TFW Effectiveness Monitoring and Evaluation Program

PROGRESS REPORT

For the period:
July 1997 to June 1999

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August 1999

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1 Introduction

This document reports on the activities of the TFW Effectiveness Monitoring and Evaluation Program (TFW-EMEP) during the biennium beginning July 1, 1997 and ending June 30, 1999. Work was focused in two major areas during this period: 1) developing and initiating the TFW effectiveness monitoring program, and 2) providing services to help TFW cooperators successfully undertake and complete monitoring projects. Section 2 describes progress in these areas during the last biennium. Section 3 discusses future direction and tasks for the program in the next two years and section 4 summarizes conclusions.

2 Progress Report for the 1997-99 Biennium

2.1 TFW Effectiveness Monitoring and Evaluation Program Development

The major focus of the program during this biennium was to develop and begin implementing a program to monitor and evaluate the effectiveness of forest practices rules in reducing impacts to aquatic resources from forest practices on state and private forest land. The program is based on the TFW effectiveness monitoring strategy (Schuett-Hames et al., 1996), which called for monitoring the effectiveness of individual practices on a site-scale and for monitoring aquatic resource response to cumulative effects of forest practices on a watershed scale. Work was done in three areas during this biennium including: 1) development of a TFW Effectiveness Monitoring and Evaluation Program Plan; 2) development of specific monitoring approaches and methods for high priority topic areas, and 3) pilot projects to test effectiveness monitoring approaches and begin answering questions concerning effectiveness.

2.1.1 Development of the TFW Effectiveness Monitoring and Evaluation Program Plan

A draft TFW Effectiveness Monitoring and Evaluation Program Plan was completed in the spring of 1998. The plan was presented to TFW cooperators in two workshops and at DNR regional TFW cooperators meetings. The plan was updated in the spring of 1999 to incorporate changes based on experience gained through the pilot projects (Schuett-Hames et al., 1999). The updated plan identifies TFW effectiveness monitoring goals, objectives and monitoring questions, presents a conceptual model for identifying forest practice-aquatic interactions, and identifies monitoring topic areas approaches, and parameters for both site-scale monitoring of practice effectiveness and watershed-scale monitoring of cumulative effects. An implementation plan is also included.

2.1.2 Development of Effectiveness Monitoring Strategies, Approaches and Monitoring Methods

Extensive progress was made developing monitoring strategies, approaches and methods for high priority effectiveness monitoring topic areas. Study design guidelines and methods were developed to monitor the effect of forest practices on mass wasting, surface erosion (roads and harvest units), riparian shade and LWD recruitment, and fish passage. Each of these is discussed briefly below.

<u>Mass Wasting</u>

Draft study design guidelines and procedures were developed for monitoring and evaluating the effectiveness of forest practices in preventing mass wasting on both the site (individual practice) and watershed scale (Sasich, 1998a).

<u>Surface Erosion</u>

Draft study design guidelines and procedures were developed for monitoring and evaluating the effectiveness of forest practices in preventing surface erosion on both the site (individual roads and timber harvest practices) and watershed scale (Sasich, 1998b).

Riparian LWD and Shade

Draft study design guidelines were developed for monitoring and evaluating the effect of forest practices on riparian LWD recruitment and shade on both the site and watershed scale (Smith and Schuett-Hames, 1999). A riparian stand survey method was also developed to document changes in riparian stand condition, composition, growth and LWD recruitment following timber harvest (Smith, 1999). The riparian stand survey is currently being refined following pilot testing.

Fish Passage

A draft monitoring approach and methods were developed for monitoring and evaluating the effectiveness of forest road stream crossing structures in providing passage for resident and anadromous salmonids at individual crossing structures (Terrapin Environmental, 1999). The document includes a separate approach for assessing the effects of many crossing structures on habitat availability and fragmentation on a watershed scale.

Sediment Reduction on Forest Roads

Building on previous work done developing methods and approaches for monitoring surface erosion and mass wasting effectiveness monitoring, this project refined and tested procedures for monitoring the effectiveness of sediment reduction (road maintenance and abandonment) plans on forest roads. The result is a draft comprehensive monitoring approach for evaluating sediment delivery from forest roads (Veldhuisen et al., 1999).

Watershed-Scale Monitoring

Work was initiated on development of a strategy and approach for conducting watershed-scale effectiveness monitoring. The purpose of watershed-scale monitoring is to determine the cumulative effects of forest practices on watershed input processes, and to document the channel, habitat, water quality and biotic response to management-induced changes in input processes. Progress during this biennium included: 1) development of a draft approach for watershed-scale monitoring (Schuett-Hames, 1999), 2) a critical review of the approach by the University of Washington Center for Streamside Studies (Sibley and Bolton, 1999); and 3) development of a pilot watershed-scale monitoring plan (O'Connor Environmental, 1999).

Stratification

This project assessed options for stratifying the landscape for the purposes of conducting effectiveness monitoring for mass wasting and surface erosion. The assessment recommended a stratification system based on physiographic regions, geology, and landform types (Sasich, 1998c). Based on these recommendations, a GIS coverage was developed for geology that condenses DNR geology units into 17 geology groups and for physiographic regions based on EPA level III and IV eco-regions.

2.1.3 Effectiveness Monitoring Pilot Projects

Nine pilot projects were undertaken to test monitoring approaches and procedures prior to initiating full-scale statewide monitoring projects. The objectives for the pilot projects were: 1) to test TFW-EMEP study design guidelines, methods and procedures; 2) to test the TFW cooperative monitoring system; and 3) to gather preliminary information on effectiveness for several key monitoring questions. A description of the pilot projects and their status follows.

Riparian prescription effectiveness

This project is designed to evaluate the effectiveness of Watershed Analysis (WSA) riparian LWD and shade prescriptions in the North Cascades physiographic region. The project will: 1) evaluate and

compare the effectiveness of WSA riparian prescriptions in maintaining stream temperatures and providing LWD recruitment, 2) examine the influence of physical site conditions on RMZ effectiveness, and 3) provide information on riparian buffer dynamics, LWD recruitment and the persistence and function of LWD (Smith et al, 1998). The pilot project will examine the feasibility of monitoring and interpreting data from sites where harvest has already been done versus sites where baseline data can be gathered prior harvest. Potential monitoring sites were identified in the Deer Creek, Griffin-Tokul Hansen, Hazel, Hutchinson Creek, Jordan-Boulder, Lake Whatcom, Skookum, and Tolt WAUs. Sixteen sites were selected, including ten post-harvest sites and six pre-harvest sites. Sampling sites were stratified by buffer width and stream gradient. Data was gathered using the TFW-EMEP riparian stand inventory procedure and the TFW LWD and habitat unit surveys. A preliminary report is in preparation.

Northeast Washington riparian stand dynamics and LWD recruitment

This project is designed to examine riparian LWD recruitment processes and stand dynamics in three types of riparian stands in the Onion Creek WAU, located in the Northern Rockies eco-region in northeast Washington (Schumaker et al., 1998). The objectives of the project are to: 1) generate information on LWD recruitment including tree fall rates and fall direction to improve models to estimate recruitment over time, 2) to document current stand conditions and recruitment rates during normal years and episodic events, and 3) to determine the persistence and function of recruited wood. Data was collected using the TFW-EMEP riparian stand inventory procedure and the TFW LWD and habitat unit surveys. A preliminary report is in preparation.

