Soil Productivity 60 ☺

Introduction: Maintenance of soil productivity is essential to sustaining ecosystems and is mandated by every act of Congress directing national forest management. Region 6 Forest Service Manual (2550.3-1, R6 Supplemental # 50) and the Gifford Pinchot National Forest Plan require a minimum of 80 percent of an activity area to have unimpaired soil productivity.

Units sampled are evaluated for the degree and extent of conditions impairing soil productivity, including compaction, displacement, erosion, and severe burning. Greenhorn Timber Sale - Unit 3 was assessed for compliance with the standards.

A soil scientist evaluated the unit for detrimental soil damage by visually estimating the extent of skid trails, landings, skyline corridors, and severely burned areas. Soils were examined in places that were most likely to have been disturbed. Displacement was assessed by measuring where subsoil was found at the surface, based on the standards and guidelines mentioned above.

Paul Smale Photo

Figure 11. - Greenhorn Timber Sale – minimal displacement of topsoil resulted from skyline logging

Results: The majority of detrimental soil conditions at the location are due to pre-existing impacts, including landings and National Forest System roads. Damage to previously undisturbed soils is minimal in extent, and occurred as logs were cable yarded. Less than 2 acres, approximately 0.4 percent of the unit, sustained damage that qualified as detrimental. The damage was spread out across the 41-acre unit, so a minimal impact occurred on the soils in the area.

The unit monitored met the standard for protection of soil productivity.

Evaluation: The unit in the monitored project met the standards and guidelines for long-term soil productivity. The project was implemented in compliance with specifications in the contract and mitigation measures in the Environmental Analysis. The area is suited to the logging systems prescribed. Use of the cable logging system design proved to be successful in avoiding damage to the soils resource. The unit was not logged with ground-based equipment, as the soils report originally recommended for most of the unit.

Best Management Practices (BMPs) [61]

<u>Introduction</u>: Best Management Practices are the primary mechanism to ensure water quality standards are met during project implementation. Best Management Practices (BMPs) are selected and tailored for site-specific conditions to provide project level protection of water quality. The Clean Water Act and the National Forest Management Act directs us to protect streams, streambanks, shorelines, lakes, wetlands and other bodies of water from detrimental changes in water temperature, blockages of water courses, and deposits of excessive sediment, where activities have the potential to seriously and adversely affect water conditions or fish habitat.

Greenhorn LSR Sale Unit 3 did not comply with one BMP and was considered a minor departure.

One harvest unit of a timber sale and a hazard tree removal project were monitored for compliance with Best Management Practices. The Hazard Tree Removal Project complied with all the BMPs. Greenhorn LSR Sale Unit 3 did not comply with one BMP and the lack of compliance was considered a minor departure.

<u>Greenhorn LSR Unit 3</u>

One stream was not properly identified during planning and layout. A Class III stream was identified as Class IV on the Sale Area Map. This improper identification did not result in any change from the silvicultural prescription which were the same for Class III and IV streams. This was considered a minor departure of BMPs, *T-8 Streamcourse Protection.*

Recommendation: Emphasize proper delineation of streams throughout the entire planning and implementation process to assure streamcourse protection.

Stream Temperature Monitoring

Introduction: The Clean Water Act and the Northwest Forest Plan direct the Forest to maintain the physical, chemical and biological integrity of our aquatic resources. The Forest Plan mandates the Forest manage its streams to fully support all designated beneficial uses of water. Cool water temperatures are important in providing quality aquatic habitat and maintaining beneficial uses.

The Forest Plan mandates the Forest manage its streams to fully support all designated beneficial uses of water

The Washington State Department of Ecology adopted aquatic life temperature criteria for fresh water, differing for various aquatic life use categories, in August 2003 (Table 10).

Table 10. - State Stream Temperature Criteria

Category	Maximum 7-Day average of the Daily Maximums
Char	12.0^{o}C
Salmon and Trout Spawning, Core Rearing, and Migration	16.0^{o}C
Salmon and Trout Spawning, Noncore Rearing, and Migration	17.5^{o}C
Salmon and Trout Rearing and Migration Only	17.5^{o}C

The Washington State Department of Ecology have proposed the 2002 Water Quality Assessment with 5 categories:

Category 1 - Meets tested standards for clean waters.
Category 2 - Waters of concern.
Category 3 - No Data.
Category 4 - Polluted waters that do not require a TMDL:
- Category 4a - Has a TMDL.
- Category 4b - Has a pollution control plan.
- Category 4c - Impaired by a non-pollutant

Category 5 - Polluted waters that require a TMDL (303(d) list).

The 303(d) list is considered those waterbodies in the proposed Category 5 listing. New data and categories resulted in four of the ten previously listed waterbodies being eliminated from the 303(d) list. Two of the previously listed waterbodies are now listed in Category 4a, because a TMDL has been completed for the Wind River Watershed. The two other previously listed waterbodies are now listed in Category 2 - Waters of concern. Twenty-five water bodies on lands managed by the Gifford Pinchot NF are listed in Category 5 (Table 11).

