Fish Habitat

Goal: Maintain or restore the natural range and frequency of aquatic habitat conditions on the Tongass National Forest to maintain the abundance and diversity of resident and anadromous fish.

Objective: Determine if our best management practices (BMPs) and 1997 Tongass Land and Resource Management Plan (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.

Background: Fish and aquatic resources on the Tongass National Forest provide major subsistence, commercial, and sport fisheries. Abundant rainfall and watersheds with high stream densities provide a high number and diversity of freshwater fish habitats. The Tongass National Forest provides spawning and rearing habitats for the majority of fish produced in Southeast Alaska. Maintenance of this habitat and high water quality is of concern to the public, State and Federal natural resource agencies, and Native organizations.

In FY 2007, major emphasis was placed on monitoring resident fish populations, BMP implementation, and stream habitats. A synthesized approach was used for all aspects of fish habitat monitoring. The Pacific Northwest Forest Experiment Station completed development of a plan for monitoring juvenile coho salmon.

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

The Forest Plan identified Dolly Varden char, cutthroat trout, coho salmon and pink salmon as MIS. An annual monitoring program for resident Dolly Varden and cutthroat and their habitat was established in 1999. In 2007, fish abundance and stream habitat surveys were completed for 21 previously sampled streams and one newly identified monitoring stream.

The protocol incorporates a design that requires monitoring of streams before and after timber harvest. Initial timber harvest is complete in two of the watersheds (Tunehean and Salty creeks). Timber harvest or road construction began in two additional watersheds (Vial and Gunsight creeks) in 2006 and is expected in another watershed (Packer) in 2008. Predicting the year of future timber harvest is difficult and is controlled by many variables including appeals and litigation of National Environmental Policy Act (NEPA) documents, the market value for timber, agreements with the conservation community, and changes in laws and policy affecting timber harvest in Southeast Alaska.

Alaska Department of Fish and Game (ADF&G) commercial harvest and escapement data are reported for coho and pink salmon for 1997 through 2007. A project was completed to develop and evaluate a protocol for monitoring juvenile coho. For pink salmon, a project to determine the sensitivity of historical escapement (number of adults returning to spawn) to previous timber harvest was replaced by a project to evaluate the suitability of monitoring pink salmon spawning habitat.

Monitoring Results for Dolly Varden Char and Resident Cutthroat Trout

Fiscal year 2007 was the ninth consecutive year for resident Dolly Varden and cutthroat monitoring. Monitoring streams are located throughout the Forest in watersheds with anticipated future timber harvest (Map Fish–1).

Power analysis has suggested 16 treatment streams will be necessary for an 80 percent chance of detecting a decline in fish populations of 0.80 of the standard deviation of the samples (the effect size). Existing long-term data sets for resident cutthroat in Oregon and for Dolly Varden in Southeast Alaska indicate that a decline of approximately 20 percent of the mean annual population can be detected. Annual mean abundance before and after timber harvest will be compared with a paired-t test.

Even though the power analysis indicated 16 streams would be sufficient for the minimum monitoring program, 21 treatment streams were selected for monitoring. We will continue identifying and adding streams for a more robust program. Doing so will compensate for fall-down in the planned timber harvest that reduces the sample of streams. A new treatment stream on Etolin Island was added beginning in 2007.

In addition to the 21 treatment streams, four control streams are being monitored (Table Fish-1 and Map Fish-1). As of December 2007, timber harvest for 11 of the treatment streams has been substantially delayed or dropped primarily due to poor timber sale economics and issues related to entering roadless areas. Timber harvest has occurred or is now likely for 10 treatment streams (including the new stream added in 2007) within the next 7 years.

Control streams were added to the design following a recommendation from the Interagency Monitoring and Evaluation Group. Control streams are not required for the planned paired-t test, but will help to explain changes in the fish abundance not related to timber harvest.

Site selection criteria for treatment streams include:

- Populations of resident cutthroat trout and/or Dolly Varden char;
- Migration barriers to prevent interaction with anadromous fish;
- FP3, MM1, or closely related channel types;
- No previous logging, but with planned future logging; and
- Not connected to lakes.

