



# APPENDIX I

## ADAPTIVE MANAGEMENT

### Introduction

#### Background

The concept of adaptive management was developed in the late 1970s from a method called “Adaptive Environmental Assessment and Management” presented by C.S. Holling (1978). Adaptive management in its current form is basically a process that provides for the integration of scientific research with applied management to reduce uncertainty in management practices by filling in gaps in our understanding of natural systems while continuing to manage them (Walters, 1986; Halbert, 1993). These gaps in our understanding are filled by research, monitoring, and evaluation that is conducted in conjunction with resource management. Thus, as the level of uncertainty associated with a particular resource management issue/decision increases, so does the importance of an adaptive management process. Adaptive management helps reduce the risk of decision-making, particularly in situations where resource managers are dealing with significant levels of uncertainty and considerable consequences (e.g., species’ extinction).

According to Walters and Holling (1990), “every major change in harvesting rates and management policies is in fact a perturbation experiment with a highly uncertain outcome, no matter how skillful the management agency”.

Based on the above, one key element of an effective adaptive management program is research designed to gather information to fill in gaps or refine current knowledge pertinent to the resource(s) of concern. This element includes decisions about what research will be conducted. The research must be relevant to the resource(s) of concern, scientifically sound, and unbiased by interest groups or stakeholders. Independent peer review by the scientific community and the public also helps ensure that the research does not appear biased. In addition, due to financial and time constraints, the research conducted must be prioritized in a manner that allows for those crucial uncertainties that pose the most risk to the resource to be addressed first.

Another key element of an effective adaptive management program is monitoring. In the context of the Washington forest practices, there are three basic types of monitoring, all of which are essential to the success of an adaptive management program:

- Compliance monitoring - designed to determine if landowners are following the Forest Practices Rules.
- Effectiveness monitoring - designed to determine how well the management approaches are meeting resource objectives; and



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- Validation monitoring - designed to determine if the assumptions (or resource objectives) upon which the regulations were based are correct.

A formal process must also be established for incorporating new information to refine regulations. This process necessarily includes evaluation of the research and monitoring results to determine their relevance and significance to regulations. When dealing with multiple stakeholders, this process would benefit from a protocol for receiving input and resolving disputes among stakeholders regarding research implications and recommendations. Another key element of this process would be to define who will be responsible for defining overall resource objectives and priorities and whether and how to modify regulations based on results of research and monitoring.

Enforcement of the regulations once they are implemented is essential to ensure that once decisions have been made to modify management practices or objectives, that all parties involved are held accountable for upholding their responsibilities.

Finally, adequate multi-year funding is critical to a successful adaptive management program. Among other things, funding must be established in advance to ensure that quality research and monitoring is conducted to support the process. Funding must also not be tied to any special interest group that then may dictate which select projects or programs will be conducted and once selected, how they will be conducted.

Notably, although an adaptive management program may have all the key elements identified above, for the program to be effective, it must be designed to readily identify critical problems and respond to them, through corrective action, in a timely manner. For a program to be responsive: 1) data must be gathered in a manner that allows for ready identification of the most significant resource issues; 2) evaluation of information and decision-making cannot be significantly delayed in dispute resolution processes; and 3) adequate funding must be secured in advance to ensure no critical delays, particularly in the collection of research and monitoring data.

### **Goals of Adaptive Management**

As stated in Chapter 1, there are 4 goals of the new Forest Practices Rules all of which the adaptive management process is designed to support:

1. To provide compliance with the ESA for aquatic and riparian-dependent species on non-federal forest lands;
2. To restore and maintain riparian habitat on non-federal forest lands to support a harvestable supply of fish;
3. To meet the requirements of the CWA for water quality on non-federal lands; and
4. To keep the timber industry economically viable in the State of Washington (as required by state law).

The overall goal of the adaptive management process as expressed in the Forests and Fish Report (April 29, 1999), is “to ‘close the loop’ when it is necessary or advisable to adjust rules and guidance to achieve the projected result.” There are three desired outcomes:

1. Certainty of change as needed to protect target resources;



2. Predictability and stability of the process of change so that landowners, regulators, and interested members of the public can anticipate and prepare for change; and
3. Application of quality controls to study design and execution and to interpret results.