Table 11. – Temperature-Listed Waterbodies on the Gifford Pinchot

Watershed	Stream	Comments
Upper Cispus River	Walupt Creek	Walupt Lake, a natural lake exposed to solar radiation, releases warm waters to Walupt Creek.
	East Canyon Creek	
	North Fork Cispus River	
	Cispus River (11N 10E 25)	No Forest Service data exceeds standard – possible listing error.
Lower Cispus River	Pumice Creek	Temperatures decreased below the standard in last two years
	Yellowjacket Creek	2 segments
	Greenhorn Creek	2 segments
	1919 Creek	Listing name error – 1918 Creek
	Iron Creek	
	Cispus River	3 segments
Middle Cowlitz River	Lake Creek	
	Lynx Creek	
	Silver Creek	2 segments
Nisqually River	East Creek	
	Little Nisqually River	
	Little Nisqually River – West Fork	2 segments
Muddy River	Clearwater Creek	
	Clear Creek	
	Muddy River	2 segments
Upper Lewis River	Quartz Creek	2 segments
	Lewis River	2 segments
Yale Reservoir	Siouxon Creek	
East Fork Lewis River	Copper Creek	
	East Fork Lewis	6 segments
Little White Salmon	Little White Salmon River	2 segments

The specific stream temperature monitoring objectives are to track trends in water temperature at the watershed scale and identify reaches adversely affecting temperatures. All stream sites that consistently exceed 16.0^{o}C are monitored annually.

<u>Results:</u> During the summer of 2003, 85 stream temperature sites were monitored continuously.

Upper Cispus River Watershed

- Water temperatures of Walupt Creek are high due to solar radiation heating the surface waters of Walupt Lake. Most of the subwatershed is in wilderness.
- East Canyon Creek exceeded the State standard and contributes a relatively small quantity of warm water to the mainstem Cispus River (less than 10% of the Cispus River baseflow). The base flow channel width (average of 25 feet) and wide floodplain allows solar radiation to heat East Canyon Creek in the lower 3 miles of the subwatershed. Sediment inputs from roads contributed to the wide low flow channel width.
- North Fork Cispus River exceeded the State standard and contributes warm waters to the mainstem Cispus River (about 10% of the Cispus River baseflow). The recovery of shade along all the tributaries flowing into the North Fork Cispus along with the addition of large wood to the mainstem North Fork Cispus may reduce the North Fork Cispus stream temperatures so that it meets the standard.

