Soil and Water

Goals: Maintain soil productivity and minimize soil erosion from land-disturbing activities. Minimize sediment transported to streams from land-disturbing activities. Maintain and restore the biological, physical, and chemical integrity of Tongass National Forest waters.

Objectives: Attain Alaska Region (R-10) Soil Quality Standards. Attain State of Alaska Water Quality Standards.

Background: Implementation of Soil and Water standards and guidelines is necessary to maintain soil productivity and water quality. The Soil and Water standards and guidelines are implemented as Best Management Practices (BMPs) described in FSH 2509.22. Region 10 Soil Quality standards are documented in FSM 2554. Methods for effectiveness monitoring of Soil Quality standards are also referenced in FSM 2554. Soil conservation practices are practices used to ensure that ground-disturbing activities will meet the R-10 Soil Quality standards. Typical soil conservation practices include log suspension requirements in timber harvest units and the use of full-bench and end-haul road construction techniques on landslide-prone terrain. Implementation monitoring evaluates whether or not soil conservation practices were required and implemented. Effectiveness monitoring determines whether or not the soil conservation practice used kept the ground-disturbing activity within the R-10 Soil Quality standard.

The State of Alaska Water Quality Standards set standards for chemical, physical, and biologic parameters of waters on National Forest System Lands. The Forest Service in Region 10 uses Best Management Practices and site-specific prescriptions to meet State of Alaska Water Quality Standards when implementing ground-disturbing activities on National Forest System lands.

Soil and Water Question 1: Are the standards and guidelines for Soil Disturbance being implemented?

The Best Management Practices (BMPs), described in the Soil and Water Conservation Handbook (Forest Service Handbook 2509.22, October 1996), define practices that protect soil and water resources. The Soil and Water standards and guidelines define site-specific measures to protect the resources. These standards and guidelines were monitored following a methodology described in the Tongass Monitoring Strategy. The strategy was developed to provide direction for Tongass Land and Resource Management Plan (Forest Plan) implementation monitoring.

The FY 2007 BMP Monitoring Report provides details on how the monitoring was conducted. Interdisciplinary Team Review trip reports detail individual reviews. These reports are included in the appendix. Additional information on the implementation monitoring is described in Soil and Water Question 3. A summary of the findings for the soil resources relative to disturbance is given below.

BMPs Applicable to Soil Disturbance

BMP 12.17 Revegetation of Disturbed Areas
BMP 13.5 Identification & Avoidance of Unstable Areas
BMP 13.9 Yarding Systems to Protect Soil/Water Resources
BMP 13.10 Landing Location & Design
BMP 14.7/ 14.12 Measures to Minimize Mass Failures/Control of Excavation & Sidecast
BMP 14.18 Control Rock Pit Sediment

Monitoring Context

Planning for some of the roads and units was completed before the Soil and Water Conservation Handbook was revised in October 1996 and new Forest Plan Standards and Guidelines were approved in May 1997. Both documents included many improvements for protecting soil and water resources. Several important changes in the 1996 Soil and Water Conservation Handbook included improving wetlands management direction, considering stream buffer windthrow, and generally making Forest Service BMPs consistent with State Forest Practices Regulations. A number of the units monitored were planned, laid out, and harvested under pre-1997 Forest Plan Standards and Guidelines. The concepts of the Forest Plan standards and guidelines were incorporated into most of these timber sales. Implementation of the Forest Plan standards and guidelines occurred in most of the units.

Monitoring Overview

Reviewing the timber sales and respective environmental documents associated with the monitoring this Fiscal Year, most of the units were harvested under contracts that were included in environmental documents that were signed before the 1997 Tongass Land and Resource Management Plan. The units and roads in the FY 2007 monitoring pool are listed below with their respective environmental impact statement (EIS) and environmental assessment (EA) or contracts. The small sales and public works contracts were all implemented under the Forest Plan Standards and Guidelines.

