Monitoring and Evaluation Guidebook

For the

Tongass Land and Resource Management Plan

Version 05.0
(Show edits)

2005

Tongass National Forest
USDA Forest Service

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Introduction  NEW sections added

Monitoring and evaluation is a quality control process for implementation of the Tongass Forest Plan. It is an essential feedback mechanism within an adaptive management framework to keep the Forest Plan responsive to changing conditions and emerging information. Monitoring is gathering information and observing results of management activities. Evaluation is a process for interpreting this information and determining whether changes in management direction are needed.

Chapter 6 of the Forest Plan outlines a general approach for monitoring and evaluation. Forty- two monitoring questions are listed, with estimated annual costs, evaluation criteria, general sampling methods, and applicable statutory regulations. This Monitoring Protocols Guidebook provides specific direction on how each monitoring question is addressed. It is a document that is meant to be updated with the latest, most timely procedures, an as such must be considered in it's most current version as the latest information available.

Definitions and Key Divisions 

Definitions of the key divisions are necessary for cross comparison of monitoring methods and data throughout this Guidebook. Symbols are provided to highlight the particular emphasis within each question.

 **Goals and Objectives** Strategic planning milestones relating the monitoring questions to discrete aspects of the Forest Plan.

 **Forest Plan Monitoring Questions** The Forest Plan monitoring questions appear at the beginning of the Guide, and are hyperlinked to the individual sections. Their order parallels how they are considered in the Annual Monitoring Report, which is also web-based and bookmarked in a similar style.

 **Background** Any background material significant to the monitoring question is addressed at the beginning of each section.

 **Data Collection/Methods** Discussions of sampling strategy and the technical aspects of monitoring methods are discussed in this section.

 **Evaluation Criteria** Evaluation of monitoring methods, including the precision and reliability of measures used in the data collection..

 **Results** Discussion of how the data are to be portrayed and formatted.

 **Analysis** Discussion about how the data are to be analyzed, evaluated and applied.

 **References Cited** Books, reports, and journal articles pertinent to the methods and analysis are located after each the monitoring question discussion..

How to Navigate through this Guidebook

The easiest way to navigate through the guidebook is by monitoring question and topic through the use of links in the Table of Contents. For example select Biodiversity by clicking it, or by clicking Biodiversity Question 3. Each of the questions is listed below in a grid and clicking on the question will take you to that portion of the Guidebook. Searching is also available in Word by using the Find feature for the following keywords: **monitoring question, background, methods, evaluation, analysis, results, and references** and by the symbols as noted above.

Interagency Monitoring and Evaluation Group Collaborators

Monitoring procedures presented in this guidebook were developed by an Interagency Monitoring and Evaluation Group (IMEG) which consists of representatives from the following State and Federal agencies:

- United States Environmental Protection Agency
- United States Department of Agriculture, Forest Service, Alaska Region, Pacific Northwest Research Station
- United States Department of Agriculture, Forest Service, Washington Office, Inventory and Monitoring Institute
- United States Department of the Army, Corps of Engineers
- United States Department of Commerce, National Marine Fisheries Service
- United States Department of the Interior, Fish and Wildlife Service, Alaska Region
- Alaska Department of Fish and Game
- Alaska Department of Natural Resources
- Alaska Department of Environmental Conservation

A Memorandum of Understanding establishes the tenets of the group and outlines their established cooperative philosophy, including assisting in the development and review of Forest monitoring procedures and collaboration and cooperation in the maintenance of monitoring and evaluation of the implementation procedures called for in the Tongass Forest Plan.

To contact IMEG contributors in the agencies listed above, please click on this symbol

Updated from Call Letter instructions document, 2004

List of Monitoring Questions and Designated Specialists

Monitoring Question	Responsible Staff	Designated Authors and Specialists
Air Quality		
Is air quality meeting State and Federal ambient air quality Standards?	Scott Snelson	Steve Paustian Patti Krosse Karen Dillman
Biodiversity		
1 Are contiguous blocks of old growth habitat being maintained in a forest-wide system of old growth reserves to support viable and well distributed populations of old growth associated species and subspecies?	Scott Snelson	Steve Fadden Linn Shipley Cynthia Sever Glenn Cross
2 Are the effects on biodiversity consistent with those estimated in the Forest Plan?	Scott Snelson	Steve Fadden Linn Shipley Glenn Cross
3 Are management practices consistent with current knowledge regarding sensitive species conservation (federally listed threatened or endangered species, Alaska Region sensitive species, and State species of special concern)?	Scott Snelson	Steve Fadden Linn Shipley
4 Are destructive insect and disease organisms increasing to potentially damaging levels following management activities?	Charley Streuli	Jim Russell

Monitoring Question	Responsible Staff	Designated Authors and Specialists
Fish Habitat		
1 Are population trends for Management Indicator Species (MIS) and their relationship to habitat changes consistent with expectations?	Scott Snelson	Dick Aho Buck Bryant Ron Medel
2 Are fish and riparian Standards and Guidelines being implemented?	Scott Snelson	Steve Paustian Dick Aho Carol Seitz Warmuth Dan Kelliher
3 Are fish and riparian Standards and Guidelines effective in maintaining or improving fish habitat?	Scott Snelson	Dick Aho Dan Kelliher John McDonell
Heritage Resources		
1 Are heritage resources Standards and Guidelines being implemented?	Scott Fitzwilliams	Mark McCallum Vice John Autrey
2 Are heritage resources Standards and Guidelines effective in protecting heritage/cultural resources as expected in the Forest Plan?	Scott Fitzwilliams	Mark McCallum Vice John Autrey
Karst and Caves		
1 Are karst and cave Standards and Guidelines being implemented?	Scott Fitzwilliams	Jim Baichtal
2 Are karst and cave Standards and Guidelines effective in protecting the integrity of significant caves and the karst landscape?	Scott Fitzwilliams	Jim Baichtal

Monitoring Question	Responsible Staff	Designated Authors and Specialists
Land Management Planning		
Is the management of National Forest System lands consistent with management objectives of adjacent lands and their management plans?	Larry Lunde	Rick Abt
Local and Regional Economies		
1 Are the effects on employment and income similar to those estimated in the Forest Plan?	Larry Lunde	Rick Abt
2 Has the Forest Service worked with local communities to identify and pursue Rural Community Assistance opportunities?	Dennis Neill	George Doyle
Minerals and Geology		
Are the effects of mining activities on surface resources consistent with Forest Plan expectations, as allowed in approved Plans of Operations?	Scott Fitzwilliams	Jim Baichtal
Recreation and Tourism		
1 Are areas of the Forest being managed in accordance with the prescribed Recreation Opportunity Spectrum (ROS) class in Forest-wide Standards and Guidelines?	Scott Fitzwilliams	Lynn Kolund
2 Is Off Road Vehicle (ORV) use causing, or will it cause, considerable adverse effects on soil, water, vegetation, fish and wildlife, visitors or cultural and historic resources of the Forest?	Scott Fitzwilliams	Lynn Kolund Bill Tremblay
Research		
Have identified high-priority information needs been fulfilled?	Larry Lunde	Rick Abt

Monitoring Question	Responsible Staff	Designated Authors and Specialists
Scenery		
Are the Standards and Guidelines effective in attaining the adopted Visual Quality Objectives established in the Forest Plan?	Scott Fitzwilliams	Dom Monaco John Short
Soil and Water		
1 Are the Standards and Guidelines for soil disturbance being implemented?	Scott Snelson	Vice Everett Kissinger Steve Paustian Carol Seitz Warmuth
2 Are the Standards and Guidelines effective in meeting Alaska Regional Soil Quality Standards?	Scott Snelson	Vice Everett Kissinger Steve Paustian
3 Are Best Management Practices being implemented?	Scott Snelson	Vice Everett Kissinger Steve Paustian Carol Seitz Warmuth
4 Are Best Management Practices effective in meeting water quality Standards?	Scott Snelson	Steve Paustian Carol Seitz Warmuth Julianne Thompson
Subsistence		
Are the effects of management activities on subsistence users in rural Southeast Alaska communities consistent with those estimated in the Forest Plan?	Scott Snelson	Dave Johnson Steve Fadden

Monitoring Question	Responsible Staff	Designated Authors and Specialists
Timber		
1 Are timber harvest activities adhering to applicable timber management Standards and Guidelines?	Charley Streuli	Jim Russell
2 Are harvested forest lands restocked within five years following harvest?	Charley Streuli	Jim Russell Cynthia Sever Karen Iwamoto
3 Is the Allowable Sale Quantity (ASQ) consistent with resource information and programmed harvest?	Charley Streuli	Dave Fletcher Rick Abt Duane Fisher Glenn Cross
4 Are the Non-Interchangeable Components (NIC) of the allowable sale quantity consistent with actual harvest?	Charley Streuli	Dave Fletcher Rick Abt Duane Fisher Glenn Cross Karen Iwamoto
5 Is the proportional mix of volume in NIC I and NIC II as estimated in the Forest Plan accurate?	Charley Streuli	Dave Fletcher Duane Fisher Glenn Cross
6 Should maximum size limits for harvested areas be continued?	Charley Streuli	Jim Russell Duane Fisher Glenn Cross
Transportation		
Are the Standards and Guidelines used for forest development roads and Log Transfer Facilities effective in limiting the environmental effects to anticipated levels?	Larry Dunham	Michele Parker (LTF) Jack Oien Dan McMahon Vaughn Hazel

Monitoring Question	Responsible Staff	Designated Authors and Specialists
Wetlands		
1 Are wetlands Standards and Guidelines being implemented?	Charley Streuli	Carol Seitz Warmuth Patti Krosse
2 Are wetlands Standards and Guidelines effective in minimizing the impacts to wetlands and their associated functions and values?	Charley Streuli	Patti Krosse
Wild and Scenic Rivers		
1 Are Wild, Scenic, and Recreational River Standards and Guidelines being implemented?	Scott Fitzwilliams	Lynn Kolund
2 Are Wild, Scenic, and Recreational River Standards effective in maintaining or enhancing the free flowing conditions and outstandingly remarkable values at the classification level for which the river was found suitable for designation as part of the National Wild and Scenic River System?	Scott Fitzwilliams	Lynn Kolund
Wilderness Areas		
1 Are Standards and Guidelines for the management of wilderness being implemented?	Scott Fitzwilliams	Lynn Kolund
2 Are Standards and Guidelines for the management of wilderness effective in maintaining the wilderness resource?	Scott Fitzwilliams	Lynn Kolund

Monitoring Question	Responsible Staff	Designated Authors and Specialists
Wildlife		
1 Are population trends for Management Indicator Species (MIS) and their relationship to habitat changes consistent with expectations?	Scott Snelson	Steve Fadden Linn Shipley
2 Are the population levels and associated distribution of mammalian endemic species on islands and portions of the mainland consistent with the estimates in the Forest Plan?	Scott Snelson	Steve Fadden Linn Shipley
Costs and Outputs		
1 What outputs were produced in the previous year?	Vice Virginia Nichols	Michele Canik Ester Bingham
2 Are the costs associated with carrying out the planned management prescriptions (including those of producing outputs) consistent with those costs estimated in the Forest Plan?	Vice Virginia Nichols	Michele Canik Ester Bingham

AIR QUALITY

Added graphics and icons to each section

Goal: Maintain the current air resource condition to protect the Forest's ecosystems from on and off Forest air emissions sources. **Objective**: Attain national and state ambient air quality standards Forest-wide.

Background: The air quality is addressed Forest-wide, but the actual monitoring takes place at one or more monitoring sites within local air sheds where there are known or suspected air quality problems. For example, Tracey Arm monitoring has been ongoing to examine cruise ship impacts to air quality. Refer to ``Juneau Air Quality Monitoring Project, Mendenhall Valley data Summary, January 1985-December 1995'' published by the Alaska Department of Environmental Conservation, January 31, 1996.

Air Quality Question: Is air quality meeting State and Federal ambient air quality standards?
(Removed Estimated Cost sections from each topic as per instruction from Carol SW)

Data Collection: List air quality data summaries from current monitoring sites, including several in Juneau's Mendenhall Valley (for particulate matter, measured as PM-10 and PM-2.5), (Added per Steve Paustian:Tracey Arm wilderness to monitor cruise ship emissions, ambient air quality monitoring as part of the Green's Creek Mine permit requirements, and monitoring past sites in Ketchikan and Sitka (for PM-10 and SO 2). Potential future sites include Ketchikan and Sitka (for PM-2.5).

(Lichen biomonitoring is used for the purpose of long-term trend monitoring of global emission sources. Lichen plots were marked in the center with an aluminum stake, an epiphytic lichen community survey was conducted, and lichens were collected for elemental analysis. The community survey and elemental analysis are used in conjunction to detect changes in air quality. Lichen species sensitive to certain pollutants disappear first before the more tolerant species. The lichen tissue collected at each plot will be analyzed at the University of Minnesota Analytical Lab for the following elements: nitrogen, sulfur, phosphorus, potassium, calcium, magnesium, sodium, aluminum, iron, manganese, zinc, copper, boron, lead, nickel, chromium, cadmium, molybdenum, silicon, titanium, beryllium, strontium, rubidium, lithium, vanadium, and barium. One of the differences in this current monitoring effort compared to the work done in 1989-1990 is that baseline data on nitrogen will be obtained along with the additional trace elements from Wilderness Areas across the Forest. The original Tongass baseline monitoring did not include nitrogen (Geiser et al. 1994).

During this sampling effort Alectoria sarmentosa, Hypogymnia duplicata, Hypogymnia enteromorpha, Platismatia glauca and Lobaria oregana were collected as target lichen species for elemental analysis. Most of these species were also collected in 1989-1990. Next year we will continue this work and place at least two air quality monitoring plots in each of the remaining Wilderness Areas on the Tongass National Forest.

Revisits of existing plots (13 in six wilderness areas) that had been established in 1989 and 1990 and the establishment of new lichen air quality monitoring plots (17 in six wilderness areas). In 2003 two air quality plots were established in one Wilderness Area. There are a total of 30 permanent air quality monitoring plots in 11 Wilderness Areas on the Tongass (Table 1). The Wilderness Areas with new air quality monitoring plots were chosen to help wilderness manager's meet BEFS requirements for air quality monitoring. Added per work of Karen Dillman as provided by Patti Krosse).

 **Evaluation Criteria:** Changes in meeting State and Federal ambient air quality standards.

The range of acceptable results is generally defined as attainment of ambient air quality standards based on the most recent monitoring data (i.e. not based solely on attainment or non-attainment designation status). However, the evaluation of non-attainment areas should also consider other factors including, but not limited to:

- The magnitude, frequency, and duration of any measures that exceed of the standards.
- The potential effects of the measures that exceed on Forest users and Forest resources.
- The extent to which Tongass National Forest management actions contribute to measures that exceed the standards. (Revised 2002-CSW

Precision and Reliability: Per ADEC and EPA regulations, guidance, and site specific monitoring plans. Units of measure vary by pollutant, but generally are expressed as unit mass per unit volume per unit time.

(Air quality monitoring in Tracy Arm has met with mixed success. Measuring opacity in the area is challenging due to the monitoring protocols requiring the ship to be stationary in relation to the location of the sun. At the current level of use by cruise ships, air opacity is believed to be acceptable in this scenic glacial fiord. Increases in cruise ship traffic could reduce the opacity. We may have to modify the existing protocols or develop another one that is geared to measuring moving ships and different sun positions. Added from 2003 Monitoring Summary)

 **Results:**

- Tabulate ambient air quality summaries from current monitoring sites; including several sites in Juneau's Mendenhall Valley (for particulate matter, measured as PM-10 and PM-2.5) and past sites in Ketchikan and Sitka (for PM-10 and SO 2).
- List any non-attainment areas, estimate the Tongass National Forest acreage affected.
- Briefly summarize the most recent ADEC data trends.

 **Analysis:**

- Evaluate the ambient air qualities and determine if the air quality on the Tongass National Forest is meeting the ambient air quality standards.
- Discuss the most recent ADEC ambient air quality trends relative to the Tongass National Forest ambient air quality at five year intervals and lichen bio-monitoring at ten year intervals.
- Report results in the annual monitoring reports as well as in the first year, fifth year, tenth year and fifteenth year monitoring and evaluation reports.

Table 1. Summary of Permanent Air Quality Monitoring Plots of the Tongass.
(Table was added from 2003 Dillman report)

Wilderness Area	Number of old plots revisited	Number of new plots established
W. Chichagof	4	
S. Baranof		4
Tracy Arm/Fords Terror		2
Chuck River		3
Stikine/LeConte	3	3
S.Kuiu		2
Tebenkof	1	1
Petersburg Creek	2	
Karta Lake	1	
S. Etolin		2
Pleasant Island	2	
Totals	13	17

BIODIVERSITY

Goal: Maintain healthy forest ecosystems; maintain a mix of habitats at different spatial scales (i.e., site, watershed, island, province, and forest) capable of supporting the full range of naturally occurring flora, fauna, and ecological processes native to Southeast Alaska. **Objectives**: Maintain a Forest-wide system of old-growth-forest habitat (includes reserves, non-development land use designations, and beach, estuary and riparian corridors) to sustain old-growth-associated species and resources. Ensure that the reserve system meets the minimum size, spacing and composition criteria described in Appendix K of the Forest Plan. Provide sufficient habitat to preclude the need for listing species under the Endangered Species Act due to habitat conditions on National Forest lands.

Background: Two coarse-filter approaches are to monitor Forest biodiversity. The first focuses on the spatial distribution and composition of old-growth reserves and the cumulative harvest of old-growth timber by biogeographic province. It is assumed that the GIS database will be measured using a current layer. The second examines emerging information concerning sensitive species conservation on the Forest.

Biodiversity Question 1: Are contiguous blocks of old-growth habitat being maintained in a forest-wide system of old-growth reserves to support viable and well-distributed populations of old-growth-associated species and subspecies?

Data Collection: Collect the following data on an annual basis

Large Reserves:

- Use GIS to measure the contiguous size in acres of each large reserve.
- Use GIS to measure the distance in miles of each large reserve and its nearest neighboring large reserve.
- Use GIS to measure the total area in acres of productive old-growth timber by Volume Class within each large reserve using TIMTYP & CLU (common land unit) land base to define the low volume, medium volume and high volume strata (see Julin & Caouette, 1997.)
- Count the number of large reserves within the range of brown bears that do not include at least one Class I anadromous fish streams.

Medium Reserves:

- Use GIS to measure the contiguous size in acres of each medium reserve.
- Measure the distance in miles of each medium reserve and its nearest neighboring medium or large reserve.
- Measure the total area in acres of productive old-growth timber by Volume Class within each large reserve.

Small Reserves:

- Exclude VCUs containing less than 800 acres of productive-old-growth timber from this analysis.
- Combine VCUs split by decimal extensions (e.g., 597.1 and 597.2).
- Measure contiguous areas of productive-old-growth timber within each VCU.

- Calculate the number of acres of productive-old-growth timber by Volume Class equal to 8 percent of each VCU.

 **Evaluation Criteria**: Changes in the system of large, medium, and small habitat reserves identified and mapped in the Forest Plan as part of a forest-wide old-growth habitat reserve strategy.

The reserve system established by the Forest Plan consists of 38 large reserves, 112 medium reserves, and approximately 237 small reserves. While the locations and boundaries of large and medium reserves are expected to remain largely unchanged for the life of the Forest Plan, criteria for small reserves are more flexible and allow for changes. The basic criterion is that each Value Comparison Unit (VCU) should contain the equivalent of at least one small reserve. Because of the one-reserve-per-VCU guideline, monitoring whether the reserve system meets size, spacing, and composition criteria is slightly more complicated than simply checking each reserve. Medium and large reserves are handled this way, but the appropriate way to monitor the status of the small reserve system is to examine each VCU to ensure that it contains at least one small reserve (or its equivalent in non-development land use designations).

Precision and Reliability: Needs to be written.

 **Results:**

Large Reserves

Utilizing GIS analysis:

- List large reserves that are less than 40,000 acres.
- List large reserves that are more than 20 miles from their nearest-neighboring large reserve.
- List large reserves that have less than 20,000 acres of productive-old-growth timber.
- List large reserves that have less than 10,000 acres of high-volume timber.
- List large reserves that are within the range of brown bear that do not have at least one Class I anadromous fish stream.
- Tabulate the productive old-growth composition by Volume Strata (low, medium, high)

Medium Reserves

Utilizing GIS analysis:

- List medium reserves that are less than 10,000 acres.
- List medium reserves that are more than 8 miles from their nearest medium or large reserve.
- List medium reserves with less than 5,000 acres of productive-old-growth timber. List medium reserves with less than 2,500 acres of high-volume timber.
- Tabulate the productive old-growth composition of Volume Strata.

Small Reserves

Utilizing GIS analysis:

- List VCUs with less than 8 percent productive-old-growth timber.
- List very large VCUs 15,000 acres with a productive-old-growth-timber reserve of less than 800 acres.
- Tabulate the productive old-growth composition of Volume Strata (low, medium,high).

 **Analysis:** Explain any deviations from size, spacing, and composition requirements (reserves listed above) for the entire reserve system. The expectation is that the reserve system will meet these requirements; however deviations are both acceptable and were, in some cases, a part of the original Forest Plan reserve system.

The following questions should be addressed if the reserve requirements are not met:

- Did the same reserve/VCU meet the requirements last year?
- Is the change due to management action (reference NEPA documentation), natural causes, encumbrance or inventory updates?
- Will reserve system be altered in response to these changes?
- Were requirements not met in areas where endemic mammals occur?
- In addition, any changes to the reserve system during the previous fiscal year should be documented in the annual report, along with a copy of the updated LUD map. Describe trends in composition in resource system since the Forest Plan was implemented. If the previous year is report recommended changes to the reserve system, the following year's report should document whether those changes were made.

 **Biodiversity Question 2: Are the effects on biodiversity consistent with those estimated in the Forest Plan?**

 **Data Collection:** Using GIS to measure the cumulative harvest of old growth forest by biogeographical province.

 **Evaluation Criteria:** Cumulative harvest of old growth should be less than or equal to planned harvest.

Precision and Reliability: All variables examined and the resulting evaluation, should provide medium to high precision and medium to high reliability. High precision is due to sampling of a database that includes data that is carefully maintained. Reliability is tempered by sources of error and bias that include reserve and LUD mapping errors, limitations of resource inventories, and delay in detecting and incorporating resource changes due to natural causes. Though these sources of error and bias reduce reliability, most should be improved or eliminated during the life of the Forest Plan.

 **Results:** Tabulate the cumulative harvest of old-growth forest by biographical province by low, medium, high volume strata for each biographical province.

 **Analysis:**

- Compare levels of cumulative timber harvest with planned harvest (see Table 3-5, FEIS) by biographical province.
- Comment on instances where actual harvest has or may exceed the 10-year planned harvest projections. *(See Table 3-5 from TLMP FEIS)*
- Relate changes in the old-growth forest to changes in biodiversity.(Added in 2002).

Table 2. Productive old-growth forest planned for harvest by Biogeographic Province by alternative (1)

Productive old-growth forest planned for harvest by Biogeographic Province by alternative																					
Alternatives and Percent Cumulative Harvest After Decades 1 and 10																					
Unit	Current [2] (1995)	1		2		3		4		5		6		7		9		10		11	
		1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10	1	10
1	6	6	6	6	13	6	7	6	8	6	8	6	12	6	13	6	23	6	13	6	7
2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
3	10	10	10	12	33	12	24	11	29	11	29	12	30	13	37	13	36	12	28	1	21
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0
5	11	11	11	14	32	12	20	11	28	11	28	12	32	14	38	14	39	13	24	12	22
6	7	7	7	9	16	7	10	7	16	7	18	8	15	8	15	8	16	8	11	7	10
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	3	3	3	4	12	3	5	3	9	3	9	4	11	4	12	4	11	3	6	3	7
9	<1	<1	<1	4	16	1	10	1	8	<1	8	4	15	5	24	4	19	1	14	2	8
10	9	9	9	12	40	10	35	10	38	10	36	14	37	12	48	12	41	11	36	11	8
11	8	8	8	11	34	12	29	10	31	10	31	11	32	11	41	12	37	12	33	11	23
12	2	2	2	5	11	5	9	4	10	4	10	4	11	7	19	6	13	5	10	5	12
13	13	13	13	16	35	14	29	14	31	14	32	14	33	19	49	16	37	14	32	14	28
14	24	24	24	27	49	25	40	24	45	24	41	25	41	27	56	27	54	25	42	25	37
15	6	6	6	9	25	9	19	7	24	7	23	9	24	12	36	9	28	9	21	7	16
16	11	11	11	14	24	12	18	12	22	12	22	12	22	14	31	15	33	12	19	12	18
17	1	1	1	2	9	1	4	1	6	1	4	2	6	8	47	9	53	2	4	1	3
18	1	1	1	6	27	5	16	4	23	4	23	7	26	7	39	7	36	6	19	4	16
19	1	1	1	1	2	1	2	1	2	1	2	1	2	1	3	1	2	1	2	1	2
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	3	3	3	5	9	4	7	3	8	3	7	4	8	5	10	5	9	4	8	4	8

[1] All figures represent the cumulative harvest of productive old-growth forest to the end of the period specified (present cumulative harvest, and at the end of one decade and ten decades of alternative Forest Plan implementation), expressed as a percent of 1954 productive old-growth. (Estimated acreages of old-growth harvest are contained in the Planning Record.)

