USDA Forest Service

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A Business Evaluation of the 2000 and Proposed NFMA Planning Rules

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The United States Department of Agriculture (USDA) Forest Service (FS), Ecosystem Management Coordination (EMC) staff tasked the Inventory and Monitoring Institute (IMI) to support and facilitate the interpretation and critical analysis of the Proposed National Forest Management Act (NFMA) Planning Rule. The Inventory and Monitoring Institute contracted BusinessGenetics Corporation to co-formulate the necessary business process analyses using generally accepted business modeling methodologies. The scope of this effort was to include development of Business Process Models of the Proposed Planning Rule, reviews for "Perceived Agency Capability to Implement" the Proposed Rule, and the development of a cost estimate of Plan Revisions (including compliance to other relative laws) under both 2000 and Proposed Rules.

This technical report presents all work conducted, completed and delivered for the business evaluation of the 2000 and proposed Planning Rules.

Please NOTE:

All uses of the terms "the 2000 Planning Rule" or "2000 Rule" refers to the 2000 NFMA Forest & Grassland Planning Rule / Regulation issued in November 2000 and published in the Federal Register.

All uses of the terms "the Proposed Planning Rule" or "Proposed Rule" refers to the various drafts of the Proposed NFMA Forest & Grassland Planning Rule / Regulation.

REPORT PRODUCED BY:
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1 ABSTRACT

Three sub-projects, that supported the comparative evaluation of the 2000 and Proposed NFMA Planning Rules, are addressed by this report: the development of business process models for the two Rules, which provided the foundation for reviews of the perceived capability to implement the Rules and the cost analyses of the two Rules. The use of eXtended Business Modeling Language SM (xBML SM) business models to depict the Plan Revision related activities called for by both the 2000 and the Proposed Rules are described. These models are literal representations of the activities that are stated in the Rules as being necessary to complete a Plan Revision. The business models facilitated an iterative process of drafting and refining the Proposed Planning Rule and were the "framework" for most other activities in this business evaluation of the Rules. The 2000 Rule contains more activities, which are more prescriptive, than the Proposed Rule. Next, the results of evaluating these business activity models to assess how well the Rules could be implemented are presented. The activities of each model were rated for their "implementability", both to evaluate the implied policies and to assist in drafting and revising the Proposed Rule. The Proposed Rule appears to be much more "implementable" than the 2000 Rule. Finally, estimates of the costs and effort required to revise a Plan following the requirements of each of the Rules are provided, based on a sample of 17 National Forests. These estimates show that the Proposed Rule is expected to cost approximately 30% less, about $9 million per forest average, compared to the 2000 Rule, which was estimated to cost about $13 million per forest average. Effort, in terms of person-days, is correspondingly less. The estimated elapsed time or duration to complete a Plan Revision is likewise shorter, approximately 5 years for the Proposed Rule compared to about 6 ½ years for the 2000 Rule. A cross-sectional analysis shows that the distribution of costs among Cost Centers is generally similar between the two Rules with the majority of costs being associated with the development of alternatives and environmental analysis activities.

2 SCOPE AND BACKGROUND

In the winter of 2000/2001, the Inventory and Monitoring Institute initiated a project to explore and understand the business requirements of the 2000 Planning Rule through the use of the BusinessGenetics proprietary Business Process Analysis Methodology. Over a period of several weeks, BusinessGenetics consultants worked with a number of subject matter experts (SME's) from IMI that were knowledgeable and experienced in Planning. These initial xBML[SM] business models were developed during Business Co-formulation[SM] (BCF [SM]) work sessions held onsite in Fort Collins, CO. Following a review of this project by the Director of EMC and two Regional Planning Directors, IMI was asked to undertake additional work.

In June 2001 a second project was initiated to support a similar business modeling evaluation of the Proposed Planning Rule. This second project expanded the scope of effort, requiring additional Forest Service SME participation in several key areas: the development of Business Models representing the Proposed Planning Rule; reviews for "Perceived Agency Capability to Implement" the Proposed Rule; and estimates of the costs of Plan Revisions (including compliance to related laws and regulations) under both 2000 and Proposed Rules. The xBML[SM] business models developed for the Planning Rules became the foundation and "business framework" for applying both the implementation reviews and the costing methods. This new project effort also utilized all previous work completed for the 2000 Planning Rule.

Given its broad scope and complexity, the project consisted of many tasks, interim and final products, and milestones. An early assessment indicated that the project would best be facilitated by using an inter-disciplinary Core Team with representatives not only from IMI and BusinessGenetics, but also from the Forest Service's Rocky Mountain and Intermountain Regions. For a period of nine months, this Core Team worked collaboratively on all aspects of the project. Additionally, several interactive workshops were held involving members of several other Forest Service teams that were working on the Proposed Planning Rule, including the Implementation Team, Business Model Validation Team, Cost Methodology Team and Cost Survey Team. These four Forest Service teams, which were composed of persons experienced in Planning, significantly contributed to the achievement of the project's objectives.

During the life of the project, the Core Team also worked with individuals from the Technical (Rule Writing) Team and the Rule Directives Team. Most often these individuals and teams were in the role of the "intended audience" for interim work products. This interaction was an opportunity for a meaningful feedback and exchange of ideas, observations, comments and recommendations that often contributed to adjusting the Proposed Planning Rule text. The Core Team also regularly communicated with "Key Stakeholders" involved in the process for developing a Proposed Planning Rule in order to maintain alignment with the overall EMC project objectives.