Intentional LWD placement

This project is designed to examine the effectiveness of Watershed Analysis LWD prescriptions for adding LWD to stream channels in the Coweeman WAU in the Cascades eco-region near Vancouver. The objectives of the project are: 1) to document the characteristics of the wood added to the channel; 2) to determine if there is an initial, quantifiable response in channel morphology (pool formation and sediment storage); and 3) to determine if the added pieces are stable and continue to function over time (Beech, 1998). Data was collected at four sites adjacent to harvest units where pieces were placed in the channel by yarding unmerchantable wood or directional falling during harvest operations and one site where a log bridge with old-growth stringers was demolished. A preliminary report is in preparation.

Wood in small streams- eastern Cascades

This project is designed to monitor riparian stand conditions and wood quantity and function in small, steep stream channels in the east Cascades eco-region. The project objectives are: 1) to determine the function of both large and small wood in small streams, and 2) to determine the type of forest stand conditions needed to provide adequate amounts of wood to provide those functions (chesney, 1999). Data from eleven managed (harvested) sites was compared with five unmanaged sites. Data was collected on riparian stand density and composition, channel wood abundance, and the function of wood in forming "steps" (obstructions that store sediment and dissipate energy). A preliminary report is in preparation.

Watershed-scale monitoring of LWD abundance- Coweeman WAU

This project is designed to establish a baseline for monitoring changes in LWD abundance on a watershed-scale. The project objectives are: 1) to document current LWD loading levels throughout the Coweeman WAU; 2) to document LWD loading levels adjacent to units scheduled for harvest within five years; and 3) to examine the relationship between current riparian stand condition and current LWD loading levels (Volkhardt, 1998). The study design involves a watershed-scale sampling scheme that places all stream segments in the WAU into 15 strata based on five stream gradient classes and three confinement classes. Sixty-eight of the 91 segments in the WAU were sampled for LWD size and abundance and riparian stand condition. A preliminary report is in preparation.

Baseline LWD prescription effectiveness and LWD abundance in the Acme WAU

This project is designed to establish a baseline for monitoring changes in LWD abundance and Watershed Analysis riparian prescription effectiveness in the Acme WAU (North Cascades-west eco-region). The project objectives are: 1) to document current LWD loading in fish-bearing streams and determine changes in LWD loading over time response to the riparian prescriptions; 2) to determine how timber harvest on Type 5 waters affects LWD recruitment and loading; and 3) to determine how the wood budget in a small sub-basin responds to management under WSA prescriptions compared to one where harvest activity is not occurring (Soicher, 1999). A preliminary report is in preparation.

Road drainage and erosion initiation- western Washington

This project is designed to examine the effect of road drainage and relief culvert spacing on initiation of mass wasting and surface erosion at culvert outlets. The objectives are to: 1) determine if standards for culvert spacing and drainage guidelines are preventing erosion at culvert outlets; and 2) determine if Watershed Analysis identifies situations where erosion at culvert outlets is likely to occur and addresses them appropriately (Russell and Veldhuisen, 1999). Four WAUs representing a range of geographic, climatic and landform conditions were selected for study, including Deer Creek, Mashel, Upper Chehalis and Hoko. A total of seventeen road segments ranging in length from 0.5-2.2 miles were sampled. In each segment, all culverts were visited to determine the spacing and drainage area and to identify and measure erosion features. A report is in preparation.

Mass wasting prescription effectiveness in the Acme WAU

This project is designed to evaluate the effectiveness of Watershed Analysis mass wasting prescriptions in the Acme WAU. The objectives are to determine: 1) if sediment delivery from management-induced mass wasting decreases over time in the WAU under the prescriptions; 2) if the prescriptions for road construction in sensitive areas prevent delivery of sediment from mass wasting: 3) if the mass wasting buffers adjacent to inner gorges are effective in preventing mass wasting and windthrow in the buffer; and 4) if prescriptions for selective harvest in the ground-water recharge zone of deep seated landslides are effective in preventing re-activation of the slides (Soicher, 1999). A preliminary report is in preparation.

Watershed-scale monitoring to determine WSA effectiveness- Quartz Mountain WAU

This project is designed to determine the effectiveness of Watershed Analysis in an eastern Cascade WAU. The project objectives are: 1) to determine the effectiveness of mass wasting, surface erosion, and riparian prescriptions; 2) to document changes in inputs of sediment, LWD, thermal energy and peak flows; 3) to determine the response of aquatic resource conditions to changes in inputs; and 4) to evaluate the performance of the WSA hazard identification procedures. Preliminary sampling of aquatic resource conditions has occurred, and additional work to document changes in input processes is planned in the coming year in conjunction with the WSA five-year review.

2.2 Cooperative Monitoring Services to Assist TFW Participants

An important function of the TFW Effectiveness Monitoring and Evaluation Program is to provide services to assist the TFW organizations conducting monitoring. To produce monitoring information that TFW can use with confidence, successful monitoring studies must be well planned and implemented. This requires quality work at every step of the monitoring process, including study design, selection of parameters, collection of data, and analysis of results. The TFW Effectiveness Monitoring and Evaluation Program provides monitoring manuals, training, quality assurance, and database support to help TFW cooperators achieve quality results. Each of these aspects is discussed below.

2.2.1 Training, Technical Assistance, Quality Assurance and Methods Testing

Monitoring Training

The TFW-EMEP provides comprehensive training services to promote consistent application of TFW monitoring methods throughout the state. These services are available through annual training workshops and on-site field training and assistance visits. During this biennium we conducted annual training sessions TFW monitoring methods (Table 1). The annual training workshops are generally conducted during the second week of June and the fourth week of July. Four days of training are provided in the June workshops to cover Stream Segment Identification, Wadeable Stream Discharge Measurement, and the Reference Point, Habitat Unit, Large Woody Debris, and Stream Temperature Surveys. The July workshop consists of three days covering Salmonid Spawning Gravel Composition, Salmonid Spawning Habitat Availability and Salmonid Spawning Gravel Scour.

Table 1. Participation at TFW EMEP annual training workshops (attended/registered by workshop).

	Workshops	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
June	Stream Segment Identification Method	?	?	36/46	44/54	50/75	50/70	30/31	33/36
	Reference Point/Large Woody Debris Surveys	?	?	22/34	43/54	46/64	49/69	36/39	35/36
	Habitat Unit Survey and Discharge Method	?	?	24/34	41/53	44/67	47/65	37/40	42/43
	Stream Temperature Survey	N/A	N/A	19/31	41/55	44/67	47/65	24/25	29/29
July	Spawning Gravel Composition Survey	N/A	?	36/50	37/62	32/58	30/62	34/35	35*
	Spawning Habitat Availability Survey	N/A	N/A	N/A	N/A	41/71	35/70	35/35	35*
	Spawning Gravel Scour Survey	N/A	N/A	N/A	N/A	40/66	29/66	31/33	35*
Total	**# People/day**	**55***	**89***	**137**	**206**	**303**	**287**	**227**	**244***

"?"=attended/registered figures not available; "N/A"=workshop not offered; "*"=estimated attendance

On-site field training and field assistance services are offered throughout the year on an appointment basis. Cooperators who cannot attend the annual workshops or require further training to address local watershed conditions use this service. These visits provide individual training in all the survey methods covered at the workshops, plus assistance in study design development and implementation strategies. On-site training also provides an opportunity to focus on method application under local conditions. Cooperators in the more remote areas of the state find this service to be most valuable. TFW-EMEP provided 12 on-site field training and assistance visits for a total of 40 people in 1997 and 8 visits for a total of 34 people in 1998 (Table 2). There have been 11 on-site training visits conducted for a total of 53 people in 1999 to date.