[2] From Table 3-4.

Biodiversity Question 3: Are management practices consistent with current knowledge regarding sensitive species conservation (federally listed threatened or endangered species, Alaska Region sensitive species, and State species of special concern)?

Data Collection:

- Annually review files and recent information regarding sensitive taxa on the Tongass National Forest. Consult with other agencies regarding these species and whether species should be added or deferred from the Region 10 sensitive species list.

Evaluation Criteria: Changes in habitat and population trends for threatened, endangered, and sensitive listed taxa.

Precision and Reliability: Dependent upon the precision and reliability are dependent upon the precision and reliability of the data collection methods used by the Forest Service and other agencies in monitoring threatened, endangered, and sensitive listed species.

 **Results:**

Annually, a report will be prepared, including:

-Number of acres by habitat type actually affected by Forest management activities (may also include percentage changes).

-Changes in population numbers (if available) to determine if trends become apparent over time.

-Number of Biological Evaluations (BE) completed (signed and submitted) in the previous fiscal year. Summarize determination results of BEs, i.e. number of BEs with “no effect” determinations, number of BEs with “not likely to adversely affect” determinations, number of BEs with “likely to adversely affect”, number of BEs with “no impacts” determinations (Sensitive listed species), number of BEs with “beneficial impacts” determinations (Sensitive listed species), number of BEs with “may impact individuals but not likely to cause a trend to federal listing or a loss of viability” or “likely to result in a trend to federal listing or a loss of viability” determination.

-Summarize results of any biodiversity effectiveness monitoring completed in the previous fiscal year.

-Report the results of any consultations with ADF&G and USFWS under the MOU with those agencies.

-Identify if other agencies have been consulted about whether to add or defer species to or from the Region 10 sensitive species list.

-As a result of the analyses above, report determinations for any need to change or modify (adaptive management) Forest Plan Standards and Guidelines.

 **Analysis:**

- Display acres of habitat type affected by Forest management activities on a spreadsheet; data available from GIS and the resource group responsible for the change.
- Display population numbers (if available) on a spreadsheet and determine trends (up, down, stable).
- Count the number of Biological Evaluations (BE) completed (signed and submitted) in the previous fiscal year. This number will also be reported in the Wildlife, Fisheries, and Rare Plant (WFRP) report. Count the number of determinations in each category for all BEs.
- Analyze any biodiversity effectiveness monitoring completed in the previous fiscal year.

- Map invasive species inventory and monitoring data in GIS. Evaluate map and tabular data of management programs that are in progress to assess status.

(portions of section deleted and re-written by Linn Shipley, 2004).

 **Biodiversity Question 4 Insects and Disease Organisms: Are destructive insects and disease organisms increasing to potentially damaging levels following management activities?**

 **Background:** Focus Monitoring on historical monitoring

 **Data Collection:** Review information from the annual Alaska Region report: ``Forest Insect and Disease Conditions in Alaska."

 **Evaluation Criteria:** Identify and quantify areas where insects or disease are occurring.

Precision and Reliability: The precision and reliability is dependent upon the precision and reliability of the data collection methods used to determine insect and disease levels.

 **Analysis:** Address implications of the Forest Insect and Disease Conditions in Alaska report concerning destructive insects and disease following management activities.

 **Results:** Summarize the annual Forest Insect and Disease Conditions in Alaska report.

FISH HABITAT

Goal: Maintain or restore the natural range and frequency of aquatic habitat conditions on the Tongass National Forest to sustain the diversity and production of fish and other freshwater organisms. **Objectives:** Use baseline fish habitat objectives as identified in the Fish Forest-wide Standards & Guidelines to evaluate the relative health or condition of riparian and aquatic habitat. Design and implement an average of 16 fish habitat improvement projects annually across the Forest.

Background: Fish and the aquatic resources on the Tongass National Forest provide major subsistence, commercial, sport fisheries, and traditional and cultural values. Abundant rainfall, streams with glacial origins and watersheds with high stream densities provide an unusual number and diversity of freshwater fish habitats. These abundant aquatic systems of the Tongass provide spawning and rearing habits for the majority of fish produced in Southeast Alaska. Maintenance of this habit, and associated high quality water, is a focal point of public, State and Federal natural agencies, as well as user groups, Native organizations and individuals.

Fish Habitat Question 1: Are population trends for Management Indicator Species (MIS) and their relationship to habitat changes consistent with expectations?

Background: Protocol determines population trends for resident Dolly Varden and Cutthroat Trout. Monitoring Dolly Varden char and Cutthroat trout is recommended as a package as they often reside together in our streams and can both be sampled by similar methods. Occasionally, only Dolly Varden or Cutthroat trout will be found in a stream.

Data Collection:

Population trends for resident cutthroat trout, Dolly Varden char, pink salmon and coho salmon MIS are consistent with habitat changes as recorded on inventoried streams and habitat surveys. A monitoring program for trends in the populations of resident cutthroat trout and Dolly Varden char and their habitat is in the fifth year. This year abundance estimates and habitat surveys were completed in all 22 previously identified monitoring streams. See the Dolly Varden and Cutthroat Trout Monitoring Plan, 2003.

Data has been collected to support the new MIS strategy as listed below:

- Revise the MIS
- Develop Models
- Design Data Layers Supporting the Models
- Model Validation
- Model Revision

Successful mark-and-recapture estimates have been made in small streams by marking and releasing fish captured in baited minnow traps on the first sampling day. On the following day, the stream is re-sampled with electrofishing gear to determine the proportion of marked fish in the population. Two capture methods (minnow trapping and electrofishing) eliminate the bias inherent to any single capture method.

The Forest Sciences Laboratory has developed a protocol for multiple-catch removal population estimates using minnow traps. This method is reported to be more effective in larger channels than mark-and-recapture methods.

It is recommended that relatively small channels be chosen for monitoring as it is difficult to capture a high percentage of the fish in large channels. This often leads to large confidence intervals around the estimated population number.

Stream sections selected for population monitoring should be above impassible waterfalls. This approach will avoid the problems of attempting to differentiate between residents and anadromous juveniles. Several people have suggested the complex life histories of anadromous Dolly Varden and cutthroat trout could make interpretation of population estimates difficult and should be avoided.

Population estimates should be made during June or July each year. Fish will be active and steam flows should be relatively low allowing easy sampling. Monitoring should be avoided during high flows following storm events.

Design

Population estimates in short sections of stream should be made on each Tongass Ranger District with a timber harvest program. It is anticipated that will include the Ketchikan, North Prince of Wales, Craig, Wrangell, Petersburg, Juneau, Sitka, and Hoonah districts. Three streams will be monitored on each district. The streams will include, one each, with:

1) no previous or planned timber harvest,
2) no previous timber harvest and planned harvest according to the present Standards and Guidelines, and
3) pre-Forest Plan Revision timber harvest and planned harvest under the current Standards and Guidelines.

According to this design, 24 streams widely distributed across the Tongass will be monitored. They will be stratified into three relevant categories. The no harvest streams will serve as controls. The streams with planned logging under the current Standards and Guidelines but no previous logging will test the effectiveness of the current Standards and Guidelines, and the streams with both old and new logging will test for interaction between the two treatments.

Where possible, monitoring for Dolly Varden and cutthroat trout should occur in the same watershed as the monitoring for trends in populations of the other fish MIS and the channel condition assessments. Multiple monitoring programs in the same stream may increase the probability of understanding the results of the individual monitoring efforts.

 **Evaluation Criteria:** Habitat changes and population trends for management indicator species.

Precision and Reliability: Precision and reliability will be dependent upon the precision and reliability associated with the data collection methods and models described in the specific monitoring protocols for the species. Refer to the report, “A Reassessment of Management Indicator Species for the Tongass National Forest” for more information on MIS strategy.

 **Results:** Discussion and illustration of the new MIS strategy. Report results of the model development, validation, and revision.

A major goal for the fifth year of the Fish MIS program was to monitor all identified treatment and control streams, and this goal was achieved. An additional control stream was added to the design. The planned monitoring program will be completed when at least 16 of the treatment streams have been logged and the amount of post-logging data is approximately equal to the amount of pre-logging data. This suggests the resident fish monitoring program will have a duration of at least 10 years.

For coho salmon monitoring, no changes in the Forest Plan are recommended at this time. For pink salmon, a review of spawning escapement data that has been collected in over 700 watersheds over the last 30 years and timber harvest history for the same watersheds has been initiated. Kuiu Island was selected as a pilot for review of the existing pink salmon escapement and logging history data. No changes are recommended for the Forest Plan until the evaluation of the existing pink salmon escapement data and the timber harvest history data are complete.

 **Analysis:** Evaluation of the application of the new MIS strategy.
Annual commercial harvest of pink salmon is reported by the Alaska Department of Fish and Game and the Forest Service and no long-term trends are apparent in the 6 years of harvest and escapement data from 1997 through 2003. Estimates of coho escapement are more difficult to collect than escapement of pink salmon as coho enter the streams during the fall when flows are often high and coho routinely distribute throughout the watersheds including into small tributary streams.

The region-wide harvest data and escapement data from index streams are good indicators of the annual abundance and potential trends of coho returning to SE Alaska. In 2003, 23 study stream segments were identified and field verified. The University of Washington completed a review of existing monitoring protocols for anadromous salmonids and prepared a bibliography for the reviewed literature.

(This section had substantial deletions, had references to old subgroup reports by Dick Aho and is being reworked by Dick Aho now).

 **Fish Habitat Question 2: Are fish and riparian Standards and Guidelines being implemented?**

 **Background:** Most of the fish and riparian Standards and Guidelines are implemented as Best Management Practices (BMPs) described in FSH 2509.22 (as amended in 1996). Monitoring will be conducted according to a Tongass-wide BMP implementation monitoring strategy described under Soil and Water Question 3 (Are Best Management Practices being implemented?). BMPs most applicable to fish and riparian resources include:

- BMP 12.6 Riparian Area Designation and Protection
- BMP 12.6a Buffer Design and Layout (TTRA and other buffers)
- BMP 13.16 Stream Channel Protection
- BMP 14.6 Timing Restrictions for Construction Activities
- BMP 14.17 Bridge and Culvert Design and Installation (fish passage, etc.)

 **Data Collection:** See Soil and Water Question 3 and refer to the Tongass Implementation Monitoring Strategy for specific detail on data collection.

Fish riparian Standards and Guidelines are being implemented based on two types of assessments for Best Management Practices (BMPs): 100 percent monitoring of units closed out and roads complete and Interdisciplinary Team (IDT) quality control monitoring.

In the 10% quality control monitoring conducted in 2003, for example, 20 units, 7 roads segments and 13 fish pass improvement sites relating to roughly 468 acres were protected were reviewed by the IDT. In

the units monitored all buffers were implemented and there were no reported infringements or buffers lost in windthrow.

 **Evaluation Criteria:** The evaluation criteria will be specific to the BMP. Refer to the Tongass Implementation Monitoring Strategy. Buffer widths by Channel type reach are measured for each unit in the field and compared to Forest Plan Standards and Guidelines. Other Best Management Practices relating to stream protection and stream crossing installations are evaluated using qualitative rating criteria by an interdisciplinary Team in the field.

Precision and Reliability: The precision and reliability will vary with the BMP monitored. Where actual measurements or quantifiable observations are made (for example, TTRA buffers or compliance with timing restrictions), both precision and reliability will be high. Where a more qualitative observation is required (for example, providing for reasonable assurance of windfirmness of riparian management areas), precision and reliability may be low.

 **Results:** Determine if our best management practices (BMPs) and Forest Plan Standards and Guidelines have been implemented and if they are effective in protecting fish habitat and fish populations. Monitor key stream channel characteristics and representative fish populations to determine if trends attributable to forest management are evident.

In 2003 identification of streams and implementation of protective measures in units and effective culverts was completed and the prescription and implementation of stream protective measures was shown to be successful in the lengths and buffers adjacent to streams being monitored.

In 2004 training and communication needs to continue to emphasize the protection of fish habitat and wetlands, productivity of soil and maintenance of water quality.

See Soil and Water Question 3 and refer to the Tongass Implementation Monitoring Strategy for specific details.

 **Analysis:** Determine if Best management Practices (BMPs) and Forest Plan Standards and Guidelines for protecting fish habitat and fish populations have been properly implemented. Monitor key stream channel characteristics and representative fish populations. Monitor key stream channel characteristics and representative fish populations to determine if trends attributable to forest management are evident. (Added by CSW in 2002-also, sections removed by Dick Aho written in 1999 about subgroup members).

 Fish Habitat Question 3: Are fish and riparian Standards and Guidelines effective in maintaining or improving fish habitat?

 **Background:**
Priority effectiveness issues for Tongass National Forest fish, riparian, soil, water, and wetlands Standards and Guidelines were compiled in 1994 and re-assessed in 1998. A riparian and aquatic synthesis was initiated to address whether these guidelines were effective in maintaining and improving fish habitat and to integrate monitoring efforts that are currently described as nine discrete fish habitat, soil and water, and wetland questions for Forest Plan monitoring (TLMP Chapter 6).

A draft *Riparian & Aquatic Synthesis Study Plan, 2004* (or, consult the ftp site, ftp://ftp2.fs.fed.us/incoming/chugtong_r10/water/) served as the framework for this strategy. Three

potential case study watershed sets have been proposed on Kuiu Island, Mitkof/Kupreanof Island, and Prince of Wales Island. The Prince of Wales case study watershed monitoring was initiated in FY 2004.

Physical habitat surveys (stream buffer effectiveness, channel condition assessment, and resident fish MIS monitoring for Forest Plan monitoring) were completed in about forty stream monitoring reaches in 2003. Ongoing statistical analyses of these data will be the bases for developing final monitoring design including the most sensitive indicators, sample size, and sampling frequency. In 2003-2004, efforts focused on re-sampling the resident fish reaches and establishing coho salmon monitoring reaches.

Further details on fish habitat monitoring procedures may be found in the R10 aquatic survey handbook, (available on the web at http://fsweb.r10.fs.fed.us/directives/fsh/2090.21/) which contains the protocols that provide the basis for habitat surveys associated with fish MIS (both resident and Coho), buffer effectiveness, case study watersheds, and channel condition monitoring programs. A quality assurance plan to streamline sampling and improve integration between various components of aquatic synthesis monitoring is currently under development and should be available for review in the near future (Personal Communication J. Thomson).

 **Results (Summary):**

As case study watersheds are established, they will be considered as locations for pilot effectiveness monitoring for wetlands, water quality, and aquatic macroinvertebrates.

Aquatic monitoring activities to date have focused on high priority issues, including 1) stream buffer stability, 2) stream buffer effectiveness, 3) fish passage, and 4) resident fish and coho MIS population monitoring, and 5) channel condition assessment. Details on study designs and interim monitoring results can be found at the following links:
http://fsweb.r10.fs.fed.us/directives/fsh/2090.21/ (Added 2003)

 **Analysis (Summary):**
Preliminary analysis of the salmonid populations sampled in channel condition assessment reaches generally found few statistically significant relationships between fish densities and physical channel attributes. A significant relationship appears between coho salmon fry and pool density (pools/stream length).

Monitoring of hydraulic and structural conditions continue at culverts recently installed at fish bearing streams. The monitoring is necessary to assess the achievement of fish passage and will assist in the evaluation of the success of design, maintenance, and other management actions. (Added from 2003 monitoring summary)

Stream Buffer Stability

 **Background**

The purpose is to evaluate timber harvest management prescriptions intended to maintain the integrity of streamside buffers.

The riparian vegetation inherent in stream buffers is recognized as an important controlling factor for bank erosion and stream temperatures. The Large Woody Debris (LWD) that riparian zones provide often define stream channel process and habitat conditions. The riparian zone is also important in controlling the amount of sediment and nutrients reaching the stream from upslope sources.

Fish and Riparian Standards and Guidelines of the Forest Plan include the following: 1) maintain natural and beneficial quantities of LWD over the short and long-term, 2) maintain stream banks and stream channel processes, 3) provide for the beneficial uses of riparian areas by maintaining water quality, 4) maintain optimum salmonid stream temperatures, 5) maintain the natural range and frequency of aquatic habitat conditions.

It is understood that by retaining riparian vegetation, in a condition found within the range of natural variability, many of the above mentioned fish and riparian Standards and Guidelines can be achieved.

Blowdown is a natural and important phenomenon of Southeast Alaska. It recycles forest stands and maintains and renews the forest ecosystem. Although, timber harvest often exacerbates the rate of blowdown in adjacent forest stands, including streamside buffers, beyond that found within the range of natural variability. The Forest Plan requires evaluation of the effect of management (including windthrow) of adjacent areas on riparian habitats. It further directs us to establish Riparian Management Areas (RMA's) for each project where ground disturbance will occur and to manage an appropriate distance beyond this no-harvest zone to provide for a reasonable assurance of windfirmness of the RMA.

Forest Plan riparian Standards and Guidelines state as an objective that riparian areas will be "maintained in mostly natural conditions, for fish, other aquatic life, old-growth and riparian associated plant and wildlife species, water related recreation and to provide for ecosystem processes, including important aquatic and land interactions".

The objective of this protocol is to monitor change in the riparian vegetation of the RMA due to blowdown. The amount of change in the riparian vegetation will be used to assess if RMA's are being maintained in mostly natural conditions.

Data Collection:

Design

All stream buffers of Class I, II and III streams, throughout the Tongass National Forest, which are associated with timber sales that are consistent with the revised Forest Plan will be monitored. Stream buffer condition will be assessed by monitoring the change in canopy cover area of the stream buffer from a period immediately following harvest to future incremental sampling periods. Canopy cover of the stream buffer during each sampling period will be documented and measured with the use of low altitude digital still aerial photographs. Riparian zones located in the vicinity of the harvest unit will also be photographed and analyzed as a control.

Methods

Fisheries and Geographic Information Systems personnel will be responsible for obtaining, processing and evaluating the initial digital still aerial photographs of stream buffers associated with harvest units within the Tongass National Forest.

Selection of Stream Buffers to be Monitored:

Personnel from each Unit on the Tongass will provide Stikine personnel with their Unit's pool of stream buffers to be monitored (see Table 1 Stream Buffer Data Card). All stream buffers of Class I, II, and III streams, which are associated with timber sales that are consistent with the revised Forest Plan, will be monitored. Monitoring all available stream buffers will prevent selection bias and allow for stratification of data after collection.

To provide consistency, a buffers for the purposes of monitoring are determined as follows: All RMA's and associated areas managed to assure a reasonable assurance of windfirmness (RAW zone) of the RMA of Class I, II and III which are specifically mentioned in the As-Planned or As-Laid-Out Unit cards. Also included will be areas not specifically mentioned in the Unit Cards which are between Class I, II or III streams and harvest units, which also meet a width criteria. The width which an area must not exceed to be considered a stream buffer, if it is not specifically mentioned in the Unit Cards, is dependent on the

Process Group and Stream Class of the channel it is adjacent to. These maximum widths by Process Group and Stream Class can be derived from Table 2 by adding the RMA width to the RAW zone width. (Added 2003).

Photographic Image Acquisition:

A De Haviland Beaver mounted with a Kodak DCS420 digital camera (28 mm lens) and two video cameras will capture the images. One of the video cameras will be a forward looking while the other will be directly downward looking. The video cameras will be used primarily for real time navigation and for assistance in post processing orientation. A Rockwell PLGR-196 Global Positioning System unit will record x, y, and z location coordinates.

Flight Specifications:

Elevation: 2,500 feet above the terrain of the stream buffer.
Altitude: Dependent on terrain elevation
Ground Speed: 90mph (132.0'/second)

Digital Still Image Specifications (at designated flight specifications):

Pixel size: 0.8 feet x 0.8 feet
Area per image: 22.82 acres per image
Dimensions of image: 1223' x 813'
Overlap 65% (for stereoscopic viewing)
Gain per image: 284.4'
Images per mile: 18.57
Intervalometer: (image cycle time) 2.2 seconds

Frequency and Time of Photographic Image Acquisition:

Digital still aerial photographs of buffers will be acquired prior to October 1 of the year in which the unit was harvested and in the 2nd, 3rd, 5th, 10th and 15th year following harvest.

Image Post Processing:

Digital still photographic images will be processed on TNTmips image processing software. Images will be digitized and polygons drawn which define the following zones: 1) the stream channel zone, 2) the RMA zone, 3) the area managed to assure a reasonable assurance of windfirmness (RAW zone) of the RMA, 4) all canopy gaps contained in these zones. The area (acres) of each polygon will be calculated by the image processing software. The area of the canopy gap polygons within each zone will be summed to obtain total area of canopy opening.

Analysis:

The condition of stream buffers will be assessed by measuring the change in area of canopy opening of the RMA from immediately following harvest activities to periods of 1, 2, 3, 4, 5, 10 and 15 years following harvest. Initial analysis will include validating the null hypothesis Ho: there is no difference between the mean change in area of canopy opening of the RMA's adjacent to harvest units and that of similar riparian areas not adjacent to harvest units. If the null hypothesis is tenable then our current prescriptions established to maintain the RMA in mostly natural conditions will be considered successful. If the null hypothesis is rejected than additional analysis will be preformed to establish the correlation between the dependent variable (% change in area of canopy opening) and the independent variables, management prescription, and blowdown hazard class (Kramer M.E.1997) and time since harvest.

Reporting

The stream buffer stability data will be compiled annually and reported in the Tongass National Forest and Alaska Department of Environmental Conservation annual monitoring reports. Data will be primarily in graphical and tabular format.

 **Literature Cited**

Kramer M.E. 1997. *Abiotic Controls on Windthrow and Forest Dynamics in a Coastal Temperate Rainforest, Kuiu Island, Southeast Alaska*. Master's Thesis, Montana State University, Bozeman. 45 pp.

Stream Buffer Effectiveness

Data Collection:

This monitoring is a continuation of Part II of the 319 Buffer Monitoring Project initiated in 1993. The objective is to collect information effectiveness of stream buffers in maintaining riparian functions and fish habitat capability. The monitoring parameters include quantitative measures of stream habitat units, stream channel morphology and stability, large woody debris, and riparian canopy gaps. Data collection procedures are detailed in the document Buffer Effectiveness Monitoring Protocols (Kelliher 1999).

To date, 25 permanent reference reaches have been established in stream buffers located throughout the Tongass N.F. These reference reaches include six Stream Process Groups. Monitoring sites have been established on Chichagof, Baranof, Kuiu, Kupreanof, Prince of Wales Island and the main-land, representing most geo-climatic subsection in the Tongass. Base line data was collected at all sites prior to or immediately following harvest of the riparian timber stand adjacent to the buffer. A total of five sites have been re-surveyed subsequent to harvesting activities.

Established reference buffer sites will re-measured periodically (a minimum of once every 5 years). Between 5 and 10 additional buffer effectiveness monitoring sites will be established for selected Process Groups and Subsections along sale units under current Forest Plan Riparian Standards and Guides in future years. Emphasis will be in the Moderate Mixed and Floodplain channel type process groups, which are more sensitive to impacts and events within watersheds. Emphasis will also be to select sites within watersheds having a Channel Condition Assessment site (CCA), or to establish a CCA site within watersheds with Buffer Effectiveness sites.

Evaluation Criteria:

Forest Plan Riparian Standards and Guidelines objectives include "maintain or restore the natural range and frequency of aquatic habitat conditions; maintain or restore stream banks and stream channel processes; and maintain or restore natural and beneficial quantities of large woody debris". Buffer effectiveness evaluation criteria include fish habitat objectives for pool area (or frequency), channel width-depth ratio and quantity of large woody debris. Additional indices to evaluate stream channel and habitat condition and trend will include streambed substrate and bed-shear ratios, riparian canopy cover, channel cross-sectional area and residual pool depth.

Precision and Reliability:

The quantitative parameters being used as evaluation criteria are precise indexes of stream and habitat conditions. These parameters are considered to have good reliability in predicting relative fish habitat capability in Alaska. Natural, spatial, and temporal variability in channel conditions, however, will require careful interpretation of data.

Results:

Stream buffer effectiveness data will be compiled annually and reported in the Tongass National Forest and ADEC BMP monitoring reports. Data compilation will be primarily in tabular format. Statistics showing trend data, and comparisons between Process Groups and Subsections population means and variances may be displayed in graphical format.

Analysis:

Effects of riparian timber harvest on LWD recruitment in streams is the primary question that monitoring of Buffer Effectiveness is intended to address. Analysis will focus on trends in stream channel and habitat condition between the pre-harvest measurement, undisturbed control sites and post-harvest response both short-term and long-term. Changes in stream channel condition indices will be compared to the natural range of variability for Fish Habitat Objectives, and to the indices resulting from CCA site data, to provide insight into the overall health of managed watersheds in the Tongass.

Fish Passage at Road Crossings

Background

The goal of this monitoring effort is to evaluate potential fish migration barriers at the intersection of road and stream networks. The objectives of this protocol: include 1) Provide specific direction on methods to consistently inventory, characterize, and evaluate existing structures present in fish-bearing streams ; 2) Outline a monitoring framework that focuses field time and resources on the highest priority stream crossings; and, 3) identify specific structural and hydraulic conditions that are assumed adequate to mitigate fish passage at road crossings.

New roads constructed under the current Standards and Guidelines will be routinely monitored following this protocol. Additionally, this protocol will be used to evaluate fish passage through forest roads constructed before implementation of the Revised Forest Plan. Monitoring of the older roads will likely occur simultaneously with Forest Plan monitoring.