This technical report describes all work completed and delivered by the Core Team for the business evaluation of 2000 and Proposed Planning Rules.

3 PURPOSE AND OBJECTIVE

The purpose and objective for this project was established and validated with the Director of EMC and the Acting Assistant Director for Planning, EMC. The overall objective was established in the Statement of Work and are as follows:

Support EMC in the definition and refinement of the Proposed Planning Rule and first draft Directives content, using the BusinessGenetics xBML^{SM} models as a "business" framework to conduct critical analyses and gain understanding of the business implications of the Proposed Planning Rule / Directives.

Facilitate a comparison of the 2000 Planning Rule to a new Proposed Planning Rule to determine potential differences in effort and cost, expressed in relative percentages, using the BusinessGenetics xBML^{SM} models as a "business" framework.

Operating Assumptions:

1. The xBML^{SM} models produced would represent a literal, hierarchical depiction of the 2000 Planning Rule text, the Proposed Planning Rule text and where applicable, (and if available), first draft Proposed Planning Rule Directives text.
2. In order to model a reasonable business process representation of the Planning Rule requirements, The Core Team would also consider other appropriate planning activities, including those potentially outside the literal scope of the Rules, but perceived necessary to reasonably reflect costing activities.
3. xBML^{SM} model content developed for the 2000 Planning Rule, the Proposed Planning Rule and where appropriate comparable Planning Rule Directives would be the foundation for applying the Implementability and Costing Methodology.
4. All xBML^{SM} model content would be developed, reviewed and validated by Forest Service SMEs familiar with Planning and the Planning Regulations.
5. All analyses (i.e.: Costing / Implementability), conducted during the course of this project, would be limited to a comparison between the xBML^{SM} model content developed for the 2000 Planning Rule and the Proposed Planning Rule and, where appropriate, (and available), any Planning Rule Directives.
6. The Project Sponsors would validate any major assumptions made in the development of model content.
7. This effort would include gathering empirical information on Planning costs and effort rather than relying on historical accounting information from fiscal reporting systems.
8. All costs would be based on estimates using the empirical knowledge of Forest Service SMEs experienced with Planning and the Planning Regulations.
9. Likelihood of occurrence (e.g., as a percentage) estimates for "optional" aspects to the Planning Rule would be based on a percentage likelihood of occurrence (derived from SME input).

10. The Core Team together with the Costing Methodology Team would be responsible for identifying appropriate costing methodologies and assumptions.
11. The Project Sponsors would validate the costing methodology and any assumptions defined.

4 PROJECT TEAM MEMBERSHIP AND WORKSHOP PARTICIPANTS

Many subject matter experts (SMEs) helped develop and refine the Proposed Planning Rule and participated in the process of analyzing the business implications of this Rule. The primary project tasks were supported by a collaborative team structure that utilized the considerable empirical knowledge of Forest Service SMEs familiar with Planning and the Planning Regulations.

A Management Committee composed primarily of the Director of EMC, Assistant EMC Director for Planning, the Regional Planning Directors and representatives from Forest Service Washington Office Wildlife staff, Forest Service Research and Development, and the Office of General Counsel (OGC) was established to coordinate, review, and oversee the overall efforts of the task teams. This Committee established several Forest Service teams to support particular areas of project focus. An Executive Secretary role was also established to support the Management Committee on a day-to-day basis to coordinate the work of these various teams.

An inter-disciplinary Core Team composed not only of IMI and BusinessGenetics representatives but also of representatives from Forest Service Rocky Mountain (R2) and Intermountain (R4) Regions was established. This Core Team had the responsibility for conducting all the business process analysis and costing activities. BusinessGenetics ensured compliance with their Business Process Analysis Methodology. The Core Team, together with input provided by the Implementation Team, established three other modeling/costing teams, the Business Models Validation Team, the Cost Methodology Team and the Cost Survey Team. In addition, three teams formed to work on aspects of the Proposed Rule, the Technical (Rule Writing) Team, the Directives Team and the Implementation Team, provided participants to the business analysis workshops and were the intended audience for the work products of this project.

To maintain compliance with project objectives, the Core Team regularly communicated with the Project Sponsors and Key Stakeholders. The teams and their communication pathways are reflected in Figure 1.