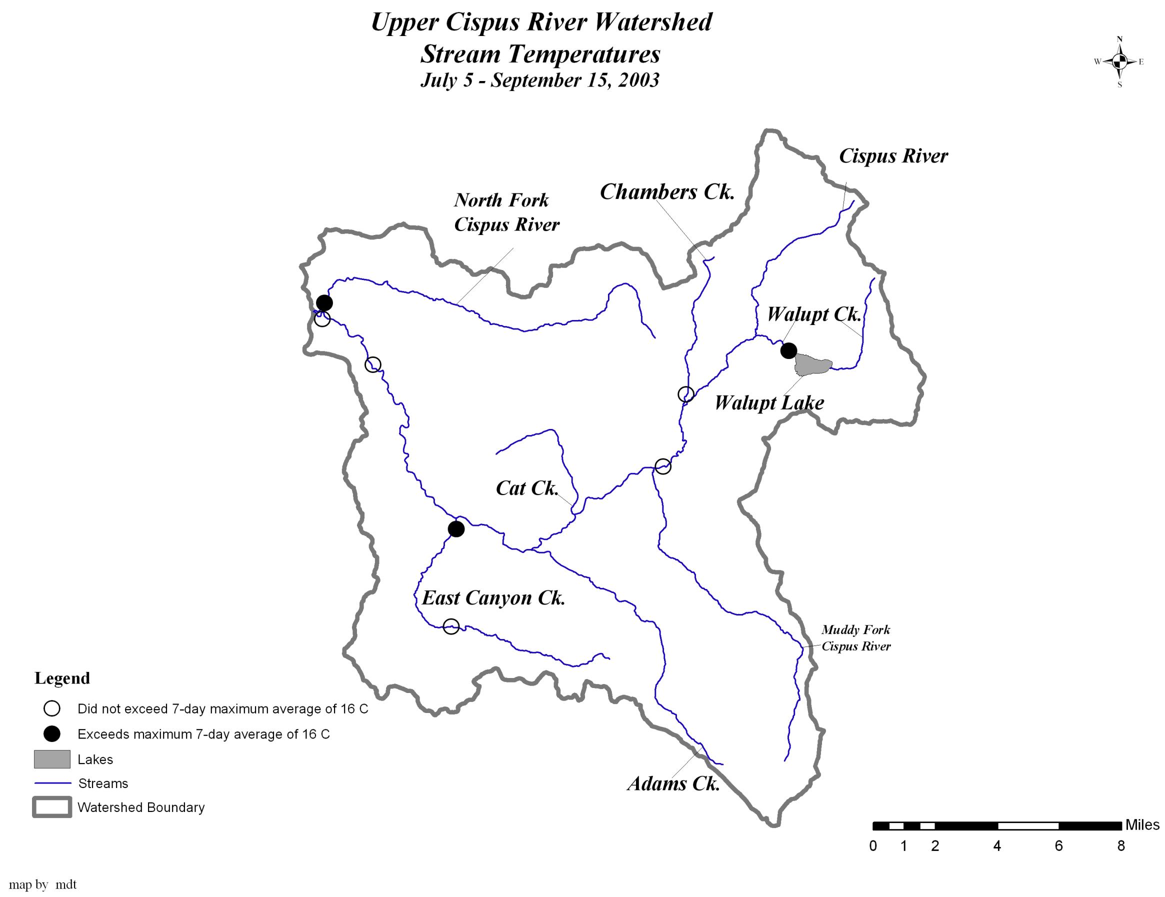

Figure 12. - Temperature Monitoring Locations in the Upper Cispus River Watershed.

Lower Cispus River Watershed

- The highest maximum 7-day average stream temperature within the Lower Cispus River Watershed was Greenhorn Creek (19.6°C
- Three of the major tributaries, Yellowjacket Creek, Greenhorn Creek and Iron Creek, contribute waters that exceed the State standard to the mainstem Cispus River for prolonged periods. Yellowjacket Creek and Iron Creek Subwatersheds have unstable channels resulting in stream widening and shifted channel position which contribute to elevated stream temperature. Past and present sediment delivery from roads and landslides are stored and processed within the lower flat reaches of these creeks and are transported or slowly stabilized over time.
- Shade loss (8-13%) from past riparian harvest and natural disturbances in the three subwatersheds also contribute to elevated stream temperatures.

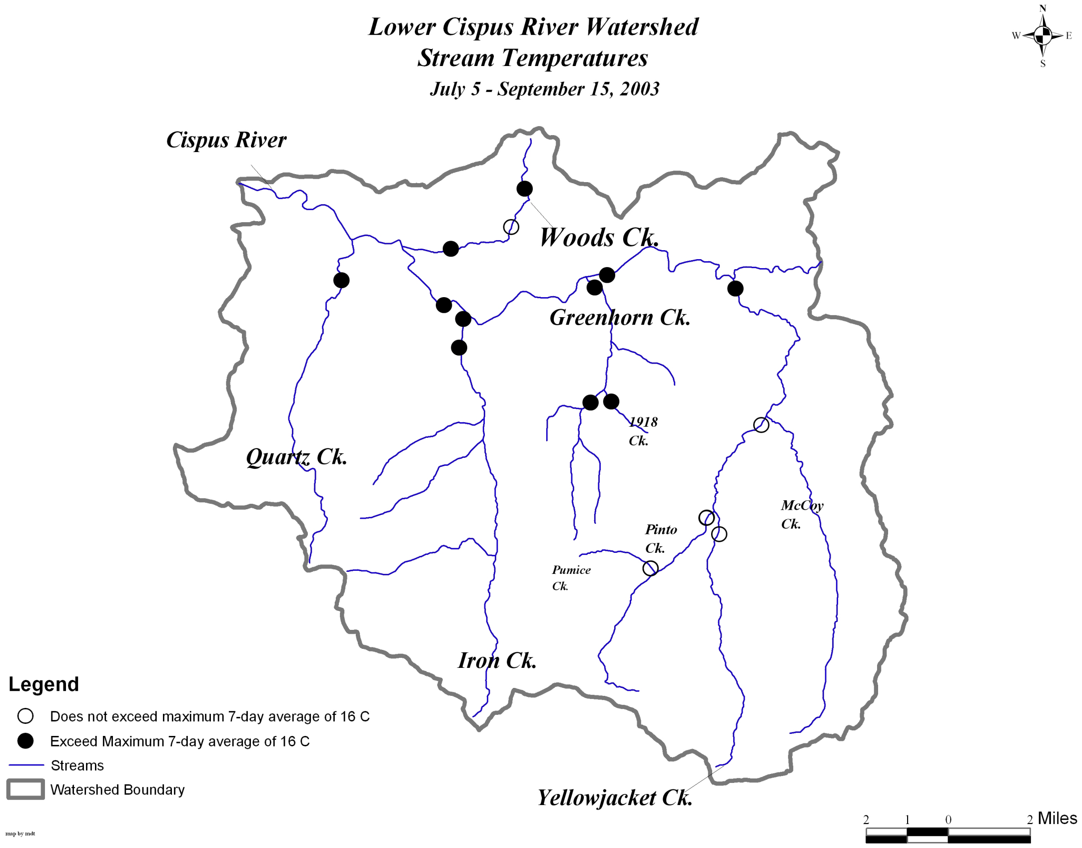

Figure 13. - Temperature Monitoring Locations in the Lower Cispus River Watershed

Stream temperatures at five sites within the Upper and Lower Cispus River Watershed were generally higher in 2003 than during 1999-2002 (Figure 14).