It is recommended that the entire length of all newly constructed roads be monitored within one year of construction. If for some reason all new roads cannot be monitored within the first year, a priority should be given to roads in watersheds that have been selected for monitoring of fish management indicator species. All forms of fish habitat monitoring should include, or focus in, watersheds chosen for monitoring population trends of the indicator species. Subsequent monitoring should occur on a periodic basis in conjunction with Road Condition Surveys.

This monitoring effort and associated protocols only address the achievement of fish passage under current conditions. They do not address design criteria, maintenance needs, or constitute a risk assessment. This monitoring effort will, however, assist in evaluation of the success of design, maintenance and other management actions. Additional protocols must be developed in these areas to ensure full implementation of the Forest Plan (1997) Standards and Guidelines.

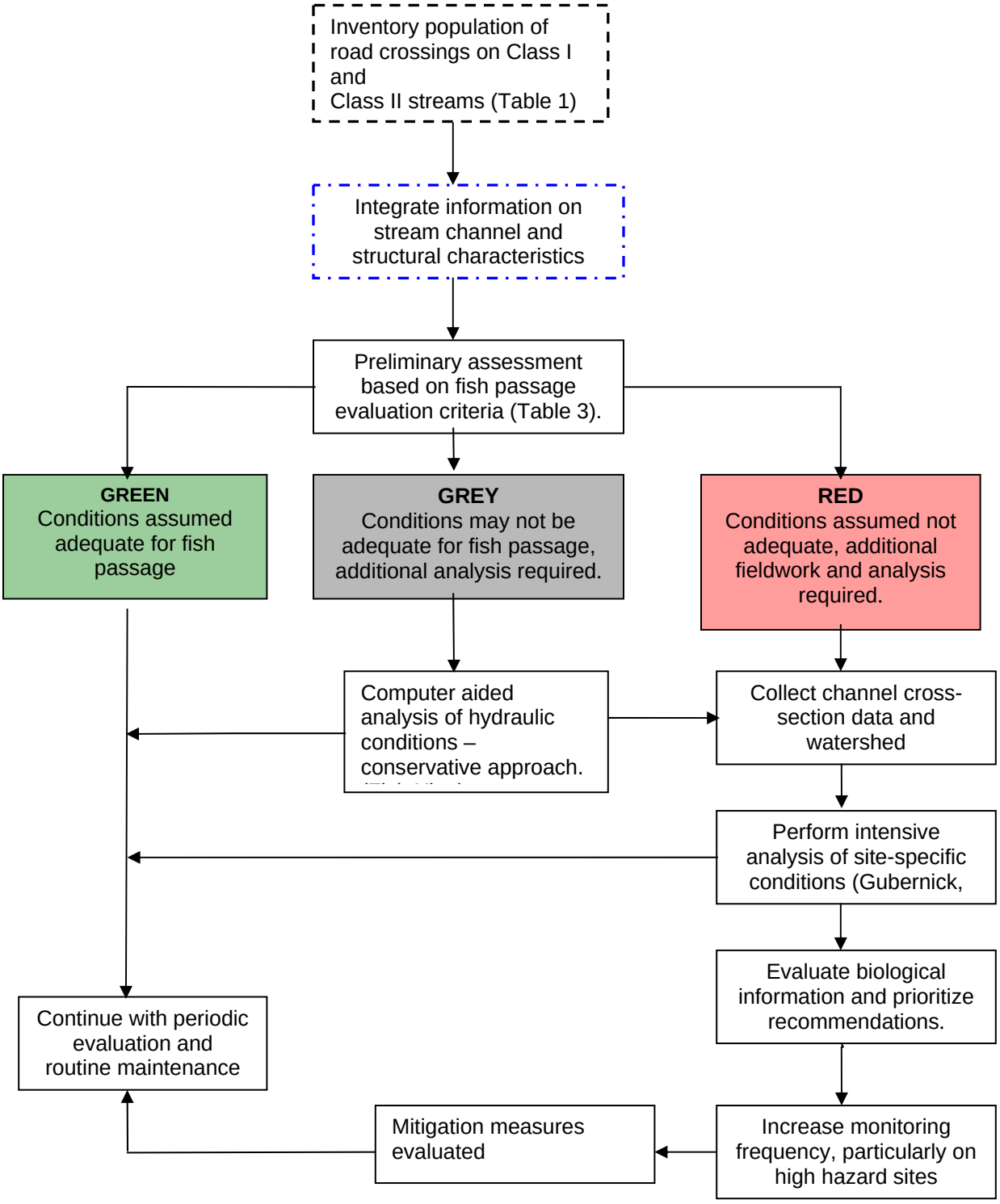
Data Collection

This monitoring strategy is based on a framework that requires consistent identification, characterization, and evaluation of fish passage structures (Figure 1). The foundation for this framework is derived from a combination of published literature and the working knowledge of State and Federal resource specialists.

Identification

The first priority is to locate and define the population of existing structures on Class I and Class II channels with upstream fish habitat. The Road Condition Surveys (RCS) currently being conducted in the Region are ideally suited to this task. For roads yet to be surveyed, engineering records and NEPA documents are alternate sources of information. The minimum meta-data requirements (spatial and temporal) to consistently track this population are listed in Table 1. Needed additions to the RCS protocol are also noted. The protocol will be revised accordingly and submitted to the Interagency Monitoring and Evaluation Group (IMEG) for approval.

Figure 1. Monitoring Framework for Fish Passage at Road Crossings



Colors added

Table 3. Meta-data standards for fish passage structures. Fields currently in the Road Condition Survey Protocol are denoted with a "Y" in the RCS column.

Data Field	**Description**	***RCS***
Road System	Name of local transportation network	Y
Route ID	System road GIS route ID (or road number)	Y
Milepost	Distance along route	Y
Unique ID	Unique identifier (road number & milepost combined)	Y
Stream LLID	Stream route ID	N
ADF&G Number	Stream number from State Anadromous Waters Catalog	N
Stream Class	Forest Plan stream classification	Y
Species Present	Documented or observed list of fish species	Y
Survey Date	Date of most recent inspection	Y

Characterization

After the population has been defined, stream channel and structural characteristics can be attributed in the database and distilled for analysis. Road Condition Surveys are once again the ideal vehicle for obtaining the required information. Data collected during a RCS on a culvert or bridge site includes attributes that describe site condition, hydraulic capacity, and the distribution of fish species.

The data fields listed in Table 2 represent the minimum requirements for conducting a preliminary evaluation of fish passage at road crossings. As previously noted, required modifications to the RCS protocol will be submitted to IMEG. These modifications will also adjust the accuracy and precision of several measurements needed for modeling purposes. For example, elevation measurements used for culvert slope calculations will need to be taken with a hand level and stadia rod rather than with a clinometer.

The most significant change to the RCS is the inclusion of a longitudinal profile for the affected stream reach. The surveyed reach should extend at least two culvert spans upstream and downstream of the structure. The elevations must be taken from a common datum point and in accordance with USGS survey protocols (Harrelson et al., 1994). Many of the elevations would replace existing depth measurements (e.g. perch height, substrate depth, outlet pool depth, etc.) currently collected by the RCS. Although the profile is labor intensive, the data is essential for modeling fish habitats.

Another important change in the RCS is a shift to recording channel bed width rather than bank full width. Channel bed width is independent of water level, and equates to the distance between the bottom-of-the-left-bank and the bottom-of-the-right-bank (vegetative trim-line to vegetative trim-line). Channel bed width is preferred over bank full width because it easier to consistently identify in the field. A more detailed description and indicators of channel bed width can be found in the revised Aquatic Management Handbook.

The bottom-of-the-bank used to determine channel bed width is essentially the same as the "ordinary high water mark" used by ADF&G and ADOT. The term "ordinary high water mark" is defined as the line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

Table 4. Minimum data requirements for preliminary assessment. Fields in the Road Condition Survey Protocol are denoted with a "Y" in the RCS column.

RCS	**Data Field**
Y	Culvert rise
Y	Culvert span
Y	Culvert length
Y	Culvert shape
N	Corrugation size
Y	Inlet configuration
Y	Installation type
Y	Blockage (restriction of culvert barrel)
N	Presence of camber
N	Structural damage (lip distortion)
Y	Pipe flotation
N	Bed elevation upstream (two culvert diameters)
N	Bed elevation upstream (one culvert diameter)
Y	Bed elevation at inlet
Y	Invert elevation at inlet
Y	Water surface elevation at inlet
N	Road surface elevation
Y	Invert elevation at outlet
Y	Bed elevation at outlet
Y	Water surface elevation at outlet
Y	Outlet pool surface elevation
Y	Outlet pool max depth
Y	Outlet pool tailcrest depth
N	Bed elevation downstream (two culvert diameters)
Y	Substrate coverage
Y	Substrate classification
Y	Velocity
N	Channel geometry
Y	Upstream bankfull width
N	Upstream bedwidth
Y	Downstream bankfull width
N	Downstream bedwidth
Y	Fish Species
Y	Fish Sampling Methods

Note: Reference Region 10 Road Condition Data Dictionary for definitions, field methods, and precision.

Evaluation Criteria

The Tongass Land and Resource Management Plan Standards and Guidelines require that the Forest Service maintain, improve, and restore the opportunities for fish migration in Class I and II streams. Furthermore, on Class I streams, juvenile coho (*Oncorhynchus kisutch*) have been specifically identified as the design species and life stage. "When a culvert is selected for stream crossing, design, install and maintain the culvert to prevent the creation of water velocity or height barriers at the outlet of the pipe, and allow upstream passage of juvenile coho" (TLMP 1997).

On Class II streams, the intent of the Forest Plan is to provide passage of resident fish in all streams, but occasionally it is not feasible to protect short sections of habitat. For Flood Plain (FP) and Moderate Gradient-Mixed Control (MM) channels the design species is Dolly Varden char, rainbow trout, and/or cutthroat trout juveniles greater than a year old. Adult Dolly Varden char, rainbow trout, and/or cutthroat trout are the design species for the remaining stream channel process groups.

The Forest Service is also subject to Section 33 Code of Federal Regulations 323.3(b) (Clean Water Act, 1987) that states; "the design, construction and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body." In addition, the Forest Service recognizes applicable provisions in the Coastal Zone Management Act and the Supplemental Memorandum of Understanding with the Alaska Department of Fish and Game.

Results

Once the structures have been inventoried, attributes listed in Table 2 will be used to conduct a preliminary assessment (RCS database queries). This assessment is directly linked to evaluation criteria that have been designed to classify the structures as reflected in Table 3.

Analysis

Structures are classified into one of the following three categories (See Table 3):

- Green: Conditions are assumed adequate for fish passage.
- Grey: Conditions may be adequate for fish passage, additional analysis required.
- Red: Conditions are not adequate, additional fieldwork and analysis required.

The validity of this preliminary assessment is dependent on the assumptions used to draft the evaluation criteria (Table 3). These criteria need to be field tested and re-evaluated on an annual basis to verify that we are successfully identifying migration barriers at road crossings.

With the aid of computer software applications (FishXing), the next step is to analyze the population of "gray" culverts, ultimately routing them to either the "green" or "red" side of the framework (Figure 1). To accomplish this task, a conservative modeling approach will be applied. Fundamental knowledge of basin hydrology and/or channel hydraulics is required to adequately perform the following seven-step analysis process. Each step in the process is designed to generate the specific values required to model fish passage capability (Table 4).

Table 5. Fish Passage Evaluation Criteria  .

	Structure	*Green*[1]	*Grey*[2]	*Red*[3]
1	Bottomless pipe arch or countersunk pipe arch, substrate 100% coverage and invert depth greater than 20% of culvert rise.	Installed at channel grade (+/- 1%), culvert span to bedwidth ratio of 0.9 to 1.0, no blockage.	Installed at channel grade (+/- 1%), culvert span to bedwidth ratio of 0.5 to 0.9, less than or equal to 10% blockage.	Not installed at channel grade (+/- 1%), culvert span to bedwidth ratio less than 0.5, and greater than 10% blockage.
2	Countersunk pipe arches (1x3 corrugation and larger). Substrate less than 100% coverage or invert depth less than 20% of culvert rise.	Grade less than 0.5%, no perch, no blockage, culvert span to bedwidth ratio greater than 0.75.	Grade between 0.5 to 2.0%, less than 4" perch, less than or equal to 10% blockage, culvert span to bedwidth ratio of 0.5 to 0.75.	Grade greater than 2.0%, greater than 4" perch, greater than 10% blockage, culvert span to bedwidth ratio less than 0.5.
3	Circular CMP 48 inch span and smaller, spiral corrugations, regardless of substrate coverage.	Culvert gradient less than 0.5%, no perch, no blockage, culvert span to bedwidth ratio greater than 0.75	Culvert gradient 0.5 to 1.0%, perch less than 4 inches, less than or equal to 10% blockage, culvert span to bedwidth ratio of 0.5 to 0.75.	Culvert gradient greater than 1.0%, perch greater than 4 inches, blockage greater than 10%, span to bedwidth ratio less than 0.5.
4	Circular CMPs with annular corrugations larger than 1x3 and 1x3 spiral corrugations (>48" span), substrate less than 100% coverage or invert depth less than 20% culvert rise.	Grade less than 0.5%, no perch, no blockage, culvert span to bedwidth ratio greater than 0.75.	Grade between 0.5 to 2.0%, less than 4" perch, less than or equal to 10% blockage, culvert span to bedwidth ratio of 0.5 to 0.75.	Grade greater than 2.0%, greater than 4" perch, greater than 10% blockage, culvert span to bedwidth ratio less than 0.5.
5	Circular CMPs with 1x3 or smaller annular corrugations (all spans) and 1x3 spiral corrugations (>48" span), 100% substrate coverage and substrate depth greater than 20% of culvert rise.	Grade less than 1%, no perch, no blockage, culvert span to bedwidth ratio greater than 0.75	Grade 1.0 to 3.0%, perch less than 4 inches, less than or equal to 10% blockage, culvert span to bedwidth ratio of 0.5 to 0.75.	Culvert gradient greater than 3.0%, perch greater than 4 inches, blockage greater than 10%, culvert span to bedwidth ratio less than 0.5.
6	Circular CMPs with 2x6 annular corrugations (all spans), 100% substrate coverage and substrate depth greater than 20% of culvert rise.	Grade less than 2.0%, no perch, no blockage, culvert span to bedwidth ratio greater than 0.75	Grade 2.0 to 4.0%, less than 4" perch, less than or equal to 10% blockage, culvert span to bedwidth ratio of 0.5 to 0.75.	Grade greater than 4.0%, greater than 4 inch perch, greater than 10% blockage, culvert span to bedwidth ratio less than 0.5.
7	Baffled or multiple structure installations		All	
8	Log stringer or modular bridge	No encroachment on bedwidth.	Encroachment on bedwidth (either streambank).	Structural collapse.

Table 6. Analytical steps and required outputs for conservative modeling approach.		
	Analytical Step	***Required Output***
1	***Target Fish***	Species, life stage, swimming speed, and periodicity
2	***Basin Hydrology***	Q_2 (discharge corresponding to 2-year return interval)
3	***Design Flow***	Q_2 2-day duration flow
4	***Manning's Coefficient***	Manning's "n" value
5	***Tailwater Estimation***	Critical depth at design flow
6	***Velocity Correction***	Boundary layer velocity
7	***Model Evaluation***	Length of culvert zones

For detailed discussions of each of the analytical steps and accompanying glossary, please see the Tiered Fish Habitat Protocols for Monitoring Question 3.

Analytical steps 1-7 were separated into discrete document to be hyperlinked).

Literature Cited

American Iron and Steel Institute. 1994. Handbook of Steel Drainage and Highway Construction Products. Washington D.C., Publisher, Pages

Barnes, H.H. Jr., 1967. Roughness characteristics of natural channels. U.S. Geological Survey. Water Supply Paper 1849 Pages

Behlke, C.E., Kane, D.L., McLean, R.F., and Travis, M.D., 1991. Fundamentals of culvert design for passage of weak-swimming fish. State of Alaska, Department of Transportation and Public Facilities,
Report No. FHWA AK-RD-90-10.

Carlson, R.F., 1987. Seasonal frequency and duration aspects of streamflow in Southeast and Coastal Alaska. State of Alaska, Department of Transportation and Public Facilities Report No. FHWA AK-RD-97-22.

Chow, V.T., 1964. Handbook of Applied Hydrology. McGraw-Hill Book Company, New York.

Cowan, W.L., 1956. Estimating hydraulic roughness characteristics. Agricultural Engineering 37 (7): 473-475.

Harrelson, C.C, Ralwlins C.L., and Potyondy, J.P. 1994. Stream Channel Reference Sites: an Illustrated Guide to Field Technique. General Technical Report RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 pp.

Jones, S.J., Fahl, C.B., 1994. Magnitude and frequency of floods in Alaska and conterminous basins of Canada. U.S. Geological Survey, Water Resources Investigation Report 93-4179 pages

Normann, J.M., Houghtalen, R.J., Johnston, W.J., 1985. Hydraulic design of highway culverts. Federal Highway Administration Report No. FHWA-IP-85-15.

West Consultants Inc., 1997. WinXSPRO User's Manual. US Forest Service Rocky Mountain Experiment Station.

Channel Condition Assessment

Data Collection:

The Forest Plan follow-on study, '*Development of Protocols for Effectiveness Monitoring of Aquatic Habitat Conditions on the Tongass National Forest: a TLMP Information Need*' is testing and revising protocols used for measuring stream channel condition as an effectiveness monitoring tool. This is a cooperative project involving personnel from the PNW Research Station and District, Area, and Regional personnel from the Tongass National Forest. This initial research identifies objective, consistent, and repeatable measurements for assessment of the physical condition of stream channels, and concludes that the condition of undisturbed channels is markedly different from that of channels highly disturbed by land use (Woodsmith et al 1996). In addition to monitoring, this information is useful for identifying restoration needs, evaluating restoration effectiveness, establishing habitat objectives, and assessing channel sensitivity. Data collection procedures include instrument surveys of channel morphology, measurement of stream bed grain size, surveys of pools and large woody debris, and remote measurement of watershed size, riparian stand condition, and land use intensity.

A cumulative effects approach is taken in that study sites are limited to low gradient channels with some floodplain development. These depositional stream reaches respond to many of the potential effects of land management throughout the watershed. However, this channel condition assessment procedure is not designed to measure changes in water chemistry, temperature, turbidity, or dissolved or suspended sediment load. During 1997, the first year of this five-year study, over forty stream reaches were sampled, including sites on each Area of the Tongass National Forest.

In order to develop an integrated approach to effectiveness monitoring, the Forest Plan follow-on study includes measurement of salmonid species density and distribution and size distribution employing depletion estimate techniques at selected study sites (Bryant et al 1992). The biologic component of this study will provide a link between the physical measurements, habitat complexity, and the response of salmonid populations.

Evaluation Criteria:

Forest Plan Standards and Guidelines include the objectives, "maintain or restore the natural range and frequency of aquatic habitat conditions ...and stream channel processes". Effectiveness monitoring evaluation criteria should include the following variables: pool frequency, large woody debris loading, the ratio of mean residual pool depth to mean bank full depth, and the ratio of the measured surface grain size to that predicted for bank full flow. Other variables that are being assessed, and should be considered, include channel width to depth ratio, relative roughness, riparian stand condition, intensity of land use, and watershed size. All evaluation should be done in a whole-watershed context, in the sense that study streams should be evaluated as part of a basin where aquatic habitat inventories include portions of the entire basin and basic watershed analysis components are conducted to assess the effects of geology, local climate, glacial deposits, etc. This framework will allow for the interpretation of measured change or lack of change in the context of processes and conditions occurring throughout the watershed.

Precision and Reliability:

Several sources of variability are being evaluated as part of this study. These sources include naturally occurring variability in channel condition parameters over time and space, variability between individual data collectors and crews, and the limits of measurement precision. An accurate assessment of these sources of variability is essential to the meaningful interpretation of

monitoring results and the distinction of apparent from real change in channel condition parameters.

 **Results:**

Interim progress and results of the five-year Forest Plan follow-on study are being reported in the 'Forest Plan Research News' and in meetings with District and Area personnel interested in results for specific sites. Automation of data analysis was a major aspect of the first year of this study and will facilitate rapid interpretation of field data in the future.

 **Analysis:**

Data will be analyzed by testing for successful discrimination among study sites on the basis of intensity of land management. This will be done qualitatively by visual interpretation of scatter plots and quantitatively using multivariate statistical techniques. Relationships between habitat measures and fish densities will be tested statistically to determine salmonid response to the type and range of habitat variables. If intensity of land use is reflected in real differences in channel condition parameters, then these parameters can be used to monitor effectiveness of Forest Plan Standards and Guidelines.

 References Cited

Bryant, M.D. Date Title, Masters Thesis, University Pages

Bryant, M. D., Wright, B.E., and Davies, B.J. 1992. Application of a Hierarchical habitat unit classification system: stream habitat and salmonid distribution in Ward Creek, southeast Alaska, Research Notes PNW-RN-508. USDA, Forest Service, Pacific Northwest Research Station, 18 pp. XX

Kuntzsch, D., Smith, D.P., Dilger, M., and Woodsmith, R.D. In draft. Channel Condition Assessment Protocol. Report name Forestry Sciences Laboratory, Juneau. Pages

Woodsmith, R.D. and Buffington, J.M. 1996. Multivariate geomorphic analysis of forest streams: implications for assessment of land use impacts on channel condition, Earth Surface Processes and Landforms, 21: 377-393.

(Need updates and corrections for these citations).

HERITAGE RESOURCES 

Goal: Identify, evaluate, preserve, protect, and enhance heritage resources. **Objective:** Protect heritage resources (see the Heritage Resources Forest-wide Standards and Guidelines).

Background: The Forest Plan provides guidance on maintenance of a heritage resource management program that identifies, evaluates, preserves, and protects significant heritage resources. This guidance applies Forest-wide and on a project-specific basis pursuant to the National Historic Preservation Act (NHPA), as amended, as well as other relevant acts and implementing regulations (for example, the Archaeological Resources Protection Act and the Native American Graves Protection and Repatriation Act). Section 106 of the NHPA requires that the Forest Service take into account the effect an "undertaking" (project, activity or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency) may have on heritage resources eligible for or listed on the National Register of Historic Places (National Register). When it is deemed necessary to complete a heritage resource survey for an undertaking, previously identified heritage resources within the project area are monitored for condition status. Section 110 of the NHPA requires a federal agency to inventory, protect, use and interpret all heritage resources eligible for or listed on the National Register.

The Alaska Region has a Programmatic Agreement (PA) with the Advisory Council on Historic Preservation and the Alaska State Historic Preservation Officer. The PA formalizes our compliance with Section 106 of the NHPA and implements monitoring standards. These standards call for monitoring of project areas either during or after project implementation to judge the effectiveness of current models that predict the heritage resource sensitivity of any given area of the forest.

The Forest Plan heritage resources Standards and Guidelines address (1) project clearance/inventory, (2) project implementation, (3) mitigation, and (4) enhancement. (Deleted the statement that referred to Heritage resource monitoring guide as per Mark McCallum's request-doesn't exist).

Heritage Resources Question 1: Are heritage resources Standards and Guidelines being implemented?

Data Collection: Refer to the heritage resource Guidebook for details on the filtering process, data collection and data collection forms.

1. Project Inventory/Clearance
   - At the end of each fiscal year, compile a list of all Section 106 undertakings and Section 110 activities completed during that year.
   - Determine whether consultation with the Alaska State Historic Preservation Officer was accomplished, according to the programmatic agreement, prior to the release of the draft Environmental Impact Statement or the Environmental Assessment for public review, or before signing a decision memo.

2. Project Implementation
   - Determine whether inventory and evaluation was accomplished under the supervision of a qualified heritage resource specialist.
   - Determine whether each undertaking or project included a statement of the operating conditions required to protect heritage resources in the project area. Determine if these included the pertinent clause notifying the operator of his or her responsibility to protect marked sites when working in the project area and the operator's liability for damage.
   - Determine whether sites were discovered during project implementation.

3. Mitigation
   - Determine whether mitigation measures were effective in protecting heritage sites.
   - Identify whether disinterment of human remains and associated grave goods, sacred objects and objects of cultural patrimony followed the Native American Graves Protection and Repatriation Act.

4. Enhancement
   - Determine whether significant and suitable heritage resource sites were managed to realize their recreational and educational values to the public.
   - Document whether heritage resource properties and their records were protected to prevent degradation or unauthorized use under authority of the Archaeological Resources Protection Act of 1979 and the regulations in 36 CFR 296.

 **Evaluation Criteria:** Compliance with Heritage Resource Standards and Guidelines. The expectation is for 100% compliance at all sites, except as documented during the NEPA and NHPA process.

Precision and Reliability: Most variables will be examined by qualified heritage resource professionals providing high precision and reliability. Some variables may be evaluated by other professionals who will be trained to recognize those specific conditions, also providing high precision and reliability.

 **Results:** Tabulate information obtained through data collection above by Section 106 undertaking and Section 110 activities as outlined in an amended Programmatic Agreement with the State Historic Preservation Office, and assure that all Forest Standards and Guidelines are being implemented to the fullest extent of the heritage laws; tabulate Native American Graves Protection and Repatriation Act (NAGPRA) related discoveries, public presentations and public outreach projects such as Passport in Time projects, all with some aspect of site inventory and monitoring, and all volunteer-based projects.