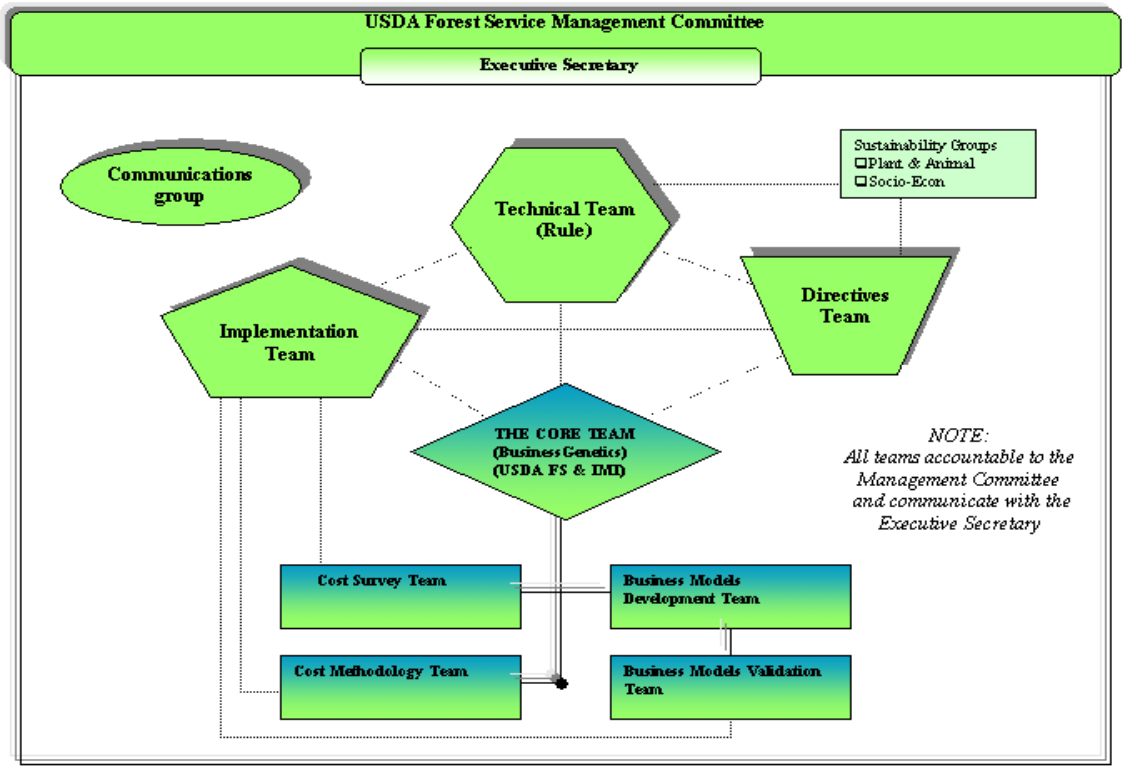


Figure 1. Agency Project Teams and Communication Channels

4.1 Project Sponsors

EMC established the project scope and project objectives. Project sponsors included:

Fred Norbury, *Director of EMC*
Steve Brink, *Acting Assistant Director for Planning, EMC (Jun 2001 – Aug 2001)*
DeAnn Zwight, *Assistant Director for Planning, EMC (and Executive Secretary)*
Tom Hoekstra, *Director of IMI*

4.2 The Core Team

The core team collaboratively took on full project delivery responsibilities for the business analysis and costing activities.

<u>Project Manager</u>
Ann Morrison (BusinessGenetics)

<u>Models Development / Implementability Joint Lead</u>
Ann Morrison (BusinessGenetics)
Matt Turner (IMI), *Acting Assistant Director, Information Analysis*

<u>Cost Study Joint Lead</u>
Cedric Tyler / Jeff Oehm (BusinessGenetics)
Greg Alward (IMI), *Assistant Director, Economics & Information Management*

Logistics / Communication / Liaison Joint Lead
Ann Morrison (BusinessGenetics)
John Rupe (Region 2), *Regional Planning Analyst*

Project Administration Joint Lead
Ann Morrison (BusinessGenetics)
Tom Hoekstra (IMI), *Director*

Report Composition/Editing Joint Lead
Greg Alward (IMI), *Assistant Director, Economics & Information Management*
Matt Turner (IMI), *Acting Assistant Director, Information Analysis*
Ann Morrison (BusinessGenetics)
Andrea Marks (BusinessGenetics)

Subject Matter Experts (Planning and the Planning Rules)
John Rupe (Region 2), *Regional Planning Analyst*
Jeff Foss (Region 4), *Regional Forest Planning Coordinator*
Greg Alward (IMI), *Assistant Director, Economics & Information Management*
Matt Turner (IMI), *Acting Assistant Director, Information Analysis*

In many instances, the Core Team members took on dual responsibilities as workshop participants, acting in their capacity as SMEs familiar with Planning and the Planning Regulations.

4.3 Implementation Team

The Implementation Team played an integral role in facilitating and sponsoring interaction between the various teams and assisted the Core Team in establishing the membership of the Business Models Validation Team, the Cost Methodology Team and the Cost Survey Team. The Implementation Team also participated in a series of formal workshops with the Core Team Leads in conducting "policy level" reviews of the 2000 and Proposed Rules. The xBML^{SM} business models were reviewed to determine the "perceived agency capability" to implement each Rule. Additional responsibilities included reviewing the cost methodology, providing timely feedback to the Technical (Rule) Team on items needing clarification and why, and working interactively with the Directives Team to ensure implementable direction. Team membership included:

DeAnn Zwight, *Assistant Director for Planning, EMC (and Executive Secretary)*
Kathy Clement (Region 5) *Planning Director / Team Sponsor*
Jeff Foss (Region 4), *Regional Forest Planning Coordinator / Team Leader*
Gary Rahm (Region 1), *Supervisory Forester*, *Idaho Panhandle National Forest*
John Rupe (Region 2), *Regional Planning Analyst*
Pam Skeels (Region 2), *Land Management Planning Specialist*
Geneen Granger (Region 3), *Land Management Planner/NEPA*
Brad Burmark (Region 5), *Regional Planner*
Tom Hussey (Region 6), *Natural Resource Planner (Policy Analysis)*
Ruth Berner (Region 8), *Biologist – Forest Monitoring Coordinator, National Forests in North Carolina*
Larry Lunde (Region 10), *Tongass National Forest, NEPA Coordinator*