Soil and Water 1. Units Monitored in FY 2007 through BMP Implementation Monitoring Process

Units	Timber Sale; EIS/ EA (decision year)
597.2-429 1A, 1B, 2	Bucktooth; Control Lake EIS (1998)
597.2-430	Angel TS; Control Lake EIS (1998)
28, 22*	Red Mountain TS, King George EIS (1996)
1A*, 1B*, 2*	Midpoint Salvage TS; Midpoint Salvage Categorical Exclusion (2005)
581-449, 581-420	Luck Lac II TS; Luck Lake EIS (2000)
1	Swing Set TS; Windthrow EA (2003)
1	Yatuk Creek Salvage TS; Yatuk Creek Categorical Exclusion (2003)

111*, 36, 43, 42E	Lindenberg TS; South Lindenberg EIS (1996)

**Monitored by IDT and 100% monitoring groups*

Soil and Water 2. Roads Constructed/ Reconstructed and Monitored in FY 2007 through BMP Implementation Monitoring Process

Roads	Road Contract/ Timber Sale
6235, 6323, 6324, 6316	Lindenberg TS; South Lindenberg EIS (1996)
43500-1*, 43500-2	Lindenberg TS Public Works
8340200*, 8340220*, 8340230*, 8340240*	Buckdance Madder TS; Sea Level EIS (1999)
Roads	**Road Contract/ Timber Sale**
6235, 6323, 6324, 6316	Lindenberg TS; South Lindenberg EIS (1996)

**Monitored by IDT and 100% monitoring groups*

Soil and Water 3. Roads with Culverts replaced for Fish Passage Improvement and Monitored in FY 2007 through BMP Implementation Monitoring Process

Roads	Road Contract/ Timber Sale
2024300 MP 1.984, 1.678, 1.067	Maybeso Bridge Replacement
2083000 MP 1.13*, 3.48*, 4.03*; 3030700 MP 0.627*	Buster Creek Bridge Replacement

**Monitored by IDT and 100% monitoring groups*

Quality Control IDT Monitoring

The IDT monitoring was completed on a stratified random sample made up of more than 10 percent of units and roads monitored during the 100 percent monitoring effort. This IDT monitoring was conducted as a quality control effort on the 100 percent monitoring as well as an effort to conduct interdisciplinary review of the implementation of the standards and guidelines. Further details on the IDT monitoring can be found in the BMP Monitoring Report and individual trip reports in the appendix.

During the IDT review, a number of units and roads were visited in Fiscal Year 2007 as noted by district below:

Petersburg Ranger District: August 28-29, 2007; Lindenberg Peninsula; Lindenberg Timber Sale; unit 111, Tonka LTF and road 43500-1.

Thorne Bay Ranger District: September 6, 2007; Prince of Wales Island; Buster Creek Bridge Replacement Project; MP 1.130, 3.486, 4.033 road 2083000.

Ketchikan Ranger District: September 6, 2007; Revillagio Island; Buck Dance Madder Timber Sale; roads 8340200, 8340220, 8340230, and 8340240.

Wrangell Ranger District: September 24-25, 2007; Etolin Island & Wrangell Island; Red Mountain Timber Sale unit 22, Midpoint Salvage Timber Sale units 1A, 1B, and 2 and Honeymoon LTF.

Monitoring Results

Evaluation of the BMP monitoring for fiscal year 2007 shows that 20 units (14 standard units and 6 salvage units) were in the unit pool, 18 roads/ road segments, including 5 bridge and 1 culvert replacement sites (on 2 roads) as well as 1 bridge removal site. The IDT monitored 5 units (2 units and 3 small savage units), 6 road construction segments including 3 bridge replacements (located on 1 road), one bridge removal and 2 log transfer facilities. The 10% quality control threshold was exceeded through the IDT monitoring in 2007. Of the 444 acres of harvested units monitored through the 100% process; 97.64 acres were monitored by the IDT during the review. Details of the Best Management Practices monitoring reviewed by the Interdisciplinary Teams are included in the IDT trip reports that are included in the appendix.

The monitoring showed that the Tongass National Forest is implementing the Standards and Guidelines for protection of Soil and Water Resources. There were two departures and three corrective actions reported as implemented relative to soil disturbance. The table below illustrates the BMP implementation ratings relative to soil disturbance.

Soil and Water 4. BMPs Implemented: Recorded on Unit and Road Forms

BMPs Applied	Number of Times the BMP was Appropriate for Use	Number of Times Corrective Action Implemented	Number of Departures from Full BMP Implementation
12.17 Revegetation of Disturbed Areas	6	1	0
13.5 Identification & Avoidance of Unstable Areas	8	0	0
13.9 Yarding Systems to Protect Soil/ Water Resources	15	0	0
13.10 Landing Location & Design	14	0	0
14.7/ 14.12 Measures to Minimize Mass Failures/ Control of Excavation & Sidecast	14	0	0
14.18 Control Rock Pit Sediment	14	1	0
Totals	**71**	**2**	**0**

Summary details on the BMP implementation are listed in the BMP Summary Report included in the appendix. In order to comply with the standards and guidelines, corrective actions were taken during timber sale administration although most were not significant enough to be noted on the forms. These corrective actions are also described in the individual BMP trip reports. No departures were noted relative to soil disturbance shows that departure from full BMP implementation.