Tabulate and account for all volunteer and community outreach projects. Passport In Time volunteers contributed 2,064 hours in FY 2003, almost equaling one full person year of contributed labor. Forest Service employees and volunteer camp hosts, recreation and GIS specialists contribute significant hours to discovering new sites and monitoring existing sites.

Analysis:

- Summarize compliance with Standards and Guidelines for all undertakings and projects. Present the total number of undertakings and projects, and percent compliance for each standard and guideline examined.
- Discuss intentional or unintentional deviation from any heritage resource standard or guideline, including what corrective action, if any, is planned.

Heritage Resources Question 2: Are heritage resources Standards and Guidelines effective in protecting heritage resources as expected in the Forest Plan?

Data Collection:

1. Project Inventory/Clearance: Conduct a files search and field review of all Section 106 undertakings completed during the fiscal year.

2. Project Implementation: Conduct field inspections on selected sites at least once a year, and document the conditions of any site, any changes from the previous inspection and, if possible, the cause of the change. Select sites based on an assessment of several factors, including their resource values and their susceptibility to disturbance from natural forces, vandalism or management activity.

3. Mitigation: Observe in the field the effects of specified protection and mitigation measures implemented.

4. Enhancement: Where heritage resources were enhanced through interpretation and education determine whether these measures were effective in communicating salient features of the site and in being compatible with the nature, quality and integrity of the subject resource.

Evaluation Criteria: Demonstrated effectiveness of activities implemented.

Precision and Reliability: Most variables will be examined by qualified heritage resource professionals providing high precision and reliability. Some variables may be evaluated by other professionals who will be trained to recognize those specific conditions, also providing high precision and reliability.

Results: Tabulate results obtained through data collection. There is a need to continue heritage resource monitoring to ensure that the Standards and Guidelines are continually met. Public outreach and other enhancement activities are perhaps our best tools in protecting heritage resources for future generations. The Tongass National Forest has a strong public outreach program that advocates forest visitors take an active stewardship role. A significant step forward in management of heritage resources in Southeast Alaska would be to develop agreements for cooperative management of historic and archeological site in the region. Working together, clans, tribes, corporations, and federal and state agencies could more effectively learn from and protect these important cultural places. (Added from 2003 Monitoring report)

Analysis:

- Describe the effectiveness of protecting heritage resources for all projects and sites examined.
- Describe the effectiveness of the standards and Guidelines in protecting heritage resources including what corrective action, if any, is planned.

KARST AND CAVES

Goal: Maintain and protect significant cave and karst ecosystems Forest-wide. **Objectives**: Allow for the continuation of natural karst processes. Maintain the productivity of the karst landscape while providing for other land uses where appropriate.

Background: The Tongass National Forest contains the largest concentration of dissolution caves known in the State of Alaska. The Forest also contains world-class surface or epikarst features particularly in the alpine and sub-alpine zones. The caves and epikarst features result from the chemical weathering of limestone and marble bedrock. The karst and cave features and associated resources are a recently discovered and recognized attribute of the lands within Southeast Alaska. The have been found to be of national and international significance for a wide variety of reasons, including their intensity and diversity of development, their biological, mineralogical, cultural, paleontological components, and recreational values.

Karst and Caves Question 1: Are karst and cave Standards and Guidelines being implemented?

Data Collection:

Revisions the Forest Plan between 1993 and 1997 included guidance in five "emphasis areas", including karst and cave resource management. Standards and Guidelines were developed which provided for other land uses while taking into account the function and biological significance of the karst and cave resources within the landscape (See Karst Recording Forms and the Final Report of the Karst Review Panel, December 2002). Final revisions to these Standards and Guidelines are expected at the end of 2004. A karst and cave resource significance assessment (Aley et al 1993) outlined the most current thinking on karst management issues. The Tongass National Forest adopted a "risk assessment" management strategy known as "vulnerability mapping". "Karst vulnerability assesses the susceptibility of the karst resources to any land use. Some parts of a karst landscape are more sensitive than others to planned land uses depending on the “open” nature of the karst system, its ability to transport water, nutrients, soil and debris, and the presence of pollutants in to the underlying hydrologic systems. The strategy assesses the capability for post-harvest regeneration in karst landscapes, the maintenance of water quality issuing from the karst hydrologic systems, and the protection of resource values within the underlying cave systems as outlined in the FCRPA.

The Tongass National Forest Plan Standards and Guidelines for Karst Resources also outlines a four-step process for karst inventory and assessment: a) identification, b) inventory of the karst development; c) inventory of the karst hydrologic systems, and d) evaluation karst resources as to their vulnerability to land uses affecting the karst systems. The Forest Plan Standards and Guidelines for Karst Resources are found in Chapter 4, pages 4-18 to 4-19 and in Appendix I, specifically pages I-12 to I-16. Implementation of these Standards has brought to light discrepancies that require clarification. Specifically, Section III, A. (4) of the Karst Landscape Assessment, entitled “Assess Vulnerability of the Karst Terrain to Management Activity”, provided the greatest challenge for implementation. For example low, moderate, and high vulnerability

karst lands require definitions and examples. The application of appropriate mitigations has been inconsistent. And, the karst and caves conflicts with riparian management standards have surfaced as topics that require clarification.

Ongoing projects and those with signed Records of Decision (RODs) focus on karst area protection. The Forest-wide Standards and Guidelines require that areas of high vulnerability karst within the project area be deleted from harvest applications. Low to moderately low vulnerability karst may be located within timber harvest units. These Standards and Guidelines are fully implemented in upcoming projects. Karst resource input was also provided to the various Federal Highway Road Projects on Prince of Wales Island and to the Tongass Wilderness Evaluation SEIS. (Added from Baichtal, 2002)

Utilize the data collection form. Select unit based upon stratified random sample weighted on sensitivity on karst vulnerability.

- For each project, review the planning record for Karst related issues.
- In the planning record review, determine whether a karst vulnerability assessment process was completed.
- Annually conduct field investigations selected harvest units and associated roads developed under the new Forest Plan to determine if Karst Standards and Guidelines have been implemented
- Determine if partial suspension was achieved in areas of moderate vulnerability karst within the harvest unit. Characterize the soil disturbance if present.
- Determine whether high vulnerability karst areas were excluded from management activities.
- Determine whether timber harvest, road construction, and/or quarry development occurred within 100' edge of a sinkhole, collapse channel, doline field, losing stream, or other collapse karst feature.
- Note if dye tracing was used to determine whether losing streams contributed to class I or II streams or domestic water supply through a karst hydrologic system.
- Note whether buffers designed to protect karst systems and their features appear to be wind firm.
- Determine whether development occurred on lands that overlie a known ``significant'' cave.
- Determine whether development occurred on lands that were close enough to the entrance of a cave to be capable of altering the microclimate of the cave's entrance, cave features within the cave or both.
- Determine if roads crossed high vulnerability areas only where no other option existed and karst resource values were not compromised. If so was the mitigation prescribed adequate to protect the karst and cave resources.
- Determine whether roads were constructed over sinkholes and other collapse features and losing streams
- Determine whether roads and other development diverted water to or from karst features
- Determine whether measures were taken to reduce erosion and sediment transport from road surface and cut slopes were effective.
- Determine whether quarries were not developed on top karst without adequate site survey and design.
- Determine if high vulnerability karst areas have been digitized into GIS and removed from the timber base.

 **Evaluation Criteria:** Compliance of land disturbing projects with Karst and Cave Forest-wide Standards and Guidelines.

Precision and Reliability: Relatively high reliability; data collection is based upon field investigations by local experts, trained resource specialists and qualified volunteers.

 **Results:**

- List projects on karst terrain or that directly effect karst terrain.
- Tabulate observations concerning suspension, road construction, or quarry development relative to standard & guide compliance.
- Document karst vulnerability assessment process used and any dye studies completed.

 **Analysis:**

- For each project summarize compliance results.
- Summarize results of karst vulnerability assessments for each project.

 **Karst and Caves Question 2: Are karst and cave Standards and Guidelines effective in protecting the integrity of significant caves and the karst resource?**

 **Data Collection:**

- Select two significant caves per year to monitor near where development has occurred. To be useful, pre-management activity information and inventory must have been collected. This includes surface and subsurface inventories and stream chemistry analysis.

- Enter the caves to determine if any of the management activities have caused damage to the cave resources including their geologic, hydrologic, wildlife, fisheries, historical, cultural, and paleontological resources have not been damaged by the timber harvest or road construction activities.

- Inspect the caves and adjacent land to determine if the karst system's and the cave's integrity has been maintained. Determine the status of the karst hydrology in the caves and note soils loss, forest regeneration, sedimentation, and debris transport if evident.

- Measure the pH, conductivity, dissolved oxygen, and turbidity of the losing or rising streams associated with the caves. Compare this information with the pre-management data collected for the sites. Try to duplicate the seasonal timing and flows of the pre-management sampling. Attach this hydrologic data to the GIS database both as a lookup table and an annotated point.

 **Evaluation Criteria:** Maintenance of caves and karst resource values.

Precision and Reliability: Relatively high reliability; data collection is based upon field investigations by local experts, trained resource specialists and qualified volunteers.

 **Analysis:**

- Prepare a written narrative assessment for the caves regarding the status of its attendant resources.
- Describe results and trends of the cave and karst resource assessment.
- Discuss any difficulties in applying the Standard and Guidelines.

Results:

- Identify locations of significant caves and karst features examined.
- Note development activities near each cave and any associated mitigation measures.
- Tabulate observations and measurements related to inspection of the cave resources.

LAND MANAGEMENT PLANNING

No goals, objectives, desired future condition, or Standards and Guidelines for Land Management Planning have been identified. The Forest Service policy and direction for improvement of government-to-government relationships, and collaborative, community-based, resource stewardship establishes a goal of compatibility of Forest Service management activities with the goals and objectives of adjacent lands. In addition, 36 CFR {219.7(f)} requires that a program of monitoring and evaluation shall be conducted that includes the effects of National Forest management on lands, resources, and communities adjacent to or near the National Forest being planned. The effects upon National Forest land by activities on nearby lands managed by other Federal or other government agencies or under the jurisdiction of local governments will also be monitored and evaluated.

Land Management Planning Question 1: Is the management of National Forest System lands consistent with management objectives of adjacent lands and their management plans?

Data Collection:

- Annually note any inconsistencies between all current fiscal year National Forest management projects and management objectives of adjacent publicly owned lands based on information from a number of sources, including project level environmental documents, input from state, local, and other federal agencies, as well as professional judgment.

- Review of project-level plans for activities or actions to be located adjacent to lands not in the National Forest System. Data sources will be the project planning records, NEPA analysis, planning documents and land management plans for the adjacent lands, and project-specific input from applicable land owners, and local, state and other Federal agencies. In addition, coordination with the adjacent land manager and input by the adjacent land manager will be reviewed. Qualitatively determine consistency or compatibility with the management objectives of adjacent lands.

Evaluation Criteria: Implementation of projects under the Forest Plan compared with land management objectives of adjacent publicly owned lands.

Precision and Reliability: The precision and reliability is dependent upon the precision and reliability of the GIS data base lands information. This precision and reliability will vary with the update status of information about the management of lands adjacent to National Forest land.

Results:

- Describe projects monitored, including location, type of project, and management objectives on adjacent non-NFS lands.
- Report whether or not the Forest Service activity is compatible with the planned objectives and uses of the adjacent lands, and the degree of the effect. Assess effects upon forest lands from adjacent land activities managed by other governments.

- List incompatibilities and note if they occur on more than an incidental basis.

Continuation of the Tongass efforts to improve government-to-government relationships as well as collaborative, community-based resource stewardship is essential to achieve compatibility of Forest Service management activities with the goals and objectives of adjacent lands. Monitoring of the effects of the Tongass National Forest management on lands, resources, and communities adjacent to or near Tongass projects will continue.

Analysis:

- Compare results of the current year's monitoring with previous years' monitoring results and trends.
- The analysis of monitoring information acquired will be qualitative, and will consist of weighing of the Forest Service activity against the management objectives of adjacent publicly owned lands, and the degree of any inconsistencies or incompatibilities. Tabulate results showing if the Forest Service activity is fully consistent with, partly consistent with, or fully inconsistent with these management objectives, and any effects that any inconsistencies may have on the management of the adjacent non-NFS lands.
- If the project is determined incompatible, describe the extent of the incompatible, the effect of the incompatibility, and what mitigation, if any, is recommended.

LOCAL AND REGIONAL ECONOMIES

Goal: Provide a diversity of opportunities for resource uses that contribute to the local and regional economies of Southeast Alaska. **Objective**: Work with local communities to identify rural community assistance opportunities and provide technical assistance in their implementation. Support a wide range of natural-resource employment opportunities within Southeast Alaska's communities.

Background: The Tongass National Forest comprises about 90 percent of Southeast Alaska's land base. The 33 communities within Southeast Alaska use and depend on Forest resources for their economies, quality of life, traditions and cultures, and recreation activities. Forest management decisions can have significant impacts, positive and negative, on these communities.

Local and Regional Economies Monitoring Question 1: Are the effects on employment and income similar to those estimated in the Forest Plan?

Data Collection:

- Annually summarize estimates of the natural resource employment and income estimates from the Alaska Department of Labor employment and earnings publications and U.S. Bureau of Economic Analysis income and employment data.
- Compare to the Forest Plan the annual estimates of the natural resource employment and income.

Evaluation Criteria: Effects of Forest Plan implementation on employment and income by resource sector.

Precision and Reliability: The precision and reliability is dependant upon the precision and reliability of the natural resource employment and income estimates and data from the Alaska Department of Labor and the U.S. Bureau of Economic Analysis.

Results: Tabulate Forest Plan estimated and the Alaska Department of Labor and U.S. Bureau of Economic Analysis income and employment data.

Analysis: Describe and explain the differences between the Forest Plan estimates and actual income and employment data.

 **Local and Regional Economies Question 2: Has the Forest Service worked with local communities to identify and pursue Rural Community Assistance opportunities?**

 **Data Collection:** Annually document the Rural Community Assistance activities. The Forest Service notifies rural communities in or near the national forests of the program and responds to requests for assistance from communities. Grants are competitive and contingent on annual appropriations. The Forest Service has entered into a cooperative agreement with the State of Alaska to provide this funding through the State's Community Development Block Grant (CDBG) mini-grant program.

 **Evaluation Criteria:** Evidence of a Rural Community Assistance program. Monitoring levels of the diverse rural assistance programs (ERP, RD and SEA-CERT) should continue. The Forest staff readily works with communities who desire assistance. The Forest Service continues to work with the local communities to identify and pursue Rural Community Assistance Opportunities.

Precision and Reliability: The precision and reliability is relatively high and based upon the precision and reliability of the documentation of Rural Community Assistance activities.

 **Results:**

- Summarize the FS role in Rural Community Assistance activities. Annually summarized estimates of the natural resource employment and income estimates from the Alaska Department of Labor and employment earnings data have been compared with annual estimates in the Forest Plan and found to be consistent.
- Continue to monitor and evaluate the effects on employment and income from Forest Management is underway. Re-evaluation and updating of the assumptions and criteria for the Forest Plan model utilized to determine projected employment and income levels is recommended.

 **Analysis:** Evaluate effects of the Rural Community Assistance in assisting communities.

MINERALS AND GEOLOGY

Goals: Provide for environmentally sound mineral exploration, development, and reclamation in areas open to mineral entry and in areas with valid existing rights that are otherwise closed to mineral entry. Seek withdrawal of specific locations where mineral development may not meet Land Use Designation objectives. Encourage the prospecting, exploration, development, mining, and processing of locatable minerals in areas with the highest potential for minerals development. Insure that minerals are developed in an environmentally sensitive manner, and other high-valued resources are considered when minerals developments occur. **Objective**: Implement the Minerals and Geology Forest-wide Standards and Guidelines.

Background: A wide variety of mineral types and mineral resources occur within the boundaries of the Tongass National Forest. Examples of some of these mineral resources are gold, silver, molybdenum, and uranium, and nationally designated "strategic" and "critical" minerals such as lead, zinc, copper, tungsten and platinum group metals. The Forest Service recognizes that minerals are fundamental to the Nation's well being and, as policy, encourages the exploration and development of the mineral resources that it manages. The Secretary of Agriculture has provided regulations (36 CFR 228) to ensure surface resource protection, while encouraging the orderly development of mineral resources on National Forest System lands.

Minerals and Geology Question #1: Are the effects of mining activities on surface resources consistent with Forest Plan expectations, as allowed in approved Plans of Operations?

Data Collection: Select a minimum of one site on each district for analysis based on random selection that is stratified by the amount of activity on each site; sites with more activity are weighted more in the selection process. Review the summary list of activity on site clean- up of abandoned sites.

- Annually summarize monitoring efforts, results, and findings conducted under project-specific Plans of Operation.
- Review the summary list of activity on site clean-up of abandoned sites.
- Review results of previous monitoring activities, both for the specific mining project and for similar projects elsewhere should be reviewed. These, in addition to research and administrative studies, can provide both baseline information and anticipated results and effects.
- Review the project NEPA analysis and plan(s) of operations for applicable site-specific mitigating measures
- Review the project NEPA analysis and plan(s) of operations for anticipated results.
- Collect project-level monitoring results for active minerals operations, or for operations under a shutdown where monitoring is continued. This includes all activities, including those in approved POOs, or done for other agencies (i.e. Environmental Protection Agency, Alaska Department of Environmental Conservation) as part of a permit or under a memorandum of understanding/agreement.

Evaluation Criteria: Evaluation will be based on the evaluation criteria of mining operations with effects not anticipated in the plan of operations: MG12IIIB. If an unanticipated effect is

identified, answer the question if so, what? If the evaluation indicates that the effect may result in unacceptable consequences or be widespread (involving multiple mineral operations), work with the Forest Minerals Specialist or Geologist to determine the corrective action and follow the Regulations and manual direction to correct actions creating unacceptable effects.

Precision and Reliability: The precision and reliability is dependent upon the precision and reliability of the documentation on mining activities and monitoring activities. The monitoring activities involve some subjective judgments by mineral specialists.

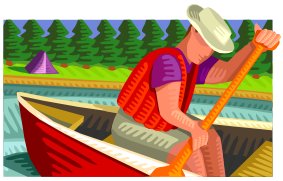
The necessity of the operator to obtain approval for their Plan of Operations provides the Forest Service the opportunity and authority to control the effects of the development on the Forest surface resources. Recommendations follow to continue the minerals monitoring program.

Results: Describe the minerals operations monitored, including a project description and monitoring efforts, results and findings.

- Summarize findings of review of abandoned site clean-up activities.
- Determine if all applicable Standards and Guidelines were incorporated into operating plans.
- Determine if applicable Standards and Guides were incorporated into project planning. If the Standards and Guides were not incorporated, determine why not.
- Determine if Standards and Guidelines identified in project planning were implemented on the ground.
- Determine if applicable Standards and Guides were not implemented and why not.
- List and describe any unpredicted effects.

Analysis:

- Analysis of monitoring data acquired is largely qualitative, and consists of analyzing the summarized data from project-level monitoring efforts.
- Analysis involves the review of assembled monitoring data for each minerals activity to determine if there are effects not anticipated in the project NEPA document or the approved plan of operations. This includes a review of monitoring results against applicable Standards and Guidelines, as well as any included mitigating measures.
- Recommended actions may range from remedial action to revision of the Land and Resource Management Plan, including development of additional Standards and Guidelines. If the effect involves resources that may be affected similarly elsewhere (other than minerals operations) addition investigation, including validation monitoring may be required.
- Describe any recommended actions to correct or avoid reoccurrence.



RECREATION AND TOURISM

Goal: Provide a range of recreational opportunities consistent with public demand, emphasizing locally popular recreation places and those important to the tourism industry.
Objectives: Manage the Forest's recreation settings in accordance with the Recreation Opportunity Spectrum (ROS) Standards and Guidelines for each Land Use Designation. Construct or reconstruct at least an average of 7 miles of hiking trails per year. Construct or reconstruct enough developed recreation sites to annually increase or improve the developed site capacity for an average of 190 people at one time.

Background: Southeast Alaska, of which the Tongass National Forest makes up about 80 percent, possesses a remarkable and unique combination of features. These include inland waterways with over 11,000 miles of shoreline, mountains, fiords, glaciers, and large or unusual populations of fish and wildlife populations that provide a wide range of excellent outdoor recreation experiences. Many of these opportunities cannot be duplicated elsewhere in North America, or most other places in the world. Southeast Alaska imparts a feeling of vastness, wilderness, and solitude. A relatively small resident population, and absence of development compared to most other National Forests also contributes to the wild nature of these lands.

Recreation and Tourism Question 1: Are areas of the Forest being managed in accordance with the prescribed Recreation Opportunity Spectrum (ROS) class in Forest-wide Standards and Guidelines?

Data Collection:

- Review previous monitoring reports, project plans, special use permits, and field review notes for surveys or interviews, indicating trends or changes in ROS classes per land use designation that may require more intensive monitoring, or require change in ROS class or other action.
- Select the sites to monitor based upon a stratified approach based on ROS class. Focus monitoring in those locales with the highest number of uses and users.
- Observe whether ROS Standards and guides have been implemented at the selected sites.
- Conduct ``visual surveys'' of use areas for indications of ROS class Standards and Guidelines, both for numbers of encounters and for activities such as facilities development, and trail construction and maintenance.
- Identify indications of conflicting uses that may result from Standards and Guides implementation.

Many sites selected to monitor for 2003 were primarily based on the location of existing recreation facilities and areas of the districts where high use traditionally occurred. Some remote locations were visited during the course of other work. Outfitter/guide special use permit records along with written and verbal accounts of guiding activity helped determine high commercial use areas. (Added from 2003 monitoring report)

A National recreation program review in 2003 highlighted the need to monitor the benefits and impacts of rapid increases in tourism and expansion of transportation networks (fast ferries, trains and new roads). The review team suggested focusing PNW research on a market and customer analysis, or analyses already in progress. Hoonah/Point Sophia was suggested as a case study site.

Information related to the ROS and the Forest-wide Standards and Guidelines will be incorporated into special use decisions that will be forthcoming in 2003. First, will be the completion of the Shoreline Outfitter/Guide Environmental Impact Statement that will refine management directions for almost 5,000 miles of shoreline along the coast of islands for four ranger districts. (Added based on 2003 monitoring report)

 **Evaluation Criteria:** Compliance with Standards & Guidelines specific to numbers of encounters allowed in each Recreation Opportunity Spectrum (ROS) class. The numerical thresholds are those levels established in each ROS class. Sites with existing recreation facilities and areas of traditional high-use are the focus of the monitoring. Emphasis will be placed on monitoring sites where potential conflicts with users or ROS were reported and monitoring needs were identified. Proposed changes in ROS will be evaluated.

Precision and Reliability: The precision and reliability is dependent upon the monitoring activities and will be affected by the subjective judgment of the recreational specialists.

 **Results:**

- Tabulate instances where ROS changed or may require changing.
- List the number of special use by activity and corresponding backlog of applications.
- For each recreation place examined in the field list:
- Corresponding prescribed and observed ROS class, number of encounters, type of facility development, trail development and associated maintenance level.
- Indications of conflicting use resulting from Standard & Guideline implementation.
- Conformance with permit requirements
- Visitor's comments on quality of their recreation experience.
- Tabulate information on permit compliance from the user reports and maintenance forms.
- Semi-annually run a GIS query of the information tracked annually on ROS by LUD. List cumulative changes in ROS class.

 **Analysis:**

- Identify opportunities for changing ROS class designation and correlate with specific land use designations.
- Characterize observed recreation places. Note compliance with applicable Standards & Guidelines, conformance with permit requirements, visitor comments on quality of their recreational experience.
- Explain difficulties implementing Standards & Guides.
- Determine if the actual use of a given recreation place, use area, or other designation is within the limits set in the Recreation Opportunity Spectrum class or other analysis (carrying capacity analyses, W.I.S., Wilderness Plan or other analysis). Determine if any changes are within the limits of acceptable change under the analysis.
- Semi-annually conduct a cumulative analysis on the information collected through GIS query describing the ROS by LUD.

 **Recreation and Tourism Question 2: Is Off Road Vehicle (ORV) use causing, or will it cause considerable adverse effects on soil, water, vegetation, fish and wildlife, visitors or cultural and historic resources of the Forest?**

 **Data Collection:**

- Survey ORV use through gathering information from the districts, information on road closures and use from engineering, and citations from law enforcement. Annually select a representative sample of ORV high-use areas distributed across the Forest. When possible, observe high use areas for extended periods of time to determine actual use.

- Review previous years' monitoring reports, law enforcement reports, comments from the public (complaints or otherwise), existing ORV management plans, project-level plans where appropriate, and studies published by other agencies or organizations.

- Talk with field employees, other administrative units, research and education organizations, off-road vehicle organizations, and outdoor recreation organizations to get assistance in the collection of information concerning the sample areas selected.

    - Conduct visual surveys of sample use areas for indications of:
    - inappropriate use of ORVs in areas where authorized,
    - unanticipated or unpredicted damage where ORV use is authorized,
    - unauthorized ORV use,
    - conflicting uses that may result from ORV use.