Table 2. Training provided by the TFW EMEP through workshops and on-site visits.

Training Services	1995	1996	1997	1998	1999	Total
Workshops	206	303	287	227	244*	1267
On-Site	87	45	40	34	53*	259
Total People/day	293	348	327	261	297*	1526

* as of 6/30/99

Watershed Analysis Monitoring Training

TFW-EMEP staff continued to conduct training in the Watershed Analysis monitoring identification procedure in cooperation with DNR at WSA training sessions during this biennium (Table 3).

Table 3. Training provided by the TFW-EMEP at DNR-sponsored Watershed Analysis training sessions.

Training Session Date	Participants in Monitoring Lab	Type of Session
June 16 – 20, 1997	11	Newly Qualifying Analysts
December 8 – 12, 1997	10	Re-qualifying Analysts
January 26 – 28, 1998	12	Newly Qualifying Analysts
July 6 – 10, 1998	18	Re-qualifying Analysts

Technical Assistance

The TFW-EMEP provides technical assistance to TFW cooperators in designing monitoring projects. During this period, we provided assistance in monitoring project design for Quartz Mt. WAU, the Weyco LLP, Thurston County assessment for Scatter Creek, Martin Fox's LWD study, and the riparian effectiveness pilot project. Technical review of monitoring plans and monitoring reports for the pilot projects was also provided (see section 2.1.3, effectiveness monitoring pilot projects).

Development of Training Materials

The 1994 TFW method manual, the 1996 Salmonid Spawning Habitat Availability Survey manual, and the 1995 Salmonid Spawning Gravel Scour Survey manual have been completely revised. The most obvious change is separating the 1994 comprehensive manual into stand-alone manuals for each specific method or survey. This structure allows quicker refinements to individual manuals in the future, easier referencing, and portability. The internal structure of the manuals has been adjusted and expanded to provide a user-friendly lineal format to facilitate high quality data collection from study design to data management. This format fills many gaps that were identified as problems in training, QA review, and data entry sessions. We found that cooperators require more guidance in study design development, pre- and post-survey tasks, and procedures. In general, the structure was refined to provide step-by-step guidance in application of the methods. Each step begins with a clear task, followed by in-depth explanations for less experienced crews. The data management sections were refined to provide information on data analysis and summary report contents. The appendices include refinements to the field forms, examples of completed field forms, and other resources and information required to conduct the specific survey. Almost every graphic has been refined or replaced and many new graphics have been added to improve comprehension.

Implementation of a Puget Sound Water Quality Action Team (PSQAT) Public Information and Education (PIE) grant resulted in completion of a training video for the Salmonid Spawning Gravel Composition Survey. Response was very positive at two training workshops where the video has been shown. 130 copies of the video have been distributed to a wide variety of TFW and other cooperators including Puget Sound educators, Washington State Extension agencies and county conservation districts. Several copies are available for loan purposes. Over 500 people have viewed the video. The PIE grant, with donations of additional equipment from the Point No Point Treaty Council and the Skokomish Tribe, provided the resources for purchase of a new McNeil gravel sampler and construction of a complete volumetric processing station. This equipment is now available for loan.

Quality Assurance

Quality Assurance (QA) services are offered to individual cooperators to ensure and document consistent application of the TFW-MP standard methods by field crews (Table 4). These services are available statewide throughout the year. QA Reviews have been conducted for the program since 1992. During this time, the QA Review system has developed into a rigorous and scientifically sound testing and evaluation format that provides insights into factors influencing monitoring variability. This system is unique among state and regional monitoring programs.

Table 4. Number of QA Reviews by survey type and year.

QA Review	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999***	**Total**
Reference Point	2	1		1	2	2	1		9
Habitat Unit	5	5	3	2	3	2	3		23
LWD Level 1	0	0	1	1	4	1	2	1	10
LWD Level 2	5	2	3	2	1	2	3		18
Temperature	N/A	0	0	1	2	0	0	1	4
Spawn. Grav. Comp. (collection)	N/A	4	3	1	2	0	0		10
Spawn. Grav. Comp. (processing)	N/A	1	4	3	3	0	0	1	12
Spawning Habitat Availability	N/A	N/A	N/A	N/A	0	0	0		0
Spawning Gravel Scour	N/A	N/A	N/A	N/A	0	0	0		0
Total	12	13	14	11	17	7	9	3	86

"N/A" means workshop was not offered; "*" as of 6/30/99

There are three goals for QA Review services: 1) to help cooperators collect the highest quality data possible; 2) to provide feedback to both the cooperator and TFW-EMEP on factors affecting data quality and repeatability; and 3) to identify specific topics for projects to test and refine the methods. A successful monitoring QA plan includes TFW-EMEP training, practice in application of the methods on study area streams, and a pre-season QA Review. Cooperators who utilize these services have stated that it provides them with confidence in the abilities of their crews and the resulting data quality. This translates into confidence that baseline and trend monitoring studies accurately depict initial channel conditions and changes in those conditions over time.

Methods Testing and Refinement

The test and refine project of the TFW-EMEP uses feedback from training sessions, assessments of quality assurance (QA) reviews, and formal testing formats as the basis for refining the method manuals. As a result of this biennium's test and refine project, the method manual has undergone a major change as noted above. These changes, based on methods test and refinement projects, are listed in Appendix A.

2.2.2 Database Support

Data Input

Monitoring data collected during the 1997 and 1998 field seasons was entered into the TFW monitoring database. Monitoring survey locations and field forms were archived for future reference. The following projects provide examples of data entered into the database:

- City of Bremerton (Kitsap basin)
- Entranco (Skokomish basin)
- Lower Elwha Tribe (Lyre-Hoko basin)
- Evergreen Land Trust (Nooksack basin)
- USFWS (Kennedy-Goldsborough basin)
- USFS (Yakima basin)
- Stevens County Conservation District (Upper Lake Roosevelt basin)

Database Development

Conversion of the AMBSYS database from the Ingress to a new Oracle-Powerbuilder client-server system was completed during this period. Data processing functions (input, maintenance, calculation and report generation) were transferred to a Powerbuilder front-end system that provides a user-friendlier format, better system documentation, and greater processing speed and flexibility. In the process, the calculations and reports were updated and upgraded, tested, and error checked. Documentation was also provided. New user entry systems in were developed in database and spreadsheet formats.

Another part of the project involved development of auxiliary tables for data in different formats collected during the period from 1989-91. Data was then exported from old Dbase and Rbase files into Excell spreadsheets, error checked, converted to standard (metric) units, and imported into the new database structure.

TFW-EMEP Web Page and Effectiveness Monitoring Information Bank

Work was done on a design for the TFW effectiveness monitoring information bank (IBank). The information bank is designed to provide internet access to TFW effectiveness monitoring information, including monitoring project reports, effectiveness monitoring topic area summaries (compilation of results by topic area), abstracts, survey data and survey data summary reports. The main internet access point is through the TFW Effectiveness Monitoring and Evaluation Program section at the NWIFC web site (http://www. nwifc.wa.gov). Users can browse or select either reports and data, using a system that allows them to select information of interest using criteria such as watershed, physiographic region, topic area, practice type, year, etc. Users will also be able to select TFW monitoring information using the map-based, point and click system being developed on the SSHIAP web page. A more complete description of IBank is provided in Appendix B.