Rick Ullrich, *Staff Budget Coordinator, EMC*
Floyd Deloney, *Assistant Budget Coordinator, EMC*
Pat Ormsbee (Region 6), *Willamette National Forest Wildlife Ecologist and Regional Bat Specialist*
Brian Kent (Rocky Mountain Research Station), *Project Leader, Natural Resource Assessment, Ecology, and Management Science Research*
Paul Beckley (Region 1), *Regional Economist*
Dave Owens (Region 6), *Ochoco National Forest, Assistant Fire Staff*

4.4 Business Models Validation Team

The Business Models Validation Team participated in a series of "informal" workshops with the assigned Core Team Model Development Leads to validate the xBML^{SM} business models developed for both Planning Rules. These activities followed soon after new draft versions of the Proposed Rule became available. Team membership included:

Ann Morrison (BusinessGenetics)
Matt Turner (IMI), *Acting Assistant Director, Information Analysis*
John Rupe, (Region 2), *Regional Planning Analyst*
Jeff Foss (Region 4), *Regional Forest Planning Coordinator*
Pam Skeels (Region 2), *Land Management Planning Specialists*
Nancy Warren (Region 2), *Regional Group Leader for Wildlife, Fish, and Rare Plants*
Carmine Lockwood (Region 2), *Planning Staff Officer, GMUG National Forest*

4.5 Cost Methodology Team

The Core Team Cost Study Leads together with the Costing Methodology Team were responsible for validating the use of the costing methodology and identifying any assumptions related to the methodology. Team membership included:

Cedric Tyler (BusinessGenetics)
Greg Alward (IMI), *Assistant Director, Economics & Information Management*
John Rupe (Region 2), *Regional Planning Analyst*
Paul Beckley (Region 1), *Regional Economist*
Linda Langner (Research, Washington Office), *Economist*
Mike Niccolucci (IMI), *Economist*
Mike Retzlaff (Region 2), Economist - Advisory Capacity

4.6 Cost Survey Teams

Nine forests/forest groups (multiple forests conducting planning together) participated in the cost survey, one from each region. Prior to initiating data collection on cost estimates, representatives from each of the selected forests/forest groups were trained in the BusinessGenetics methodology and the tools provided to support their tasks. The data collection process involved several iterations of data collection, validation and refinement.

4.6.1 Forest Cost Survey Team Leads

Joe Kruegger (Region 1), *Forest Planner*
Thurman Wilson (Region 2), *Planning and Public Services Staff Officer*
Bruce Higgins (Region 3), *Forest Planning Specialist*
Jeff Foss (Region 4), *Regional Forest Planning Coordinator*
Brad Burmark (Region 5), *Regional Planner*
Connie Smith (Region 6), *Forest Environmental Coordinator*
Ruth Berner (Region 8), *Biologist – Forest Monitoring Coordinator*
Jim DiMaio (Region 9), *Forest Planner*
Warren Oja (Region 10), *Forester*

4.6.2 Regional Cost Team Leads

Jeff Foss (Region 4), *Regional Forest Planning Coordinator*
John Rupe (Region 2), *Regional Planning Analyst*
Tom Hussey (Region 6), *Natural Resource Planner (Policy Analysis)*

4.6.3 Indirect and Add-on Cost Team Leads

Greg Alward (IMI), *Assistant Director, Economics & Information Management*
Brian Kent (Rocky Mountain Research Station), *Project Leader, Natural Resource Assessment, Ecology, and Management Science Research*

The Cost Survey Team Leads had an average of 22.5 years of experience with the Forest Service and an average of 16.4 years experience in Planning. The Cost Survey Teams significantly contributed to the achievement of project objectives for the cost study.

4.7 Key Stakeholders

The Core Team regularly communicated with the Key Stakeholders involved in drafting the Proposed Planning Rule. The membership in the Stakeholder group changed frequently during the life of the project for various reasons. The membership was composed of individuals in the following roles:

- Director of EMC
- (Acting) Assistant Director for Planning, EMC
- Director of IMI
- Technical (Rule Writing) Team Lead / Representative
- Directives Team Lead / Representative
- Directives Team Sponsor
- Implementation Team Lead / Representative

5 THE xBML[SM] BUSINESS MODELS

As noted earlier, Business Activity (or "*What*") Models were developed for the 2000 Planning Rule during November 2000 through March 2001. These models describe the business activities that are literally required by the Rule in order to revise Plans. Additional business models reflecting the elements of time (a "*When*" model), information (a "*Which Information*" model) and organization (a "*Who*" model) were combined into a single workflow view (a business process flow or "*How*" model).