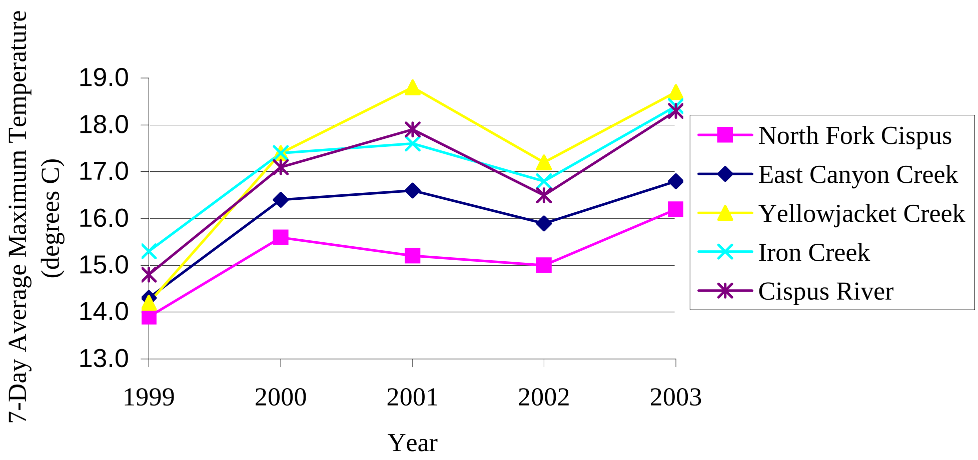

Figure 14 – Recent Average Maximum Stream Temperatures

Middle Cowlitz River Watershed

- Silver Creek has the highest maximum 7-day average stream temperature (16.9°C) of the tributaries to the mainstem Cowlitz River in the Middle Cowlitz River Watershed. Silver Creek has exceeded the State standard every year monitored (9 years).
- Link Creek and Lake Creek, tributaries to Silver Creek, exceeded the State standard on both years monitored (1999, 2003).
- Past management activities such as removal of riparian shade, road construction and large wood removal probably contributed to the present elevated stream temperatures, although a comprehensive analysis has not been completed to date.