## **Proposed Alternatives for Adaptive Management**

### **Overview**

Adaptive management is one of the cornerstones to the success of the new Forest Practices Rules. As stated above, the level of importance of adaptive management increases with the level of uncertainty and risk to resources associated with a particular set of management actions. Thus, due to uncertainties surrounding forest management practices regarding effects on water quality and fish habitat, concern has increased over deficiencies in the current adaptive management program.

The description of the Forest Practices Board EIS alternatives for adaptive management below, focuses on select aspects of the current program (Alternative 1) that are being proposed for change in Alternatives 2 and 3 and how these changes relate to meeting the Forest Practices Board goals. Key aspects of the current program proposed for change include: 1) formalizing the process, 2) increasing accountability in the process, 3) formalizing effectiveness and validation monitoring, and 4) refining how decisions are made in the adaptive management process. With respect to decision-making, the changes proposed address formalizing dispute resolution and defining the role of the TFW Policy Committee and/or the Forest Practices Board in the adaptive management process. An overview of the background for development of the current adaptive management program is presented under Alternative 1. The descriptions of the three alternatives are then followed by a section comparing the proposed changes with respect to the key elements of an adaptive management process described in Section 1.0 above as well as the Forest Practices Board goals.

### **Alternative 1 - No Action**

The use of adaptive management in Washington forest practices was provided for in the 1988 TFW agreement, and is considered one of the key elements of the agreement. Notably, the TFW agreement is particularly unique among other resource management agreements in that it incorporates an adaptive management process through the establishment of the Cooperative Monitoring, Evaluation, and Research (CMER) program (Halbert, 1993). Through the TFW agreement, adaptive management was established by rule in the Washington Forest Practices Rules. Adaptive management and monitoring is thus required under current Forest Practices Rules (WAC 222-08-035 and 222-12-045). The current adaptive management process basically establishes that resources be managed using the best available information, with the understanding that Forest Practices Rules and field methods can be changed in response to results of research and monitoring. Under WAC 222-12-045 the WDNR is “directed to report to the Forest Practices Board on opportunities to modify these regulations when baseline data, monitoring, evaluation or the use of interdisciplinary teams show that such adaptive management will better meet the purposes and policies of the FPA”.

Unfortunately, although adaptive management has been formally incorporated into state Forest Practices Rules, the process for implementing it remains relatively informal and is inconsistently applied. The TFW Agreement (1987) established the CMER Committee specifically to conduct research and monitoring. TFW decides which research and monitoring projects to support (once per



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biennium) and makes recommendations on resource objectives to be determined by the Forest Practices Board. Research and monitoring in TFW is outlined in a work plan developed by CMER, who is also responsible for implementing the plan. Based on results of this research and monitoring, CMER is then charged with developing tools and methods for forest management and identifying and filling gaps in knowledge relevant to Forest Practices Rules. Results of CMER research and monitoring are discussed among subcommittees established within CMER. Once consensus is achieved among the CMER subcommittees, results of CMER research and monitoring are presented to and evaluated by the TFW Policy Committee. The TFW Policy Committee then determines if any changes in Forest Practices Rules are necessary based on consensus among TFW participants. Once consensus is achieved, the TFW Policy Committee makes any agreed-upon recommendations to the Forest Practices Board. The Forest Practices Board then decides if and how to adjust rules based on these recommendations.

This process was used to implement the recommendations of the original TFW Agreement and continues to be used to refine Forest Practices Rules. Some noteworthy results of this adaptive management process include: 1) changes in stream shade requirements based on CMER stream temperature data (Sullivan et al., 1990); 2) determination of RMZs for lands on the east side of the Cascade Crest; and 3) the establishment of the watershed analysis process to provide for the development of basin-specific management (Benda and Miller, 1991).

Notably, there is currently no formal dispute resolution process within TFW; therefore, lack of consensus among CMER or TFW participants can delay or prohibit presentation of CMER research and monitoring results to the Forest Practices Board. The TFW Policy Committee thus has a large role in the current adaptive management process, particularly in determining which projects to support and serving as the connection between the CMER and the Forest Practices Board, which is ultimately responsible for all decision-making regarding Forest Practices Rules. In addition, adequate, long-term funding cannot be guaranteed. Funding under the current program is dependent on several factors, any of which can change from one year to the next. The factors include the discretion of the Forest Practices Board, staff-level and policy-level decisions by the DNR, across-the-board budget reductions, appropriations by the state Legislature, and general competition for federal monies.