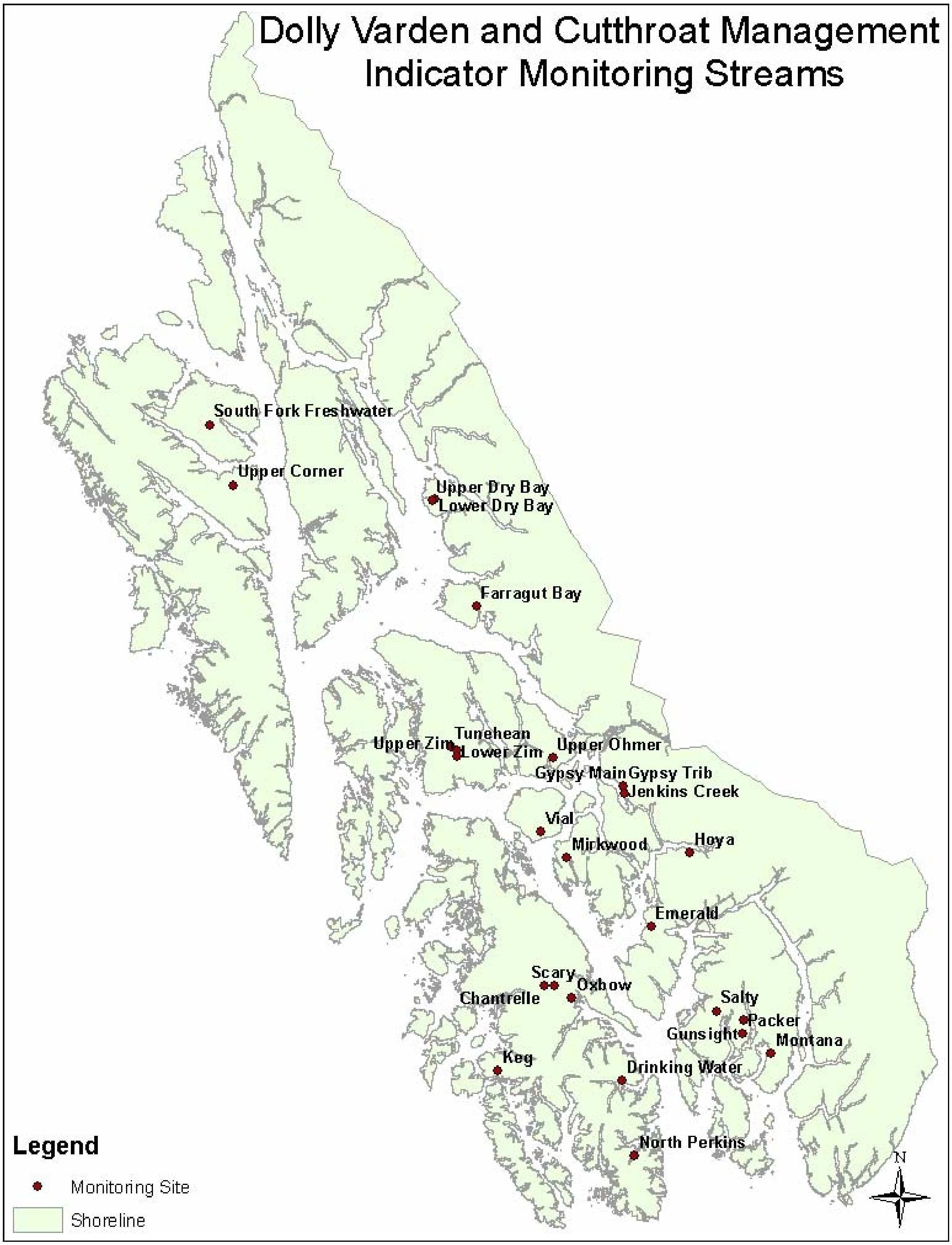
Control streams meet the same criteria except there is no planned future logging.

Two of the monitoring streams are located in case-study watersheds. One is a control stream (Chanterelle Creek) and the other is Scary Creek, a previously harvested watershed. Scary Creek data cannot be used for the resident fish MIS project, as the watershed does not meet the site selection criteria. Both data sets will be valuable to help interpret the wide range of monitoring data being collected from the case-study watersheds.

Table Fish-1. Summary of Stream Reaches for Resident Fish Monitoring in 2007

Ranger District	Stream Name	Year of Timber Harvest	Channel Type	Fish Species	Population Estimate	Habitat Survey
Craig	Drinking Water Cr	On hold	MM1	Cut, DV	Yes	Yes
	N Perkins Cr	2011	MM1	Cut, DV	Yes	Yes
	Keg Cr	Control	FP4	DV	Yes	Yes
Hoonah	S Fork Freshwater Cr	2010	MM1	Cut, DV	Yes	Yes
Juneau	Dry Bay Upper	Dropped	FP3	DV	No	No
	Dry Bay Lower	Dropped	FP3	DV	No	No
Ketchikan-Misty	Montana Cr	On hold	MM1	Cut	Yes	Yes
	Packer Cr	2008	MM1	Cut, DV	Yes	Yes
	Gun Sight Cr	2006	MM1	DV	Yes	Yes
	Salty Cr	2001	MM1	Cut	Yes	Yes
	Emerald Cr	On hold	FP3	Cut	Yes	Yes
Petersburg	Farragut Cr	Deferred	FP3	Cut, DV	Yes	Yes
	Tunehean Cr	2002	MM1	Cut, DV	Yes	Yes
	Lower Zim Cr	2014	MM1	Cut, DV	Yes	Yes
	Upper Zim Cr	2014	FP3	Cut, DV	Yes	Yes
	Upper Ohmer	Control	FP3	DV	Yes	Yes
Sitka	Corner Bay Tributary	Dropped	MM1	Cut	Yes	Yes
Thorne Bay	Oxbow Cr	Control	MM1	Cut, DV	Yes	Yes
	Chanterelle Cr	Control	MM1	DV	Yes	Yes
Wrangell	Gypsy Mainstem	Deferred	MM1	Cut	Yes	Yes
	Gypsy Tributary	Deferred	MC1	Cut	Yes	Yes
	West Fork Hoya Cr	Deferred	FP3	DV	No	No
	Vial Cr	2006	MM1	DV	Yes	Yes
	Jenkins Cr	Deferred	MM1	Cut	Yes	Yes
	Mirkwood Cr	2009	MM1	DV	Yes	Yes

Map Fish–1. Location of DV and cutthroat MIS monitoring streams



In 2007, density of cutthroat and Dolly Varden varied widely among the sampled streams (Appendix Fish-1). Densities ranged from four to 24 fish per 100 m^2 for streams with only Dolly Varden. Streams with only cutthroat had densities ranging from three to 27 per 100 m^2. In streams with both species, the combined fish density ranged from nine to almost 53 per 100 m^2. Estimated fish densities in 2007 were generally within the ranges estimated for earlier years. Of the 22 streams monitored this year, six have only Dolly Varden, four only cutthroat, and 12 have both species. Estimated abundance of Dolly Varden and cutthroat in the monitoring reaches generally tracks the density and in 2006 ranged from 20 to 243 fish (Appendix Fish-2).

We also annually monitor stream habitat in the same reaches where we estimate fish abundance. We track number of pieces of large woody debris, pool area, number of pools, average residual pool depth, length of undercut banks, and the D50 substrate size (Appendix Fish-3). Differences in the amount of these habitat components are apparent between streams. For example in 2007, large woody debris counts ranged from 17 in Oxbow Creek to 156 in Keg Creek. For pool area, the range was 31 m^2 for Mirkwood Creek to 599 m^2 for Upper Ohmer Creek. Complete data on reach lengths and additional descriptions of large woody debris, pools, and substrates are in the project files.