 **Evaluation Criteria:** Compliance with all applicable Standards and Guidelines. The threshold is the point at which ORV use is unsuitable, or causes unacceptable damage. The threshold of unsuitable is reached when the use of ORVs is considered inappropriate in a given area. This may be caused by use of ORVs in areas where such use is proscribed by law or regulation, by changes in allocation (legislatively or administratively), or by changes in management goals through area-specific analysis. The threshold for areas where uses of ORVs are unsuitable is any use other than that specifically allowed by law. For example, the use of ORVs in wilderness is unsuitable outside the uses allowed in ANILCA Section 1110, which permits the use of over-the-snow vehicles during periods of adequate snow cover for traditional activities. All other use is unsuitable and has crossed the threshold for acceptable use. A second example would be use of ORVs in an area closed to such use under 36 CFR §261.53 or §261.56; any use of ORVs is considered unsuitable.

The threshold for ``unacceptable damage'' is determined by the resource and its sensitivity to adverse activity; this includes effects on soil and water, fish and wildlife, vegetation, cultural and historic properties, or other human users. Qualified persons for a particular resource specialty must set the limits of acceptable damage; the limits may be quantitative or qualitative.

In 2003 the monitoring efforts in Yakutat determined that improperly developed ATV trails through wetlands divert surface and ground water flow and act as drainage ditches. This reduces water residency times and alters wetland function. Most of the other districts had minor adverse resource impacts that could be grouped into two areas. Although most of these impacts were minor, increased use of ATVs and snowmobiles could significantly increase the effect on the soil and water resources. Continued monitoring of the impacts associated with ATVs is recommended. (Added from 2003 monitoring report).

Precision and Reliability: The precision and reliability will be dependent upon the monitoring activities. The monitoring activities will require subjective and professional judgment by the recreational specialists on the effects of observed and anticipated effects of ORVs.

Results:

- List the sample of high-use ORV areas sampled.
- Summarize issues and observations from reports and conversations concerning sampled areas.
- Tabulate results of visual surveys.
- Continued emphasis on education of the public on potential impacts associated with ORV use is essential.

Analysis:

- Describe use patterns in relation to applicable Standards and Guidelines and Forest plan goals and objectives for each land use designation, as well as the resource Standards and Guidelines for the various resources.
- Evaluate the extent of ORV use and the degree of unacceptable resource damage with respect to the goals, objectives, Standards and Guidelines and resource values for a given area.

RESEARCH

Goal: Continue to seek out and promote research opportunities that are consistent with identified information needs. **Objectives**: Cooperate with PNW in pursuing the high-priority information needs identified in Appendix B of the Forest Plan through the intra-agency agreement entitled ``Joint Studies for Improved Future Tongass National Forest Planning'' and other means.

Background: Ten high-priority information needs are identified in Appendix B of the Forest Plan. Results from this research will be used to strengthen the scientific information base for the next Forest Plan revision or amendments to the current Forest Plan.

Research Question: **Have identified high-priority information needs been fulfilled?**

Data Collection:

- For each study, contact the responsible Alaska Regional Coordinator(s) and PNW Research Station Principal Investigator(s) listed below.

  - Timber productivity and response to harvest of forested wetlands in southeast AK
  - Determine the relationship between socioeconomic conditions in rural communities and resource allocations on the Tongass NF.
  - Determine subsistence resource patterns in southeast Alaska.
  - Identify and measure the interactions between aquatic/riparian habitat and perturbations in upland areas and the response of anadromous and resident salmonids.
  - Determine the geographic and habitat distribution of endemic mammals on the Tongass National Forest.
  - Evaluate the future timber productivity of young-growth stands on the Tongass NF.
  - Evaluate alternatives to intensive single stand harvest on the Tongass NF.
  - Determine Alaska timber prices and market arbitrage in the Pacific Northwest.
  - Determine prices and costs in Alaska timber production and product supply.
  - Study lumber recovery of second growth timber from southeast Alaska.
  - Obtain an annual progress report describing work completed in the previous fiscal year, and work planned for the following year, including any substantial changes to the study design.
  - Document the overall study cost on annual and cumulative bases.

Evaluation Criteria: Progress and completion of studies.

Precision and Reliability: The precision and reliability will be relatively high since it is dependent upon summary of research work completed relative to needs.

Results:

- List the status of each study in terms of percent completion and projected completion date.
- Tabulate preliminary findings.
- Tabulate costs.
- The Tongass Leadership Team in cooperation with the PNW continues to developed additional research needs.

Analysis: For each study describe the following:

- Schedule of completion.
- Expenditures to date and anticipated future budgetary needs.
- Key preliminary or final results and their implications for management of the Tongass.

SCENERY

Goal: Provide Forest visitors with visually appealing scenery with emphasis on areas seen along the Alaska Marine highway, State highways, major forest roads, and from popular recreation places; recognize that in other areas where landscapes are altered by management activities, the activity may visually dominate the characteristic landscape. **Objectives**: Manage the scenery of the Forest in order to achieve the following visual quality objectives: Retention 4.8 million acres Retention in Wilderness; Partial Retention 3.2 million acres; Modification 0.4 million acres; Maximum Modification 2.8 million acres.

Background: Each land use designation in the Forest Plan has a corresponding visual quality objective that defines maximum levels of visual impact desirable from human-induced alterations to the natural landscape character. Associated with each objective is a set of recommended Guidelines that includes unit size ranges and type of harvest treatment (e.g., clear-cut, group selection, single-tree selection) for different visual absorption capability settings (e.g., landscapes with steep slopes; minimal terrain and vegetative diversity to landscapes with gentle slopes; high terrain and vegetative diversity). Also part of the FORPLAN modeling process includes a set of Guidelines that define roughly how much of a view shed (or logical part of a view shed segment) can be in a ``disturbed'' condition and still meet the visual quality objective. This monitoring effort is intended to assess whether these Guidelines, as applied actually results in meeting established visual objectives.

Scenery Question: Are the Standards and Guidelines effective in attaining the adopted visual quality objectives established in the Plan?

Data Collection:

- For each 5-year period, select 10 view sheds across the Forest associated with the visual priority travel routes and use areas listed in Appendix F of the Forest Plan. Chosen view sheds should (1) contain harvest units cut under the current Forest Plan, and (2) include areas representing the different characteristic landscapes (e.g., if possible include relatively high elevation rugged terrain with significant alpine openings along with the lower elevation, broad or rolling landscapes with more or less uniform forest cover); different visual absorption capacity settings; and different visual quality objectives.

- In each view shed select the major viewpoints from (a minimum of 3 in travel routes) which harvest activity is clearly evident.

- Obtain photographs from each viewpoint that provide a representation of the entire activity seen from that viewpoint. It is preferable to use a 50-mm focal-length lens. This focal length most closely approximates what is seen by the naked eye. Photographs should be taken in optimum lighting conditions for seeing the activity.

  Each photograph must be accompanied by the following:
  - Date of photograph.
  - Date of cuts or activity.

  - Correlation data in the form of a key which ties the photograph to a map.
  - Visual quality objective (VQO) for area visible in photograph.
  - Visual absorption capability (VAC) of area in the photograph.
  - Vegetation type seen in the photograph (spruce, mixed hemlock/ spruce, etc.).
  - Size of each opening or of treatment area if not clear-cut (source would be GIS, unit card, or both.
  - Distance to between openings or treatment areas.
  - Type of treatment applied and other descriptive features of the area after treatment such as size of groups and density of groups in a group selection harvest; density of trees retained for single tree removal; stem diameter and spacing Guidelines used in over story removal cutting. Record this information for the current and past activities and other activities such as roads, landings, and recreation facilities that appear in the photograph.
  - Landscape position (i.e., is the opening on a lower slope, valley bottom, mid-slope, or upper slope near the ridge.
  - Topography (e.g., steep uniform slopes, highly dissected, diverse steep terrain, or gently sloping and rolling terrain).

- Measure the total view shed size using GIS.
- Plot a map that includes at least all 100-foot contours (preferably 40-foot contours if available), boundary of view shed, delineation of priority travel routes and use areas, delineation of refined and updated visual absorption capacity ratings, treatment area location areas by type, location of viewpoints, and numbers that key photographs from these viewpoints.

In 2003 the effectiveness of the Scenery Standards and Guidelines were tested on two different viewsheds (the shoreline of Frederick Sound between Portage Bay and Twelvemile Creek and Deer Island, located on the Wrangell Ranger District) were studied on the Tongass in 2003. These viewsheds were harvested as part of two timber sales that were planned under the guidelines of the 1997 Forest Plan.

The purpose of this monitoring was to determine if this type of uneven management prescription on a steep forested slope would meet the Retention objective. The Tongass Forest Plan scenery Standards and Guidelines do not really address different uneven-aged management scenarios and what visual objectives they will meet. (Added from 2003 Monitoring report).

 **Evaluation Criteria:** Whether the combination of unit size, type of harvest treatment, dispersal of openings, and overall percentage of view shed ``disturbed'' results in the visual objective being met for the view shed under review.

Precision and Reliability: Relatively high, the judgments are drawn from field investigations and based upon criteria established in the scenery management system.

 **Results:**

- Identify view ports, location and aspect for current and future monitoring.
- Show a photographic record of scenic quality as seen from identified view ports. This record will provide a baseline for measurement of the impacts of future activities in the area and a baseline for measurement of the rate of recovery of scenic quality.
- Determine the effectiveness of the Standards and Guidelines for management of scenic quality.

As a result of the comparative 2003 monitoring it is clear that an uneven-aged prescription that leaves 65-75 percent of a unit's volume evenly distributed throughout the treatment area will meet a Retention Visual Quality Objective in a uniformly forested landscape, even on the 50-70 percent slopes that are prevalent in these units.

Analysis: For each 5 year reporting period:

- Identify the range of sizes of created openings in each view shed.
- Calculate the percentage of each view shed occupied by created openings.
- Calculate average distance between openings.
- Describe whether management activities have maintained intended visual quality objectives. If the answer to this question is no, discuss what factors contribute to not meeting VQOs (e.g. size of openings or treatment, type of treatment, dispersal, location of activities in landscape, or overall level of disturbance.
- Describe whether Standards and Guidelines related to harvest unit sizes and harvest type and treatment are successful in attaining desired visual objectives.
- Assess whether different visual quality objective-visual absorption capacity settings in the FORPLAN model use the correct cumulative visual disturbance thresholds. In viewsheds that have had more than one entry over several years to several decades, analyze to extent possible what entry cycles might be suitable in these different settings. Note that the entry cycle factor is used in only a much generalized way in the FORPLAN model.
- Where appropriate, assess effectiveness of various harvest units, facility, road or other activity design techniques in achieving adopted visual quality objective (e.g., shaping techniques, hiding of backlines behind ridges, placement of units).
- Assess separately effectiveness of specific harvest prescriptions other than clear cutting in meeting visual quality objectives. Note such specifics as percent of treatment area harvested, size of groups harvested, size of groups retained, number of trees taken (or retained), and overall size of treatment area. The Forest Plan states in general terms where single-tree selection or group selection methods might be appropriate, but it does not provide specific Guidelines concerning these treatments.

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 Forest-wide.

Background: Implementation of Soil and Water Standards and Guidelines is necessary to maintain soil productivity and water quality.

Implementation monitoring evaluates whether or not a BMP was required and implemented. Effectiveness monitoring includes evaluating the effectiveness of individual BMPs and where practicable, comparing the physical, biologic, and chemical parameters of water against the State of Alaska Water Quality Standards.

Implementation monitoring will be conducted according to a Tongass-wide BMP implementation-monitoring strategy described under the Soil and Water Question 3. BMP's monitored that are most applicable to the soils resources include:

BMP 13.5 Identification & Avoidance of Unstable Areas
BMP 12.17 Re-vegetation of disturbed Areas
BMP 13.9 Yarding Systems to Protect Soil/ Water Resources
BMP 13.10 Landing Location & Design
BMP 13.11/14 Erosion Control Measures
BMP 14.5 Erosion Control Plan Non-Point Source Discharge Plan
BMP 14.7 Measures to Minimize Mass failures
BMP 14.8/ 12.7 Measures to Minimize Surface Erosion
BMP 14.9 Drainage Control structures to Minimize Erosion & Sedimentation
BMP 14.12 Control of Excavation & Sidecast
BMP 14.14/14.17 Bridge/ Culvert Design, Installation & Removal
BMP 14.18 Control Rock Pit Sediment
BMP 14.20/14.22 Road Maintenance/ Access Management

Soil and Water Question 1: Are the Standards and Guidelines for soil disturbance being implemented?

Implementation monitoring of soil conservation practices are documented in the annual BMP implementation monitoring report. Refer to Soil and Water Question #3 protocol.

Soil and Water Question 2: Are Standards and Guidelines effective in meeting Region-10 Soil Quality Standards?

Background: 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 referenced in the 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 practice(s) 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.

Soil effectiveness monitoring has two parts:

1. Determining the amount and degree of soil disturbance related to management activities
2. Inventory landslides related to management activities. The density of landslides is greatest in managed stands than unmanaged areas in all four mass movement hazard classes. The effectiveness of this Forest Plan Standard should not be evaluated based on this limited preliminary information. The landslide inventory should be expanded to other areas of the Tongass ands the data rigorously analyzed before conclusions can be drawn.

Data collection for both of these projects has been completed as project monitoring on the Ketchikan Area. Further data collection will depend on the results of the analysis.

Soil Disturbance

Data Collection: Data collection has followed the procedures outlined in "Guidelines for Sampling Some Physical Conditions of Surface Soils" R-6-RWM-146-1983, USDA-FS, Pacific Northwest Region, 34pp. Sampling was modified for Alaska conditions with procedures similar to those outlined by Landwehr, 1993 unpublished white paper. Most Soil Quality Standards can be monitored though the completion of randomly located line transects within 2 years of timber harvest.

- Review data set of roughly 31 miles of random and non-random transects collected over a 7 year period for the completion of the 89-94 Ketchikan Pulp Company Final Environmental Impact Statement Soil and Water Monitoring.
- Review the data set for statistical soundness against statistical methods including the statistical analysis method described in ``Guidelines for Sampling some Physical Conditions of Surface Soils'', R6-RWM-146-1983, USDA-FS, Pacific Northwest Region, 34p.

Soil disturbance Standards and Guidelines are being implemented based on two types of assessments for Best Management Practices (BMPs), 100 percent monitoring of units closed out and roads completed composed the implementation monitoring process and a 10% quality control monitoring of a subset of the monitoring pool. (Added from 2003 monitoring report)

Evaluation Criteria: Statistical summaries of transect data are evaluated against the Soil Quality Standards.

Precision and Reliability: The precision and reliability can be very high. FSM 2554 suggests precision to the 90 percent confidence level; however plots of the existing data show a one-sided, somewhat non-normal distribution. A 90 percent confidence level is difficult to achieve. The actual precision and reliability of the data can be calculated and reported. Non-parametric statistics can be used to further display the data.

Results:

- Tabulate and summarize the transect data from the 89-94 Ketchikan Pulp Company Final Environmental Impact Statement Soil and Water Monitoring.
- Summarize the findings on the statistical soundness of the transect data set.
- Tabulate and summarize transect data from completed units with the partial suspension cable systems.
- Compare the R-10 Soil Quality Standards for disturbance relative to the findings of transects completed.

Analysis:

- Discuss the results of the transect data relative to the recorded disturbance associated with controlled shovel yarding, partial log suspension, and full log suspension.
- Determine if the transect data set is statically sound.
- Discuss the findings from transects relative to application of the Standards and guides and whether the Standards and guides are effective in meeting the Alaska Regional Soil Quality Standards.

Landslide Inventory

Data Collection: Through GIS identify areas of high concern based upon high mass movement soils (MMI=3 or 4) and steep areas (>72%) and select a subset of a minimum of 1 area to monitor. Surveys are conducted annually during project implementation and again 3 years after project completion. The VCU or Watershed selected for monitoring should have landslide potential addressed in the EA or EIS and soil conservation practices implemented.

- Conduct a field investigation of landslides associated with road construction activities or unit harvest as soon as practical after they occur and collect data elements describing the following attributes as listed:
  - Define slide type
  - Identify slip plane
  - Define potential for continued mass movement
  - Identify potential for sediment transport that will contribute to water quality problems

- Document the date of the slide and management factors associated with the slide through discussions with the Sale Administrator, Engineering Representative, Contracting Officer's Representative, or Contractor.
- Define slide location through ground based or aerial surveys.

- Investigate site and construction diaries and harvest reports for indicators of potential causes for the landslide. Identify:
  - Geomorphology: hollow topography, landforms
  - Water indicators: wet-site indicator plants at the headwall
  - Soil Disturbance indicators: soil disturbance, stumps pulled at headwall
  - Construction/ Logging activity: road construction, blasting, yarding
  - Construction/ Logging phase: equipment in slide
  - Impacts: Violation of State Water Quality Standards (document report to ADEC)

- Collect information on the precipitation for the previous week and details on any associated storm event.

Evaluation Criteria: Slides included in this inventory can be any size. Slides must have an identifiable slip plane; cutbank failures in glacial till are excluded unless the failure is cutback to an identifiable slip plane at the till/ soil or till/ bedrock interface.

Precision and Reliability: The inventory is a 100 percent sample of landslides associated with a single project on Prince of Wales Island. Landslide frequency studies have indicated a higher rate of mass movement in older second growth than in old-growth conditions. The effects of timber harvest on slope stability can be long-term and extend beyond the three-years-after-harvest as monitored in this project.

Continued emphasis is necessary to implement measures that minimize mass failures and landslides Application of partial suspension and full suspension has contributed to limiting soil disturbance. Full bench design, end haul and control blasting has contributed to minimize mass failures. Seeding and slope stabilization has been effective in limiting erosion and landslides. Emphasis should continue on removing over steep areas and areas that show unstable soils prone to mass movement.

Results:

- Tabulate the data describing each landslide.
- Summarize the background data pertinent to the cause of the landslide.
- Mark the location of the landslide on a map & in the GIS database.
- Define the mapped soil series and MMI for the headwall of the site.

Analysis:

- Summarize the integrated landslide table by causal agents, activity causing slides, impact on water quality.
- Identify trends in landslide frequency and magnitude relative to geomorphology, parent material, rainfall, timing of the slide event compared to construction and logging activities, and other site conditions.
- Identify the range in the observed soil series and MMI at the headwall with respect to the mapped units.

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

 **Background:** 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. Typical BMPs include buffer zone design and layout for stream course protection, re-vegetation of disturbed areas, and timing of instream activities. Implementation monitoring evaluates whether or not a BMP was required and implemented.

Turbidity, sediment, and temperature are considered the most likely water quality parameters to be affected by the activities implemented under the Forest Plan. Stream turbidity associated with culvert and bridge installation, records of the impacts of road maintenance activities are monitored annually and the program has expanded dramatically over the last four years.

A wide range of stream temperature data collection and data management protocols are currently in place throughout the Tongass National Forest. An analysis of legacy stream temperature data is in progress.

In a pilot study monitoring macroinvertabrates, Environmental and Natural Resource Institute (ENRI) sampled 58 reference reaches, 36 logged reaches, and six urban reaches in Southeast Alaska, including many sites within the Tongass National Forest. This pilot effort will set the stage for determining whether macroinvertebrates will be used as water quality monitoring indicators in the Tongass National Forest. (Added 2003 from monitoring report)

This BMP implementation monitoring protocol integrates selected implementation monitoring questions that address direct and indirect effects to aquatic resources.

In addition to Soil and Water question 3, the following questions are addressed, in part, through this implementation monitoring protocol:

- **Fish Habitat Question 2:** Are fish and riparian Standards and Guidelines being implemented?
- **Soil and Water Question 1:** Are the Standards and Guidelines for soil disturbance being implemented?
- **Timber Management Question 1:** Are timber harvest activities adhering to applicable timber management Standards and Guidelines?
- **Wetlands Question 1:** Are wetlands Standards and Guidelines being implemented?

 **Data Collection:** The soil and water Standards and Guidelines are implemented as Best Management Practices (BMPs) described in FSH2509.22. Monitoring will be conducted according to a Tongass-wide BMP Implementation Monitoring Strategy described in the two tier approach below.

A two-tiered approach to monitoring will be applied to address these implementation-monitoring questions. First, all harvest units, temporary roads, and specified roads (new construction and reconstruction) will be monitored by timber sale administrators and engineering representatives for implementation of Forest Plan Standards and Guidelines and BMPs upon their completion. Second, a sub sample of projects (10%) will be monitored for implementation and effectiveness by an interdisciplinary team. Specific details on the monitoring protocol for each of the implementation monitoring items can be found in the Tongass Monitoring Strategy.

For all harvest units, temporary roads, and specified roads developed using current Standards and Guidelines sale administrators and engineering representatives complete the following and record data on the forms provided.

- Review records (e.g., unit folders- soil resource reports, soil conservation practice and logging suspension prescriptions, NEPA documents, sale area maps, unit cards, road cards, construction inspection daily diaries, and timber sale inspection reports) to identify:
  - Very steep slopes (>72%) and whether the analysis approving timber harvest on steep slopes was documented.
  - Prescribed buffer areas (riparian, beach, estuary). Record the approximate size of buffers identified as requiring protection measures.
  - Prescribed channel protection measures (e.g., directional felling, split yarding, and debris removal). Record total length of stream protection measures prescribed by type.
  - Estimated area extent within units requiring suspension.
  - Whether an erosion control plan was prepared. Record area extent of measures proposed.
  - The area extent of wetlands and mitigation measures prescribed (e.g., suspension, exclusion of sensitive wetlands, shovel yarding, road relocation).
  - Fisheries timing prescriptions for stream crossings and road segments. Record onset and duration of timing prescriptions.
  - The lengths of temporary road requiring erosion control measures.
  - Whether erosion control measures were implemented and a non-point source discharge plan was in place before roads and units were accepted.
  - Whether oil control measures and spill prevention control and countermeasure plans were in place before roads and units were accepted.
  - Whether an oil or gas spill occurred during project implementation.
  - Whether potentially unstable slopes were identified and recommendations were made to limit mass movement.
  - Whether measures to restrict blasting or full bench road prisms were designed and built or end haul segments were designed and implemented.
  - Prescribed erosion control measures including seeding, water bars, ditches, erosion netting-fabric, terraces, benching, and riprap.
  - Evaluation of rock durability and mechanisms used to limit rock degradation (e.g., variable tire pressure, road maintenance).
  - Prescribed drainage control structures and road erosion control features (e.g., inlet aprons).
  - Measures prescribed to minimize sedimentation from excavated and sidecast materials.
  - Measures prescribed to minimize adverse impacts on water quality and stream courses.
  - Whether hydrologic analysis showed runoff rates, volumes, flood conditions, flow velocities, and sedimentation.
  - Measures at rock pits to minimize adverse impacts on adjacent resources.
  - Prescribed methods for organic material disposal.
  - Road access management objective and prescribed measures.

- In the field inspect:
  - Units to identify any very steep slopes. Note if measures to avoid the area or mitigation to limit mass movement were implemented.
  - Units to verify that all riparian areas were identified.
  - Whether prescribed buffers were maintained.
  - Units and roads to determine whether erosion control measures were applied in areas where displaced soil could effectively channel water.

- Units to determine whether prescribed channel protection measures were implemented. Record total length of stream protection measures by type.
- Units to estimate the actual size of areas where suspension requirements were met.
- Landings to assess whether landings were constructed in ways that minimized soil erosion and water quality degradation and confirm whether logging slash and sediment was kept out of streams.
- Units and roads to estimate the area extent of erosion control measures implemented.
- Units and roads to estimate the actual size of wetlands in units and the area extent of wetland mitigation measures applied.
- Road segment stream crossings and road segments to determine whether timing prescriptions were met.
- Temporary roads where erosion control measures were applied.
- Units to and roads to determine specified erosion control measures were implemented.
- Log transfer facilities and observe whether settling ponds were properly constructed and measures to minimize sediment transport were implemented.
- Roads, landings, and log transfer facilities, fueling facilities, and fuel tanks to observe whether good housekeeping techniques were implemented to minimize hydrocarbon contamination.
- Fill slopes adjacent to streams, clearing widths, and borrow disposal sites were constructed to minimize mass movement potential.
- Roads cut slopes and observe where they were seeded to prevent erosion.
- Erosion control measures implemented including seeding, water bars, ditches, erosion netting-fabric, terraces, benching, and riprap were implemented.
- Roads for implementation of drainage control structures.
- Culverts to determine whether their spacing and sizing dissipated flows.
- Ditches and cross drains to identify whether they were installed to limit erosion and sediment transport.
- Roads to identify erosion control features applied (e.g., trash racks, drop inlets, inlet aprons, and armored outlets).
- Roads to determine whether measures to minimize sedimentation from excavated and sidecast material were implemented.
- Bridges and culverts to identify whether their design minimized restriction of the channel and prevented scour of the fill slopes and drainage.
- Rock pits to identify whether prescribed measures to mitigate adverse impacts other resources were implemented.
- Road corridors to determine whether organic debris was disposed of using the prescribed method.
- Roads to evaluate whether prescribed road access measures were implemented.

 **Evaluation Criteria:** Compliance with the Forest Plan Standards & Guides and BMPs. Whether the unit harvest as well as the road and facility construction shows subsequent effects that support the applicable objectives for fish habitat, soil and water, wetlands, timber, and transportation resources.

Recommendations include continued focus on the implementation of riparian buffers and their stability or windfirmness over time as a higher priority for Forest Plan monitoring. In regard to stream buffer effectiveness, an understanding of the complexities of predicting and abating windthrow in RMAs is required to move closer toward the achievement of Ecosystem Health objectives.