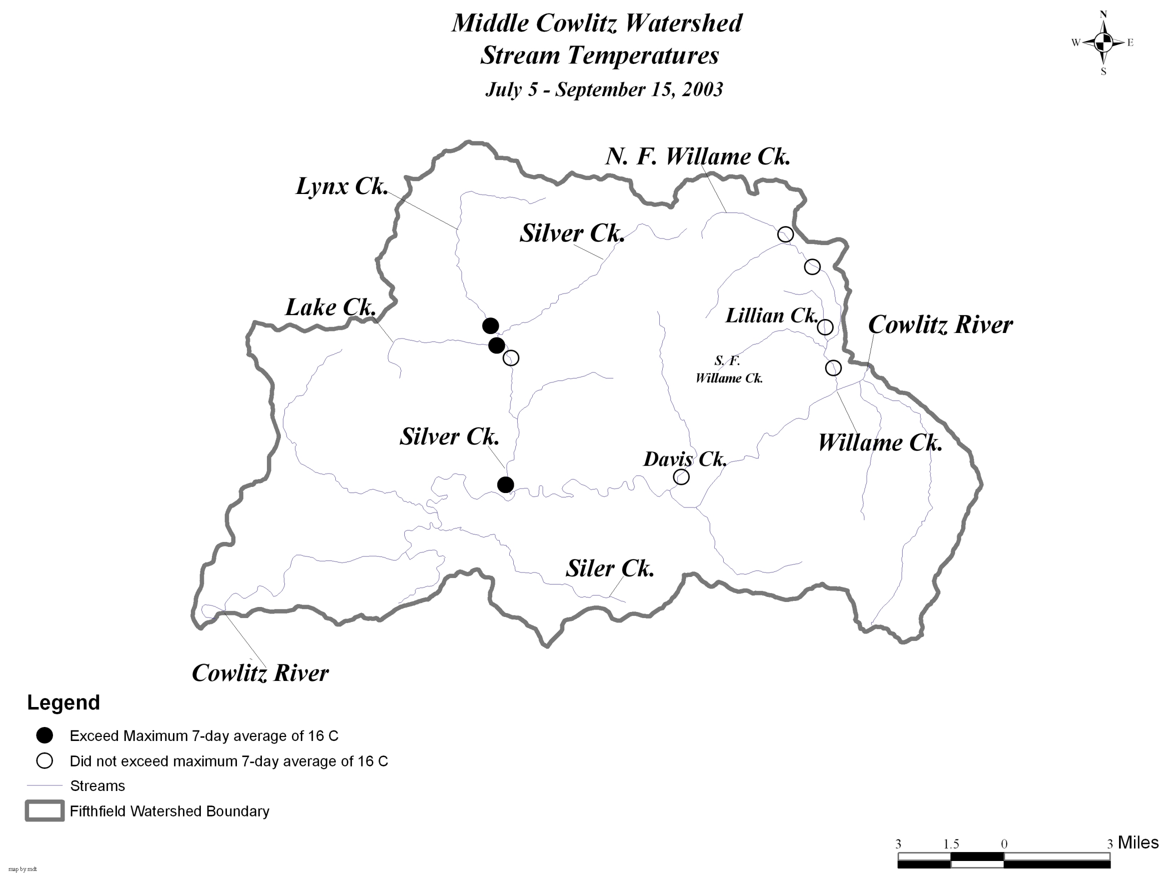

Figure 15. - Temperature Monitoring Locations in the Middle Cowlitz River Watershed.

Upper Nisqually River Watershed

- Little Nisqually River entered Alder Creek Reservoir with a maximum 7-day average temperature of 17.3 °C during the summer of 2003 (Figure 16).
- East Creek had the highest maximum 7-day average temperature (19.0°C) in the watershed (Appendix 1).
- Environmental and/or human caused sources causing elevated stream temperatures have not been assessed in detail for this Watershed.
- All streams monitored were greater than the newly adopted standard (12 °C) for Char spawning and early tributary rearing waterbodies. Extensive surveys have not found any Char (bull trout) in this Watershed.

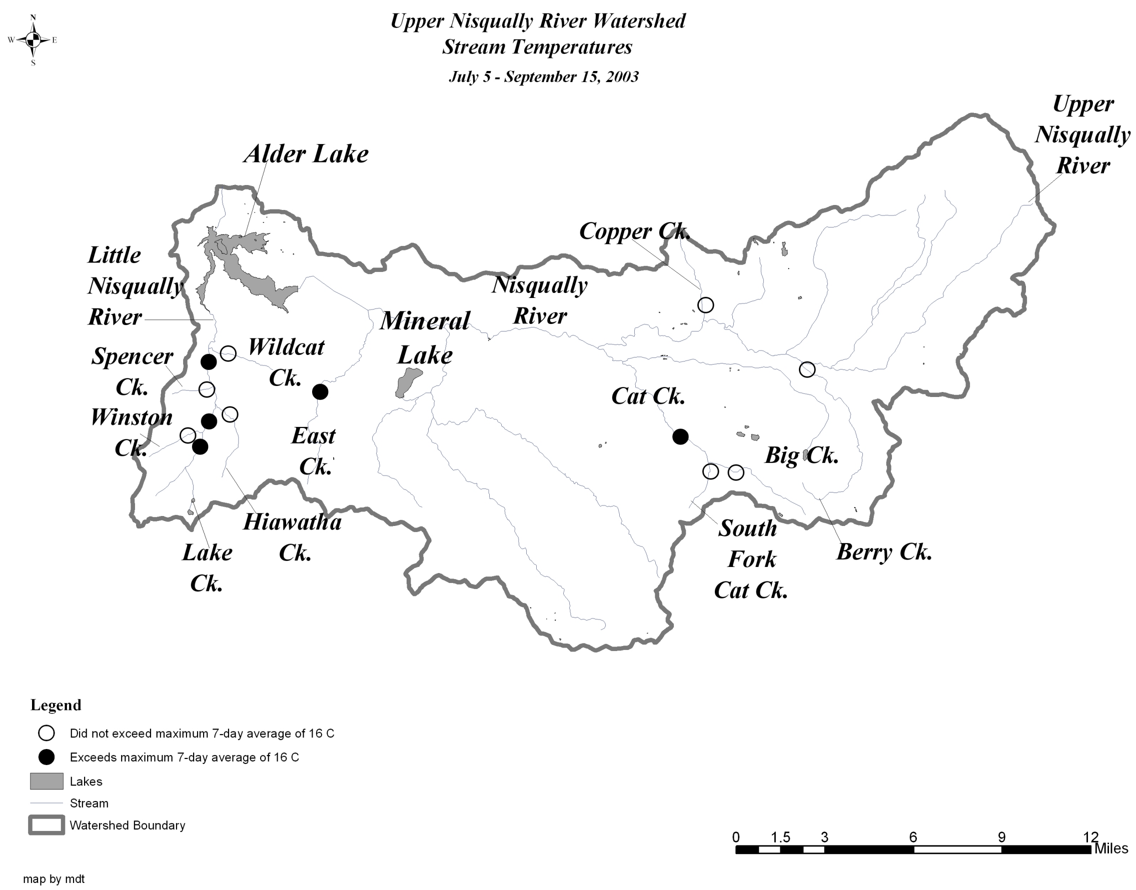

Figure 16. - Temperature Monitoring Locations in the Upper Nisqually River Watershed.