An Activity Model displays, in a literal, hierarchical diagram, the business activities necessary to accomplish a high-order purpose. In other words, an Activity Model addresses the question "*What activities are necessary to accomplish the stated purpose?*" These high-order activities are successively decomposed into more detailed "levels" of activities that help achieve the purpose or goal. For example, a high-level activity indicated in the Rule might be "*Evaluate the Application of Science in the Planning Process*". At the next level of detail, activities such as "*Utilize Independent Peer Reviews*" and "*Utilize Science Advisory Boards*" are necessary to accomplish that higher-order activity. Each activity can be decomposed to successively lower level activities as necessary to capture the ultimate business requirements. The highest "level" in the decomposition diagram represents or is a proxy for *all* subsequent sub-activities and is referred to as a *coarse* or *high-level* view.

A similar suite of business models were created for the Proposed Planning Rule, focusing primarily on the key business activity ("*What*") and business process flow ("*How*") models. All models for both the 2000 Planning Rule and Proposed Planning Rule were subjected to structure and content validation by a number of Forest Service SMEs, all knowledgeable about Planning. The business modeling development process for the Proposed Rule operated dynamically, with several iterative cycles of model creation/revision, model review/validation, and rule language feedback throughout the course of the project. As a version of the Proposed Rule was written, the rule text fed the development of the models, and the development of the models pointed out where the rule text needed further clarification.

5.1 Objectives

The objectives of the business modeling were to determine and understand the business requirements set forth in the Proposed Rule. With almost daily feedback to the Assistant Director for Planning, EMC and the Technical (Rule Writing) Team, a process unfolded to define and refine the business requirements of the Proposed Rule text. Seven iterations of rule text were modeled, each improving the clarity and focus in the rule language and concepts being discussed. In other words, the process of business modeling itself pointed out clarity and implementation problems with the Proposed Rule, which were then addressed by the Technical (Rule Writing) Team.

The business modeling objectives focused on producing a sufficiently stable set of activity models as a basis for:

1. A "policy level" review of the Proposed Planning Rule as described by the xBML^{SM} business models, in order to determine the perceived agency capability to implement this Proposed Rule, and
2. Using the models as a foundation and "business framework" to collect cost information for both Rules.

The audiences for these modeling products included the Core Team members responsible for estimating costs associated with Plan Revisions under the Rules, the Implementation Team, the Directives Team, the Cost Survey Team and EMC.

5.2 Business Modeling Process

While the 2000 Planning Rule business models had already been developed through the BusinessGenetics BCF ^{SM} process with IMI between November 2000 and March 2001, two tasks remained to assure an adequate foundation upon which comparisons could be made with models of the Proposed Rule. These tasks included conducting a model validation workshop with the Business Models Validation Team, and expanding the models to incorporate some additional planning activities beyond the literal scope of the 2000 Rule. Including these additional activities was necessary in order to determine the complete cost of Plan Revisions since some essential planning activities were not explicitly mentioned in the 2000 Rule. For example, activities required by the Endangered Species Act and the Clean Water Act, while not explicitly mentioned in the 2000 Rule but certainly essential to revising a Plan, were added to the activity models of the 2000 Rule. This was done for the Proposed Rule as well.

In order to streamline the effort of developing and validating the Proposed Rule xBML^{SM} business models, the Core Team adopted a process of rapidly developing an initial model and then conducting "informal" workshops with the Business Models Validation Team to validate the content and stabilize the models. These actions were performed iteratively as new draft versions of the Proposed Rule became available. These tasks were scheduled to coordinate with other workshops related to the drafting of the Proposed Rule, implementation reviews of the Proposed Rule, and collecting and analyzing cost information for both Rules during the months of June 2001 through January 2002.

The xBML^{SM} models that were created for both Rules can be found in Appendix A.

It should be noted that while an objective of this study was to develop business models for the Directives related to both the 2000 and Proposed Rules, these Directives remain incomplete. This has precluded the development of models of the business processes described by the Directives. Directives sets for both rules however were used as a resource for the cost survey teams while completing the cost surveys.

6 REVIEWING THE "PERCEIVED AGENCY CAPABILITY TO IMPLEMENT"

During April through May 2001, a group of Forest Service Regional Planners were convened to provide a "policy level" review of the 2000 Planning Rule based on the xBML^{SM} business activity models. Their purpose was to provide a "perceived agency capability" to implement the 2000 Planning Rule. The results of this workshop were collated and presented to the EMC Director and the Regional Planning Directors, in Washington DC, on April 17, 2001, with a final report being provided to EMC on May 10, 2001. The results of this review are summarized in the preamble to the Proposed Rule, with the full review report found in Appendix B of this report.

Similar tasks were subsequently completed for the Proposed Planning Rule. Three review workshops were conducted and results communicated to the Directives Team, the Technical (Rule Writing) Team and to EMC. Workshop participants consisted of the Implementation Team members with representatives from both the Directives Team and Forest Service Research.

A formal presentation of results collated during the first workshop for the Proposed Planning Rule was presented to the Directives Team in Washington DC, on September 5, 2001. The results of this review process also facilitated informal, topical exchanges between members of the Implementation Team, the Technical (Rule Writing) Team and the Acting Assistant Director for Planning, EMC. The results of the review process related to the Proposed Rule can also be found in Appendix B of this report.