Mirkwood Creek Monitoring Reach

A crew of two or three people completed the monitoring for each stream. A Supervisor's Office employee traveled to many of the districts and worked with district representatives. This approach provided training for the often-newer district employees. Experienced Ketchikan and Thorne Bay Ranger District employees monitored the streams on their districts. Both approaches helped ensure consistency and will be used next year. The Sitka, Wrangell, and Petersburg districts are completing more of the monitoring on their units.

Evaluation of Results

Annual variation in estimated fish abundance is evident for all monitored streams (Figures Fish-1 and Fish-2). This variation will affect our ability to detect change following timber harvest. The preliminary sample size of 16 streams was based on annual variations for fish populations found in the literature. We now have multiple years of Dolly Varden and cutthroat abundance data from our own streams. Based on the annual variation calculated in 2006 for streams with 8 years of data, we will likely be able to detect a change in mean abundance of 12 to 38 percent if the stream has 40 or more fish and approximately 25 to 50 percent if the populations are less than 40 fish. Annual abundance estimates are more variable for streams with fewer fish.

Annual variation for pool area (Figure Fish-3) and large woody debris (Figure Fish-4) appear to be less than the variation for fish. Calculated standard deviations for most of the habitat variables confirm this visual observation.

Dolly Varden on measuring board

Cutthroat Trout

Figure Fish - 1. Dolly Varden char abundance estimates for streams with 9 years of data.

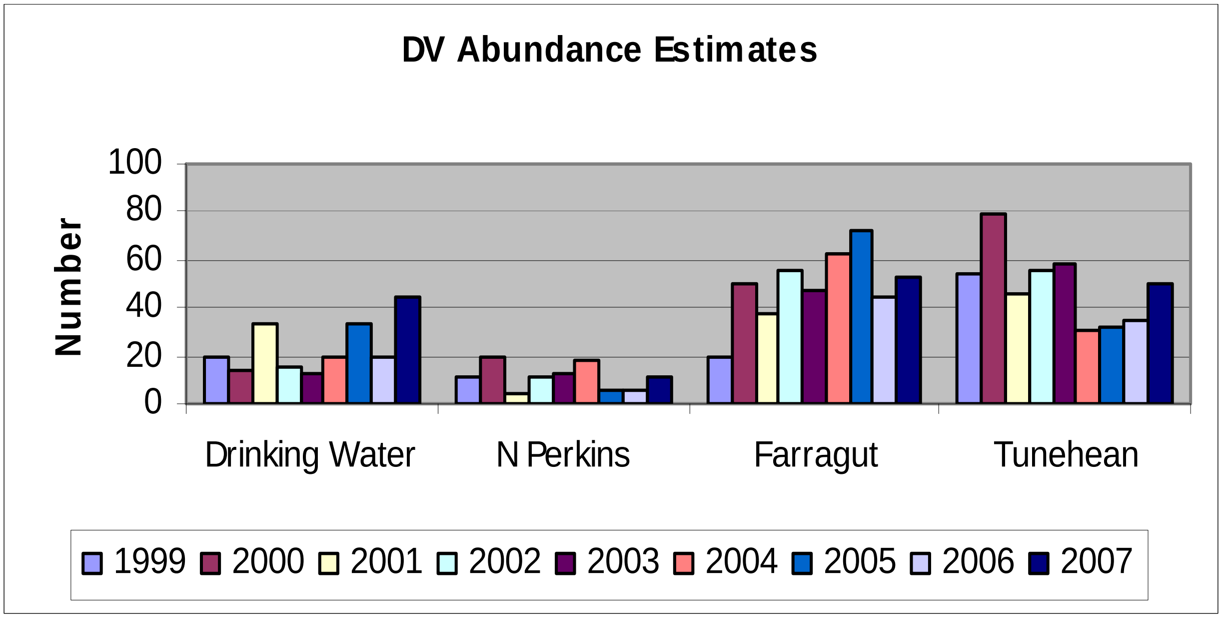


Figure Fish - 2. Cutthroat trout abundance estimates for streams with 9 years of data.

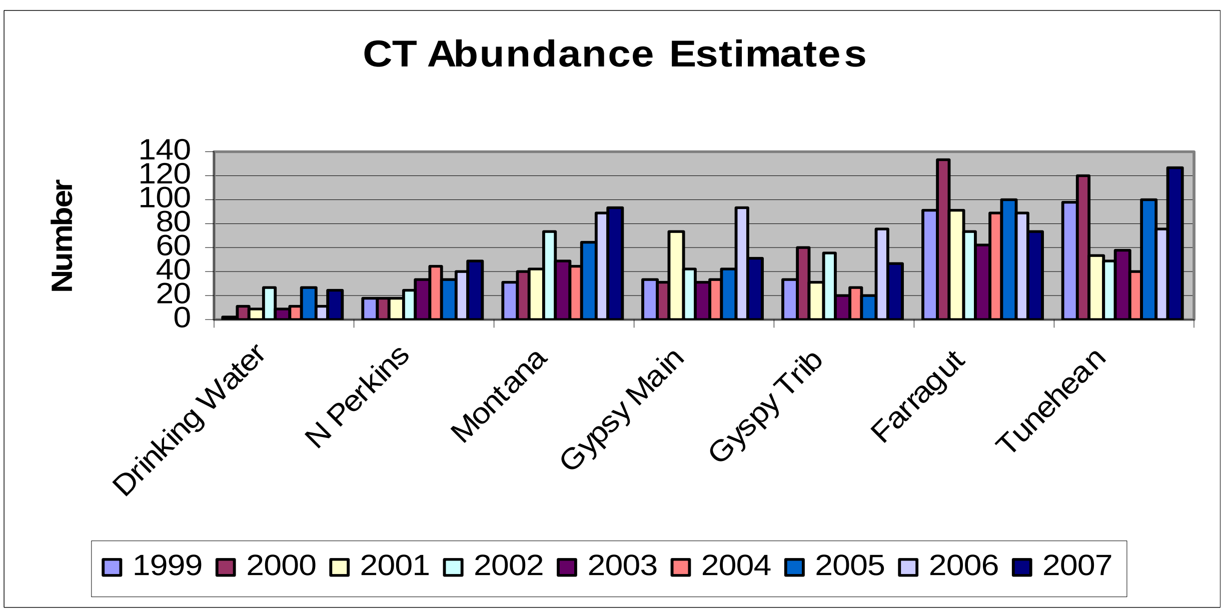


Figure Fish - 3. Measured pool area for the streams with 8 or 9 years of data beginning in 1999.