Upper Lewis River Watershed

- The mainstem Lewis River exceeded the temperature standard at all stations downstream of Quartz Creek.
- Quartz Creek had the warmest temperatures on record during 2003 – maximum 7-day average of 18.0 °C.
- Environmental and/or human caused elevated stream temperatures have not been assessed in detail for this watershed.
- Quartz Creek and Alec Creek exceed the newly adopted standard (12 °C) for Char spawning and early tributary rearing waterbodies.

Upper Lewis River Watershed Stream Temperatures
June 15 - September 15, 2003

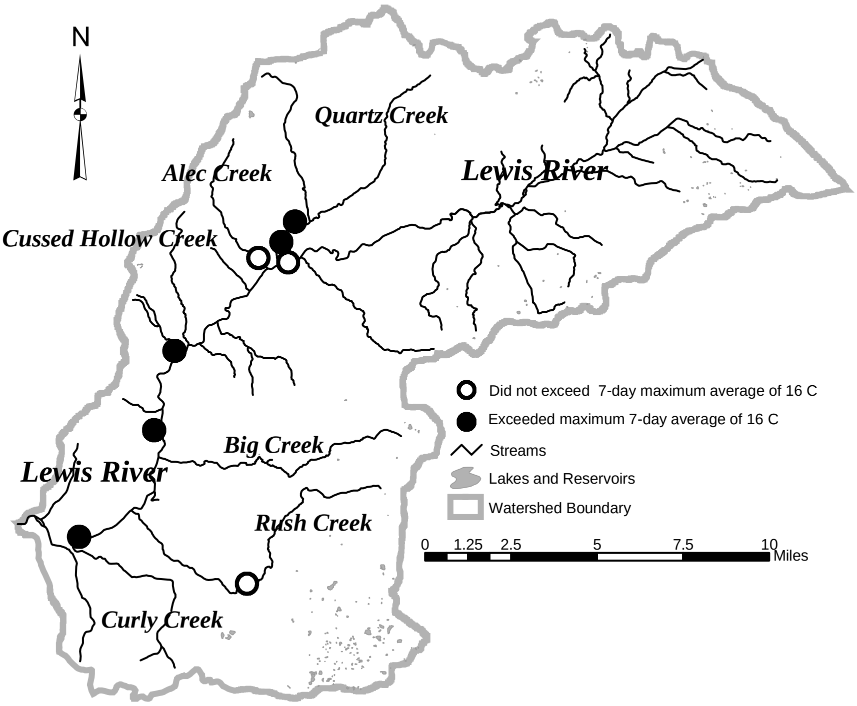

Figure 17. - Temperature monitoring locations in the Upper Lewis River Watershed.

The Muddy River and Swift Reservoir Watersheds

- All stations monitored in the Muddy River Watershed exceeded the temperature standard (Appendix 1).
- The 2003 stream temperatures at all stations monitored in the Muddy River Watershed were not the highest recorded temperatures.
- Environmental and/or human caused elevated stream temperatures have not been assessed in detail for this Watershed. The 1980 Mt. St. Helens volcanic eruption disturbed the streams and riparian vegetation in a significant portion of the Clearwater Creek, Smith Creek (major Muddy River tributary) and Muddy River Subwatersheds
- Clearwater Creek, Clear Creek and Pine Creek exceed the newly adopted standard (12 °C) for Char spawning and early tributary rearing waterbodies. Pine Creek has known Char populations.

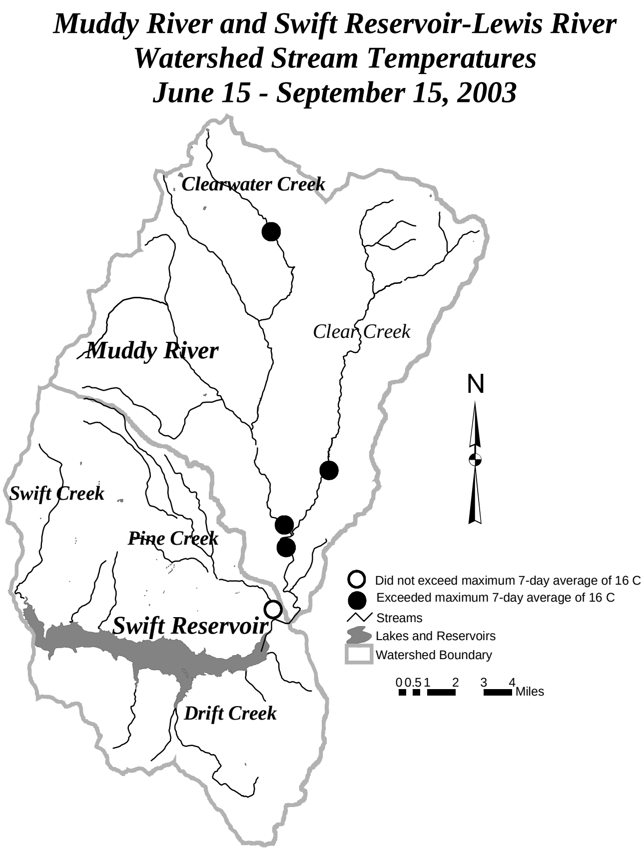

Figure 18. - Temperature monitoring locations in the Muddy River and Swift Reservoir Watersheds.