Precision and Reliability: Generally the precision and reliability is very high. The implementation of the Best Management Practices (BMPs) is documented during the monitoring conducted by the Sale Administrators, Engineering Representatives, and Contracting Officer's Representatives. Implementation Monitoring is conducted at 100 % of the sites and implementation-monitoring forms documenting this activity are filed at the time each unit and road is finalled or closed. Ground traverses and inspections have 100 % reliability and show a precision of +/- 1 foot, +/- 5 % slope gradient, and +/- 10% acre.

Analysis:

- Prepare a table showing the summarized results of the attribute ratings.
- Compare the number of fully successful implementations of the BMPs or Standards and Guides to the departures from full implementation.
- Discuss any difficulties implementing the BMPs or applying the Standards and Guides.

Results:

- Tabulate the data collected to list attributes of the unit and road specific to the streams, slopes, oil pollution prevention, sediment transport, and wetlands.
- Document the number instances of fully successful implementations of the BMPs or Standards & Guides.
- Document the number of instances of departures from full implementation of BMPs or Standard & Guides.
- Summarize the situations and circumstances where departures from full implementation of the BMPs or Standards & Guides occurred.

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

Background:

Effectiveness in meeting water quality standards has several components, which are discussed in various other protocols as listed below:

- Stability and effectiveness of stream buffers: Fish Habitat, Channel condition Assessment, 319 Protocols
- Road drainage structure operations and maintenance: Fish Habitat, Fish Passage
- Stream buffer strip stability and consequences of blowdown: Fish Habitat, 319 Protocols
- Effectiveness of class III stream prescriptions in minimizing sediment delivery to fish streams: Fish Habitat, Channel Condition Assessment, 319 Protocols
- Effectiveness of yarding methods in minimizing soil disturbance and achieving soil quality standards: Soil and Water, Soil Disturbance Protocols
- Frequency and effects of landslides in old growth, young growth, and clear-cut sites: Soil & Water, Landslide Protocols

Data Collection:

Since 1997, BMP effectiveness monitoring has focused on individual practices such as stream buffers and measures to minimize landslides. Under the current Forest Plan (with the exception of compliance monitoring associated with the Greens Creek Mine on Admiralty Island and permit monitoring associated with Log Transfer Facilities), water quality data were not collected for

purposes of evaluating BMP effectiveness until 1999, when turbidity monitoring was initiated during culvert installation.

The Forest Plan EIS discusses efforts to monitor sediment in the Tongass National Forest in the 1970s and 1980s. Conclusions with respect to the effects of forest management on sediment yields were severely limited by the inherent variability of sediment yields and short duration of these studies. Stream sediment has not been monitored in the Tongass National Forest since these efforts because it is very difficult and costly to directly measure sediment transport rates with reliability.

Stream temperature monitoring efforts have been underway since the early 1990s at selected sites in the southern Tongass National Forest in response to widespread adult pink salmon pre-spawning mortality documented in the late 1980s and early 1990s.

In the 2001 Monitoring and Evaluation Report it was stated that these data may correlate to fish kills; however, the current data collection protocols (including locality and site specific placement) limit the utility of the data for evaluating BMPs currently under the Forest Plan.

A study of stream temperature influences on fish kills suggests that low dissolved oxygen levels associated with very low volume stream flow is the greatest factor influencing large fish kills in Southeast Alaska (Alaska Working Group on Cooperative Forestry and Fisheries 1991). This study reported that low dissolved oxygen levels were controlled primarily by stream discharge and fish abundance (high respiration rates) and occurred even where stream temperatures were within water quality criteria.

Evaluation of Stream Temperature Monitoring Results Since 1997

At this time, there is insufficient information to evaluate the effectiveness of BMPs in attaining state water quality criteria for stream temperature in the Tongass National Forest. The stream temperature monitoring sites were selected on the basis of historic fish kills, and are not representative of current Forest Plan Standards and Guidelines. Past reports show that stream temperatures sometimes exceed state water quality criteria in un-harvested as well as harvested watersheds. Maximum stream temperatures are probably more closely related to climate influence than implementation or effectiveness of current Forest Plan Standards and Guidelines.

A recent examination of the Staney Creek streamflow record indicates decadal climatic cycles have a significant influence on the frequency and duration of low-flow events (Neal 2000). This finding highlights the need for long-term data to evaluate the influence of forest management on streamflow as well as stream temperature in Southeast Alaska. Hyporheic processes and riparian stand conditions (deciduous versus coniferous) also play significant roles in moderating stream temperatures.

It is reasonable to assume that shade and cover associated with intact riparian vegetation throughout stream networks (maintained through no-harvest buffers required under the current Forest Plan) will maintain a natural range of variability in stream temperatures. It is also reasonable to assume that in Southeast Alaska, summer stream temperatures will rise in all watersheds, especially those with lakes, during periods of little or no rainfall.

No corrective action with respect to maintaining stream temperatures necessary for protecting beneficial uses in the Tongass National Forest at this time. It is reasonable to assume that the current riparian Standards and Guidelines maintain the riparian processes associated with moderating stream temperatures beneficial to aquatic life.

The continued focus on the implementation of riparian buffers and their stability or windfirmness over time as a higher priority for Forest Plan monitoring. In addition, we recommend that stream temperature alone not be reported as effectiveness monitoring results pending further evaluation.

Since we may be unable to explicitly link stream temperature data to current BMPs, this approach is more defensible and more consistent with the monitoring and feedback strategy approved by the regulatory agencies. There is strong evidence that the maintenance of intact riparian forest is a primary mechanism for moderating stream temperatures. There is also strong evidence to suggest that rainfall itself has a moderating influence. Forest Plan activities do not alter climate and other important temperature-moderating mechanisms. However, if stream buffers are not implemented as planned, or if they subsequently blow down, stream temperatures may be affected as a result. Therefore, it is a more efficient use of time and funds to monitor the buffers and provide immediate feedback to managers regarding their implementation and effectiveness.

The Forest Plan does not require stream temperature monitoring in and of itself as a method for evaluating the effectiveness of BMPs. Stream temperature data must be interpreted in concert with climate, streamflow, riparian, and watershed data over the long-term. Understanding stream temperature regimes is essential to cumulative effects analysis, continued management, and restoration of previously harvested watersheds.

Visual Observation of Water Quality Degradation

Observing and documenting water quality degradation during resource management activities is a Forest Service responsibility in the 1992 Memorandum of Agreement between the Forest Service and ADEC. Forest Service employees who have field inspection and/or administration responsibilities document and immediately report visual observations of water quality degradation.

See the following protocols for data collection components since the data will be collected in completing implementation of these protocols:

- Fish Habitat: Fish passage, 319 protocol, channel condition assessment
- Soil & Water: Mass movement/ Landslides, Soil Disturbance
- Transportation
- Aquatic Resources: Erosion, sediment transport (Added 2002)

 **Evaluation Criteria:** Alaska State Water Quality Standards, 18AAC70 and protected beneficial uses.

 **Results:**

- Evaluate data collected on other protocols, specifically Fish Habitat: Fish Passage, Soil & Water: Mass movement/ Landslides and Transportation. Compare this data relative to the BMP's for water quality.
- Define if BMP's were implemented.
- Determine if the water quality was impacted.
-

 **Analysis:**

- Ascertain which BMP's were implemented (or not implemented) in situations where water quality was impacted.
- Summarize where water quality was impacted and chart the duration and magnitude of exceedance of the water quality standards.

References Cited

Alaska Department of Environmental Conservation. 1999. 18 AAC 70 Water Quality Standards as amended through May 27, 1999. Retrieved November 11, 2002 from http://www.state.ak.us/local/akpages/ENV.CONSERV/title18/70wqs.pdf

Alaska Department of Environmental Conservation. 2000. Alaska's Nonpoint Source Pollution Strategy. Retrieved November 11, 2002 from http://www.state.ak.us/dec/dawq/nps/pdf/npsfinal.pdf

Alaska Working Group on Cooperative Forestry and Fisheries Research. 1991. Factors affecting pink salmon pre-spawning mortality in Southeast Alaska. Technical Report 91-01.
Neal, Ed (United States Geological Survey) correspondence to Steve Paustian (USDA Forest Service), July 28, 2000
(Added 2002)

SUBSISTENCE

Goal: Provide for the continuation of subsistence uses and resources by all rural Alaskan residents. **Objectives**: Evaluate and consider the needs of subsistence users in making project land management decisions.

Background:

The known effects of management activities on subsistence users (rural residents as described in ANILCA) have not been inconsistent with the Forest Plan. Many of the monitoring projects are long term in nature, and conclusions will not be available for several years. Several other data collection efforts are on going and are in a variety of stages of analysis. In addition to working through another annual cycle of wildlife regulation proposals, the second cycle of subsistence fishing regulation proposals were evaluated and presented to the Southeast Regional Advisory Council.

The effects on subsistence resources will continue to be analyzed in NEPA documents and subsistence determinations will be made on these activities. Consultations with tribes and communications with community leaders continue to take place in many forms.

Subsistence Question: **Are the effects of management activities on subsistence users in rural Southeast Alaska communities consistent with those estimated in the Forest Plan?**

Data Collection:

1. Record summaries to report the effects of the Forest Plan on subsistence users by community. Information should include testimony from subsistence hearings, project evaluations and testimony from hearings conducted under ANILCA Section 810, comments from federally recognized tribes, and comments from council meetings. Communications with community leaders and elders including formal and informal meetings, as well as efforts to capture traditional environmental knowledge should be documented. Document comments on subsistence from AK Federation of Natives, AK Native Brotherhood Grand Camp, and Tlingit Haida Central Counsel. Summarize information obtained from the subsistence study specified in the Information Needs Appendix of the Forest Plan.

2. Review existing data including :(1) results of 1988 Tongass Resource Use Cooperative Study (TRUCS) and updated TRUCS (1996 data available for 10 SE communities; (2) updated survey results to be available for all SE communities by year 2000); (3) narrative in project-level EISs' on effects of proposed management activities on subsistence use and resources; transcripts from ANILCA 810 hearings; (4) Alaska Department of Fish and Game harvest trend data; (5) *official minutes from Southeast Regional Advisory Council meetings (two meetings/year)* (6) meeting notes from Forest Service key contact meetings with *federally recognized* tribal leaders and community leaders on affects of proposed management activities on subsistence use and resources.

3. Collect species-specific harvest data for Southeast Alaska communities. This would include: (1) field observation and interviews in study communities completed for other activities and

monitoring efforts and; (2) compilation and analysis of harvest reports and surveys. Products for use in analyzing the effects of forest management activities on communities would include Subsistence Use Area maps as well as reports produced annually.

4. Review SERAC Annual Reports. Under Sec. 805(a)(D), the SERAC is required to prepare an annual report to the Secretary which shall contain: ``(i) an identification of current and anticipated subsistence uses of fish populations; (ii) an evaluation of current and anticipated subsistence needs for fish and wildlife populations within the region; (iii) a recommended strategy for the management of fish and wildlife populations within the region to accommodate such subsistence uses and needs; and (iv) recommendations concerning policies, Standards and Guidelines, and regulations to implement the strategy."

5. Annually monitor ANILCA 810 sections of environmental impact statements and evaluate proposed net effects of management activities on subsistence use and resources. Collect ADF&G harvest trend data. Review SERAC annual reports and track regulatory changes. Document key contact meetings with tribal and community leaders.

 **Evaluation Criteria:** Changes in traditional resource use patterns, traditional environmental knowledge, and subsistence needs and uses.

Precision and Reliability: Precision and reliability will depend on the different types of data and methodologies being used. Different aspects of the data collection will have different precision and reliability: some of the data will be documentation and other data will be affected by judgments in interpretation during summary processes.

 **Results:**

1. Once every five years, summarize and evaluate the effects of the Forest Plan on subsistence users by community. Summaries should include testimony from subsistence hearings, project evaluations and testimony from hearings conducted under ANILCA Section 810, comments from federally recognized tribes, comments from council meetings. Summarize comments on subsistence from AK Federation of Natives, AK Native Brotherhood Grand Camp, and Tlingit Haida Central Counsel. Communications with community leaders and elders including formal and informal meetings, as well as efforts to capture traditional environmental knowledge should be evaluated. Summarize information obtained from the subsistence study specified in the Information Needs Appendix of the Forest Plan, specifically including comments from individuals responding on NEPA efforts.

2. Summarize data including :(1) results of 1988 Tongass Resource Use Cooperative Study (TRUCS) and updated TRUCS (1996 data available for 10 SE communities; (2) updated survey results to be available for all SE communities by year 2000); (3) narrative in project-level EISs' on effects of proposed management activities on subsistence use and resources; transcripts from ANILCA 810 hearings; (4) Alaska Department of Fish and Game harvest trend data; (5) *official minutes from Southeast Regional Advisory Council meetings (two meetings/year)* (6) meeting notes from Forest Service key contact meetings with *federally recognized* tribal leaders and community leaders on affects of proposed management activities on subsistence use and resources.

3. Summarize Board of Game and Federal Subsistence Board regulatory changes, reports from ADF&G Subsistence & Wildlife. Summarize species-specific harvest data for Southeast Alaska communities. This would include: (1) field observation and interviews in study

communities completed for other activities and monitoring efforts and; (2) compilation and analysis of harvest reports and surveys. Products for use in analyzing the effects of forest management activities on communities would include Subsistence Use Area maps as well as reports produced annually.

4. Summarize SERAC Annual Reports. Under Sec. 805(a)(D), the SERAC is required to prepare an annual report to the Secretary which shall contain: ``(i) an identification of current and anticipated subsistence uses of fish and wildlife populations within the region; (ii) an evaluation of current and anticipated subsistence needs for fish and wildlife populations within the region; (iii) a recommended strategy for the management of fish and wildlife populations within the region to accommodate such subsistence uses and needs; and (iv) recommendations concerning policies, Standards and Guidelines, and regulations to implement the strategy.''

5. Summarize any noted effects from ANILCA 810 sections of environmental impact statements and evaluate proposed net effects of management activities on subsistence use and resources. Evaluate ADF&G harvest trend data. Summarize SERAC annual reports and tracked regulatory changes. Summarize subsistence issues discussed at key contact meetings with tribal and community leaders.

Analysis:

1. Once every five years summarize and evaluate the effects of the Forest Plan on subsistence users by community.

2. The information provided through community surveys and other sources will provide the base information on which the Southeast Regional Advisory Council will develop their report. The recommendations and strategies provided by the Council will then be used in developing further monitoring activities or modifications to existing monitoring activities.

3. Analysis of Testimony from Subsistence Hearings and Project Evaluations: Monitor ANILCA 810 sections of EISs and evaluate proposed net effects of management activities on subsistence use and resources. A social scientist will review and analyze all project hearing transcripts and project evaluations. A summary report will be compiled.

4. Key Contact Meetings with Tribal and Community Leaders: Analyze key contact meetings with tribal and community leaders

TIMBER MANAGEMENT

Goal: Manage the timber resource for production of saw timber and other wood products from suitable timber lands made available for timber harvest, on an even-flow, long-term sustained yield basis and in an economically efficient manner. **Objectives**: 1) Pre-commercial thin an average of 2,130 acres annually of previously harvested suitable timber land; 2) Evaluate non-clearcutting silvicultural systems; 3) Conduct a systematic inventory of all vegetation for southeast Alaska by completing the installation and measurement of the permanent plot inventory grid; 4) Seek to provide a timber supply sufficient to meet the annual market demand for Tongass National Forest timber, and the market demand for the planning cycle, up to a ceiling of this Plan's allowable sale quantity, which is 653 million cubic feet or 2.67 billion board feet per decade.

Background:

Size of Clear cuts. The standard upper limit for individual created openings in the hemlock-Sitka spruce type of coastal Alaska is 100 acres (36 CFR §219.27[d] [2]). Larger openings are allowed at the discretion of the Forest Supervisor (150-acre maximum) and the Regional Forester (200-acre maximum) when warranted (Forest wide Standards & Guidelines, Timber Sale Preparation, Size of Clear cuts).

Slope Guidelines. At the project planning level, the Forest Supervisor or District Ranger may approve timber harvest on slopes of 72% or more on a case-by-case basis, based on the results of an onsite analysis of slope and class IV channel stability and an assessment of potential impacts of accelerated erosion on down slope and downstream fish habitat, other beneficial uses of water, and other resources.

Management of beach and estuary fringe. The beach and estuary fringes are classified as unsuitable for programmed timber harvest. Non-programmed timber harvest is allowed as part of a salvage sale, for specialty wood products, for customary and traditional uses, and for landings, roads, or timber harvest (along the landward edge of the fringe) necessary to access timber in adjacent programmed areas where there are no feasible alternatives in project design.

Falldown Factors. Forest planners recognized limitations in their ability to accurately estimate timber output levels based on existing inventories and unforeseen circumstances encountered during project implementation. ``Falldown'' occurs when the number of acres actually harvested is less than the number of acres planned for harvest. To anticipate fall down, Forest planners applied Modeled Implementation Reduction Factors (MIRFs) to reduce the area of land suitable for timber production.

Non-interchangeable Components (NIC). Forest planners partitioned the annual allowable sale quantity into two components to promote economic sustainability of the timber resource. This approach distinguishes portions of the timber supply at lower risk of attainment from those portions at higher risk of attainment. Volumes associated with each component will be identified separately in annual harvest plans for the Forest and are not to be substituted for volume from the other component to determine the allowable sale quantity. Forest planners created two non-interchangeable components based on operability: land of normal operability was designated NIC

I (220 million board feet per year); all other land was designated NIC II (47 million board feet per year).

Implementation Monitoring detailed in the Soil and Water Question 3 includes specific reference to the unit size, slope guidelines, and beach/ estuary buffers. Many of the timber management Standards and guides are implemented as best Management Practices (BMPs) described in FSH 2509.22. These attributes are monitored during the implementation-monitoring phase in both the 100% monitoring and in the 10% IDT monitoring of all units closed.

 **Timber Management Question 1**: **Are timber harvest activities adhering to applicable timber management Standards and Guidelines?**

 **Data Collection:**

- Refer to the Soils Implementation Monitoring Protocol.
- Review the Region's Silvicultural Information System (SIS) database, environmental impact statements (EISs), unit cards, and unit card addenda for areas harvested in the last year to identify where created openings (alone or in combination with other adjoining created openings) exceed the 100-acre limit.
- Identify why exceptions (if any) were allowed. Obtain citations for decision documents where the Forest Supervisor or Regional Forester approved the exceptions.
- See Soils section for details on data collection on slopes 72% gradient and higher and harvest within the 1000 feet beach or estuary buffer.
- Identify non-programmed timber harvest activities from EISs and unit cards within the 1,000-foot beach or estuary fringe completed in the previous year.

 **Evaluation Criteria:** Created openings should be less than 100 acres unless approved by Forest Supervisor (up to 150 acres) or Regional Forester (up to 200 acres). Timber harvest should not be conducted within the 1000 feet beach or estuary buffer.

Precision and Reliability: The precision and reliability will be dependent on the precision and reliability of the SIS data base, unit cards, implementation monitoring forms, and Forest records.

 **Results:**

- Refer to the Soil and Water Question 3, Implementation Monitoring.
- Tabulated details describing harvest units greater than 100 acres, documenting rational and approval of the activity.
- List any non-programmed timber harvest (salvage sales, commercial sales and harvest of blow down) within the 1000 feet beach or estuary buffers.

 **Analysis:**

- Refer to the Soil and Water Question 3, Implementation Monitoring.
- Explain circumstances where the 100-acre upper limit of created openings has been exceeded.
- Explain circumstances where beach or estuary fringe buffers have been reduced to less than 1000 feet.

 **Timber Management Question 2: Are harvested forest lands restocked within five years following harvest?**

 **Background:**
An examination of the amount of harvest compared to the ASQ level modeled in the Forest Plan, this question will assume the effects modeled in the Forest Plan are valid and compare the amount of sold and harvested timber to the output of the FORPLAN model ASQ determination. The ASQ is an upper ceiling governing the amount of timber that may be sold over a decade. The amount of sold timber may vary year to year but must not exceed the decadal ceiling. Timber is considered sold when the contract is awarded to the high bidder.

 **Data Collection:**

- Obtain the Status of Reforestation Five Years after Final Harvest Report prepared annually by the Regional Forest Management staff.
- Quantify the areas that met and failed to meet stocking requirements established by the Region.
- Characterize (e.g., soil series, aspect, community type) of lands where stocking requirements were not achieved.

 **Evaluation Criteria:** Stands should be fully stocked 5 years after harvest

Precision and Reliability: High precision and reliability, based upon intensive fieldwork. Data is collected by plots (1 plot/ acre) and walk through surveys.

 **Analysis:** Summarize the reforestation performance industry a description of circumstances where stocking requirements were not achieved.

 **Results:**

- Tabulate results from the Reforestation report including the total area that failed to meet stalking requirement.
- List characteristics associated with substandard stocking.

 **Timber Management Question 3**: **Is the allowable sale quantity consistent with resource information and programmed harvest?**

 **Data Collection:** Review and analyze assumptions in the Forest Plan at least every five years, unless significant changes in any of the following factors are evident:

- Timber Inventory Results which are completed every 5 years. Use the new timber inventory and the TIMTYP data layer to estimate low, medium, & high volume stands (refer to Julin and Caouette 1997 for methods).
- Timber Dispersion Requirements. Define if visual constraints changed (e.g., clear-cut size, adjacency, and disturbance rules).
- Tentatively Suitable Land Base. Determine if there is new information that affects the size of the tentatively suitable land base (e.g., forested wetlands suitability classification).

- Yield Tables. Determine if new information has been developed that significantly alters yield predictions (e.g., coefficients, new data range). Contact the Resource Management and Productivity Group at the Juneau Forestry Sciences Laboratory to obtain updates on timber growth and yield.
- Operability Layer Inventory. Determine if the operability layer updated and has this coverage changed significantly.
- Riparian Buffers. Determine if the buffer width guidelines changed?
- Beach and Estuary Fringe. Address if beach and estuary fringe buffer widths changed.
- Modeled Implementation Reduction Factors. For each new project, upon completion, document falldown for each factor listed in the table below.

Table 7. Fall Down Factor by Administrative Area

	Administrative Area		
			Chatham
	----------	Percent Reduction	----------
Land Selections	2.0	2.0	2.0
Unmapped TTRA Buffers	2.5	2.5	2.5
Non-Commercial Forest (applied to low volume stratum only)	18.0	18.0	18.0
Slope and Soil Conditions	32.0	3.1	3.1
Cost Efficiency (applied to low-volume stratum, difficult and isolated operability; medium-volume stratum isolated operability)	100.0	100.0	100.0
Riparian	14.2	14.3	14.3
Karst and Caves	0.5	5.9	0.3
Standards & Guidelines	1.0	1.0	1.0

Evaluation Criteria: The assumptions used to calculate ASQ in the Forest Plan.

Precision and Reliability: Based upon the level of precision and reliability of the GIS database and aerial photograph interpretation.

Results:

- Tabulate timber inventory results with regard to timber volume.
- List changes in visual constraints.
- List new information that affects the size of the tentatively suitable land base.
- Tabulate new information on yield predictions.
- Tabulate results of timber operability review.
- List changes to buffer width guidelines by channel process group.
- List any changes to any beach and buffer width guidelines.
- Tabulate the observed project fall down factors.

Analysis:

- Summarize changes in the assumptions used to calculate ASQ
- Compare falldown estimates used in the Forest Plan with those obtained during project planning and implementation.
- Identify any additional falldown factors that might be considered in the next Forest Plan revision.

Timber Management Question 4: Are the non-interchangeable components (NICs) of the allowable sale quantity consistent with actual harvest?

Background: The ASQ consists of two separate non-interchangeable components (NIC), also referred to as economic components. Under the 1997 Forest Plan, the ASQ is divided into NIC I (set at 2.2 billion board feet of timber per decade) and NIC II (set at .47 billion board feet per decade). The economic components of the ASQ equate to an average of 220 million board feet (MMBF) NIC I and 47 MMBF NIC II per year for an average annual total of 267 MMBF/year. The Forest Plan sets the proportional mix of timber harvest volume for the NIC I and NIC II

categories. The proportional mix in the Forest Plan is set at approximately 80 percent NIC I and 20 percent NIC II (Forest Plan ROD, pg 8). This represents a higher reliance on the NIC II component than that found in the 1979 TLMP.

All timber sale harvest units that were completed during FY 2003 were categorized into non-interchangeable components (NIC). Total timber volume harvested on the Tongass in FY 2003 was approximately 35 million board feet.

The Forest Plan ROD states that the ratio of the NIC I and NIC II mix is approximately 80 percent NIC I and 20 percent NIC II (Final EIS, Table 3-81, page 3-282; and 1997 ROD page 8). The mix of NIC I and NIC II for FY 2003 is 91 percent NIC I and 9 percent NIC II. In actuality, the NIC I proportion for 2003 was 91% and NIC II 9% by acres. In general, it appears the Forest Plan underestimated road construction opportunities. However, based on the low harvest levels from this year's data, it appears that economics played a major role in the purchaser's selection of what units to harvest.

 **Data Collection:** Record logging system code and operability code designation for each harvest unit

 **Evaluation Criteria:** Estimated timber volume for the non-interchangeable component (NIC) I (220 mbf/yr.) & II (47 mbf/yr.) categories

Precision and Reliability: The precision and reliability will be dependent upon the precision and reliability of the GIS data base timber data.