3 Future Direction for the TFW EMEP in the 1999-2001 Biennium

The TFW Monitoring Advisory Group (MAG) has requested funding for the TFW-EMEP in the next biennium to support: 1) the adaptive management component developed as part of the forestry module negotiations (USFWS et al., 1999); 2) the WSA five-year review process; and 3) the adaptive management elements of the state salmon strategy. MAG proposes to implement statewide effectiveness monitoring to answer a limited number of key effectiveness monitoring questions. Several of the proposed statewide monitoring projects are focused on evaluating the effectiveness of specific forest practice prescriptions that are being implemented under the forestry module agreement and WSA prescriptions. Another project is designed to answer watershed-scale effectiveness questions involving changes in input processes and associated aquatic resource response. Work is also proposed in database and information bank development and maintenance and in monitoring support services. Plans for the effectiveness monitoring projects are currently under development and will be submitted to CMER for review prior to the next biennium. The proposed projects are discussed briefly below.

3.1 Site-Scale Practice Effectiveness Monitoring

The following projects will evaluate the effectiveness of specific forest practices in protecting aquatic resources on a site-scale. The information will be used to determine how design of the practices and physical site conditions influence effectiveness, and to identify how performance can be improved.

3.1.1 Riparian practice effectiveness

Riparian RMZs on fish-bearing waters

This project will evaluate the effectiveness of riparian practices in providing LWD recruitment and shade on fish bearing waters. The objectives of the project are to: 1) evaluate effectiveness of riparian practices in providing LWD recruitment; 2) to evaluate effectiveness of riparian practices in providing shade; and 3) to determine how site conditions influence riparian practice effectiveness. The project design will be based on the riparian effectiveness monitoring study design guidelines (Smith and Schuett-Hames, 1998). Sampling sites will be selected in each physiographic region and stratified by forest stand type, channel gradient-confinement class and RMZ design. Riparian stand conditions will be documented before harvest, immediately after harvest, and over time to evaluate the effects of timber harvest on LWD recruitment and shade. Changes in stream temperature, in-channel LWD, pool habitat and sediment storage will be documented.

Riparian hardwood conversion.

This project will evaluate the effectiveness of prescriptions for thinning/hardwood conversion in changing stand composition and tree size to increase LWD recruitment. The effect of these practices on shade and stream temperature will also be documented. Stratification and site selection will be similar to the design for monitoring riparian RMZ prescriptions (above). Riparian stand composition, LWD recruitment potential and shade will be documented before and after application of the prescriptions. Changes in stream temperature and in-channel LWD will be documented.

Riparian protection for non-fish bearing waters

This project will evaluate the effectiveness of riparian buffers on small, non-fish-bearing streams in preventing adverse changes in stream bank integrity, LWD function and stream temperature regimes. Sampling sites will be stratified by physiographic region, forest stand type, buffer design, and stream channel gradient/confinement class. Changes in riparian stand condition, stream bank erosion, LWD loading and function, and stream temperature will be documented.

3.1.2 Effectiveness of road maintenance and abandonment plans in reducing sediment delivery

This project will evaluate the effectiveness of road maintenance and abandonment plans in preventing sediment delivery from surface erosion and mass wasting. A sample of road maintenance plans developed under the proposed forest practices rules will be selected to represent different physiographic regions, geology groups and sediment reduction strategies. Evaluation of sediment reduction effectiveness will occur on a WAU or WAU sub-basin scale. Within the WAU, physical site characteristics and road type/use categories will further stratify road segments. Road segments will be visited before and at intervals after implementation of the road maintenance plan to collect data on road characteristics and to identify mass wasting erosion features. Sediment delivery from surface erosion will be estimated for both the pre- and post-implementation conditions to determine the effectiveness of the plans in controlling surface erosion. Pre- and post-implementation data on mass wasting rate, volume and potential will be compared to determine effectiveness of the plans in controlling mass wasting.

3.1.3 Fish passage effectiveness at stream crossing structures on forest roads

This project will evaluate the effectiveness of forest road culverts installed according to the criteria in the rules in providing passage for various salmonid species and life history stages. Sites will be stratified by physiographic region, stream gradient/confinement class and crossing structure type. Information on fish movement, together with data on the physical and hydraulic characteristics of the crossing structure and the fish distribution response will be used to evaluate effectiveness.

3.2 Watershed-Scale Monitoring

This project will evaluate the effectiveness of the forest practice management system in preventing changes in watershed processes and aquatic resource conditions due to cumulative effects from forest practices on a watershed-scale. The objectives are to answer the following questions:

1) How do inputs of sediment from surface erosion and mass wasting, LWD input, thermal energy input change over time in response to the cumulative effects of forest practices?
2) How do aquatic resources respond to changes in the inputs induced by forest practices conducted under the state forest practice management system?

The approach for designing the watershed-scale effectiveness monitoring project is to identify a sample of small watersheds (WAUs) where the predominant land use is state and private forest land. The physiographic regions will stratify WAUs and a sample will be selected to represent the different geologic and climatic conditions. To determine changes in input processes, management-induced changes in mass wasting, surface erosion, LWD recruitment potential, and shade will be documented (Schuett-Hames, 1999). This information will be used to evaluate the effectiveness of the forest practice management system in controlling adverse changes in input processes in different situations and identify ways that performance can be improved. To determine the response of aquatic resources to changes in inputs, a series of response reaches will be selected for monitoring. Monitoring reaches will be stratified by "response situation", (defined by channel type, input process regime and geology). A hypothesis will be developed for each reach that predicts how aquatic resource conditions in the reach will respond to changes input processes. Monitoring will determine trends in aquatic resource conditions over time to evaluate if the management system is effective in creating conditions that provide protection and/or allow recovery of aquatic resources. Finally, information on the response of input processes to forest practices will be used to determine the effectiveness of the management system in identifying sensitive areas for each input process and areas of resource vulnerability.

3.3 Database And TFW Effectiveness Monitoring Information Bank Development

Additional database development is planned to manage data collected in effectiveness monitoring surveys. Databases are planned for mass wasting data, surface erosion data, road erosion data, riparian

stand survey data, and fish passage data. Work will involve development of a database structure to contain survey data, data entry systems, and development and documentation of applications to perform standard calculations and to generate survey data summary reports. Construction of the internet interface for the information bank is scheduled to occur during this period.

3.4 Effectiveness Monitoring Support Services

During the next biennium the TFW-EMEP proposes to continue providing study design assistance, training and quality assurance services to TFW cooperators participating in effectiveness monitoring projects. Development of method manuals and training services for the riparian stand survey and road sediment surveys is planned. Additional work is planned to continue testing and refining existing monitoring methods. These projects will be integrated with future effectiveness monitoring projects. Test and refine projects will be designed to 1) determine if surveys are repeatable by different observers under similar conditions; 2) determine the influence of discharge on repeatability of surveys; 3) determine if survey sites can be accurately relocated; and 4) determine if TFW monitoring parameters and methods are able to detect management–induced change over time.

3.5 Adaptive Management Support

The results of the effectiveness monitoring projects will be conveyed to CMER and the TFW adaptive management committee in the form of written reports, presentations and field trips. The reports will provide preliminary results, identify situations where performance needs to be improved, and discuss options for improving effectiveness.