East Fork Lewis River Watershed

- The maximum 7-day average temperature of the mainstem East Fork Lewis River exceeded 16°C during 2003 at all stations.
- Temperature patterns during 2003 were warmer than during 2002 and 2001. More temperature exceedances occurred downstream of Slide Creek in the mainstem of the East Fork Lewis River.
- The Copper Creek data logger failed, which resulted in a total loss of data during 2003. Copper Creek maximum 7 day average temperatures was 17.2°C during 2002.

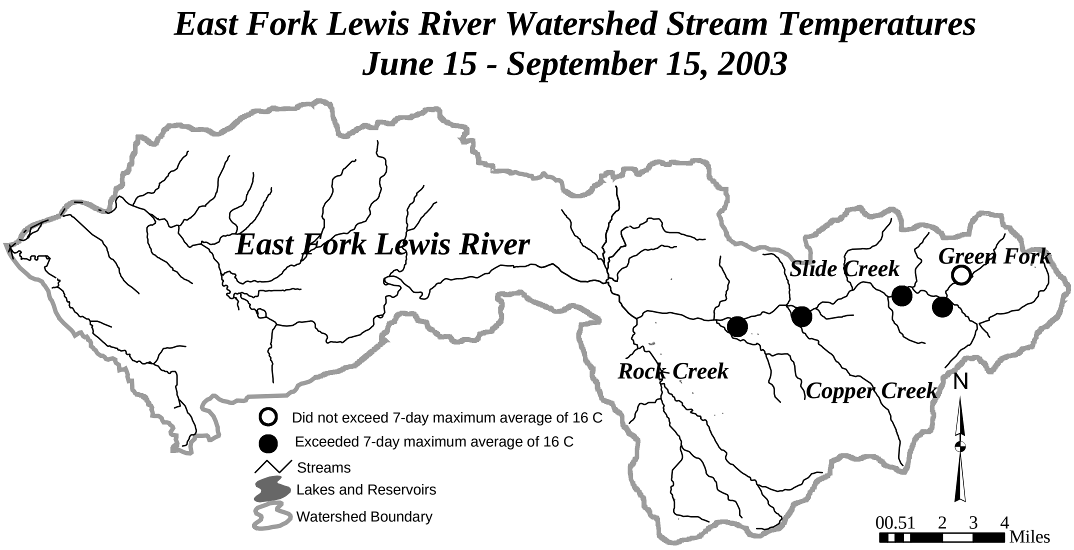

Figure 19. - Temperature monitoring locations within the East Fork Lewis River Watershed.

Yale Reservoir and Merwin Reservoir Watersheds

- Siouxon Creek exceeded the standard (16.0°C) during 2003 as it has during all monitoring years (Appendix 1). The drainage area that occurs upstream of the monitoring point is predominately unroaded and was affected by past landscape scale fires.
- Canyon Creek had zero temperature exceedances during 2003.