 **Results:** Through GIS exercise, annually tabulate the volume of harvest by NIC I and NIC II categories.
(NIC I includes standard cable and tractor with normal operability. NCI II includes long span cable, access limited with difficult operability and isolated high-volume strata.)

 **Analysis:** Compare the cumulative volume in these categories to the ceilings specified for the first decade in the Forest Plan for each component. NIC I was estimated in the Forest Plan to be 80-82%; NIC II was 18-20%

 **Timber Management Question 5: Is the proportional mix of volume in NIC I and NIC II as estimated in the Forest Plan accurate?**

 **Background:**

The 1997 Forest Plan set the ASQ ceiling at 2.67 billion board feet per decade, equivalent to an annual average of 267 million board feet per year. The two separate components were proportioned at 2.2 billion board feet of NIC I and 0.47 billion board feet of NIC II per decade or 220 MMBF NIC I and 47 MMBF of NIC II per year.

The non-interchangeable components (NIC I and NIC II) of the timber cutting areas harvested during FY 2003 were compared to the Forest Plan Operability GIS layer for each NIC category.

The NIC components for the planned and implemented FY 2000, 2001, 2002 and 2003 were compared. A difference of plus or minus five percent is within acceptable limitations of the data and seems to hold true for FY 2000 and 2001. The data for FY 2002 and FY 2003 indicates that as timber sale economics become limiting, purchasers are concentrating on the more economic sales associated with the NIC I component.


Data Collection: Obtain results from logging and operability review


Evaluation Criteria:
NIC I 80-82% of the total ASQ
NIC II 18-20% of the total ASQ

Precision and Reliability: The precision and reliability will be dependent upon the precision and reliability of the timber data and the GIS database.


Results:

- Summarize the NIC administrative study results to determine if changes in the Forest Plan are required.
- Summarize the timber operability review to determine of change in the Forest Plan are required.


Analysis: Discuss the implication of the review for calculating the NIC components.


Timber Management Question 6: Should maximum size limits for harvested areas be continued?


Background:

During FY 2003, 29 harvest areas (timber stands) were delineated in the Forest's geographic information system (GIS), with corresponding records created in the Forest's Silviculture Information System (SIS) database. Accounting for adjacency (harvested stands that touch one another, which create a larger opening when added together), 24 harvest areas were logged in FY 2003 that created openings using the even-aged Silvicultural system

In fiscal year 2003 the timber harvesting activities were shown to be adhering to the Standards and Guidelines consistently. Timber monitoring for timber implementation is recommended to continue focus on the limitation of created openings greater than 100 acres and the 1,000-foot beach and estuary buffer requirement. Continued application of the Forest GIS system to identify and describe the harvest units relative to size, location and beach buffers is recommended.

The amount of timber sold is below the ASQ set in the Forest Plan. The ASQ is consistent with resources and programmed harvest as long as the suitable timber land base is maintained. Monitoring the level of programmed harvest is planned. Utilization of this GIS system is recommended to continue, and further revision of the process used to track NIC I and II is ongoing.

 **Data Collection:** Annually query the Region's Silvicultural Information System for trends in harvest unit size.

 **Evaluation Criteria:** Circumstances that warrant increasing the harvest unit size greater than 100 acres.

Precision and Reliability: Based upon the reliability and precision of GIS and associated field traverses. The precision and reliability of this data is relatively high for resources except land use suitability, which is under development. The data is collected through field traverses and include GPS location data.

 **Results:** Summarize annual trends in harvest unit size by silvicultural system using the Region's Silvicultural Information System (SIS). Track separately by land use designation categories.

 **Analysis:** Annually evaluate monitoring results for other resources (e.g., scenic) in combination with professional judgment to determine whether or not to recommend a change to the maximum allowable harvest unit size.

TRANSPORTATION

Goal: Develop and manage roads and utility systems to support resource management; recognize the potential for future development of major transportation and utility systems. **Objectives**: Provide access for Forest users. In support of Forest resource management activities, design and construct up to an average of 110 miles of roads annually. Manage and maintain roads to protect water, soil, fish, and wildlife resources.

Background: Transportation implementation monitoring issues are addressed in the fishery, soil, and water resource protocol. This section should be referenced for information as to what Standards and Guidelines were implemented so that effectiveness can be tracked.

Stream turbidity during in-stream activity was not rated as a high priority issue but represents a simple low cost observation of a water quality standard responding to routine effectiveness monitoring commitments in the USDA Forest Service Memorandum of Understanding with the Alaska Department of Environmental Conservation (1992).

Monitoring will continue to be conducted for each log transfer facility (LTF) under terms of the LTF permits, in accordance with Alaska Water Quality Standards, and requirements from the Environmental Protection Agency for Storm Water Discharge.

Bark accumulation and oil sheen monitoring provide information to determine compliance with Alaska Water Quality standards for settable residues in marine waters as well as to satisfy requirements for the EPA NPDES permits. The monitoring of bark accumulations and oil sheens will continue. This information will be included in the annual report that is due by January 31 of the year following each calendar year of operation and discharge under the General NPDES Permit.

Transportation Question: **Are the Standards and Guidelines used for forest development roads and log transfer facilities effective in limiting the environmental effects to anticipated levels?**

Data Collection:

- Annually conduct field inspections on a representative sample of harvest units and their associated roads. These roads were closed and their motorized use eliminated in the current year. Similarly Log Transfer Facilities connected by these roads were closed. Monitoring would seek to determine whether the current Standards and Guidelines adequately mitigated the adverse impacts on other resources, including soil productivity, water quality, and wildlife and fish habitat. This monitoring may overlap with timber, karst, wetlands, soil & water, and fish monitoring. (reworded 2002)

- Refer to the Soils section, Implementation monitoring. For each road constructed, collect field data and complete implementation monitoring form noting compliance with Best Management Practices for eagle nest buffers, fisheries prescriptions (specify fish passage requirements and timing guidelines), oil pollution control plan, timing restrictions to minimize

erosion, measures to minimize mass failures, measures to minimize surface erosion (seeding), drainage control structures, control of excavation and side cast, bridge and culvert design and installation, control rock pit sediment, and disposal of slash and stumps.

- Monitoring will continue to be conducted for each log transfer facility (LTF) under the terms of that LTFs permit, in accordance with Alaska Water Quality Standards and Environmental Protection Agency Regulations for Storm Water Discharge.

- Closed roads and trails should be inspected once every 3 years.

- Gates and barriers on closed roads should be visually inspected for integrity and evidence of being bypassed.

- Turbidity measurements will be taken at the stream crossings where culverts greater than 48" in diameter are installed above and below the culvert site using visual observations. Turbidity measurements will be taken at a minimum of 40 % of the sites using a portable turbidity meter.

For turbidity water measurements the following equipment will be needed:
- Turbidity Meter equivalent to a Hach Pocket Turbidity Meter or Hach 2100P Portable Turbidity Meter.
- Clean plastic or glass water sample collection bottle.
- Sample testing vial (specialized vial for meter).
- Drying cloth for testing vial.
- Lint/ Oil cloth for testing vial.

The samples will be taken following a standard sampling procedure:
- 3 to 4 samples should be taken from various locations in the stream cross section and the readings averaged. Caution should be taken not to stir up sediment in crossing the stream in collecting samples.
- Stand downstream of the sample site. Sample sites should be selected at a site that represents the average water quality. Sites generally should be selected that are in the center of the flow, roughly mid-depth in the sediment mixing zone.
- Invert the sample collection bottle and lower it to ½ the stream depth.
- Turn the bottle upright with the opening pointing upstream and elevate the bottle out of the water.
- Immediately cap bottle for transport to testing site.
- Transfer water from collection bottle to testing vial insuring that water and sediment stays in solution and testing vial is not scratched.
- Dry testing vial initially with dry cloth then lint/ oil cloth.
- Ensure test vial is not fogged up nor shows condensation.
- Test the water for turbidity either using the visual measurement or the turbidity meter.
- Make every effort to pair the turbidity readings above and below the site of project impact, taking into account non-local influences that may be affecting turbidity readings and recording these disturbances in terms of location to project and nature of the disturbance. (Added 2002)
- Record the readings on the turbidity monitoring data input table for the site as well as on the Turbidity Monitoring Data Summary Table.
- Record details on any departures from the State Water Quality standards and any corrective actions/ mitigation measures implemented on the Turbidity Corrective Action/ Mitigation Measures Table.

Turbidity will be measured at the following time intervals:
- Immediately before construction begins at the stream crossing location or if not possible immediately prior to construction, as close to construction time as possible
- 48 hours after culvert installation is complete, downstream within 20 feet of the installation

- Upstream of any stream work immediately following the sampling downstream of the installation site
- If turbidity measurements show elevated levels downstream of the installation relative to upstream, turbidity measurements should continue both upstream and downstream daily until the turbidity levels upstream and downstream are relatively no longer elevated.

  Elevated defined as:

  1. For readings lower than 50 NTUs; elevated levels are turbidity levels >5 NTU difference between the upstream and downstream measurement
  2. For readings higher than 50 NTUs; elevated levels are turbidity levels >10 % increase over upstream levels or a maximum of >25 NTU difference between upstream and downstream measurement

Descriptive notes on the stream bed material (i.e. bedrock, organic soil, glacial till, clean gravel, silt and gravel, silt, sandy loam, gravel and boulders, sand, gravel and boulders), traffic, stream character (i.e. steep sideslope drainage, meandering, braided), stream gradient (% slope gradient measured from the inlet of the culvert roughly 25 feet upstream) flow conditions (high flow, low flow, water turbulence, and estimated flow in cubic feet per second), and precipitation should be kept with the turbidity measurements.

One turbidity data sheet should be completed for each culvert site. The specific date and time construction starts at the culvert site, ends at the culvert site, as well as the time and date of the turbidity measurements should be recorded. The turbidity data and descriptive site information should be recorded on the Turbidity Monitoring Data Input Table as well as on the Turbidity Monitoring Data Summary Table. A copy of the contract plan sheet showing the culvert location and culvert construction details should be attached to the turbidity monitoring data sheet. Details on any departures from the State Water Quality standards as well as any corrective actions/ mitigation measures should be recorded on the Turbidity Corrective Action/ Mitigation Measures Table. A cross reference note should be listed on the roads implementation monitoring form for this road segment in the comments column under BMP14.14/ 14.17 Bridge/ Culvert Design, Installation & Removal to see the turbidity monitoring data table(s) and reference the road station numbers of the culvert sites where turbidity measurements were completed.

 **Evaluation Criteria:** Refer to Soils section, Implementation Monitoring. Compliance with the Standards & Guides for Soil and Water, Clean Water Act, Code of Federal Regulations for Non-Point Source Discharge, and Alaska State Statutes & Regulations for petroleum discharge and water quality.

Turbidity

The basis of the turbidity sampling procedure is to determine if a `degradation of water quality' occurred and to determine if the Best Management practices are effective in preventing water quality degradation. The turbidity measurements should be evaluated against the criteria for the Degradation as well as the Alaska Water Quality Standards for both drinking water supply and the standard for propagation for aquatic life. The Alaska Water Quality Standards (18AAC70) require that the most stringent criteria for water quality apply to streams unless a variance to change the designated use is granted. Because the standards are written as an increase above upstream or natural levels, it is important that the downstream observation be compared to the upstream. The upstream level is used as the base, and will vary with different conditions including precipitation.

Degradation

Per the State Forest Practices Regulations (11AAC95) and incorporated by reference into the R10 Soil and Water Conservation Handbook; ``degradation of water quality'' does not include

changes that are temporary, localized, and reparable decreases in water quality; in this paragraph (a)"reparable" means an effect on or change to, a use or aquatic system due a decrease in water quality that is reversible by natural processes such that the use or system will return to a state functionally identical to the original; (B)"temporary" means 48 hours or less with respect to existing uses."

Drinking Water Standards

The Alaska State Water Quality Standards (18AAC70) for turbidity require that, with respect to the most stringent use the turbidity should be evaluated against the criteria for water supply (i) drinking, culinary, and food processing, these standards state that the levels “may not exceed 5 NTU (nephelometric turbidity units) above natural conditions when the turbidity is 50 NTU or less, and may not have more than 10 % increase in turbidity when natural turbidity is more than 50 NTU, not to exceed a maximum increase of 25 NTU”.

Propagation of Aquatic Life Standards

The Alaska State Water Quality Standards (18AAC70) for turbidity require that, with respect to the beneficial use ``growth and propagation of fish, shellfish, other aquatic life, and wildlife,'' the levels may not exceed 25 NTU (nephelometric turbidity units) above natural conditions; for all lake waters, the levels may not exceed 5 NTU above natural conditions.

Transportation Criteria

The Forest Service handbook FSH 7709 lists criteria for road maintenance, which can be used as evaluation criteria to access the road condition. The observed conditions of the roads, rock quarries and LTF's can be evaluated against the design criteria in the plans, typicals and the Forest Service Handbook FSH 7700. Criteria for evaluating the LTFs can be found in the storm water discharge plans, operator’s pollution prevention plans, EPA guidance documents on fuel storage as well as in the construction plan typicals and site plans.

Precision and Reliability: Visual turbidity measurements should be calibrated with a portable turbidity meter. Upon visual calibration a person can define whether the turbidity is 25 NTUs or greater. Turbidity measured with a turbidity meter should show +/- 5% over a range of 0.1 - 400 NTU. Specific precision and accuracy of less than 1 NTU is considered acceptable for this application.

Results:

- Tabulate field inspection data on the representative sample of older and newer harvest units and associated roads and log transfer facilities.
- List impacts on other resources including soil productivity, water quality, and fish and wildlife habitat.
- Compile implementation monitoring form data including details on the status of the drainage structures, sediment transport and erosion control.
- Tabulate the turbidity observation and measurements indicating the time and date of measurement, culvert size, brief description of the streambed material, stream character, flow conditions, precipitation at the time of installation and turbidity measurement, as well as any unusual site characteristics such as highly degrading road fill or high silt/ schistose rock road fill.
- List any mitigation measures, corrective action, and remediation measures taken at sites where turbidity measurements were outside the levels defined in the Alaska State Water Quality Standards.

- Tabulate the assessments of the LTF facilities, including clean-up of bark and debris, functionality of runoff controls, storage of petroleum products, ability of refueling facilities to contain petroleum products during transfers and secondary containment facilities, used fuel storage, and sediment settling ponds.

Analysis:

- Describe the observed impacts caused by roads and log transfer facilities on soil productivity, water quality, and fish and wildlife habitat.
- Assess the road prisms for drainage ditch conditions, sufficiency of cross drainage, cut and fill slope conditions (stability and erosion) and running surface condition.
- Compare the turbidity measurements relative to the Alaska State Water Quality Standards and determine if the measurements are within the criteria for degradation, drinking water quality and propagation of aquatic life.
- Summarize the turbidity measurements and assess the sites to determine if the construction is contributing to elevated levels.
- Determine if any of the mitigation measures, corrective action, and remediation measures taken at sites where turbidity measurements were outside the levels defined in the Alaska State Water Quality Standards were effective in contributing to bring the water quality into compliance into State standards.
- Assess the rock quarries and gravel sources for erosion control and stability.
- Assess the LTF facilities for run-off, bark accumulations, fuel storage, and functionality of sediment settling ponds.
- Explain how well the Best Management Practices were implemented and if the implementation was effective.

WETLANDS

Goal: Minimize the destruction, loss or degradation of wetlands and preserve and enhance wetland functions and values. **Objectives:** Avoid alteration of, or new construction in, wetlands whenever there is a practicable, environmentally preferred alternative. Implement Best Management Practices and estuary, riparian, and soil and water Standards and Guidelines specific to wetlands.

Background: Wetland implementation monitoring will follow established protocols for BMP implementation monitoring on a representative sample of harvest units and associated roads for the Tongass NF. Avoidance of wetlands will by monitored Tongass-wide each year, through GIS analysis.

Currently, the Tongass NF does not have an approved method to evaluate impacts of management activities to wetland functions and values. Some studies exist that are aimed at partially answering functional effectiveness questions. Some of these studies are complete and some are on going. No one study can give us the answer to all the functional questions associated with management activities in wetlands.

Future wetland effectiveness monitoring will be based on the results of research by the Forestry Sciences Laboratory, which will be conducting a "Problem Analysis" relative to the question of wetland functions in Southeast Alaska. This analysis will include a review of the breadth of research and other pertinent information relative to specific wetland functions in Southeast Alaska. These functions will include the terrestrial, aquatic and human uses of wetlands. A review of the existing literature and a summary of what we presently know and understand about wetland functions will be written. In addition, a summary of missing information, or data gaps, relative to wetland functions will be included in the Problem Analysis. The summary of the problem analysis will include a strategy on how to proceed with additional research in order to have a more complete understanding of baseline wetland functions. Wetland functions will vary depending on geomorphic setting and wetland type.

Once this problem analysis is complete, (March 2005) we plan to modify the wetland effectiveness monitoring protocols to reflect the strategy for answering the effectiveness question identified in the Monitoring Plan. (Added 2002 and last two para added 2004 as per Patti Krosse)

Wetlands Question 1: Are wetlands Standards and Guidelines being implemented?

Data Collection:
Currently, each environmental impact statement completed for projects that contain wetlands includes evaluation and finding for impacts relative to wetlands. Studies exist that partially answer functional effectiveness questions. Some of these studies are complete and some are ongoing. No one study gives the answer to all the functional questions associated with management activities in wetlands.

With less than 0.1 percent of the total wetlands impacted by road construction and timber harvest,

the Tongass National Forest has fulfilled the intent of the Standards and Guidelines. Even with the combined effects of Fiscal years 1998-2003 activities on wetlands, the Forest is illustrating avoidance of wetlands in its management activities.

Avoidance Implementation Monitoring

1. Calculate total wetlands Tongass-wide in the GIS database (CLU layer) using the following categories:
    a. Estuarine
    b. Lacustrine
    c. Palustrine
        1) Forested
        2) Fens (short and tall sedge fens)
        3) Bogs (moss muskeg)
        4) Subalpine forest/bog (muskeg) mosaic
        5) Bog (muskeg)/forested wetland mosaic
        6) Forested upland/wetland mosaic
    d. Riverine

2. Use most Forest-wide roads inventory to analyze total area affected by roads (use 3 ac/mile).
3. Calculate total area (acres) of wetland impacted by road construction by wetland category (above).
4. Calculate percent of wetlands (Tongass-wide) affected by roads by wetland category.

 **Evaluation Criteria:** The CLU database will be the standard for wetland analysis. Wetland categories mentioned above will be queried in GIS, using a new ITEM (called WETLD_CAT) which will be added to the CLU.SMUT look-up table. The Forest-wide inventory for roads will be used to calculate acres of roads.

Precision and Reliability: Total acres of wetlands will be measured to the nearest 5 acres. The CLU database and associated wetland categories will be used consistently across Administrative Areas. Wetland information generally does not change over time (unless a wetland is converted to upland or vice versa, which rarely occurs); therefore the reliability of the database is high. Forest-wide road database will be updated every year.

 **Results:**

1. Report total acres of wetlands by wetland category.
2. Report total acres of wetland impacted by road construction.
3. Discuss specifically any acres of wetland fens or estuaries (high value wetlands) impacted by road construction.
4. Report percent of Tongass-wide area by wetland category.
5. Report percent of wetlands impacted by road construction by wetland category.
6. Report Tongass-wide total percent wetlands impacted by road construction.

 **Analysis:** to be written

BMP Implementation Monitoring

BMP implementation monitoring for wetlands (BMP 12.5) follows Tongass National Forest Best Management Practices Implementation Monitoring Strategy (June 1998) protocols. Results from that monitoring are reported in the annual BMP Implementation Monitoring Report.

The Best Management Practices (BMPs) for wetland Standards and Guidelines were monitored on the Tongass through guidelines described in the Tongass Monitoring Strategy. The strategy was developed to provide direction for Forest Plan implementation monitoring. The BMPs evaluated are included in the Soil and Water Conservation Handbook (FSH 2509.22, October 1996). (Added 2002).

 **Results**:

1. Summarize BMPs, which were implemented for the monitored sites.
2. Summarize BMP ratings for sites monitored.
3. Discuss how well the BMP was implemented and summarize results.

 **Analysis:** To be written

 **Wetlands Question 2: Are wetlands Standards and Guidelines effective in minimizing the impacts to wetlands and their associated functions and values?**

 **Data Collection:**

1. Define wetland functions by wetland category.
2. Review completed and on-going research/monitoring on wetlands to determine if they address effectiveness of management activities on wetland functions. These studies include:
   - Timber Productivity and Response to Harvest of Forested Wetlands in Southeast Alaska - FSL - Dave D'Amore.
   - Effects of overlay road construction on ground water hydrology - Study done by Terry Brock and FSL on Wrangell Island (which includes Impacts of Forest Roads on Sloping Peatlands - Glaser, 1996.)
   - Southeast Alaska Wet-Soil Monitoring Project - FSL - Dave D'Amore
   - Road Interception of Ground Water Movement - FSL - KK McGee
   - HydroGeomorphic Model (HGM) (modified Wet II) analysis method to evaluate beneficial functions and values of wetlands affected by management activities.

 **Evaluation Criteria:** The evaluation criteria used will be the standard, generalized functional attributes by wetland category. To evaluate if the studies cited can address the effectiveness questions, a team of Soil Scientists, Ecologists, Hydrologist and Fisheries Biologists from the TNF and FSL will review the studies and discuss their findings in a group forum. This group will also discuss usage of the HGM and its applicability to southeast Alaska wetlands.

Precision and Reliability: This will be based on the scientific validity of the studies being used to address the effectiveness questions. Each study should have a defined methodology and results should be peer-reviewed before acceptance.

Results:

1. Describe generalized wetland functions by wetland category.
2. Describe project activities in wetlands.
3. Describe wetland mitigation measures applied (BMPs, mitigation or restoration).
4. Summarize findings of research/monitoring studies as they apply to different management activities and how they affect wetland functions.
5. Develop a plan of action to use the HGM or other tool for making simple, reliable functional assessments of wetlands before and after activities take place.

Analysis: to be written

WILD AND SCENIC RIVERS

Goal: Maintain the outstandingly remarkable values (ORV) and the free flowing conditions of rivers designated or recommended for designation as components of the National Wild and Scenic Rivers System. **Objectives**: Manage the 32 study rivers (or segments) recommended for designation as Wild, Scenic, or Recreational pending designation by Congress, to maintain the eligibility of the total miles of river for the following recommended classifications:

Wild	364.5 miles
Scenic	87.5 miles
Recreational	89.0 miles

Background: The Wild and Scenic Rivers Act of 1968 established a policy for preserving selected rivers in a free-flowing condition that would balance the development of water, power and other resources on rivers of the United States. Rivers are eligible to be considered for inclusion in the National Wild and Scenic Rivers System if they are essentially free-flowing (without major dams, diversions, or channel modifications) and if they possess at least on "outstandingly remarkable" scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar value. These values should be a unique or exceptional representation for the area that the evaluation of a river's eligibility considers.

A monitoring program has two purposes on inventoried study rivers: it answers the questions how the current management of the river corridor is affecting the Outstandingly Remarkable Values; and, it identifies the conditions needing corrective actions to retain and enhance extant river values identified in the inventory.

There are two scales of monitoring: examining the effectiveness of specific activities in accomplishing specific resource conditions such as free flow or ORVs; and, monitoring long-term trends. The short term monitoring program is limited by sideboards that include national, regional, and local allocations of resources. The long term program is affected by the potential changes in "study rivers" into "suitable or eligible" rivers, and process. Designated rivers require detailed management plans, and within these plans river values are outlined. Monitoring, therefore, is guided by measurements of these values and how they reflect on the river as a whole, and whether it is improving, remaining the same, or declining over time.

When river's are being managed to Standard this means managers are being able to account (identify and describe) Outstandingly Remarkable Values (ORVs), do the same for the classes within the river, prepare a boundary map, a CRMP management plan, maintain text and history for easements, describe water resources project development, develop a monitoring plan to protect and enhance values, establish permits for commercial outfitting, develop agreements to protect river values with State, local agencies, private organizations, and describe of extant water chemistry and water quantity dependency at Federal level.

Monitoring for Wild and Scenic River focus on the non-degradation or enhancement policies regardless of classification and include: 1. An assessment of the potential effects to river's free flowing conditions, 2. Assessment of the water quality or ORV use related to adverse effects

mitigated to the extent of FS authority, and evidence of management of existing adjacent or river bank uses, such as recreation and transportation. (Added as per Jackie Deitrich, National WSR coordinator in Region 6 and Lyn Kolund, TNF, who attended her seminar)

Wild and Scenic River Question 1: Are Wild, Scenic, and Recreational River Standards and Guidelines being implemented?

Data Collection:

- Annually select three proposed or designated Wild, Scenic, and Recreational River to monitor. Select an area that reflects a higher intensity on those Rivers with the highest use within the river corridor (such as the Blind River corridor on the Petersburg District or the Hasselborg and King Salmon Rivers on Admiralty National Monument), and those adjacent to or within project areas for other activities, such as timber sales. Choose a wild, scenic, recreational river, rated by recreational staff that shows high use.

- Review project-specific plans and approved Management Plan (if applicable) for special management considerations, carrying capacities and River- or project-specific Standards, Guidelines and mitigating measures, and authorized projects and activities. Note if all applicable Standards and Guidelines were incorporated into project plans and special use authorizations.