4 Conclusions

The past two years have been a dynamic time of change, characterized by rapid and extensive work to implement the 1996 effectiveness monitoring strategy in the areas of:

- Development of a TFW effectiveness monitoring and evaluation program plan
- Identification and prioritization of effectiveness monitoring topic areas
- Development of effectiveness monitoring approaches and methods
- Implementation of pilot projects to test approaches and produce preliminary results

At the same time the program has continued to provide and refine training, quality assurance and database services for TFW cooperators.

Future effort will be focused on statewide implementation of projects to test the effectiveness of the revised forest practices rules adopted to protect salmon stocks. Priority projects include:

- Riparian RMZ prescriptions on fish bearing waters
- Riparian practices on non-fish bearing waters
- Riparian hardwood stand conversion practices
- Road sediment reduction (road maintenance and abandonment plans)
- Fish passage at stream crossing structures on forest roads
- Watershed-scale monitoring of cumulative effects of forest practices

In addition, the program will continue to provide training, quality assurance and database services for TFW cooperators. New databases will be developed to support the new effectiveness monitoring projects, the internet interface for the TFW effectiveness monitoring information bank will be implemented, and the results of effectiveness monitoring projects will be reported to TFW field managers and policy-makers.

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APPENDIX A

TFW EMEP METHODS TESTING AND REFINEMENT PROJECT DESCRIPTION

The test and refine project of the TFW Monitoring Program uses feedback from training sessions, assessments of quality assurance (QA) reviews, and formal testing formats as the basis for refining the method manuals. As a result of this biennium's test and refine projects, the method manual has undergone a major change. The following section describes specific refinements made during this biennium by general and individual manual.

General Manual Refinements

There are nine general refinements that have been made to the TFW Monitoring Program method manual. The most obvious change is separating the 1994 comprehensive manual into stand-alone manuals based on specific methods and surveys. This structure is designed to allow quicker refinements to individual manuals in the future, easier referencing, and portability. The internal structure of the manuals has been adjusted and expanded to provide a user-friendly and lineal format to facilitate high quality data collection from study design to data management. This format fills many method application gaps that were identified as problems during training, QA review, and data entry sessions. We found that cooperators required more guidance in study design development, pre- and post-survey tasks, and procedures. In general, the method section structure was refined to provide step-by-step method application guidance with each step beginning with a clear task, followed by in-depth explanations for less experienced crews. The data management section has been refined to follow database development and to provide information on data analysis and summary report contents. The appendix includes refinements to all of the field forms, examples of completed field forms, and other resources and information required for conducting the specific survey. Almost every previous graphic has been refined or replaced and many new graphics have been added to improve method comprehension. These and other general refinements are listed below. Specific refinements to method parameters and criteria will be discussed by individual survey.

1. New stand-alone manual format
2. Refined and expanded introduction section includes previous purpose and training, field assistance, and quality control sections
3. New study design section
4. New pre-survey preparation section
5. Refined methods section
6. New post-survey documentation section
7. New data management section refines and expands previous data processing and analysis section
8. Refined and expanded appendix section
9. Refined and new graphics

Individual Manual Refinements

Stream Segment Identification

Refinements were made to the method, field segment verification, and appendix sections of the Stream Segment Identification manual. Refinements to the segmenting method were made with the assistance of the Salmon and Steelhead Habitat Inventory and Assessment Project (SSHIAP). These refinements were made to improve consistency in segment and boundary identification. An optional sub-segmenting technique has been introduced to provide flexibility for cooperators to meet individual needs, yet maintain the integrity of the core method. A new field verification section has been developed to translate remote segmenting applications into actual field identification procedures. These and other specific refinements are listed below.

1. Refined segmenting method
   - Refined and expanded preparation procedures
   - New flow, gradient, and confinement layering technique
   - New lumping and splitting rules
   - New optional sub-segmenting technique
2. New field segment verification section
3. Refined and expanded appendix section
   - New materials, equipment and information sources
   - Refined Form 1
   - New lump/split worksheets
   - New glossary of terms
   - New completed examples of Form 1 and lump/split worksheets
   - New data management examples
   - New segmenting task checklist
   - Refined gradient and quarter of quarter template
   - Updated Watershed Analysis tables
   - New standard field and vehicle gear checklist

Reference Point Survey

Results of QA reviews and follow-up testing projects showed a need for refinements to the Reference Point Survey method manual. Establishing and documenting reference points has been refined to promote placing reference points on both banks at each segment boundary and 100 meter reference point. Documentation of reference point locations is now supported by complete triangulation procedures and a new Form 2T. Variability in bankfull width measurements was caused by biased and inaccurate bankfull channel edge identification. The problem was that crews were biasing identification towards their lowest confidence range and this typically underestimated the channel's bankfull width. As a result, the confidence/default identification technique was improved and given higher prominence. Variability in bankfull depth measurements was caused in part by bankfull channel edge identification, but also by an inaccurate mean depth measurement protocol. A follow-up testing project using a variety of existing and new bankfull depth techniques produced the new 10 percent cell procedure. Variety in canopy closure measurements was found to be caused by problems with equipment type, accuracy, and consistency in crew use. A follow-up testing project showed significant differences between the convex and concave spherical densiometer types, inadequate manufacturer instructions, and an impossibly complex measurement procedure. Instructions are now provided to modify and stabilize the equipment, and to improve the measurement procedure with clear criteria. Reference photograph procedures have been

expanded to support more rigorous studies and documentation. Procedures have been added to address the reconstruction and relocation of lost reference point tags or sites due to factors such as tag removal or channel migration. These and other specific refinements are listed below.

1. Refined method section
   - Refined establish and document reference points procedure
   - Refined bankfull channel edge identification procedure
   - Refined bankfull depth measurement procedure
   - Refined canopy closure measurement procedure
   - Refined reference photograph procedure
   - New reconstruction and relocation of lost reference points procedure
2. Refined and expanded appendix section
   - Dropped scan entry Form 2
   - New task checklist
   - New materials, equipment and information sources
   - New Forms 2H and 2T, and refined Form 2D (Form 2D replaces previous Form 2)
   - New standard field and vehicle gear checklist
   - New completed examples of field forms 2H, 2T, and 2D
   - New bankfull depth cell method interval matrix
   - Refined and expanded data management examples
   - New glossary of terms

Habitat Unit Survey

Refinements were made. Results of QA reviews showed a need for refinements to the method and appendix sections of the Habitat Unit Survey manual. The discharge measurement method was dropped from this manual and is now presented as a separate, stand-alone manual. This will allow the discharge method to be refined, expanded, and make it more easily accessible for other surveys requiring discharge measurements. Variability associated with unit type and boundary identification for tailout and cascade units was found to be too high for monitoring purposes. Smaller tailout units were inconsistently identified and larger tailout unit boundaries were also inconsistently identified. Smaller cascade units meeting the minimum surface area criteria, especially in lower gradient streams, were rarely identified. The refined system uses only riffle and pool units as the primary habitat types. Sub-surface flow, wetland, and obscured unit type identification procedures have also been refined and expanded to clarify many crew misunderstandings in when and where they occur. An optional sub-unit type procedure (not supported by training or *QA* review) has been included to allow more detailed classification of habitat units when necessary to meet individual cooperator needs. A new channel location category has been added to classify surface water flowing within a separate channel in the bankfull channel being surveyed, but originating from a tributary. These and other specific refinements are listed below.