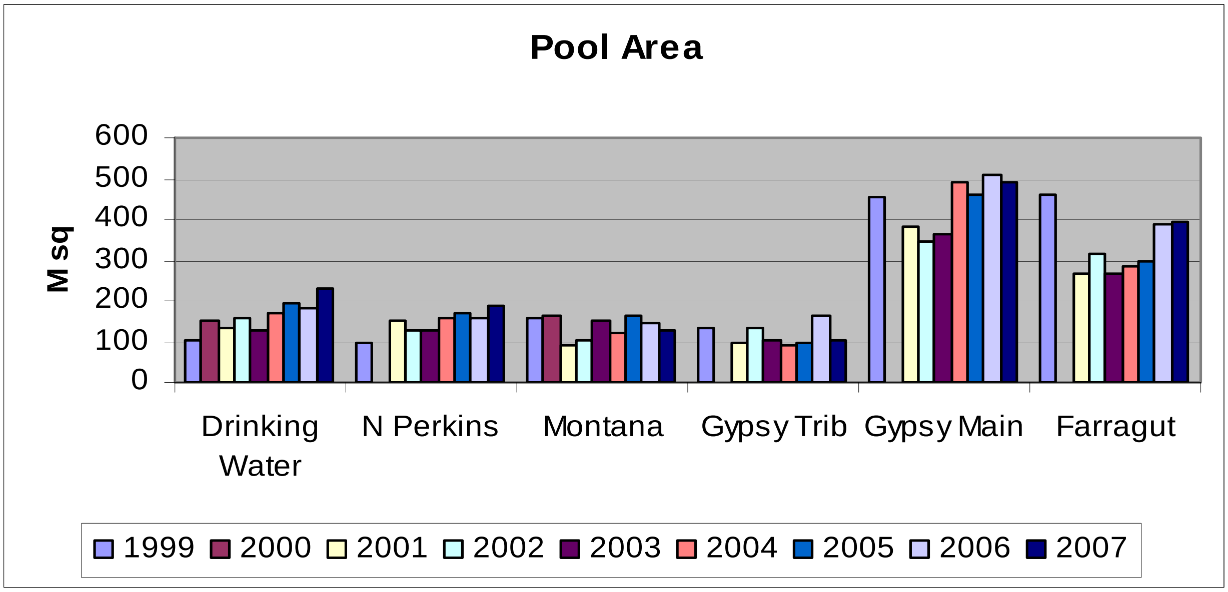
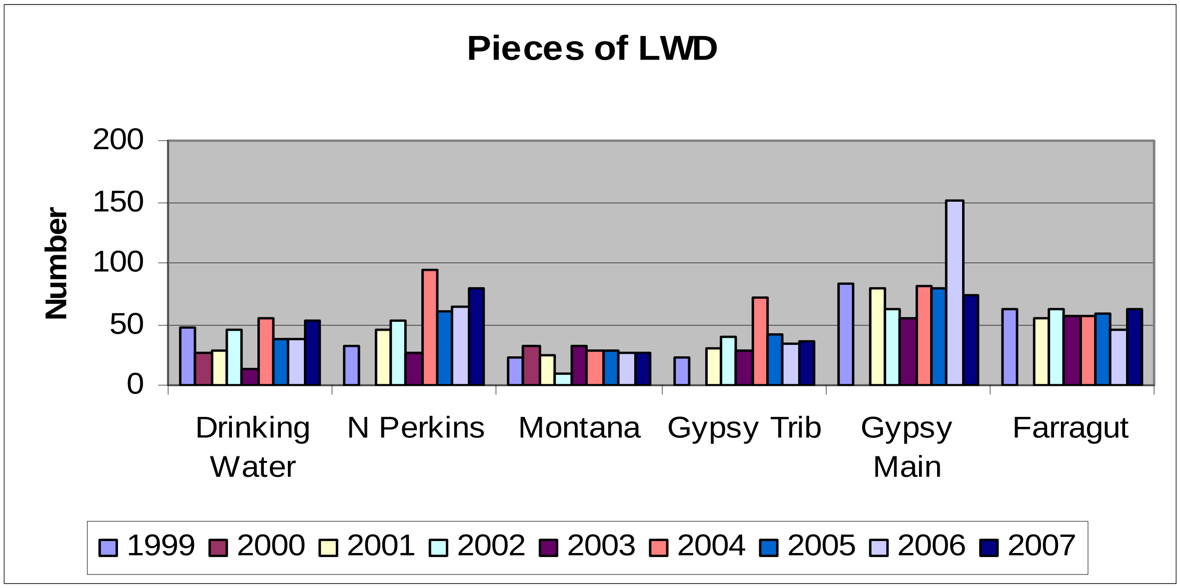


Figure Fish - 4. Pieces of wood for the streams with 8 or 9 years of data beginning in 1999.



No consistent trends are evident in the annual fish abundance data (Figures Fish–1 and Fish–2). Dolly Varden abundance in Farragut appeared to be increasing through 2005, but the trend reversed with a reduction in 2006 and 2007. Cutthroat abundance in Montana appears to be increasing from 1999 through 2007 with the peak estimated in 2007. Fish abundance in many streams demonstrate no apparent trend and short term-trends for individual streams often reverse as monitoring continues.