### **Alternative 2 - Forests and Fish Report**

There are basically three main areas of the current adaptive management program that are targeted for change under Alternative 2: 1) formalizing the overall adaptive management process; 2) improving accountability in the process; and 3) formalizing monitoring (Figure 1). In addition, this alternative states that adequate and long-term funding would be secured to ensure the uninterrupted collection of quality data to support the process; however, no process is described for securing these funds. Changes in these aspects proposed in Alternative 2 are described below.

#### **1. Formalized Process**

Under Alternative 2, the adaptive management process would be formalized through a variety of mechanisms. Key to this proposal, the Forest Practices Board would establish the adaptive management process by rule and would appoint and empower the CMER committee by rule to impose accountability and formality in the process. The CMER would be lead by a full-time

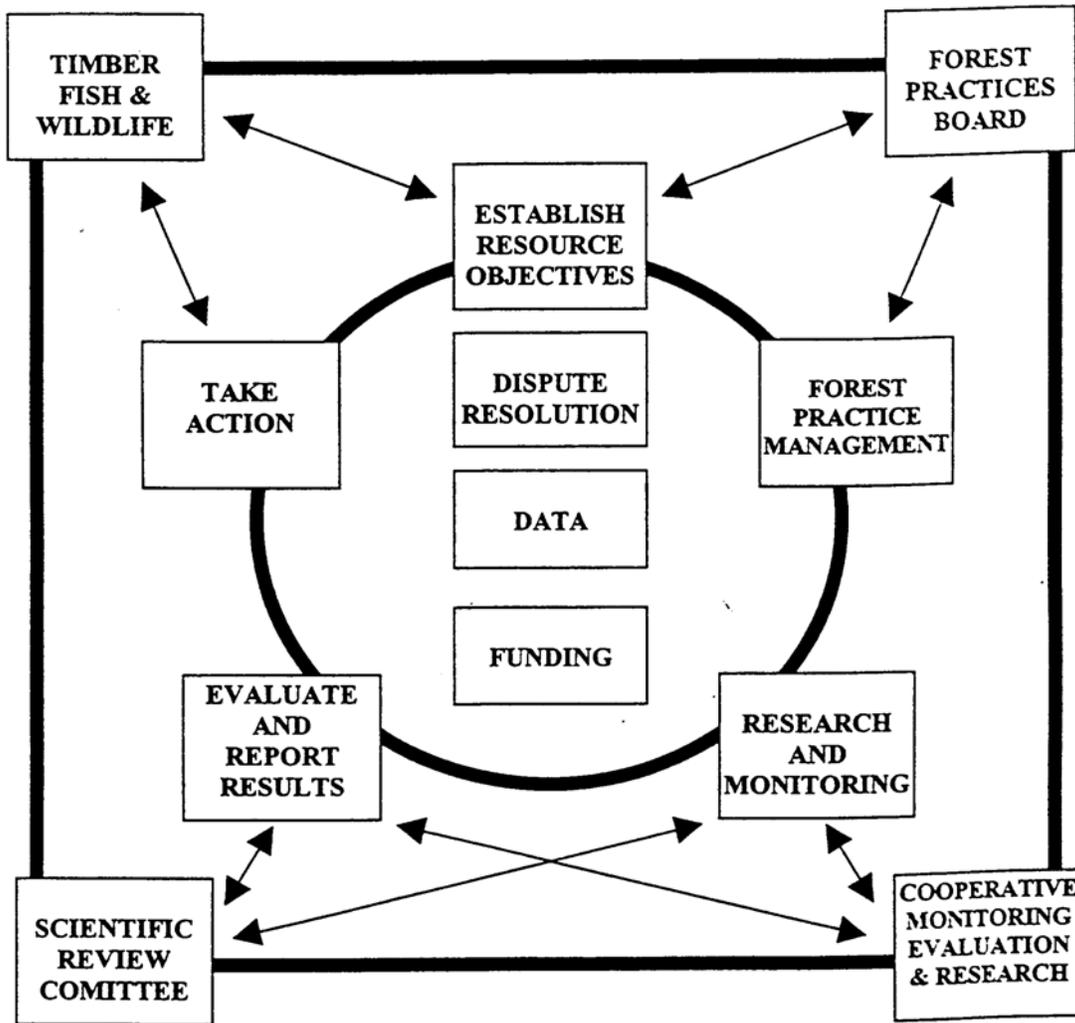


Figure 1. Adaptive Management Process Under Alternative 2  
 (Source: Forests and Fish Report, 1999)



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Adaptive Management Program Manager appointed by the Forest Practices Board with consultation from TFW. This coordinator would have credentials as a scientist and researcher. The Forest Practices Board would still, however, establish resource objectives and would set priorities based on information gathered.