1. Refined method section
   - Moved discharge section to new Wadable Stream Discharge Measurement method manual
   - Refined core habitat unit type list and identification techniques; dropped tailout and cascade unit types
   - New optional sub-unit type procedure
   - New channel location category for tributary channels

2. Refined and expanded appendix section
   - Dropped completed discharge Form 7, blank Form 7, scan entry Forms *3A* and *3B*, and metric conversion chart
   - New Form *3.0* and refined Form *3.1* (Form *3.1* replaces previous Form *3)*
   - New completed examples of Forms 3.0 and 3.1
   - New habitat criteria and code field sheet replaces previous TFW ambient monitoring code sheet
   - New standard field and vehicle gear checklist
   - Refined and expanded data management examples

Large Woody Debris Survey

Results of *QA* reviews showed a need for refinements to the method and appendix sections of the Large Woody Debris Survey manual. Variability in LWD jam identification was found to be caused by problems with the "in contact/touching" criteria and general jam identification guidelines. Refinements were made to clarify jam identification and to include pieces that are not directly in contact with another qualifying piece, but are associated with jam structure. Variability in LWD jam piece count was caused by problems with the 10 piece criteria and whether to count associated jam pieces totally in zone 4. The refined procedure provides clear instructions that jam identification still requires a minimum of 10 qualifying pieces (including associated zone 4 pieces), but that jam counts reflect only those individual pieces with lengths extending into zones 1,2, and 3. Level 1 and 2 surveys have been refined to include optional supplemental parameters that have been identified as important to cooperators, but are not supported by training or QA review services. The new parameters include key pieces as defined by Watershed Analysis, pieces with lowest portion of their lengths extending only into zone *3*, two options for both channel orientation and decay class parameters, and a simple yes/no sediment storage parameter. Problems with jam piece counts where a single jam influences two or more survey segments has been addressed by assigning piece counts based on the midpoint locations of individual pieces. These and other specific refinements are listed below.

1. Refined method section
   - Refined jam identification and recorded piece count criteria
   - New optional Level I supplemental key piece and zone *3* data collection procedures
   - New optional Level *2* supplemental zone *3*, channel orientation, decay class, and sediment storage data collection procedures
   - New splitting jams at segment boundaries procedure
   - New optional jam supplemental zone *3* and key piece data collection procedures
2. Refined and expanded appendix section
   - Dropped scan entry field forms and decay class codes
   - New Form *4.0* and refined Forms *4.1*, *4.2*, and *4.3* (Form *4.3* replaces previous Form *5)*
   - New completed examples of Forms *4.0*, *4.1*, *4.2*, and *4.3*
   - New LWD criteria and code field sheet replaces previous Habitat/LWD code sheet
   - New standard field and vehicle gear checklist
   - Refined and expanded data management examples

Wadable Stream Discharge Measurement

The Wadable Stream Discharge Measurement method manual is an expanded version of the procedure previously provided in the Habitat Unit Survey. Placing the method in the general manual format facilitates the refinement, expansion, and access of those methods for other surveys requiring discharge measurements. Research into the previous discharge measurement procedure did not provide clear documentation or scientific basis for reducing the number of measurement stations from the USGS minimum of *25* to the recommend 15-20. USGS does state that on smaller streams the number can be reduced, but this is a very subjective call. An attempt was made to improve the decision-making process for justifying a smaller number, but ultimately this is left to the discretion of the cooperator. A minimum averaged velocity criteria per measurement station has also been added to meet USGS standards. These and other specific refinements are listed below.

1. Refined method section
   - Refined minimum number measurement station criteria to meet USGS standards
   - New minimum averaged velocity criteria to meet USGS standards
2. New appendix section
   - New Form 7.0 and refined Form 7.1
   - New completed examples of Forms 7.0 and 7.1
   - New standard field and vehicle gear checklist
   - New USGS float and volumetric measurement technique

Stream Temperature Survey

Results of training sessions and discussions with WDOE water quality personnel showed a need for refinements to the study design, calibration, method, and appendix sections of the Stream Temperature Survey manual. The study design section has been refined to reflect the temperature station and thermal reach format, guidelines for determining monitoring parameters, and selecting temperature recording instruments. The calibration section has been refined to meet the needs of the newer generation of data loggers. The method section replaces the Level I method with the temperature station data collection procedure and the Level 2 and 3 methods with the optional thermal reach data collection section. The thermal reach data collection section refines procedures to follow other current survey methods for parameter measurements such as bankfull width and depth. The thermal reach riparian zone characterization procedures were refined and expanded to follow Watershed Analysis methods. These and other specific refinements are listed below.

1. Refinement and expansion of study design section
2. Refinement of temperature instrument calibration section
3. Refined method section
   - Replaced Level I method with the temperature station data collection procedure; refined installation, documentation, periodic field check, and removal techniques
   - Replaced Level 2 and 3 methods with the optional thermal reach data collection procedure; refined bankfull width and depth, wetted width and depth, and canopy closure procedures to follow 1998 Reference Point Survey methods; Refined and expanded riparian management zone characterization
4. Refined appendix section

- Dropped previous Form 8.0, calibration worksheet for thermographs, previous Form 8. 1, max/min temperature worksheet, and canopy closure field worksheet
- New Forms 8.0, 8. IL, 8. IM, 8.2, 8.2L, 8.2M, 8.3, and 8.3R
- New completed examples of Forms 8.0, 8. IL, 8. IM, 8.2, 8.2L, 8.2M, 8.3, and 8.3R
- New standard field and vehicle gear checklist
- New data management examples
- Revised and expanded Washington State Water Quality Standards Classification List
- New Sullivan et al., 1990 stream gradient measurement method

Salmonid Spawning Gravel Composition Survey

Results of QA reviews and experience from the 1996 shovel/McNeil test project showed a need for a few refinements to the method and appendix sections of the Salmonid Spawning Gravel Composition Survey manual. The gravel patch identification and inventory procedure was completely changed based on research and development of criteria for the Salmonid Spawning Habitat Availability Survey. A new transect strategy was developed with assistance from a NWIFC biometrician for estimating the sample population of gravel patches. The sample population strategy has been refined to include all riffle crests and gravel patches that have at least one estimated sample. Sample point identification has been refined in the collection section to replace the old one-half/two-thirds technique with a quick calculation criteria. To reduce the weight of sample buckets for removal from the field, a decanting technique has been added. These and other specific refinements are listed below.

1. Refined method section
   - Refined and expanded section structure into pre-method, method, and post method tasks
   - Refined and expanded riffle crest identification and inventory procedure
   - New gravel patch identification and inventory procedure
   - New sample population identification procedures
   - Refined and expanded sample collection section including a new sample point identification and sample bucket decanting techniques
2. Refined and expanded appendix section
   - Restructure and refinement of field forms: new Form 6.0, old 6.0 = new 6. 1, old 6.1 = new 6.2, and old 6.2 = new 6.3
   - New completed examples of Forms 6.0, 6.1, 6.2, and 6.3
   - New standard field and vehicle gear checklist
   - New sample tracking slip refines previous labels for sample buckets
   - New data management examples
   - Refined random number table

Salmonid Spawning Habitat Availability Survey

The results of training sessions and cooperator feedback showed that refinements were needed to the method and appendix sections of the Salmonid Spawning Habitat Availability Survey manual. Several refinements were made to reflect changes in other surveys such as bankfull width measurement and patch boundary identification techniques following current Reference Point and Habitat Unit Survey methods. A new patch/sub-patch system has been implemented to track patch connectivity while providing the

highest surface area measurement accuracy. Measurement of the wetted channel surface area has been given its own procedures section and field form. These and other specific refinements are listed below.