Timber harvest began in the Tunehean Creek watershed in 2002. A large culvert was being installed just upstream from the monitoring site during the 2002 monitoring and timber had been fallen in upstream units. The Dolly Varden populations were reduced in 2004, 2005, and 2006 and we wondered if this was an effect of forest management. It is possible, but it is also likely the decline is natural variation caused by multiple factors currently not fully understood. Additionally, cutthroat in Tunehean declined through 2004, but rebounded markedly in 2005, 2006, and 2007.

In 2002, timber harvest and road construction occurred directly upstream from the Salty MIS site. Some trees in the stream buffer have blown down upstream from and directly into the monitoring reach. The cutthroat population declined to approximately half in 2004 and 2005, but rebounded to pre-timber harvest levels by 2007.

Fish populations declined for several years following forest management in the Tunehean and Salty watersheds. Even though management activities occurred close to the stream, this may be coincidence as fish populations in unharvested watersheds exhibited similar declines. It is too early to speculate on the effects of forest management until sixteen treatment streams are harvested and the statistical tests are completed.

There are no consistent trends in the habitat data. For example, the area of pools appears to be increasing for Drinking Water, North Perkins, and Farragut creeks, but relatively uniform for Montana Creek, Gypsy Tributary, and Gypsy Mainstem (Figure Fish-3). An increasing trend of large woody debris was apparent for North Perkins and Gypsy Tributary through 2004, but the number of pieces declined sharply in both streams in 2005 and 2006 (Figure Fish-4).

We are curious if annual variation for fish abundance in a specific stream is related to measured changes in habitat for that stream. Montana Creek was chosen for an analysis because we have nine continuous years of data and only cutthroat reside in the stream eliminating potential effects of species interaction. The product moment correlation coefficient for cutthroat density and pool area, pieces of large woody debris, average residual pool depth, and length of undercut banks are not significant at the 0.05 level so it appears that short-term fluctuations of fish abundance are not related to stream habitat in Montana Creek.

In addition, a sharp three-year decline of Dolly Varden density in Gunsight Creek does not appear to be related to habitat changes in the monitoring reach. Formal analysis is not warranted due to the small number of observations, but visual inspection revealed no obvious relationships.

The difference in abundance and density of fish between streams is intriguing. It was anticipated that there would be more fish in FP3 channels compared to the slightly steeper MM1 channels. Nine of the streams had high fish density in 2007 of more than 20 per 100 M sq. Six of the nine streams with dense populations are MM1 channels (Table Fish-1 and Appendix Fish-1). Fish in Emerald Creek were approximately twice as dense as the next densest stream in 2007 and is an FP3 channel. The differences in abundance and density of fish between streams are likely caused by multiple factors including watershed geology, elevation, stream productivity, and physical habitat. However, we have to remember that the number of fish in individual streams is not as important as the eventual comparison of the number of fish in each stream before and after timber harvest.

Actions Recommended for FY08

Continue annual fish abundance and stream habitat monitoring in FY08. The monitoring program will be complete when at least 16 treatment streams have been logged and the number of years of the post-logging data is approximately equal to the number of years of pre-logging data. This suggests the resident-fish monitoring project will continue for more than 10 years.

Add new treatment streams as opportunities arise. It now appears that timber harvest will only occur for 10 of our treatment streams, and power analysis has indicated the need for a minimum of 16. New treatment streams should be associated with timber sales likely to be sold and harvested within the next several years.

Consult a statistician to evaluate progress in the monitoring project. Ask if the data collected to date will be suitable for answering the monitoring question. Additionally, consult with a statistician to further evaluate relationships between measured stream habitat and fish abundance in the existing data.

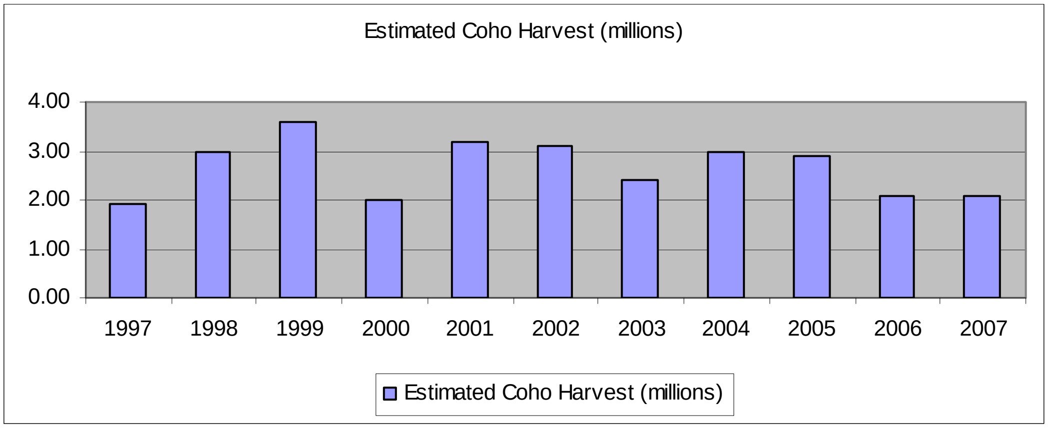
Continue to monitoring resident fish populations in the case-study watersheds.

Amend the Forest Plan to specify monitoring the abundance and habitat of resident Dolly Varden and cutthroat. The Forest Plan currently states we will monitor Dolly Varden char and cutthroat by annually evaluating the ADF&G’s harvest statistics and completing population surveys on a sample basis, if necessary. We have found the harvest statistics are only available for popular sport fishing streams. Many of these streams are anadromous and do not have planned future logging.

