctuation. Streams in the Coast Range are dependent on groundwater recharge during the summer, and are not fed by snowmelt. Therefore, air temperatures have a greater influence. During hot periods of the summer, stream temperatures go up, regardless of the amount of shade present.

3. Stream temperatures appear to be partly dependent on the underlying bedrock. Approximately 75% of the temperature sites on basalt bedrock met the DEQ standard, whereas only a quarter of the

sites on the Tyee Formation did. The Tyee Formation consists of layers of sandstone, siltstone and shale, with very little pore space and water-holding capacity. The basalt, on the other hand, is more fractured, and can hold more groundwater.

4. West Branch of the North Fork Smith River study. In the summer of 2000, the West Branch of the North Fork Smith River was intensively monitored for stream temperature. Ten thermographs were installed along the mainstem and tributaries, and a log jam was bracketed on the mainstem. In addition, above each temperature monitoring site, the amount of shade was measured using fish-eye lens photography, pebble counts were done to measure the amount of bedrock present, cross-sections were done to calculate width/depth ratios, and flow measurements were taken. The purpose of these efforts was to see if any one variable was dominant in determining stream temperatures.

No correlation was found between stream temperature and any one particular variable, suggesting the influences on stream temperatures are complex. Only eight sites were available for comparison, which is a very small statistical sample. Having said that, the West Branch study suggests some relationships that might exist.

Transect 7 is located on the mainstem just above a tributary (transect 8). The mainstem had 43% solar radition during the summer months, while the tributary had just 21% solar radiation. In the mainstem, however, 77% of the substrate consisted of gravels and 1% was bedrock, whereas only 13% of the substrate in the tributary was gravels and 19% was bedrock. The 7-day average maximum temperature in the mainstem was 61.2F; the 7-day average maximum in the tributary was 73.8F, over 10 degrees warmer. This comparison suggests that amount of gravels in the streambed may be more important than shade. In addition, the mainstem flows south, whereas the tributary flows west, so the mainstem should be exposed to more solar radiation during the day.

Comparing the temperatures above and below a large logjam also suggest that the amount and type of substrate plays an important role in regulating water temperatures. Transect 6a and 6b are below and above a large log jam, respectively. Gravels have backed up behind the jam for approximately 1000 feet. The 7-day average maximum temperature above the jam, and below the 73.8F tributary (transect 8) is 71.2F. The 7-day average maximum below the jam is 66.2F, five degrees cooler.

Looking at the temperatures, shade and substrate near the mouth of the West Branch suggests that shade is also important. The substrate in this reach is primarily bedrock (77% for transect 1a); however, solar radiation during the summer is only 23%, and the 7-day average maximum is 64.2. These results suggest that adequate shade prevents the solar radiation from heating the bedrock, and subsequently the water. See Table 7 for the data gathered in this study.

Table 7. Comparing All Variables Measured For The West Branch Of The North Fork Smith River.

	Transect 1a	**Transect 1b**	**Transect 2**	**Transect 3**	**Transect 4**	**Transect 5**	**Transect 6a**	**Transect 6b**	**Transect 7**	**Transect 8**
Comparing canopy values (percent)										
Indirect solar radiation	29.02		25.47	23.82	12.05	24.22		34.17	38.62	40.74
Direct solar radiation	22.37		21.66	22.11	17.95	20.96		40.7	41.74	24.22
Summer average (direct radiation)	23.12		23.45	22.09	18.39	21.86		44.10	43.87	21.03
Comparing substrate (percent)										
Sand	8.13	6.96		19.63	4.17	12.68		11.11	24.71	12.82
Gravel	19.51	3.48		19.63	9.37	22.39		14.81	77.64	12.82
Cobbles	38.221	6.96		38.65	6.25	39.55		47.22	0	48.71
Boulders	4.88	5.22		17.79	6.25	5.97		12.96	2.35	4.27
Bedrock	27.64	76.52		1.23	68.75	8.95		9.25	1.17	18.8
Other	2.44	0.087		3.07	5.21	8.95		4.63	7.05	2.65
Comparing Width/depth ratios from cross-sections										
ratio	19.2	42.9	26.47	19.78	8.28	9.62	18.08	21.6	28.05	15.29
Comparing Low –Flow data										
Date	9/1/00	9/1/00	9/5/00	9/5/00	9/5/00	9/1/00	9/1/00	9/1/00	9/1/00	
Discharge(Q) (CFS)	1.28(?)	0.44	0.41	0.34	0.07	0.26	0.31	0.22	0.07(lots of sub-surface flow)	
Aspect	SE	SE	SE	W	W	SE	SE	SE	SE	W
Comparing Temperature Data										
Instant daily high	67.3	65.5	67.3	62.9	60.6	67.0	67.3	72.3	61.2	75.1
7-day average maximum	64.2	64.3	66.0	61.9	59.7	65.9	66.2	71.2	60.0	73.8
# days >64	7	5	12	0	0	12	19	38	0	55

TERRESTRIAL (FOREST VEGETATION)

ISSUE: Is the forest seral stage distribution moving toward the desired future condition? Are forest stand composition and structure moving toward the desired condition?

Question 1: What are the spatial trends in seral conditions including age and structural distribution?

Monitoring actions: This monitoring question is tiered to the province scale Late-Successional and Old-Growth Forest Effectiveness Monitoring Plan for the Northwest Forest Plan (Hemstrom et al 1998). A pilot study was conducted in the Oregon Coast Range Province from 1996 - 1999 to test some of the province-scale effectiveness monitoring questions, including this one.