Corrective actions were noted relative to a few BMPs. On the Lindenberg Public roads project, a corrective action was noted relative to road 43500-1 that was the road segment that extended from MP 1.78 to MP 4.00. There was a minor slide that occurred in the overburden that was excavated from a rock pit. The bared soil was seeded and this action fully implemented BMP 14.18 Control Rock Pit Sediment. On the Bucktooth Timber sale units 1A, 1B & 2 a corrective action was noted relative to seeding disturbed areas of soil that was bared during yarding. This seeding was completed and the action contributed to fully implementing BMP 12.17 Revegetation of Disturbed Areas.

Evaluation of Results

Generally 10 percent quality control monitoring completed by the IDT showed agreement with the monitoring completed by the sale administrators and engineering representatives. Monitoring showed that Best Management Practices (BMPs) were implemented. The numerical rating system that summarizes BMP use, number of departures, and corrective actions worked sufficiently. This numerical rating served to clarify the split between the ratings and help the group rate the BMP implementation more consistently. The numerical rating system facilitated reflecting on the significance of the departure and the impact on the soil, water, and timber resources.

During the IDT monitoring, the group identified strengths associated with BMP implementation and a few BMPs that need continued emphasis.

Identified strengths of BMP implementation relative to soil disturbance included:

BMP 13.5 Identification and Avoidance of Unstable Areas

BMP 13.9 Yarding Systems to Protect Soil/Water Resources

BMP 13.10 Landing Location and Design

Identified emphasis items relative to soil disturbance included:

BMP 14.7/ 14.12 Measures to Minimize Mass Failures/ Control of Excavation & Sidecast

During the IDT review, there was discussion of the importance of limiting side cast on steep slopes and adjacent to streams. The challenge of providing for stream protection as well as soil resources during construction along steep side slopes on roads constructed through linear graded road construction contracts is under review. Recommendations include developing provisions to ensure that streams with buffers are designated in the contract and the buffers are maintained during road construction. Provisions to allow designation of end haul sections as well as sections of road with blasting restrictions due to unstable slopes are also recommended.

The sale administrators and layout crews work to limit blind leads and harvest on unstable slopes. Particularly, they worked to limit soil disturbance and achieve the prescribed suspension. The layout crews and sale administrators deleted over steep areas in the units to limit potential landslide issues particularly in areas where the operator could not achieve the prescribed suspension. In most cases, the over steep areas and areas that show unstable soils were identified prior to the environmental assessment and a soils prescription for the areas was developed. The sale administrators worked with the Timber Management Assistant to implement deferral of the steep portions of the units for helicopter harvest.

Action Plan

Examining trends in the BMP implementation, the construction of roads under linear graded road construction contracts has developed a need for close evaluation of construction on steep side slopes. Much of the steep terrain and unstable terrain has been dropped from units or the trees are harvested with helicopter so there is less concern relative to unstable slopes.

General recommendations on the BMP monitoring process include moving toward a smaller sample set for monitoring. The selection should be based upon random selection and monitoring conducted by an IDT. The district soil scientists need to continue to be involved with the prescription of suspension and harvest limitations in the units relative to defining unstable slopes and concerns related to constructing road on steep slopes. The district specialists should continue to work with the layout and sale administrators on implementation of the Best Management Practices on a routine basis.

Emphasis needs to continue on removing over steep sections and areas that indicate unstable soils from the units and road construction during initial planning, and layout phases. Emphasis needs to be focused on developing provisions so we can utilize linear graded road contracts and implement the BMPs. Emphasis on training people as to the BMPs and the actual reference for the BMPs and form guidelines is necessary. The importance of a strong understating of the BMPs and the mechanism for tracking implementation is necessary to continue integrity in the monitoring program as well as for implementation of the Standards and Guidelines that protect soil and water resources.

Soil and Water Question 2: Are the standards and guidelines effective in meeting Alaska Regional Soil Quality Standards?