6.1 Objectives

The primary objectives for the implementability workshops were to:

1. Provide support to the Technical (Rule Writing) Team and to EMC in the writing and refining of the Proposed Planning Rule, using the xBML^{SM} business process models as a "business" framework; and
2. Provide support to the Directives Team in crafting a first draft Directives by capturing and presenting findings from the implementability workshops.

6.2 Review Process

In each workshop, the participants gained an understanding of the xBML^{SM} business activity models. In order to limit the effort and focus discussions, the participants evaluated the coarse or high-level activities of the business activity models for their suitability in representing the Proposed Rule business requirements. The workshop discussion for each business activity centered on answering two questions:

1) Is the business requirement clearly understood?
2) What is the perceived ability to execute the requirement?

In providing their perceptions, the workshop participants were asked to also consider any general assumptions, dependencies, issues or concerns pertaining to clarity, budget, skills or expertise, information requirements, time and cooperation, and propose any perceived solutions.

Their responses were recorded using the following approach:

1. CLARITY OF UNDERSTANDING (of the business requirement)
    - ✍ GREEN – Complete understanding
    - ✍ YELLOW – Need some clarification
    - ✍ RED – "No Clue"
2. ABILITY TO EXECUTE THE BUSINESS ACTIVITY
    a. Binary Y / N
    b. Perceived % implementation
    c. Assumptions / Issues / Concerns / Dependencies per:
        - Clarity, Budget, Skills / Expertise, Information, Time, Cooperation
3. PROPOSED SOLUTIONS

The implementation review process was iterative. The schedule for these tasks coincided with the availability of "milestone" versions of the Proposed Rule during the months of June 2001 through January 2002. Workshops to review a "Perceived Agency Capability to Implement" of the Proposed Rule were conducted in August 2001, October 2001 and January 2002. The initial workshop for 2000 Rule was conducted in April 2001.

Results of these reviews can be found in Appendix B.

7 COST STUDY

The work of Planning has typically been funded from a variety of sources, not just the Planning budget item. It is virtually impossible to reconstruct the actual historical cost of Plans from fiscal reports. Consequently, the Director of EMC requested that the Core Team gather empirical information about the costs associated with Plan Revisions. Given the Public, Departmental and broader Agency interests, a relative comparison between the estimated costs of Plan Revisions based on both the 2000 Rule and the Proposed Rule was deemed appropriate to the rulemaking process. Costing of the 1982 Rule was beyond the scope of this project.

7.1 Establishing a Methodology

The Core Team Leads identified members for the Cost Methodology Team. This team was formed with the concurrence of the Acting Assistant Director for Planning, EMC. Through a series of workshops and conference calls, the Cost Methodology Team established the method for determining Forest scale Costs for Plan Revisions. The method selected was Activity Based Costing (ABC), which developed cost estimates for both Rules based on the activities set forth in the business activity models. These methods are given in the Planning Cost Estimation Methodology document. (See Appendix C)

7.1.1 Objectives

The objectives were to validate the appropriateness of using ABC and identifying any assumptions on its approach and application. As a result of this process, it was determined that supplemental methods were necessary to estimate Indirect or Add-on Costs (see discussion below in section 7.1.2).

7.1.2 Delivery Approach

The Core Team, together with the Costing Methodology Team, reviewed the use of ABC and identified assumptions related to its application. The ABC Method of cost estimation was applied to the xBML^{SM} business activity models (specifically to the activities identified within the models) developed for the 2000 Planning Rule and the Proposed Planning Rule. The EMC Director and Acting Assistant Director for Planning, EMC corroborated on the costing method and the related assumptions.

The Core Team devised the methods for the estimating Regional Activity Costs, Science Activity Costs, and various Indirect and Add-on Costs. Regional Activity Costs are the costs of Plan Revision activities that are carried out by the Regional Office (rather than the Forest) and were estimated using the same ABC method applied to the estimation of Forest activities. These activities include those with a broader focus than a single forest or group of forests such as quality assurance activities, setting regional policies, broad-scale assessments, and reviewing objections. A similar approach was used to estimate the costs of Science Activity Costs, including activities like technical reviews and science consistency evaluations. Not all costs of planning can easily be related directly to individual activities (and thus estimated with the ABC method). Indirect costs are typically related to the overall size of the planning effort rather than specific activities. Included in these costs are asset and

administrative cost pools (e.g., the cost of office buildings, utilities, security, administrative personnel and services), travel while doing planning work, transfer-of-station costs of planning personnel, OGC costs, the expense of printing and publishing planning documents, leadership team costs, and contracts for services (e.g., local analyses, specialized skills). Each of these indirect costs were estimated by an applicable method (e.g., proportional to total effort, lump-sum add-on) and then grouped into total Add-on Costs.

The methods used and the estimates of both Regional and Science Activity Costs are given in Appendix C along with other documents supporting the estimation of costs.

7.2 Cost Surveys

The BusinessGenetics approach to gathering cost information usually involves a facilitated workshop. However, since Forest Service planning SMEs are dispersed throughout the nation, alternate approaches for collecting cost information were evaluated. The selected approach considered how best to identify candidate forest participants, solicit and appropriately train the participants (who then made up the Cost Survey Team) and support their data collection efforts remotely. ABC Estimation Survey Tools were tailored to accommodate this approach.