A set of protocols and standards would also be developed to define and guide execution of the process. An independent scientific review committee (SRC) would be established to oversee the work of CMER and, with CMER, would develop the protocols governing the adaptive management process. As described in the Forests and Fish Report (April 29, 1999), these protocols and standards would govern, but not be limited to, the following:

- content and presentation of hypotheses and/or data used to support requests for rule change or new rule development or initiation of research or monitoring projects;
- requests for initiation of monitoring programs as appropriate or research projects and the review and decision-making process to be applied to such requests;
- format and processes for reporting results of the program to the Forest Practices Board;
- monitoring programs as appropriate;
- analysis and evaluation of resource and operational impacts;
- peer review processes and reviews of study designs;
- the process of reporting results and initiating requests for changes in statute or regulation; and
- coordination with other statewide efforts on salmon, steelhead, bull trout, and clean water.

Any proposed changes to target forest conditions, forest practices, or enforcement programs would be evaluated by these protocols. These protocols would also be used to document any hypothesis statement, data collection and analysis, hypothesis testing, and conclusions and all would be open to public review.

Under Alternative 2, a formal dispute resolution process would replace the consensus requirement in the current TFW Policy Committee, such that if consensus is not reached among TFW participants on interpretation of research results, recommended direction or other controversies, the Forest Practices Board would make the final determination subject to rights of appeal. Key elements of this process would include: 1) the establishment of specific substantive and benchmark (schedule) triggers for each monitoring and research project for invoking dispute resolution; and 2) the process would be staged and applied at any level of the adaptive management process.

### **2. Increased Accountability**

As described in the Forests and Fish Report (April 29, 1999), another main goal of Alternative 2 with respect to adaptive management is to build more accountability into the process. This accountability would be established primarily by tying the process directly to the Forest



Practices Board (instead of through the TFW Policy Committee), and opening the process to public review and outside scientific review by the SRC mentioned above. The Forest Practices Board, CMER, SRC, TFW Policy Committee, and the CMER administrator together would be empowered to conduct the required activities of the adaptive management process. As in Alternative 1, the TFW Policy Committee would continue to have an integral role in the adaptive management program by evaluating CMER research and monitoring results and, based on consensus, making recommendations to the Forest Practices Board for Forest Practices Rules changes, program priorities and specific projects. However, in contrast to Alternative 1, CMER would be accountable to both TFW and the Forest Practices Board. Further, CMER and the SRC would interact with the TFW Policy Committee and the Forest Practices Board to establish goals and objectives, guide management practices, develop and implement research and monitoring projects, evaluate results of research, and take action to modify Forest Practices Rules or management objectives as necessary to meet goals of the adaptive management program.

### 3. Formalized Monitoring

Another key intent of Alternative 2 is to develop more formal validation, effectiveness, and compliance monitoring programs. Overall performance goals would be established (see Schedule L-1) that restrict forest practices, either singly or cumulatively, from impairing the capacity of aquatic habitat from: a) supporting harvestable levels of salmonids; b) supporting the long-term viability of other covered species; or c) meeting or exceeding water quality standards. As outlined in the Forests and Fish Report (April 29, 1999), four primary relationships would be monitored:

- correlations between target forest conditions and goal attainment;
- effect of forest practices on forest conditions;
- effect of forest practices on other resource objectives; and
- enforcement and on-the-ground implementation of forest practices.

This would be accomplished through the establishment of a science-based program to monitor the relationship between forest practices and forest conditions, and to evaluate the effectiveness of achieving target forest conditions and processes. A centralized, uniform system of baseline data would be developed to support implementation of the adaptive management process and to monitor change. Project definition and selection would be scientifically rigorous, guided by policy oversight, and subject to peer-review by the SRC. Under Alternative 2, one compliance monitoring study would be completed each biennium, starting with the 2001-2003 biennium. Areas with the greatest amount of uncertainty would be the top priorities. Additionally, an infrastructure would be established to ensure compliance. This infrastructure would include adequate compliance monitoring integrated into enforcement, training, and education programs.