Monitoring Results for Coho Salmon

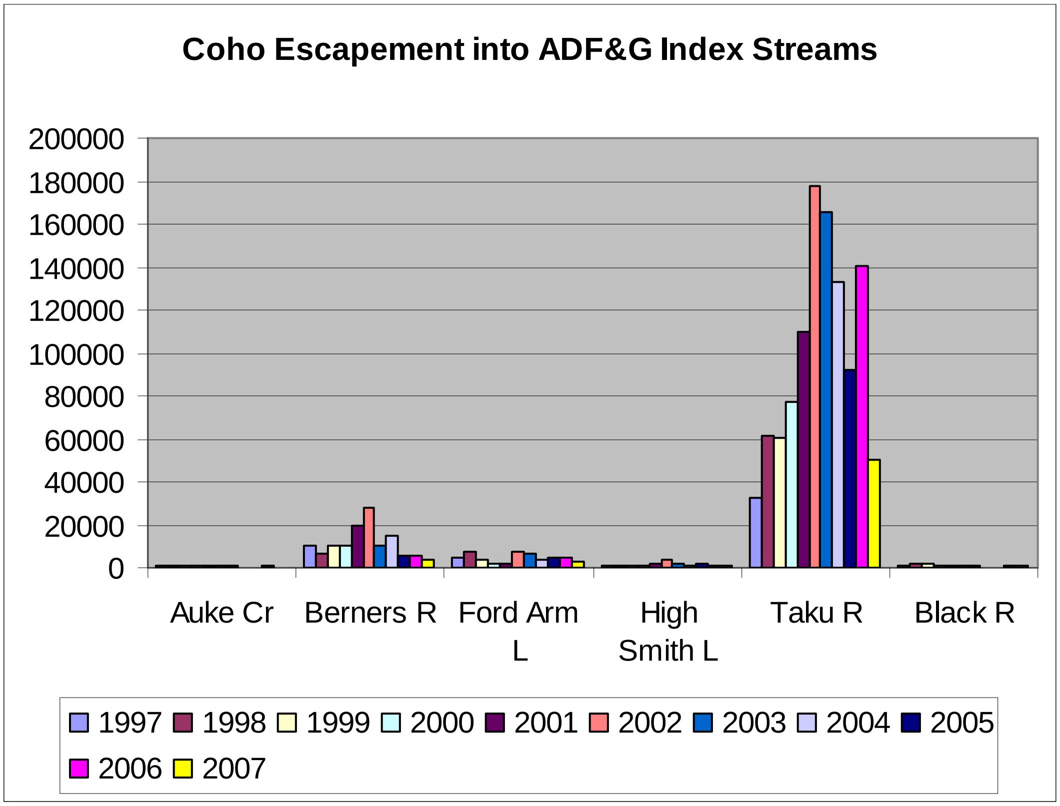
Annual commercial harvest of coho salmon is reported by the ADF&G, and the Forest Service evaluates these estimates for trends (Figure Fish-5). No consistent long-term trends are evident, although in the short term harvest has been down. Harvest was approximately 2 million in 2006 and 2007 and lower than the approximately 3 million harvested in 2004 and 2005. After reviewing ADF&G's entire data set that extends back to 1960, it was interesting to note that the commercial harvest of coho salmon has been above the long-term average for 10 of the last 11 years.

Figure Fish - 5. Annual commercial harvest of coho salmon in Southeast Alaska from 1997 through 2007, Data provided by ADF&G



Coho escapements are difficult to estimate since the adults enter spawning streams during the fall when flows are often high. The ADF&G has selected a small number of representative streams across Southeast Alaska to carefully (and expensively) count or estimate escapement. Data from these streams and rivers are the best available for the Forest Service to review for trends (Figure Fish-6).

Figure Fish - 6. Annual escapement of coho salmon in six index streams from 1997 through 2007, Data provided by ADF&G.



Coho escapement appears to be trending downward since a peak in 2002. High escapements in 2002 have been attributed to reduced commercial fishing effort and harvest due to low selling prices for wild salmon.

Evaluation of Results

An ADF&G coho research biologist reports that the mean wild coho abundance in SE Alaska from 1982 through 1997 was 3.68 million, and the mean from 1998 through 2007 was 3.54 million. This indicates there are no major differences in wild coho abundance following completion of the Forest Plan in 1997. The ADF&G is becoming concerned that glacial rebound near Yakutat is causing dewatering of many small rearing streams that may result in a long-term decline for wild coho from that region.

The ADF&G also report that marine survival of wild coho smolts was well below average for adults returning in 2007. Returns to five index streams averaged 8% survival compared to an estimated average survival of 15% from 1990 to 2006. This indicates that marine survival is an important factor for number of returning adults. Shaul et al (2007) report that slightly more than half of the variation in adult returns has been due to marine survival and close to half due to smolt production.

The region-wide commercial harvest estimates and escapement data from index streams are indicators of the annual abundance and potential trends of adult coho returning to Southeast Alaska. Since juvenile coho normally spend one or two years rearing in freshwater, juvenile survival is likely affected by changes in the quality of stream habitat. Research in the Pacific Northwest and in Southeast Alaska has shown that forest management affects coho salmon on a stream-by-stream basis. Coho are also affected by the severity of winter weather and the cyclical productivity of the marine environment. Monitoring the abundance of juvenile coho in freshwater may be a more direct indicator of potential effects of timber harvest as sources of annual variation from marine survival and commercial and sport harvest are largely excluded.

Literature Cited

Shaul, L., L.Weitkaamp, K. Simpson, and J. Sawada. 2007. Trends in abundance and size of coho salmon in the Pacific Rim. N. Pac. Anadr. Fish Comm. Bull. 4: 93-104.

Development of Monitoring Protocols Using Juvenile Coho Salmon

The Juneau Forest Sciences Laboratory has developed a protocol for juvenile coho abundance as an indicator of potential effects of forest management. The protocol has been submitted to the Pacific NW Research Station for publication as a General Technical Report. Supporting work from the University of Washington (Wissmar 2006) and Western Ecosystems (McDonald et al. 2006a; McDonald et al. 2006b) is incorporated into the protocol.