The activities and supporting information used to construct the surveys came from the business activity models. Three surveys were developed: one for the 2000 Rule, one based on the business activity models developed for the October 1, 2001 version of the Proposed Rule (that contained only Ecological Sustainability Option 1), and one that supplemented the Proposed Rule survey based on the business activity models developed for the January 10, 2002 Proposed Rule version of Ecological Sustainability Option 2. See Appendix A for copies of these business models and Appendix B for sample pages of the ABC Surveys for both Rules.

7.2.1 Objectives and Approach

The primary objectives were to:

1. Empirically examine the "real" cost of Plan Revisions as literally called for by the Planning Rules.
2. Identify differences in cost by comparing the Proposed Planning Rule to the 2000 Planning Rule.

Nine forests/forest groups (multiple forests conducting planning together) participated in the cost survey, one from each region. Prior to initiating data collection on cost estimates, representatives from each of the selected forests/forest groups were trained in the BusinessGenetics methods and the tools provided to support their tasks. The data collection process involved several iterations of data collection, validation and refinement.

7.2.2 Survey Team Selection (Forest Participation)

Conditions within each of the nine Forest Service Regions are too diverse to have a single forest or group of forests represent the entire range of variability. Even so, selection criteria for participation in the Plan Revision cost survey attempted to encompass a wide range of conditions encountered in Plan Revision, including:

1. Few to many wildlife/ESA (Endangered Species Act) issues;
2. Straightforward to complex socio-political issues;
3. Simple to complex science involvement in assessments and inventories
4. Well established collaborative processes to situations requiring the establishment of collaborative processes;
5. Broad-scale assessments and/or data already in place to situations requiring the development of either or both;

6. Single forest revision efforts to multiple forest (2, 3, or 4 forests) combined revision efforts;
7. Large to small Forest budgets; and
8. Conditions faced by rural forests to conditions faced by urban forests.

The forest/forest groups that participated in the cost survey spanned this range of issues and conditions above. The forests that participated were:

Region 1: Idaho Panhandle and Kootenai in a two-forest group
Region 2: San Juan
Region 3: Kaibab
Region 4: Boise, Payette, and Sawtooth in a three-forest group
Region 5: El Dorado, Stanislaus, Tahoe, and Lake Tahoe Basin Management Unit in a four-forest group
Region 6: Colville, Wenatchee, and Okanogan in a three-forest group
Region 8: Nantahala-Pisgah
Region 9: Huron-Manistee
Region 10: Chugach

7.2.3 Data Collection & Training

The set of nine forests/forest groups included a total of seventeen individual National Forests. Working from their home locations, where access to additional SMEs could be obtained, the Cost Survey participants made estimates of the effort required to complete each of the activities noted in the survey instrument. Regular conference calls hosted by the Core Team during the data collection timeframe also helped to facilitate their efforts by sharing assumptions and discussing implementation approaches. The ABC Survey tool was the primary vehicle for capturing and storing the estimated effort of Plan Revisions for both Rules. The Proposed Rule survey was later supplemented to obtain estimates of Ecological Sustainability Option 2.

To establish common assumptions and provide for a consistent and reliable data collection process the leaders of the Cost Survey Teams were given a 3-day xBML^{SM} and ABC training workshop.

Sample pages of the ABC Surveys for both Rules are provided in Appendix C.

7.2.4 Data Validation/Delphi

Once the initial survey responses were received, a preliminary analysis of the survey contents was conducted to identify any anomalies or obvious deficiencies in the data. The Cost Survey Team Leads were re-convened for a second workshop to evaluate the initial findings and for an opportunity to reconsider the process and assumptions used to make their initial estimates. The teams were encouraged not to “average” their findings to others but rather to retain the legitimate differences encountered under varying conditions. Data entry errors were also identified and corrected by the participants. The Cost Survey participants were given a final opportunity to revise their information and provide any additional assumptions to support their estimates.

7.3 Cost Analysis

The Average Total Cost of Plan Revisions (by forest) under each Rule was estimated and compared, both in absolute and relative terms. Total Costs were developed from various components (e.g., Activity Costs by type – Forest, Regional or Science; Indirect and Add-on Costs) and compared between the Rules. Since the survey instrument was administered in nine settings representing seventeen National Forests, effort and costs actually represent the average or mean Total Cost based on the sample of seventeen forests.

7.3.1 Objectives

The primary objective focused on collating and analyzing the various components of cost information derived and collected from the Forest Cost Teams to compare the cost of Plan Revisions under the Proposed Rule and the 2000 Planning Rules.

7.3.2 Delivery Approach

Estimates of the effort (in person-days) embracing a range of Low to High (and by inference, the mid-point mean between the two) were made by each Cost Survey Team for each business model activity identified in the survey for each Rule. The Forest teams also identified the "most likely" or "expected" estimate (which could be either the Low, mid-point or High estimate) for each activity. The Core Team applied a loaded daily rate (i.e., the total cost of a person-day of work) by skill type to each of these estimates. Various Add-on Costs were also applied to each of the Forest's Activity Cost estimates. The Total Cost estimates from each of the nine-forests/forest groups (or seventeen forests) are presented as the average or mean estimated total costs on a per forest basis.

The Average Total Cost of Plan Revision was constructed from the components displayed below in Table 1.