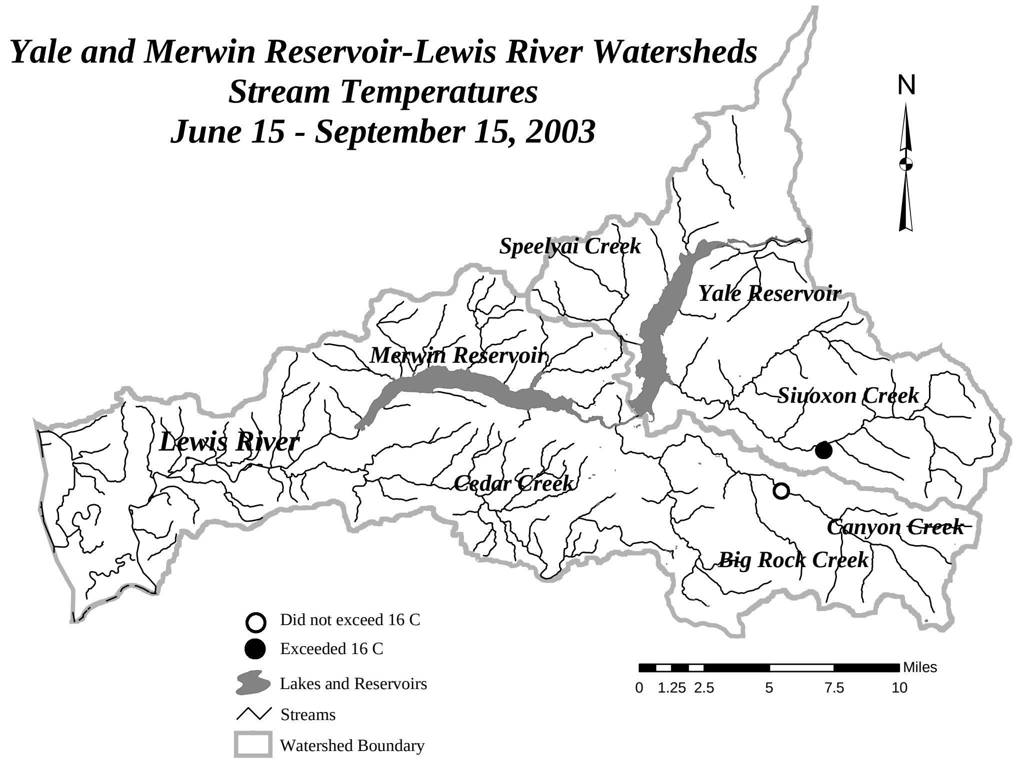

Figure 20. - Temperature monitoring stations in the Yale and Merwin Reservoir Watersheds.

Wind River Watershed

- Water temperatures exceeded the standard at eleven of seventeen monitoring stations in the watershed.
- Trout Creek below Hemlock Lake had the highest maximum 7-day average temperature recorded of the year at 23.8°C
- Water temperature maximums were ***lowest*** in Trout Creek above Crater Creek, reaching just 8.0°C.

Figure 21. - Temperature monitoring locations in the Wind River Watershed.

The Wind River Watershed Temperature Total Maximum Daily Load (TMDL) Submittal Report was published in June 2002. This caused the designation of the temperature impaired stream reaches to be eliminated from the "impaired" category. The TMDL report recommends the management activities of the 2001 Gifford Pinchot NF Wind River Water Quality Restoration Plan for compliance with the water quality standards for water temperature. The management activities specified for 2002-2006 included 39 acres of shade restoration, 15 miles of channel stabilization and 5 miles of road decommission.

Water Quality Restoration Plans ⓘ

The development and implementation of Water Quality Restoration Plans provides the specific actions by which the Forest Service meets Total Maximum Daily Load (TMDL) requirements for 303(d) listed water bodies on lands under Forest Service jurisdiction. Total Maximum daily load refers to the maximum amount of solar radiation received by a stream per day. Management can affect solar radiation by reducing stream shade.

The Forest completed a Water Quality Restoration Plan for the Lower Cispus River Watershed in 2003.

The Gifford Pinchot National Forest will follow protocols specified in Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters (USDA, 1999) when developing Water Quality Restoration Plans. The Gifford Pinchot National Forest completed a Water Quality Restoration Plan for the Lower Cispus River Watershed in 2003.

The Water Quality Restoration Plan for the Lower Cispus River Watershed focuses on four subwatersheds: Yellowjacket Creek, Greenhorn Creek, Iron Creek and Woods Creek. The four human caused sources that alter natural processes and contribute to increased stream temperatures on National Forest System Lands are past riparian timber harvest, past removal of large instream wood, increased sediment load from roads and landslides, and high road densities. Yellowjacket Creek and Iron Creek Subwatersheds exhibit high levels of all these human caused sources:

- Reduced riparian shade resulted from past riparian timber harvest and stream widening.
- Degraded channel conditions (widened and shallowed) resulted largely from removal of large instream wood and increased sediment load from roads and landslides (both natural and management related).
- Increased drainage network from high road density also contributed to stream widening, though to a lesser extent.

A GIS shade analysis estimated the difference between the current condition shade and shade that would result from 160 feet tall conifer species. Decreased shade levels occurred in Yellowjacket Creek (13%), Greenhorn Creek (10%) and Iron Creek (8%).

Stream instability has caused increase stream widths in Yellowjacket Creek and Iron Creek. Increased sediment load from roads and management related landslides were high in Yellowjacket Creek and Iron Creek.

To a lesser extent, stream stability is being affected by the high road density causing increased drainage density in Yellowjacket Creek and Iron Creek.

Woods Creek channel perturbations may be the result of increased peak flows caused by vegetation removal within this subwatershed.

Recommendations:

Recommendations for active restoration within all four subwatersheds include:

- 14 acres of shade zone improvements,
- 361 acres of precommercial thinning and conifer release within the riparian areas of previously managed stands,
- 3 miles of instream stabilitity improvements,
- 26 miles of road decommission/close stabilization activities, and about
- 50 miles of road improvements.

Most of these active restoration recommendations are for Yellowjacket Creek and Iron Creek Subwatersheds**.**