The protocol provides quantitative methods to measure trends of juvenile coho in small streams that are located in watersheds managed in accordance with standards and guidelines in the Forest Plan. The field methods and analysis are based on a three-year pilot study that was completed in 2005 (Bryant and others 2005). Results from the pilot study were used to estimate sample sizes required for specified levels of statistical power (i.e. the ability to detect trends in population size.) To detect a decrease in population abundance of juvenile coho of 5 % per year, a sample size of 12 streams per treatment (TLMP and old growth) are required at $\alpha = 0.10$ and $\beta = 0.20$ over a ten-year monitoring period.

The protocol provides a description of a sampling strategy, a detailed sampling methodology to obtain quantitative estimates of fish population numbers and habitat, and statistical analysis to measure population trends. The primary analysis of trends in salmon abundance is a mixed-effects linear regression model that adjusts treatment effects for both correlation among years and values of habitat covariates. Inclusion of significant covariates accounts for differences among streams that may be external to management effects. Examples of potential landscape covariates are watershed relief and drainage density identified by Wissmar and Timm (2006). Significant differences among locations (north to south) were observed for coho salmon fry in the pilot study (McDonald et al. 2006b). Covariates for the protocol were identified from existing SE Alaska data collected over a ten-year period using a stepwise regression methodology. The details for conducting the protocol, sampling fish and habitat, and analysis are provided in a set of appendices in the protocol.

Literature Cited

Bryant M. D., B. E. Wright and A. Truesdell. 2005. Development and Testing of a Protocol to Use Coho Salmon as a Management Indicator Species for the Tongass Land Management Plan. Progress Report for FY 2005 to the Tongass National Forest, USDA Forest Service, Region 10. Aquatic/Land Interactions Research Program, Pacific Northwest Research Station. 2A, Juneau, AK 99801. .

McDonald T., M. B. Stahl and L. McDonald. 2006a. Model Validation for The Relationship Between Coho Salmon Density and Stream Habitat Measurements Under Various Forest Management Practices in Southeast Alaska. U.S.D.A. Forest Service, Tongass National Forest, Federal Building, 648 Mission Street, Ketchikan, AK 99901-6591. WEST, Inc. 2003 Central Avenue, Cheyenne, WY 82001. 32 p.

McDonald T., M. B. Stahl and L. McDonald. 2006b. Relationship between coho salmon density and stream habitat measurements under various forest management practices in southeast Alaska. U.S.D.A. Forest Service, Tongass National Forest, Federal Building, 648 Mission Street, Ketchikan, AK 99901-6591. WEST, Inc., 2003 Central Avenue, Cheyenne, WY 82001. 19 p.

Wissmar R. C. and R. K. Timm II. 2006. Watershed and Stream Landscapes, Prince of Wales Island, Alaska. Final Report to the U.S. D.A. Forest Service,Tongass National Forest. University of Washington. Seattle, WA. 57 p.

Actions Recommended for FY08

Continue to evaluate ADF&G's commercial harvest and escapement statistics. There is a concern that the region-wide coho databases are insensitive to National Forest management, but should be evaluated until a more sensitive protocol is implemented.

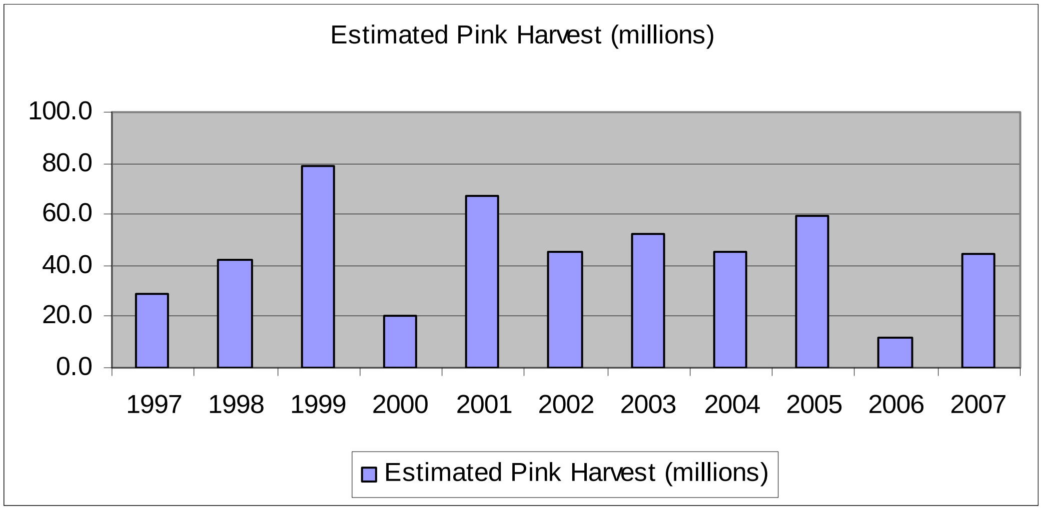
Complete publication of the juvenile coho monitoring protocol developed by the Juneau Forest Sciences Laboratory. The Forest should review the protocol and determine if the recommended monitoring is sufficiently sensitive to forest management and is affordable. If both are affirmative, the Forest should locate the monitoring streams (minimum of 24) that meet the selection criteria. Monitoring could begin in FY09.

No changes in the Forest Plan are recommended at this time.