1. Refined method section
   - Refined tranesect survey
   - Bankfull width measurement to follow 1998 Reference Point Survey methods
   - Refined identification and new lumping rules for size class boundaries
   - New SHA patch survey replaces previous spawning habitat patch survey (Part 3)
   - New patch/sub-patch identification technique
   - Refinement of patch boundary and surface area measurement techniques to follow 1999 Habitat Unit Survey methods
   - New wetted channel width measurement procedure
2. Refined and expanded appendix section
   - New Forms 9.0 and 9.3; refined Forms 9.1, 9.2
   - New completed examples of Forms 9.0, 9.1, 9.2, and 9.3
   - New SHA field code sheet
   - New standard field and vehicle gear checklist
   - New data management examples

Salmonid Spawning Gravel Scour Survey

The results of training sessions and cooperator feedback showed that manual refinements were needed made to the method and appendix sections of the Salmonid Spawning Gravel Scour Survey manual. Specific refinements are listed below.

1. New monitoring approach, products, and cooperator services sub-sections
2. Refined and expanded study design section
3. New equipment calibration section
4. Refined method section for greater clarity
5. Refined and expanded appendix section
   - New Form 10.0 and refined Forms 10.1, 10.2,10.3, and 10.4
   - New completed examples of Forms 10.0, 10.1, 10.2,10.3, and 10.4
   - New standard field and vehicle gear checklist
   - New data management examples

APPENDIX B. TFW-EMEP EFFECTIVENESS MONITORING INFORMATION BANK

Introduction

The TFW effectiveness monitoring and evaluation program encourages TFW cooperators across the state to generate comparable monitoring information. A means to collect, organize and store this information and make the results available to TFW cooperators for use in adaptive management is needed. The TFW Effectiveness Monitoring Information Bank is designed to meet this need.

Overview

The TFW Effectiveness Monitoring Information Bank (IBank) is a system for organizing and storing information on the effectiveness of forest practices in protecting aquatic resources and making it available to TFW cooperators for adaptive management purposes. IBank supports adaptive management by:

- Providing access to effectiveness information for TFW cooperators, field managers, and prescription teams for use in designing effective forest practices, restoration measures, and management systems.
- Assembling information from many sites and cooperators for use by the TFW adaptive management group and TFW policy committee in the formal TFW adaptive management process to improve aquatic resource protection throughout the state.

Information is contributed to IBank by CMER-sponsored projects, TFW cooperators, and other participating organizations. The type of information contributed to IBank includes effectiveness monitoring survey data and reports that present results and conclusions that address effectiveness monitoring questions identified in the TFW Effectiveness Monitoring and Evaluation Plan. Projects contributing information to IBank are screened to ensure that MAG guidelines for study design, data collection, data analysis, and data interpretation have been met. This ensures the comparability of information and consistency in evaluation and interpretation of results. Incoming survey data is stored in the existing AMBSYS database system, while reports are stored in electronic format. Information is organized by topic area, and sorted into categories based on the type of practice or management system and physical setting (situational category). This system of organization allows information to be accumulated for regional and statewide analysis by topic area and situation, and for results to be extrapolated to similar situations. TFW cooperators and interested parties query IBank through an internet interface that is accessed from the user's personal computer. The query capability lets the user sort and select data or reports by attributes such as topic area, situational category, type of survey, or geographic location. The system of situational categories allows users to quickly identify and retrieve relevant information from similar situations. Products available as outputs from IBank include:

- Monitoring survey data (unanalyzed data).
- Survey summary reports (data with basic calculation performed).
- Effectiveness monitoring project reports (results and conclusions from individual monitoring projects).
- Topic area summary reports (summaries of the results of many projects by topic area and situational category).

Description of IBank System Components

IBank consists of a data input and storage system, data access and query options, and outputs (Figure 1).

Input and Storage of Information. The following section describe how monitoring survey data and effectiveness monitoring reports are stored in the IBank system.

Monitoring Survey Data. Monitoring survey data is housed in an Oracle database at NWIFC. The database, known as AMBSYS, is designed to store TFW monitoring data. Monitoring survey data produced by TFW cooperators and TFW Monitoring Program staff is input into the database via spreadsheets or an Access database application. Data is error checked by cooperators and screened by TFW monitoring program staff for accuracy and compatibility before input into the AMBSYS database. A Powerbuilder application is used to process data, maintain and query the database, perform standard calculations and generate survey data summary reports.

Effectiveness Monitoring Reports. Two types of reports are stored in IBank, reports presenting the results of individual monitoring projects and reports that summarize results of two or more projects for a particular topic area. TFW Monitoring Program staff or TFW cooperators produce reports on monitoring projects. Reports summarizing results of various projects by topic area are produced by TFW monitoring program staff under guidance of MAG. Reports under go review by CMER/MAG prior to being accepted into IBank. Electronic versions of reports are stored on the server connected with the TFW Monitoring web page. Hard copies of reports are kept on file with the TFW Monitoring Program at NWIFC and the DNR Forest Practices Division. Backup copies of reports on disk are kept at both these locations.

Information Access and Query Options. Users can to identify and access information they need from IBank either via the internet through the NWIFC web site or by requesting lists of information from the TFW Monitoring Program.

Internet access. The main access to IBank is through TFW monitoring area of the NWIFC web site at http://www.nwifc.wa.gov. The IBank section of the TFW monitoring area provides an introduction to IBank and a tabular menu system that allows users to browse, sort, select and download information (Figure 2). Reports can be sorted by topic area, location or other situational criteria and downloaded directly from the web page. Survey data can be sorted by survey data type, location, date, source, and other criteria. A map-oriented system that allows users to point and click on maps of stream systems to select various types of data is being planned for the Salmon and Steelhead Inventory and Assessment Program (SSHIAP) area of the NWIFC. A link to SSHIAP area will be developed for those interested in a map-oriented data selection option. SSHIAP will develop a GIS layer showing the location of TFW monitoring surveys. Users will be able to select TFW effectiveness monitoring data of interest using this system. The SSHIAP map-oriented data selection system will be linked to IBank and the AMBSYS database to provide access to TFW effectiveness monitoring information selected.

Lists of information. An alternative access route for those without Internet access consists of lists describing the effectiveness monitoring reports and monitoring survey data in available in IBank. Users identify information of interest on the list and call, fax, mail or email requests for effectiveness monitoring information of interest to TFW monitoring program.

Output Options. Survey data and survey data summary reports are available for downloading through the IBank section of the NWIFC web site. The data in IBank is available to any interested party, except when the cooperators contributing the data request that permission be obtained from them before data is released. Survey data without restrictions can be downloaded directly, as can data summary reports for those surveys. Copies of survey data are also available on floppy disk or via email from the TFW monitoring program at NWIFC. Data requiring permission is shown on the survey list, but is not available for viewing or downloading. This data is sent via disk or email once permission has been obtained. Hard copies of data summary reports are also available from NWIFC. Effectiveness monitoring reports can be browsed or downloaded directly from the web site. Paper copies of effectiveness monitoring reports are available from the TFW monitoring program and the DNR forest practices division.