Soil and water effectiveness monitoring is completed through monitoring the soil quality standards as described in Forest Service Manual 2554, and is addressed in two parts: 1) Soil Disturbance, and 2) Landslide frequency.

Soil and Water Question 3: Are Best Management Practices being implemented?

The Best Management Practices (BMPs) were monitored on the Tongass National Forest, using guidelines described in the Tongass Monitoring Strategy. The strategy was developed to provide direction for Forest Plan implementation monitoring. An interagency team of representatives from the Forest Service and Alaska Department of Environmental Conservation selected specific BMPs to be monitored, based upon potential risk factors to soil and water resources. Members of the Monitoring and Evaluation Group (IMEG) then reviewed their selection. The BMPs evaluated are included in the Soil and Water Conservation Handbook (Forest Service Handbook 2509.22, October 1996). Soil and water effectiveness monitoring is completed through monitoring the soil quality standards as described in Forest Service Manual 2554, and is summarized in this report.

The BMP implementation monitoring included two distinct efforts: (1) 100 percent monitoring of the units closed out and roads completed, and (2) interdisciplinary team (IDT) monitoring. These monitoring efforts are briefly described in Soil and Water Question 1 and described in more detail in the Tongass Best Management Monitoring Report in the appendix.

BMPs Monitored and Reported

BMP 12.5 Wetlands Protection Measures

BMP 12.6/ 12.6a Riparian Area Designation & Protection/Buffer Zone Design and Layout

BMP 12.7/ 14.5/14.8 Measures to Minimize Surface Erosion

BMP 12.8/ 12.9 Oil Pollution Control Measures

BMP 12.17 Revegetation of Disturbed Areas

BMP 13.5 Identification and Avoidance of Unstable Areas

BMP 13.9 Yarding Systems to Protect Soil/ Water Resources

BMP 13.10 Landing Location and Design

BMP 13.11/ 13.14/ 14.5 Erosion Control Measures for Units & Temporary Roads

BMP 13.16 Stream Channel Protection

BMP 14.6 Timing Restrictions for Construction Activities/ Fisheries Prescription

BMP 14.7/14.12 Measures to Minimize Mass Failures/ Control of Excavation & Sidecast

BMP 14.9 Drainage Control Structures to Minimize Erosion & Sedimentation

BMP 14.14/ 14.17 Design & Installation of Bridges and Culverts

BMP 14.18 Control Rock Pit Sediment

BMP 14.20/ 14.22 Road Maintenance Access Management

BMP 14.26/ 14.27 LTF Surface Erosion Control Plan, Storm Water Pollution Prevention Plan

Monitoring Overview

The monitoring overview section for Soil & Water Question 1 should be referenced for a description of the units and roads monitored. This overview also provides details on the units and roads monitored during the quality control IDT process. Additional information describing the IDT monitoring is included in the appendix in the individual BMP trip reports.

Monitoring Results

Evaluation of the BMP monitoring for fiscal year 2007 shows that 20 units (14 standard units and 6 salvage units) were in the unit pool, 18 roads/ road segments, including 5 bridge and 1 culvert replacement sites (on 2 roads) as well as 1 bridge removal site. The IDT monitored 5 units (2 units and 3 small savage units), 6 road construction segments including 3 bridge replacements (located on 1 road) a bridge removal and 2 log transfer facilities. The 10% quality control threshold was exceeded through the IDT monitoring in 2007. Of the 444 acres of harvested units monitored through the 100% process; 97.64 acres were monitored by the IDT during the review. Details of the Best Management Practices monitoring reviewed by the Interdisciplinary Teams are included in the IDT trip reports that are included in the appendix.

The monitoring showed that the Tongass National Forest is implementing the Standards and Guidelines for protection of Soil and Water Resources in most cases. There were only a few departures from full implementation that were noted involving erosion control at bridge replacement sites. There were some questions raised as to whether the linear graded road construction contracts provided for implementation of the BMPs.

In the cases involving unit layout, corrective actions to modify the unit configuration were implemented during unit layout and sale administration. In a few situations seeding was not completed during the seeding window, but direction to comply with the seeding was conveyed. Action plans were developed to fully implement the BMPs.

The number of times corrective actions were implemented is summarized in the table below as well as departures from full BMP implementation. Corrective actions are actions completed to mitigate situations that occur during implementation. In some cases, corrective action was taken so that the BMP was fully implemented before the unit or road was approved by either the sale administrator or contracting officers representative. In a few cases, the monitoring resulted in action plans being drawn up to complete additional work so the BMPs would be fully implemented.