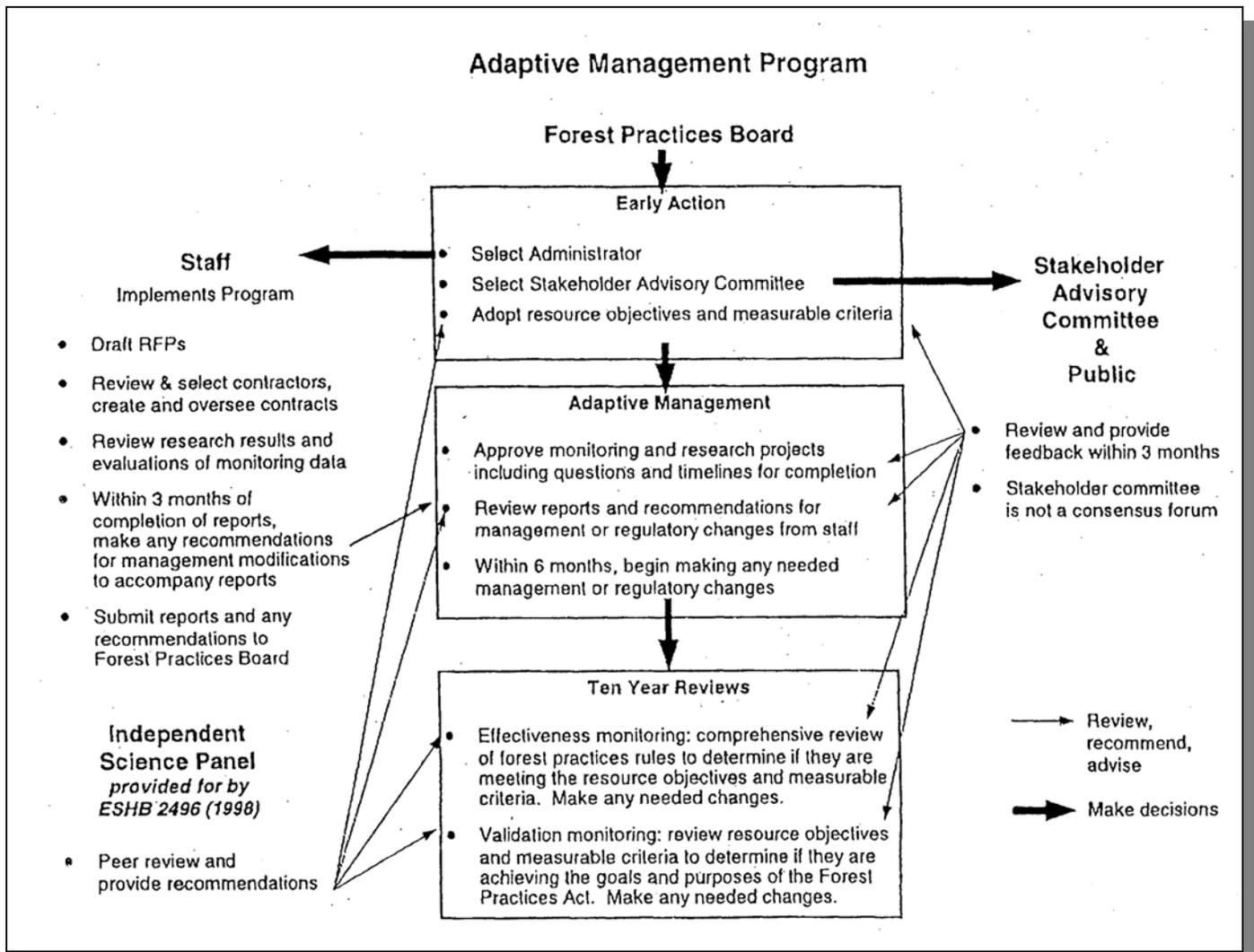
### **Alternative 3**

The adaptive management process proposed in Alternative 3 is modeled after that presented in the Environmental Caucus Proposal (Figure 2) (WEC and WAS, December 1998). Similar to



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Alternative 2, one of the main intents of this alternative is to obtain more accountability in the adaptive management process by tying it more directly to the Forest Practices Board. The way in which Alternative 3 would accomplish this goal, however, would be through significant changes in the level of participation that the TFW Policy Committee would have in the adaptive management process. As in Alternative 2, CMER would be directly accountable to the Forest Practices Board; however, in contrast to both Alternatives 1 and 2, the TFW Policy Committee would not have a specific role in the adaptive management process.