- Review current year observation records from visitors for evidence of implementation of Standards and Guidelines, particularly those concerning the quality of the river experience.

- Conduct visual surveys of use areas to determine whether Standards and Guidelines have been implemented, both for numbers of encounters and for construction and maintenance activities.

- Identify indications of conflicting uses that may result from Standards and Guidelines implementation.

- When possible, observe activities of outfitter/guides under permit for conformance to permit requirements, especially in numbers of visitors.

- When possible, interview visitors for indications of the quality of their river experience. Visit permitted recreation cabin sites for compliance with permit requirements.

- Monitor each proposed or designated river at least once every five years. For each selected wild, scenic recreational river stratify the area into different levels of use and focus the monitoring on the reaches of highest use or with adjacent other activities (i.e. timber sales).

- Review previous monitoring reports, permit administration records, project NEPA documents, and monitoring and research from other sources for predicted conditions, identification of previous problems, development of trends, and anticipated effects of past activities.

- Interview field employees, research and education organizations, outfitter/guide organizations, and visitor's organizations about conditions and status of river selected.

 **Evaluation Criteria:**

- Evaluation will be based on whether or not applicable Standards and Guidelines were incorporated into project planning documents and special use permits, and if they are being implemented on-the-ground.

- Numerical thresholds are those established by respective Standards and Guidelines and ROS class for each river classification, and relates to numbers of groups, party size, and numbers of encounters. The thresholds for social encounters and social effects (quality of the river experience) are based on personal and professional experience and knowledge.

Precision and Reliability: Precision and reliability will be dependent upon the precision and reliability of the monitoring activities. The precision and reliability will be affected by the subjective judgement of the people interviewed as well as the recreation specialists.

 **Results:**

- Describe the River environment monitored, including a description of locations visited and activities monitored.
- List Standards and Guidelines incorporated into project plans and implemented on the ground.
- Identify any Standards and Guidelines not incorporated into project planning
- Identify if the appropriate ROS class applied, relative to river classification, based on pre-designation uses?
- List the numbers of encounters for each ROS class observed.

 **Analysis:**

- Describe the implementation of the Standards and Guidelines for these rivers. Describe circumstances where the Standards and guides were not implemented. Examine the trends observed relative to implementation of the Standards & guides, ROS classes relative to river classifications and numbers of encounters.
- If numbers of encounters exceeded the established limits, why? What actions, if any, are recommended?
- Discuss whether ROS class applied was appropriate.
  Evaluate the encounter numbers prescribed and realized and explain the differences.

 **Wild & Scenic River Question 2: Are Wild, Scenic, and Recreational River Standards effective in maintaining or enhancing the free flowing conditions and outstandingly remarkable values at the classification level for which the river was found suitable for designation as part of the National Wild and Scenic River System.**

 **Data Collection:** For rivers selected for implementation monitoring:

- Document the Standards & Guides implemented.

- Review the administration records to evaluate whether the Standards & Guides were implemented.

- Interview field employees, research and educational organizations, outfitter-guide organizations concerning the effectiveness in the Standards & Guides in a achieving the River objectives.

- Select at least one proposed or designated Wild, Scenic, and Recreation River per Area, in conjunction with and at the same intensity level as, wild and scenic river implementation monitoring above.

- Review previous monitoring reports, permit administration records, project NEPA documents, and monitoring and research from other sources for predicted conditions, identification of past problems, development of trends, and anticipated effects of past activities.

- Review approved project-level plans, special use permits, and (where applicable) approved River management plans, for special management considerations, carrying capacities, River-specific Standards, Guidelines and mitigating measures, and authorized projects and activities.

- Conduct field surveys of use areas for indications of excessive or inappropriate use, or other indicators that the applicable Standards and Guidelines are not effective in maintaining the river resource. Indicators include streambank damage, stream sedimentation, destruction of vegetative cover, site hardening, concentrations of visitors, grouping of camping sites, shortcuts in relation to trails, excessive motorized or mechanical use, excessive or readily observable permitted authorized facilities, excessive evidence of human presence and deterioration of facilities such as trail, boat mooring sites, and cabin sites.

 **Evaluation Criteria:** The degree to which human activities maintain or enhance the resource values of the river.

Evaluation of the results of monitoring will be based on whether or not the Standards and Guidelines guiding Forest Service-approved activities have been effective in maintaining the river resource.

If Standards and Guidelines are being properly implemented but effectiveness monitoring indicates that unacceptable damage to the river resource is occurring, and analysis identifies the reason for failure, take action to correct the downfall. Actions may be to limit numbers of users, physically restrict access, physical restoration of the site, or work with commercial users to use alternate sites. Conversely, if it is found that the Standards and Guidelines are effective in maintaining or enhancing the river resource, the appropriate action may be to reduce or eliminate monitoring.

Precision and Reliability: The precision and reliability will be affected by the professional judgement of the recreational specialist conducting the monitoring activity.

 **Results:**

- List the Standards & Guides Implemented.
- Summarize observations of Standers & Guide Implementation.
- Compile interview data concerning the effectiveness of Standards & Guides in achieving the River objectives.
- Summarize field surveys describing indications of unplanned use relative to maintaining the River resource.

Analysis:

- Describe the overall effective of the Standards and Guides in maintaining the River resources reviewed.
- Explain any challenges or conflicts resulting from implementation of the Standards & Guides. Recommend measures that would be more effective in protecting the river resource.

WILDERNESS AREAS

Goal: Manage designated Wilderness to maintain an enduring wilderness resource while providing for public access and uses consistent with the Wilderness Act of 1964 and the Alaska National Interest Lands Conservation Act of 1980 (ANILCA). **Objectives**: In Wilderness, manage for the adopted ROS class. Where ROS has not been adopted, manage for no greater development than semi-primitive motorized (with certain localized exceptions due to the effects of activities outside wilderness and ANILCA exceptions).

Background: Congressionally designated Wilderness in the Tongass National Forest comes from two pieces of legislation. Alaska National Interest Lands Conservation Act (ANILCA) of 1980 established 14 Wildernesses totaling 5.5 million acres within the Tongass. Two of the area, Admiralty Island and Misty Fiords, we also designated as National Monuments. Prior to ANILCA three was no designated Wilderness on the Tongass. In 1990, the Tongass Timber Reform Act (TTRA) amended ANILCA and designated five new Wilderness and one Wilderness addition totaling 296,080 acres. This brings the total to 5.7 million acres in 19 Wilderness on the Tongass National Forest. The geographic distribution and expanse of the 19 Wilderness units, along with limited staffing and budgets, make the implementation of Standards and Guidelines difficult.

Wilderness Question 1: Are Standards and Guidelines for the management of wilderness being implemented?

Data Collection:

- Recreation Staff collaborates with District wilderness managers on prioritizing wilderness areas for monitoring and evaluation.
- Select at least one Wilderness per Area with the highest number of uses and users.
- Document the degree of compliance with applicable Standards and Guidelines.
- Perform a field monitoring trip on a representative sample of wilderness areas each year to assess compliance with Standards and Guidelines not related to authorizations and as an overview of permit compliance within that individual wilderness area.
- Review applicable Wilderness Implementation Schedule or approved Wilderness Management Plan, permit administration records, and project NEPA documents for incorporation of applicable Standards and Guidelines.
- Review past monitoring reports for indication of Standards and Guidelines implementation in past years.

- Collaborate and coordinate with field employees (such as wilderness rangers), other administrative units, research and education organizations (i.e. Wilderness Resource Institute), outfitter/guide organizations, and wilderness visitors organizations (i.e. Alaska Wilderness Recreation and Tourism Association), to provide assistance in the collection and evaluation of data.

- Review the approved Wilderness Implementation Schedule, approved Wilderness Management Plan (if applicable), and project-specific plans for special management considerations, carrying capacities, Wilderness- or project-specific Standards, Guidelines and mitigating measures, and authorized projects and activities. Note if all applicable Standards and Guidelines were incorporated into project plans and special use authorizations.

- Review special use permit files for authorized amount and location of use, and performance history.

- Review current year observation records/comments of wilderness rangers, other official visitors, and recreational visitors for evidence of implementation of Standards and Guidelines, particularly those concerning the quality of the wilderness experience.

- Review previous monitoring reports for identification of problems, areas of needed improvement, or areas where no additional monitoring may be required.

- Conduct visual surveys of use areas for indications of Standards and Guidelines implementation, both for numbers of encounters, etc. and for activities such as facilities development, and trail construction and maintenance.

- Identify indications of conflicting uses that may result from Standards and Guidelines implementation.

- When possible, observe activities of outfitter/guides under permit for conformance to permit requirements, especially in numbers of visitors.

- When possible, observe high use areas for extended periods of time to determine numbers of visitors for compliance with ROS class limits or, if applicable, with established carrying capacities.

- When possible, interview wilderness visitors for indications of the quality of their wilderness experience. Visit permitted recreation cabin sites for compliance with permit requirements.

- When possible, visit sites of administrative activities, such as fish habitat improvements and recreation cabins, for compliance with Standards and Guidelines for appearance.

 **Evaluation Criteria:** Compliance with Guidelines establishing levels of social encounters, development, and visitor impacts by Recreation Opportunity Spectrum class.

Threshold: The numerical thresholds are those levels established in the Recreation Opportunity Spectrum class (Forest-wide Standards and Guidelines), or as a carrying capacity either in the W.I.S. or an approved Wilderness Management Plan. The threshold for implementation of other required Standards and Guidelines is ``Were the Standards and Guidelines implemented?'' and is answered yes or no.

Evaluation: Evaluation of the results of monitoring will be based on whether or not the actual use of a given wilderness is within the limits set in the Recreation Opportunity Spectrum class, the W.I.S., or Wilderness Management Plan. Visitor use days can be within the threshold, but other Standards and Guidelines are not being implemented in order to prevent effects such as hardening of sites other than those predicted as acceptable, unacceptable bunching of camp sites, obvious damage or evidence of use, or concentrations of visitors.

In addition to the evaluation of the levels of social encounters, the level of development (See campsite inventory instructions for Class 2 and 3 sites and forms for Class 2 and 3 sites), and the character and intensity of visitor impacts specifically identified in the monitoring question Evaluation Criteria, determine whether the Standards and Guidelines relating to wilderness management are being incorporated into project planning or special use permits. Determine, through field observation, if these Standards and Guidelines were implemented on the ground.(Added 2004 as per information provided by KMRD and CSW)

Precision and Reliability: The precision and reliability will be dependent upon the data documentation and the professional judgement of the recreational specialist.

Results:

- Describe the wilderness environment monitored, including a description of locations visited and activities monitored.
- Review the project plans and determine if the Standards and Guidelines were incorporated into project plans.
- If applicable Standards and Guidelines were not incorporated into project planning, determine why not.
- Determine if Standards and Guidelines identified in project planning were implemented on the ground.
- Determine if applicable Standards and Guidelines were not implemented, why not?
- Determine if the appropriate ROS class applied, relative to remoteness.
- List the numbers of visitors and numbers of groups encountered.
- Determine if the numbers of encounters were within the numbers established for the ROS class, or in a Wilderness Implementation Schedule or approved Wilderness Management Plan.

If monitoring indicated that Standards and Guidelines are being incorporated into wilderness planning and implemented on the ground, rely on effectiveness monitoring to indicate whether the Standards and Guidelines are effectively maintaining an enduring wilderness resource while providing for public access and use. If monitoring indicates that applicable Standards and Guidelines are not being incorporated into project planning or implemented in the field, particularly relating to outfitter/guide use, administrative actions should be taken to insure that these Standards and Guidelines are implemented in the future. Administrative action may include limiting commercial use, stricter special use enforcement, limiting of non-commercial use, or, if conditions warrant it, changing the current ROS class to one less restrictive.

Wilderness rangers made monitoring trips to the Admiralty National Monument and Kootznoowoo Wilderness, Misty Fiords National Monument Wilderness, Tracy Arm – Fords Terror Wilderness, Petersburg Creek-Duncan Salt Chuck, West Chichagoff, South Baranof Wilderness, Tebenkof Bay, Kuiu, and Chuck River Wilderness in 2003. These trips lasted from a single day visits to campsites and cabin surveys to season long assessments of cruise ship use and impacts. Many visits were interdisciplinary in nature and included gathering data for the purposes of monitoring wilderness values, recreation use, rare and sensitive plant surveys and conditions of heritage sites.

The ability to have an administrative presence in the Wilderness is not only reassuring to the managers but to the special use permit holders and residents. An emphasis within the Forest Service for managing this increase of use in the Wildernesses needs to be recognized and monitored. (Added from 2003 monitoring report).

Analysis:

Analysis of monitoring information acquired will primarily be qualitative and will be weighed against the principle Land and Resource Management Plan Goals and Objectives of managing designated Wildernesses to maintain an enduring wilderness resource while providing for public access and use. As stated above, the included Standards and Guidelines are only those felt to be key to the monitoring question. Other Standards and Guidelines may be required by a project-specific plan, and should be included in any analysis relating to the monitoring question.
If numbers of encounters exceeded the established limits, why? What actions, if any, are recommended?

Wilderness Question 2: Are Standards and Guidelines for the management of wilderness effective in maintaining the wilderness resource?

Background: The Standards and Guidelines are general and their effectiveness in maintaining the Wilderness resource is difficult to quantify. The geographic area's large size and complexity, along with limited budgets, make implementation of Standards and Guidelines difficult to monitor for effectiveness.

Data Collection:

- Recreation Staff collaborates with District wilderness area managers in order to prioritize wilderness areas for monitoring and evaluation.
- Select at least one Wilderness per Area per year with the highest number of uses and users in conjunction with wilderness implementation monitoring .
- Review past monitoring reports, permit administration records, project NEPA documents, and monitoring and research from other sources for predicted conditions, identification of past problems, development of trends, and anticipated effects of past activities.
- Collaborate and coordinate with field employees (such as wilderness rangers), other administrative units, research and education organizations (i.e. Wilderness Resource Institute), outfitter/guide organizations, and wilderness visitors organizations (i.e. Alaska Wilderness Recreation and Tourism Association), to provide assistance in the collection and evaluation of data.
- Review the approved Wilderness Implementation Schedule, and, where applicable, the approved wilderness management plan, for special management considerations, carrying capacities, Wilderness-specific Standards, Guidelines and mitigating measures, and authorized projects and activities.
- Review special use permits for authorized amount and location of use, and performance history. Review current year observation records of wilderness rangers, other official visitors, and recreational visitors for indications of problem areas, areas of concentrated use, or inappropriate or excessive use.

- Review previous monitoring reports for identification of problems, areas of improvement, or areas where no additional monitoring may be required.

- Conduct visual surveys of use areas for indications of excessive or inappropriate use, or other indicators that the applicable Standards and Guidelines are not effective in maintaining the wilderness resource. Indicators include stream bank or shoreline damage, stream sedimentation, destruction of vegetative cover, site hardening, concentrations of visitors, grouping of camping sites, shortcuts in relation to trails, excessive motorized or mechanical use, excessive or readily observable permitted authorized facilities, excessive evidence of human presence (may not result in site hardening, etc., but still readily evident), and deterioration of facilities such as trail heads trails, boat mooring sites such as abandoned log transfer facilities, and cabin sites.

 **Evaluation Criteria:** The degree to which human activities maintain the wilderness resource.

Threshold: The threshold for any given standard and guideline will vary by the type of Standards and Guidelines and location; however, the overall guiding threshold is the standard and guideline effective in maintaining the wilderness resource?. The answer is yes or no. If no, corrective action must take place. The exception will be only those effects that have been identified in an approved NEPA document.

Evaluation of the results of monitoring will be based on whether or not the Standards and Guidelines guiding Forest Service-approved activities have been effective in maintaining the wilderness resource. Standards and Guidelines relating to resource protection (Best Management Practices, visuals, trail construction requirement, etc.) may effectively protect that resource, but not be acceptable in terms of the overall wilderness resource. This evaluation is primarily qualitative rather than quantitative and is subject to personal and profession interpretation.

Recommended Actions: If Standards and Guidelines are being properly implemented but effectiveness monitoring indicates that unacceptable damage to the wilderness resource is occurring, and analysis identifies the reason for failure, take action to correct the downfall. Actions may be to limit numbers of users, physically restrict access, physical restoration of the site, or work with commercial users to use alternate sites. Conversely, if it is found that the Standards and Guidelines are effective in maintaining the wilderness resource, the appropriate action may be to reduce or eliminate monitoring.

Precision and Reliability: The precision and reliability will be dependent upon the professional judgement of the recreational specialist completing the monitoring activity.

 **Results:**

- Describe the wilderness environment monitored, including a description of locations visited and activities monitored. Include a description of those Standards and Guidelines identified for effectiveness monitoring.

- Describe in a narrative if the Standards and Guidelines identified in project planning were implemented on the ground.

- Determine if Standards and Guidelines effective in protecting the wilderness resource?

- Evaluation of the effectiveness of the Standards and Guidelines continues to be difficult because of impacts from uses in the air space and on salt water that are outside the jurisdiction of the Forest Service.

Analysis:

- Analysis of monitoring information acquired will primarily be qualitative and will be weighed against the principle Land and Resource Management Plan Goals and Objectives of managing designated Wildernesses to maintain an enduring wilderness resource while providing for public access and use. The applicable wilderness implementation schedule will describe limits of acceptable change, desired conditions, and anticipated effects by the various wilderness visitors. While the quantifiable data obtained may indicate that use has not reached numerical limits indicated in applicable Standards and Guidelines, W.I.S., or approved wilderness management plan, professional experience and knowledge may suggest that acceptable use has been met or exceeded, and the Standards and Guidelines ineffective in maintaining the wilderness resource. If an unacceptable condition is identified, determine the cause, if it is site-specific or widespread, if it is a single-year occurrence or on going, and what the cumulative effects, if any, may be.

- Summarize findings if Standards and Guidelines were not effective in protecting the wilderness resource. Address what actions, if any, are recommended.

WILDLIFE

Changes here were from input by Linn Shipley.

Goal: Maintain the abundance and distribution of habitats, especially old-growth forests, to sustain viable populations in the planning area. Also, maintain habitat capability sufficient to produce wildlife populations that support the use of wildlife resources for sport, subsistence, and recreational activities. **Objectives:** In addition to objectives included in Biodiversity, design and implement non-structural wildlife habitat improvement projects to improve an average of 8,000 acres annually across the Forest. Include a young-growth management program to maintain, prolong, and/or improve understory forage production and to increase future old-growth characteristics in young-growth timber stands for wildlife. Additionally, design and implement an average of 75 structural wildlife habitat improvement projects annually across the Forest.

Background: The Tongass National Forest provides habitat for 54 species of mammals (including the (recently) introduced elk on Etolin Island, marten and red squirrels on Admiralty, Baranof and Chichgof Islands, and marten on Prince of Wales Island), 231 species of birds, and five species of amphibians and reptiles. There are an additional 18 species of marine mammals found in Southeast Alaska waters that depend entirely on the ocean environment, and 45 bird and 3 amphibian or reptile species considered casual or accidental visitors to Southeast Alaska. These species provide many opportunities for consumptive and non-consumptive uses, including guided , general (commercial, sports), and subsistence hunting and photographic and viewing activities. The Forest is rich in its varied and unique species; some of the species found on the Forest in relative abundance (such as bald eagles and brown bears) are threatened or endangered in other parts of the United States.

Wildlife Question #1: Are population trends for Management Indicator Species and their relationship to habitat changes consistent with expectations.

Background:

(Population trends for MIS on the Tongass N.F. are probably not affected as much by forest management and road building as projected in the 1997 Forest Plan. The reason for this is that the levels of timber harvest and road building have been consistently less than that proposed by the Forest Plan, which projects a maximum yearly harvest of 267 MMbf.)

(Work will continue toward updating the wildlife MIS list to determine the need to adjust the number of recommended species for monitoring.) Species included at this time in the MIS list are the following: brown creeper, hairy woodpecker, red-breasted woodpecker, Vancouver Canada goose, bald eagle, river otter, American marten, red squirrel, mountain goat, Sitka black-tailed deer, wolf, black bear, and brown bear.

Data Collection:

The National Forest Management Act of 1976, Code of Federal Regulations prescribes the use of Management Indicator Species (MIS) for monitoring the effects of Forest Service activities on fish and wildlife resources (CFR 36, Part 219.19, also USDA FS, 1982). The intent of these analyses is to develop information useful for Forest Plan amendments and revisions. Consistent with these planning regulations, the Monitoring and Evaluation Plan in the 1997 Tongass Land and Resource Management Plan (TLMP; pages 6-15) identifies 13 wildlife MIS and provides

monitoring direction for these species. This section fulfills the Forest Plan recommendation for a summary evaluation of MIS distribution, habitat and population trends every 5 years.

(A brief summary of the habitats used by the 13 wildlife MIS, population status and trends, and the general management trends on the Tongass National Forest (TNF) that may influence habitat capability for these species. More detailed summaries of each species are available upon request. In addition, determinations of 1) the relationships that existed between changes in habitat capability and MIS population changes and information on 2) information on the if the habitat and population information is consistent with expectations in the Forest Plan is also addressed. Various techniques were used to infer trends in habitat capability by assessing changes in important habitats. Each species summary was examined to determine its value of that species as an MIS. This evaluation was based on the quality and quantity of existing data available for that species, the magnitude of the management issues associated with the species, and the cost and feasibility of gathering additional data. For many species we acknowledge that linking population changes to management activities is difficult to implement (Landres et al. 1988, Mladenoff et al. 1997), that analyses could likely only detect dramatic changes in populations, and that it cannot be determined whether changes in the population were due to human caused habitat change. (Added 2002 and Paragraph removed on 2001 draft task group reports on MIS species that appeared at beginning of revision)
Reference to the DeGayner document of 1999-removed from appendix as document separated from Guidebook).)

- Monitor habitat changes, using the most recent version of the interagency habitat capability models to estimate change in the relative habitat values for each MIS since the start of the Forest Plan implementation.
- Compare population trends for MIS with habitat changes.
- Evaluate approximately every 5 years for consistency with plan expectations.
- See the Forest Plan, pages 6-14 to 6-16 for details on data collection for each MIS.

 **Evaluation Criteria:** [to be written] Habitat changes and population trends for management indicator species.

Precision and Reliability: [to be written]

 **Analysis:** [to be written]

For wildlife MIS on the Tongass, the best monitoring strategy probably involves continually evaluating and improving habitat capability models, including testing the assumptions that underlie them. To this end, IMEG recommends reconvening the Interagency Model Group. Action items will include:

- Reevaluate the existing MIS list (recommend species to add or drop).
- Recommend information needs for evaluating existing models or constructing new ones as appropriate.
- Where possible, and if issues demand it, develop population indices for monitoring individual MIS.
- Develop discussion on limitations of CFR language on MIS and the existing Forest Plan language (in Chapter 6).
- Review and evaluate annually data collected for each MIS to determine population trends.

 **Results:** [to be written]

 **Wildlife Question #2: Are the population levels and associated distribution of mammalian endemic species on islands and portions of the mainland consistent with the estimates in the Forest Plan?**

 **Background:** An information need was identified to determine the geographic and habitat distribution of endemic mammals on the Tongass National Forest**.** A study was conducted by the Forest Science Laboratory to determine the geographic and habitat distribution of endemic small mammals on the Tongass National Forest.

 **Data Collection:**

- Document the geographic extent and habitat distribution within and across islands and the mainland portion of the Tongass National Forest of several recognized mammalian taxa that demonstrate limited historical ranges.
- Determine population levels and associated distribution of mammalian endemics on islands and portions of the mainland that have had timber harvest

(1. Review the progress on the small mammal study on endemic mammals.
2. Review and results of the study, noting the geographic and habitat distribution as well as any effect from timber harvest.)

 **Evaluation Criteria:** to be written

Precision and Reliability: The precision and reliability is dependent upon the precision and reliability of the wildlife studies and associated databases.

 **Results:**

1. Summarize the progress on the small mammal study on endemic mammals.
2. Summarize the results of the study, describe the geographic and habitat distribution of the species and note any significant effect from timber harvest activity on the population of the mammalian endemics.

 **Analysis:**

1. Describe the status of the endemic small mammal study on endemic mammals including the work completed and planned in the study. Explain the rational that has lead to modifications in the study plan.
2. Document any trends noted in the geographic and habitat distribution of species relative to timber management activities endemic small mammals.
3. Recommend changes in the study plan to ensure the study is providing the necessary information to determine if population observations are consistent with estimates in the Forest Plan.

COSTS AND OUTPUTS

Costs & Outputs Question 1: What outputs were produced in the previous year?

Data Collection:

- Read management report.
- Review Forest Plan projections.

Evaluation Criteria: Achieve levels of desired goods and services as described in the Forest Plan.

Precision and Reliability: The precision and reliability will be dependent upon the precision and reliability of the cost and output data and will vary on specific items dependent upon the input data.

Results: Tabulate current and planned output levels.

Analysis: Compare current and projected output levels and explain differences.

Costs & Outputs Question #2: Are the costs associated with carrying out the planned management prescriptions (including those of producing outputs) consistent with those costs estimated in the Plan?

Data Collection:

- Review estimated costs in the Forest Plan.
- Obtain actual costs of producing outputs (every 5 years)

Evaluation Criteria: Produce outputs at a cost less than or equal to planned costs.

Precision and Reliability: The precision and reliability will vary with the specific data input for costs and outputs.

Results: Tabulate annual current and planned costs.

Analysis: Compare actual with planned costs and explain differences.