Soil and Water 5. Summary of BMP Implementation Monitoring for Harvest Units, Roads Constructed/ Reconstructed, Road Segments with Culverts Reconstructed for Fish Passage Improvement

BMPs Applied	Number of Times BMP was Appropriate for Use	Number of Times Corrective Action Noted & Implementation Initiated	Number of Times Departure from full BMP Implementation Noted
12.5 Wetlands Protection Measures	15	0	0
12.6/ 12.6a Riparian Area Designation & Protection/ Buffer Zone Design and Layout	11	0	0
12.8/ 12.9 Oil Pollution Control Measures	30	0	0
12.17 Revegetation of Disturbed Areas	6	1	0
13.5 Identification and Avoidance of Unstable Areas	8	0	0
13.9 Yarding Systems to Protect Soil/ Water Resources	15	0	0
13.10 Landing Location and Design	14	0	0
13.11/ 13.14/ 14.5 Erosion Control Measures for Units & Temporary Roads	10	0	0
13.16 Stream Channel Protection	14	0	0
12.7/ 14.5/ 14.8 Measures to Minimize Surface Erosion	16	4	2
14.6 Timing Restrictions for Construction Activities/ Fisheries Prescription	9	0	0
14.7/ 14.12 Measures to Minimize Mass Failures/ Control of Excavation & Sidecast	14	0	0
14.9 Drainage Control Structures to Minimize Erosion & Sedimentation	9	0	0
14.14/ 14.17 Design & Installation of Bridges and Culverts	16	0	0
14.18 Control Rock Pit Sediment	14	1	0
14.20/ 14.22 Road Maintenance Access Management	6	0	0
14.26/ 14.27 LTF Surface Erosion Control Plan, Storm Water Pollution	11	0	0

Prevention Plan			
	218	**6**	**2**

Corrective Action Summary

Comparison of the data that is summarized in the previous table and the narratives describing the monitoring shows that corrective actions during unit and road planning, design, layout, harvest and construction were implemented in efforts to fully implement the Best Management Practices. Details outlining some of the corrective actions are summarized in below as well as in detailed trip reports.

The corrective actions included;

- seeding overburden disposal area where the soil had slumped
- design of diversion structures in ditches at bridge replacement sites
- seeding for surface erosion control at bridge sites and road construction sites

Departure from Full BMP Implementation Summary

In FY 2007, the corrective actions contributed to the BMP implementation in most cases so there were very few departures from full implementation noted. Departures from full BMP implementation occurred on 2 events on 1 road associated with one bridge replacement contract. A departure was noted relative to BMP 12.7/ 14.5/ 14.8 Measures to Minimize Surface Erosion.

BMP 12.7/ 14.5/ 14.8 Measures to Minimize Surface Erosion was not fully implemented at the bridge replacements at MP 1.13 and 3.48 on road 2083 that were part of the Buster Creek Bridge Replacement project. At the site at MP 1.13, overburden was stacked in a steep slope adjacent to the stream and showed a high potential to ravel into the stream. This would potentially contribute sediment to the class II drainage. At MP 3.48 a departure was noted with a ditch dam that did not provide adequate diversion to water flowing into the class II stream at the bridge crossing. At this site, a class IV stream was not noted during design. In response to the water flowing into the site, the contracting officer representative directed the contractor to grade the ditch to drain away from the stream and install a diversion ditch. The grading and diversion ditch did not fully implement the BMP since the water is still flowing into the class II stream and potentially transporting sediment.

Evaluation of Results

Generally, 10 percent quality control monitoring completed by the IDT was in agreement with the monitoring completed by the sale administrator and engineering representative, and showed that the BMPs were being implemented. The variation occurred in differences of degree of BMP implementation. Evaluation of these ratings shows the sale administrators and contracting officer's representatives were more stringent in their ratings than the IDT and more precise in measuring stream lengths/buffers. There were few inconsistencies in interpretation of how to apply the guidelines and the specific BMPs that the forms were referencing.

During IDT monitoring, the group identified strengths associated with BMP implementation and a few BMPs that need continued emphasis. Identified strengths of BMP implementation included: riparian area designation and implementation of buffers, stream channel protection, identification and avoidance of unstable areas, yarding systems to protect soil and water resources, and landing locations and design.