**Figure 2.** Adaptive Management Process Under Alternative 3

(Source: Washington Environmental Council and Washington Chapter - National Audubon Society. 1998. The Salmon Recovery Proposal)



The Forest Practices Board would assume full responsibility for implementing the adaptive management program for forest practices to promote an objective and scientifically credible learning process to guide the forest practices management system. With DNR support staff and a program administrator, the Forest Practices Board would take direct control over all effectiveness and validation monitoring and any research projects needed to answer questions relevant to forest practices. Under Alternative 3, the Forest Practices Board would also designate a Stakeholder Advisory Committee and provide opportunities for public participation at all points in the program. Notably, the stakeholder committee would not operate as a consensus forum. The Forest Practices Board would utilize the state's Independent Science Panel (see ESHB 2496) to provide peer review on all research projects.

Similar to Alternative 2, another key intent of Alternative 3 is to develop a good effectiveness monitoring program, but specific details of this program have not been outlined. Compliance and validation monitoring are not addressed.

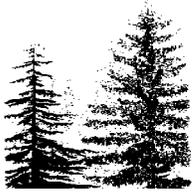
### **Comparison of Alternatives**

As stated above, an effective adaptive management program is particularly important to employ in situations where management approaches have been developed with a lack of information and thus an element of uncertainty. Furthermore, the level of importance of adaptive management increases with the level of uncertainty and risk to resources associated with a particular set of management actions. Thus, due to uncertainties surrounding forest management practices effects on water quality and fish habitat, the establishment of an effective adaptive management program is essential to ensure meeting the first three of the four Forest Practices Board goals.

Based on the key elements of an effective adaptive management program described in Section 1.0 above, a number of deficiencies exist in the current adaptive management program with respect to meeting the Forest Practices Board goals. Some key deficiencies include, but are not limited to, the following:

1. lack of consistent application of adaptive management, including monitoring, due to lack of established policy;
2. lack of established standards and guidelines for implementation rendering the process informal;
3. public concern over biased decision-making, including resource objective definition; research project selection, and interpretation of research and monitoring results;
4. lack of a process for incorporating the use of outside research;
5. lack of a dispute resolution process within TFW to ensure a consistent and streamlined approach to decision-making within TFW that will not significantly delay the adaptive management process; and
6. lack of adequate long-term funding to ensure the uninterrupted collection and analysis of information to support the process.

Between Alternatives 2 and 3, Alternative 2 would best support meeting the Forest Practices Board goals. This alternative addresses the first five of the six key deficiencies in the current adaptive management program (Alternative 1) listed above and provides the most specificity in describing



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ways to improve the program. The primary ways in which Alternative 2 addresses these deficiencies include the following:

- To ensure consistent application, the adaptive management process (including monitoring) would be established by rule.
- The process would be more formalized through the establishment of a variety of protocols to support implementation.
- To address public concern over biased decision-making and lack of use of outside research, among other things, the process would be open to public review and review by the SRC, and the CMER would be directly linked to the Forest Practices Board such that ultimately the Forest Practices Board would have access to all results of research and monitoring;
- To decrease delays in decision-making within the TFW Policy Group, a dispute resolution process would be established

Alternative 3 would be expected to better support meeting the Forest Practices Board goals than the current program, but not as well as Alternative 2. Alternative 3 addresses three of the six key deficiencies in the current program (Alternative 1) listed above and provides less specificity than Alternative 2. Similar to Alternative 2, Alternative 3 addresses concerns over delays in dispute resolution and biased decision-making. These concerns are addressed primarily by giving the Forest Practices Board full responsibility for the program (with no specified role for the TFW Policy Group), establishing a Stakeholder Advisory Committee, providing public participation at all points in the program, and utilizing the state's Independent Science Panel for project peer review. One major difference between Alternatives 2 and 3 is that Alternative 2 would establish the adaptive management process by rule and would develop more-formalized compliance and validation monitoring programs.

One key deficiency of the current program is not addressed by either Alternative 2 or 3: adequate long-term funding. Although Alternative 2 states that adequate long-term funding would be secured, no process has been identified for accomplishing this.

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