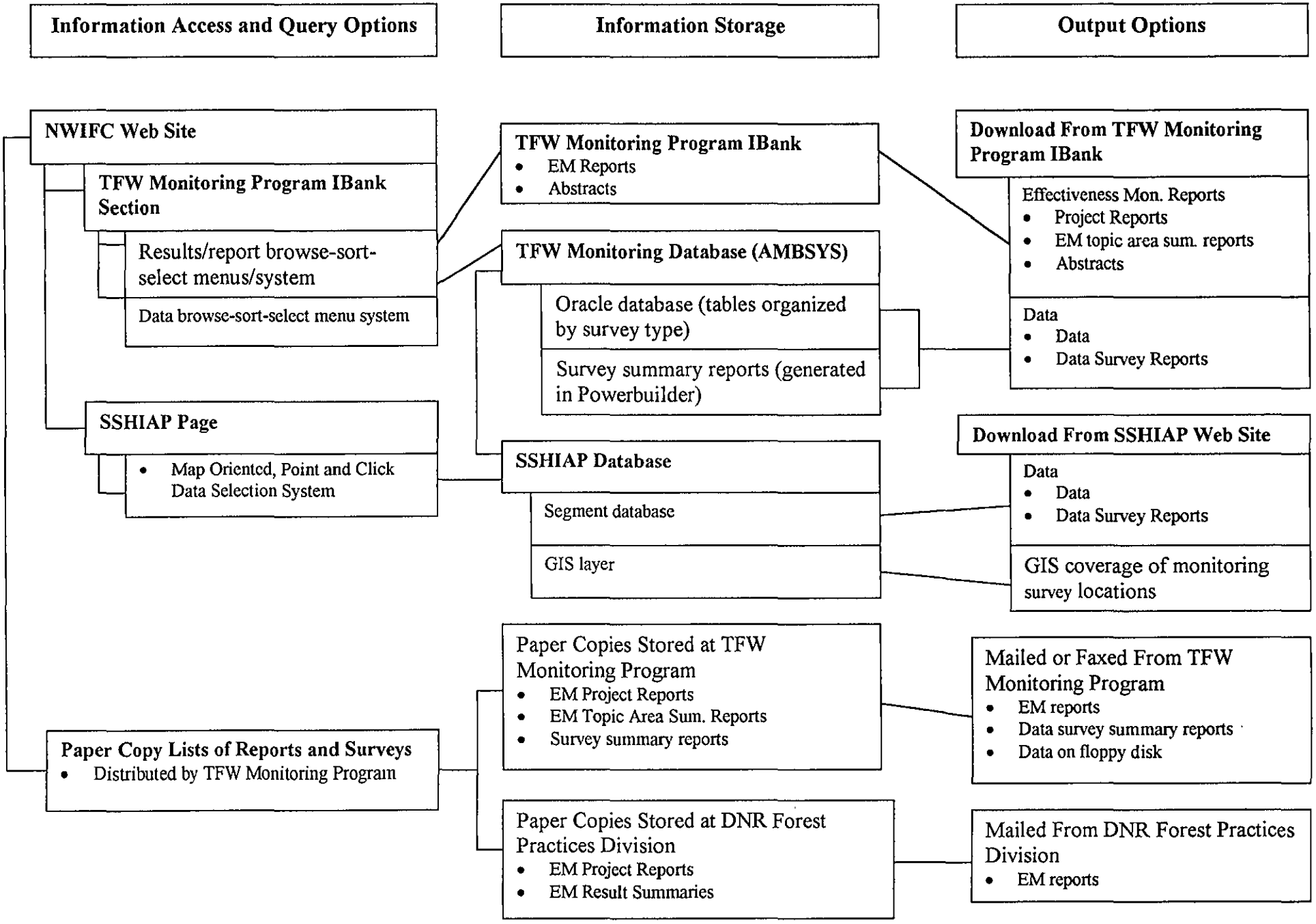

Figure 1. Schematic showing linkages between the IBank information access options, the IBank information storage system, and outputs.

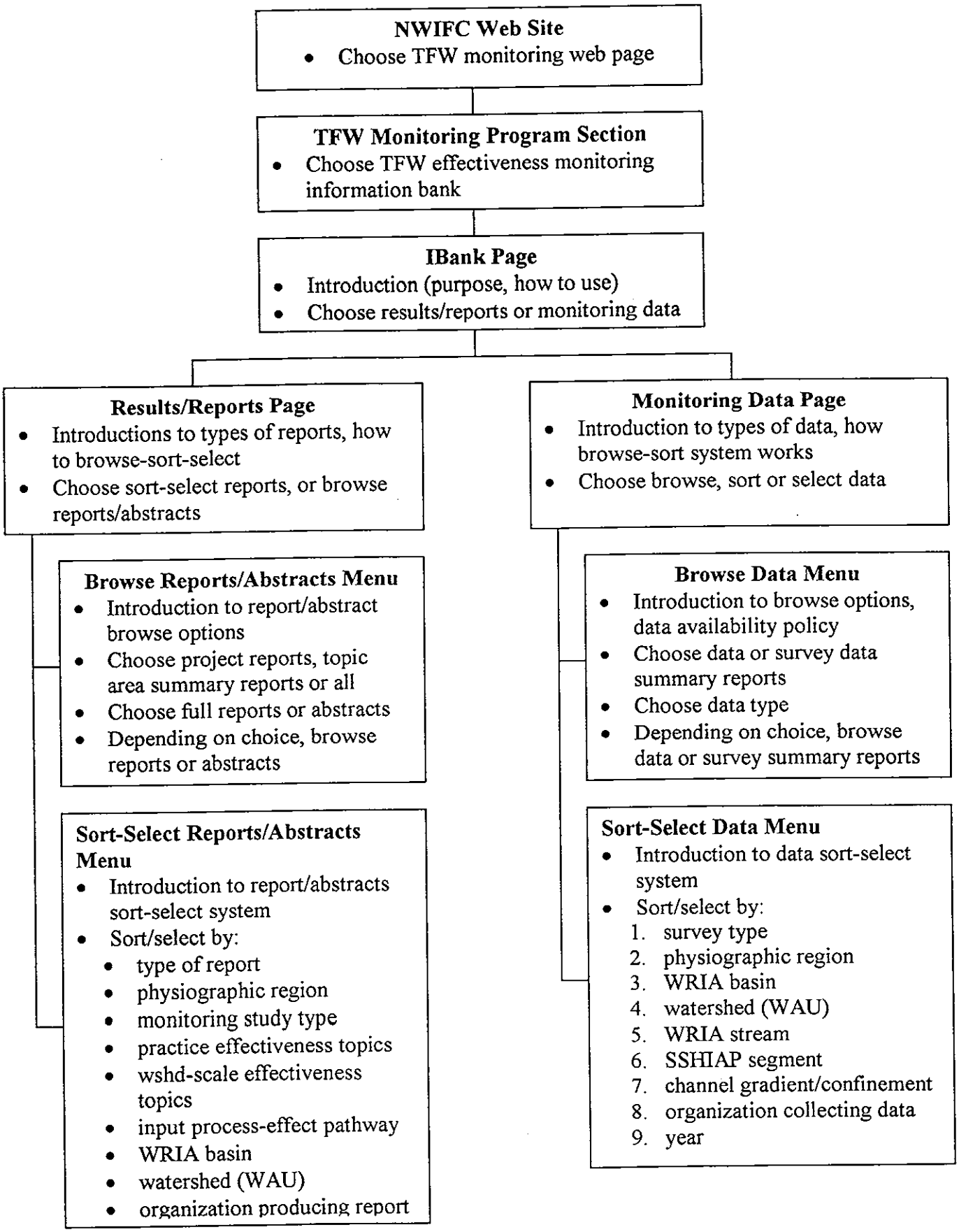

Figure 2. Schematic Showing Sequence of Pages and Menus in IBank Information Access System