In the harvest units, continued emphasis is focused on consistent identification of streams and prescription/implementation of protective measures (buffers) as well as avoidance of unstable areas and associated mitigation covering bared soil with vegetative debris and seeding. Emphasis is also being placed on BMPs specific to seeding of roads, and cross drain function. Focus need to be on developing erosion control measures and plans and ensuring the operators plan of operations includes these measures. Oil pollution control measures, and LTF surface erosion control/storm water pollution prevention continue to be practices that require continual effort to implement. Additional details on the emphasis items that contributed to departures can be found in the appendix in the BMP report.

During completion of the roads, continued emphasis is being placed on implementation of BMPs during linear graded road construction. This road construction contracting method provides a list of the culverts and bridge crossings; however, the road is not designed. A group of specialists are working with the engineers to make recommendations to address these concerns. Continued emphasis is also being focused on rock pit sediment control, seeding soil exposed in road cuts, development of the settlement ponds and ditches to minimize transport of sediment at LTF structures.

Focus on the design of the culverts/bridges specific to the site will be emphasized on sites where structures are being replaced or removed. At these sites, detailed survey and investigation should focus on maintaining the original stream course, surface drainage, as well as providing fish passage. The structures and sites should be surveyed after construction completion and the initial high flows to ensure fish passage is provided and surface water is controlled. Particular focus should be placed on minimizing stream turbidity for compliance with State Water Quality Regulations.

Overall, the sale administrators and engineering representatives demonstrated diligence in implementing appropriate protection of the stream courses, as well as prescribed suspension, effective culvert/water bar installation, and limiting sediment transport. The terrain in some of these units was excessively steep, requiring extensive efforts on the part of the sale administrators to implement the BMPs. The sale administrators worked carefully to identify streams missed during the environmental assessments and during layout, and implemented the appropriate stream protection measures.

There were numerous cases where the IDT identified strengths and a few cases of concerns. Brief overview of the situations that related to departures from full BMP implementation is included in the BMP report in the appendix.

Summary

The results show that the Tongass has successfully implemented the Best Management Practices and is continuing to improve on implementing the BMPs as well as documenting the BMP monitoring. Specific details on the situations that were associated with the departures as

well as corrective actions taken in response to efforts to implement the BMPs are detailed in the BMP Summary Report included in the appendix.

Overall, the monitoring showed that the Tongass National Forest is implementing the Best Management Practices successfully. There was general agreement between the 100 percent monitoring effort and the IDT monitoring effort. There were two departures from full BMP implementation noted. These departures involved some instances of site specific related problems associated with placement of excavated material and surface water flow. There problems will be considered more carefully in inspection of these structures and will be addressed in site maintenance.

Work to modify the specifications for linear road construction contracts is ongoing. The current contracts are very flexible and implementation of the BMPs occurs during administration. Considerations for changes in these contracts include providing a map showing stream protection measures and buffers, specifications for ditches, end haul, blasting restrictions, and erosion control.

Generally, the sale administrators and engineering representatives have a strong understanding of the Best Management Practices (BMPs) and work to implement these BMPs on the ground. The sale administrators, engineering representatives, and contracting officer's representatives have responsibilities for implementation of many of the BMPs through the contract administration. Through the hard work and diligent efforts of the sale administrators, engineering representatives and contracting officer's representatives, the BMPs are implemented on the ground.

Action Plans

The IDT monitoring of the Tongass this year shows that the sale administrators, engineering representatives, and contracting officer's representatives are consistently implementing these BMPs fully and monitoring the same criteria as the IDT. This is a trend that has continued to generally improve over the past five years. The departures noted last year identify some focal points for Fiscal Year 2007. Examining the IDT review relative to the departures and emphasis items, evaluation of the data shows that review of a subset of the data could be used to identify if BMP implementation was occurring.

Particular action plans drafted last year and implemented have improved consistency of stream identification and prescription relative to riparian streams as well as water quality streams. A lecture and field training program were conducted across the Tongass to promote consistency in stream classification. Continual emphasis on review of any questionable stream prescriptions and locations should be a focal point of the layout crews.

Field participation by the district soil scientists, hydrologists, and fish biologists throughout the environmental assessment and layout is necessary. Emphasis on detailed field review of contract developed environmental assessment as well as layout is necessary. Numerous of the discrepancies between the environmental documents, layout and timber that could be harvested with maintaining BMP implementation was related to errors or oversights in the contract work.