Monitoring Results for Pink Salmon

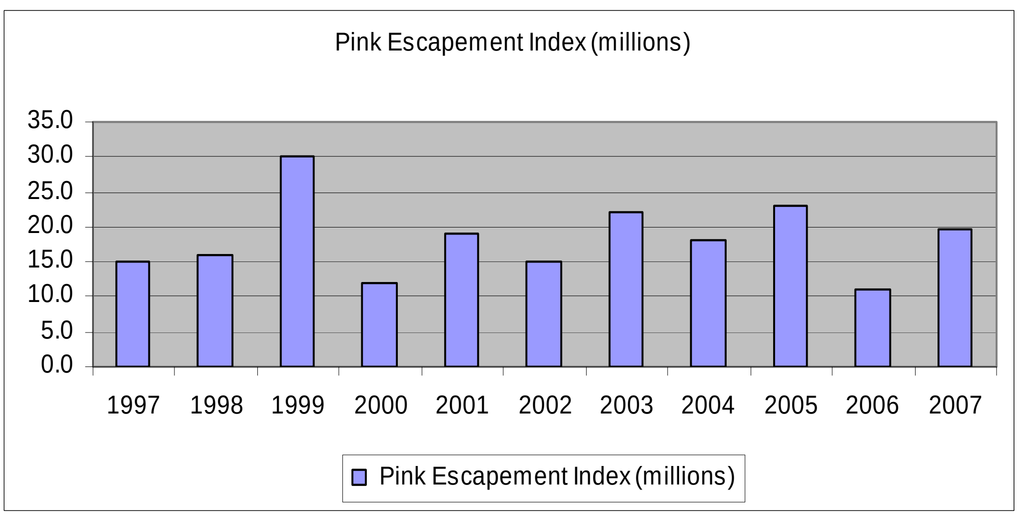
Annual commercial harvest of pink salmon is reported by the Alaska Department of Fish and Game. The Forest evaluated these estimates to see if trends are evident following completion of the Forest Plan in 1997. Annual commercial harvest is an indicator of population abundance. Harvest data from 1997 through 2007 are presented in Figure Fish-7.

Figure Fish - 7. Annual commercial harvest of pink salmon in Southeast Alaska from 1997 through 2007. Data provided by ADF&G



Another indicator of pink salmon abundance is the number of adult fish returning to spawn. ADF&G biologists fly over the spawning streams and count pink salmon concentrated on broad spawning riffles. ADF&G annually reports this spawning-survey data (commonly and hereafter called "escapement" data) for a series of index streams across SE Alaska. The reported data is the annual sum of the peak escapement counts for approximately 850 index streams across Southeast Alaska (Figure Fish-8).

Figure Fish - 8. Annual escapement of pink salmon in Southeast Alaska from 1997 through 2007. Data provided by ADF&G



No consistent trends are apparent in the harvest and escapement data from 1997 through 2007. After reviewing the entire data set for commercial harvest of pink salmon, it is interesting to note that the harvests in 1999 and 2001 were the highest and second highest recorded. The estimated harvest of 12 million pink salmon in 2006 is well below the average long-term harvest since 1960. The reduced 2006 return was surprising to fishermen and fisheries managers, and commercial harvest was curtailed to allow for escapement into spawning streams. In 2004, region-wide cold weather and stream freezing when the eggs and fry were incubating in the spawning streams is the likely explanation of the reduced 2006 return of pink salmon. In 2007, harvest and escapement rebounded and were close to the averages since 1997.

Evaluation of Results

The combination of annual harvest and escapement is a good indicator of the annual abundance and potential trends for the pink salmon returning to Southeast Alaska. It is generally believed, that pink salmon abundance is controlled by several factors including stream freezing and the cyclical productivity of the marine environment. Quality of the freshwater habitat, mainly the percentage of fine sediment in the spawning gravel, is also important and may be affected by forest management, but is likely overshadowed by the influence of winter freezing and ocean productivity. Short-term trends in the data, for example high abundance in 1999 and low abundance in 2006, are not attributed forest management.

Commercial harvest of both pink and coho salmon was high in 1999. The synchrony of high commercial harvest of both species suggests a strong influence of ocean productivity on the abundance of these species.

A study to determine the sensitivity of pink salmon escapement to previous forest management was initiated in 2000. The plan was to review approximately 30 years of spawning escapement data collected in over 800 watersheds and relate escapement trends to timber harvest for the same watersheds.

Kuiu Island was selected for a pilot study. Eighty-one streams were identified on Kuiu with long-term escapement records, and a strategy was developed to quantify the logging history for each watershed. Information was gathered on the percent of watersheds harvested each year, harvested on slopes greater than 72 percent, and harvested in riparian areas; the road density; the amount of road on slopes greater than 5 percent; and the amount of road within riparian areas and on wetlands. Adjacent logged and unlogged streams were paired to compare trends in escapement. The project slowed in 2002 when concerns surfaced that the pink salmon escapement data was not suitable for this project. In 2006, ADF&G determined the data is not suitable and the project terminated.

In 2007, a conceptual proposal was prepared to monitor important pink salmon habitat as the next best approach. The relationship between amount of fine sediment in spawning gravel and the survival of salmon eggs has been established in laboratory and field studies and it is accepted that construction and use of logging roads, timber harvest, and landslides triggered by timber harvest can increase delivery of fine sediment into streams. The conceptual proposal provides a review of previous studies to quantify fine sediment, summarizes the results of two studies of SE Alaskan streams to measure fine sediment, and offers an initial recommendation for monitoring fine sediment in known pink salmon spawning gravel resulting from forest management.

Actions Recommended for FY08

Annually review the ADF&G's pink salmon harvest and escapement data for trends.

Complete internal Forest Service review of the conceptual proposal to monitor fine sediment in pink salmon spawning gravel. If the proposal is well received, request other-agency peer review and consult with a statistician on experimental design and required sample sizes. Estimate monitoring costs and begin looking for a watershed, or watersheds, suitable for implementing the monitoring project.

Decide whether to implement the monitoring project. If the decision is to implement the proposal, monitoring could begin in FY09 or FY2010.

As stated in Chapter 6 of the Forest Plan, work with the Pacific Northwest Experiment Station for general guidance and specific assistance in evaluating and designing the project.

No changes in the Forest Plan are recommended at this time.