The IDT recommends focusing on emphasis items rather than the specific rating for the BMP. Follow through on a feedback system has been initiated to get information from monitoring back to the planning, design, layout, and contract preparation groups.

Turbidity Compliance Monitoring

Background: The Clean Water Act establishes regulatory authority for water quality within the Environmental Protection Agency (EPA) and Alaska Department of Environmental Conservation (ADEC). ADEC has established numeric criteria for water quality as Water Quality Standards (ADEC, 1999). The Forest Service must apply Best Management Practices that are consistent with the Alaska Forest Resources and Practices Regulations to achieve Alaska Water Quality Standards. The site-specific application of BMPs, with a monitoring and feedback mechanism, is the approved strategy for controlling nonpoint source pollution as defined by Alaska's Nonpoint Source Pollution Strategy (ADEC, 2000).

Monitoring Context

Stream turbidity monitoring during road construction activity is a simple, low-cost observation of a water quality standard that responds to routine BMP implementation monitoring outlined in the USDA Forest Service Memorandum of Agreement with the Alaska Department of Environmental Conservation (1992). Turbidity is specifically referenced as an erosion control measure in BMP 14.5 Road and Trail Erosion Control Plan which was developed as an administrative and preventative practice. The objective of turbidity sampling is to determine if the erosion control measures are achieving State water quality criteria for turbidity. If turbidity exceeds water quality criteria, corrective action(s) are taken. If turbidity continues to exceed water quality criteria despite corrective actions, the Alaska Department of Environmental Conservation is consulted.

The waters within the Tongass National Forest are classified for multiple beneficial uses (water supply, water recreation, and growth and propagation of fish, shellfish, and other aquatic life and wildlife (Alaska Water Quality Standards 18 AAC 70.020,1999 as amended, 2002). If water bodies are protected for more than one use class, the most stringent water quality criteria for all included use classes apply. The most stringent criteria for turbidity are that samples:

> *"…may not exceed 5 NTU (nephelometric turbidity units) above natural conditions when the background turbidity is 50 NTU or less, and may not have more than 10% increase in turbidity when the natural turbidity is more than 50 NTU, not to exceed a maximum increase of 25 NTU." (AK Water Quality Standards (WQS) Tables, 2006)*

Actual uses for these affected waterways are related to the growth and propagation of fisheries (Alaska Water Quality Standards 18 AAC 70.020(c), Table A, as amended, 2002), therefore a second criteria for turbidity important to the forest management is that samples,

> *"…may not exceed 25 NTU above natural conditions. For all lake waters, may not exceed 5 NTU above natural conditions."*

Monitoring Methods

Turbidity protocols require sampling before construction, within 48 hours of the beginning of construction, and subsequent sampling as necessary. Grab samples and a portable turbidity

meter were used in all cases. Some sites received pre-sampling background data gathering and some received post-impact sampling for several days after construction was completed.

Turbidity measured upstream of the drainage structure site was assumed to reflect natural or background conditions for evaluating the achievement of water quality criteria downstream of the drainage structure where construction has occurred. The difference in the paired upstream and downstream data is evaluated against the State water quality criteria standard that compares the disturbed site data against the natural conditions. By collecting both upstream and downstream data in the same period, natural variations in the turbidity due to precipitation, stream flow and upstream events are accounted.

Site conditions play a substantial role in determining the nature of the turbidity readings. Stream discharge varies depending upon the bed load deposits, channel shape, stream size, and drainage area. The turbidity measured in the grab samples varies with the amount of fines in the channel and the flow.

Turbidity is measured in nephelometric turbidity units (NTUs). Turbidity increases occur in response to natural channel processes as well as forest management activities. Spikes in turbidity levels may be due in part to increased precipitation, level of flow, changes in watershed conditions or construction/ timber harvest. Measuring changes in turbidity with grab samples only reflects the conditions of the stream at the time the sample was collected.

Monitoring Results

Nine new or replaced drainage structures were monitored in FY 2007 per criteria for turbidity monitoring protocol (*Tongass National Forest Turbidity Monitoring Protocols, as revised, 2004*). Five of these structures were new bridges and culverts installed on a road during construction. Four of the structures were identified in the road condition survey process and prioritized for replacement. The construction and replacement of culverts to improve fish passage frequently involves multiple phase construction of structures designed to provide fish passage. Diversion of water flow or “dewatering” from the immediate zone of construction, through cofferdams and diversion pipes is typically required. The stream gradients are then constructed specifically to provide fish passage. The stream banks are reconstructed to near their original contours.

Consultations with ADEC occurred at each site where turbidity levels were elevated and no violations of the State Water Quality standards were issued. One of the nine sites may have exceeded the water criteria for short periods of time during construction but the turbidity cleared as shown in the next sample taken 39 hours later. The data shows that the water quality returned to less than 5 NTUs in most cases shortly after construction completion.

In 2007 turbidity grab samples were only collected on two construction projects; Lindenberg Timber Sale Road Project and Maybeso Bridge Replacement Project. On the Lindenberg Project on Petersburg Ranger District 5 sites were monitored utilizing the turbidity monitoring protocol and 4 other sites were slated to be monitored; however, the sites were dry during construction. On the Maybeso Bridge Replacement project 4 sites were monitored. Details about these sites and a summary of the data are included in the Appendix. One site located on road 2024300 at MP 1.678 on the Maybeso project showed an incidental period where the 5 NTU criteria were exceeded. All sites met the 5 NTU criteria within 48 hours.

Evaluation of Results

Turbidity data reported in FY 2007 demonstrates compliance with State water quality criteria. Compliance was achieved in a period less than 48 hours after construction was initiated to a short period following construction completion. The increased turbidity appears to be an incidental occurrence in response to in stream activity and the turbidity dissipated following the in stream work. The nine sites met the State Water Quality Standards following the end of construction once the fines generated during in stream work were dissipated.

Conclusion:

- There were no violations of state water quality standards for turbidity issued by the State. The Forest responded to temporary exceedances with corrective actions and consultation with ADEC according to our MOA.
- The Forest will continue dialogue with ADEC and EPA on the application of numeric turbidity criteria and appropriate corrective actions and monitoring protocols.
- The grab sample turbidity monitoring is serving as a useful monitoring tool to indicate to the contracting officer's administrators when corrective action to reduce turbidity is necessary during construction of complex fish passage structures.

Action Plans

Continued turbidity monitoring for compliance with the BMP 14.5 requiring erosion Plans for construction activities is recommended. We intend to use the grab sample turbidity monitoring to indicate compliance with the State Water Quality Standards. Continued emphasis is necessary to follow the protocol in collecting up stream and down stream samples is necessary. Focus on collecting samples that show recovery of the site following construction end is imperative. Additional training and focus on inspection and monitoring of the fish passage improvement sites is recommended.

The elevated turbidity levels documented at numerous sites typically recovered to background levels within 48 hours. At the sites where this did not occur, additional mitigation was applied to decrease the turbidity levels. Recommendations follow to tighten the contract provisions for the specification of backfill and application of mitigation measures in response to the compliance turbidity monitoring made in 2004 were developed in 2005 and then implemented. As mentioned above, dialogue with ADEC and EPA on the application of numeric turbidity criteria and appropriate corrective actions and monitoring protocols will continue.

Soil and Water Question 4: Are Best Management Practices effective in meeting water quality standards?

Goal: Maintain and restore the biological, physical, and chemical integrity of Tongass National Forest waters.

Objective: Attain State of Alaska water quality standards forest-wide.

Background: The Clean Water Act establishes regulatory authority for water quality within the Environmental Protection Agency (EPA) and Alaska Department of Environmental Conservation (ADEC). ADEC has established numeric criteria for water quality as Water

Quality Standards (ADEC 2003). The Forest Service must apply Best Management Practices that are consistent with the Alaska Forest Resources and Practices Regulations to achieve Alaska Water Quality Standards. The site-specific application of BMPs, *with a monitoring and feedback mechanism*, is the approved strategy for controlling nonpoint source pollution as defined by Alaska's Nonpoint Source Pollution Strategy (ADEC 2000).

Attainment of state water quality standards is a specific Forest Plan objective driving the Aquatic Synthesis. Continuous water quality and stream stage (water depth) instruments have been installed in a set of three case study watersheds (Thompson 2007) to monitor stream turbidity and temperature as Forest Plan implementation proceeds.

Monitoring Results and Evaluation

We are within a calibration period for evaluating reference water quality in the case study watersheds. Results and evaluation presented in this report should be considered provisional and subject to revision as additional data are collected and analyzed.