Table 1. Average Total Cost of Plan Revision Coponent Cost Estimation Methods

Total Cost Components	*Cost Sub-Components*	*Estimation Method*
Activity Costs		
	Forest Activity Costs	Days of effort * Loaded Daily Rate by Skill Type
	Regional Activity Costs	Days of effort * Loaded Daily Rate by Skill Type
	Science Activity Costs	Days of effort * Loaded Daily Rate by Skill Type
Add-on Costs		
	Indirect Costs	Add-on rate (~20%) * Cost of Total Days of Activity Effort
	Leadership Costs	Add-on rate (~3%) * Cost of Total Days of Activity Effort
	TOS Costs	Expected number of transfers of station * per TOS cost
	Travel Costs	Travel rate (2-10%) * Total Days of Activity Effort * Daily Travel Cost
	OGC Costs	Expected days of OGC effort * Loaded Daily Rate
	Contract Costs	Estimated contract cost
	Printing Costs	Estimated cost of printing and publication of planning documents

8 COST STUDY FINDINGS

8.1 Synopsis of Information from the Effort Survey

This survey elicited estimates of the effort (measured in person-days) required to complete each coarse or high-level activity defined in the business process model created for each planning Rule. A range of estimates was solicited in order to encompass the uncertainty in the responses. The survey participants gave both *High* and *Low* estimates for each activity and the Core Team inferred a mid-point between each of these estimates. Survey participants were also asked to designate one of these three (*High*, mid-point, or *Low*) as the estimate "expected" or "most likely" to represent their actual situation.

To summarize, the following terms are used to describe the measurement of Plan Revision effort:

> ***High Estimate of Effort* -** The *High Estimate of Effort* represents the largest number of person-days of effort required to complete an activity based on the unique conditions that apply to a Forest. Each survey participant was asked to provide this estimate taking into account the conditions that apply to their Forest (or group of Forests). Estimates of effort for Plan Revision activities carried out by the Regional Office and those involving the use of Science were derived in an identical manner.
>
> ***Mid-Point Estimate of Effort* -** The *Mid-Point Estimate of Effort* is simply the mid-point (i.e., mean) between the High and Low estimates. Mid-point estimates of effort for Plan Revision activities carried out by the Regional Office and those involving the use of Science were derived in an identical manner.
>
> ***Low Estimate of Effort* -** The *Low Estimate of Effort* represents the smallest number of person-days of effort required to complete an activity based on the unique conditions that apply to a Forest. Each survey participant was asked to provide this estimate taking into account the conditions that apply to their Forest (or group of Forests). Estimates of effort for Plan Revision activities carried out by the Regional Office and those involving the use of Science were derived in an identical manner.
>
> ***Expected Effort* –** The survey participants designated one of the above estimates of *effort* (High, Low or Mid-Point) as the likely or *Expected Effort* estimate.

These estimates of *effort* for Forest Activities, together with estimates developed for Regional activities, Science activities and appropriate Add-on costs, contributed in sum to the *Total Cost* estimates and *Component Cost Center estimates*.

8.1.1 Components of Total Costs

Total costs were derived by combining the estimates of activity-based effort from the surveys with information about the "per person-day" costs of that effort and by accounting for miscellaneous additional or "add-on" costs unassociated with the level of effort. The purpose was to determine the expected *Total Cost*, as well as the ranges of the estimates, of a Plan Revision for each of the Rules. Since the effort survey was administered in nine settings representing seventeen National Forests, effort and costs actually represent the average, or mean, *Total Cost* based on the sample of seventeen Forests.

To summarize, the following terms describe the measurement of Plan Revision costs:

Total Cost **-** *Total Cost* is the sum of all *Activity Costs plus Indirect & Add-On Costs.*

Forest Activity Cost **–** *Forest Activity Costs* were derived by combining the estimated person-days of effort for each high-level activity, the distribution of skill-types required (identified by pay-schedule grade level in the effort survey) to complete the activity, and the applicable loaded daily rates. Simply put, *Activity Costs* were estimated by multiplying person-days of *effort* to complete an activity by the applicable *loaded daily rate.*

Indirect and Add-On Costs **-** *Indirect and Add-On Costs* include a variety of indirect costs that were typically proportional to total effort or cost rather than to the effort of individual activities. These include indirect costs (asset and administrative cost pools, approximately 20% add-on), leadership costs (leadership team, approximately 3% add-on), travel costs (per diem, lodging and travel costs associated with 2-10% of total effort), and other add-ons (Forest or Regional or Science contracts, transfer-of-station, OGC costs, printing costs).

Regional Activity Costs **-** *Regional Activity Costs* are costs associated with Plan Revision activities conducted by the Regional Office. These activities primarily include conducting of broad-scale assessments and considering and resolving objections. In order to make them commensurable on a "per Forest" basis, these regional costs are a Forest's proportionate share (i.e., the total cost of regional activities is typically shared among several Forests) necessary to complete that Forest's planning effort. They were estimated using methods identical to other *Activity Costs.*

Science Activity Costs **–** *Science Activity Costs* are associated with activities involving the use of the "best available science" in Plan Revision. They were derived separate from the Forest *Activity Costs* since the effort survey did not include estimates for these activities (they were estimated separately by the Forest Service Research member of the Implementation Team). These activities include conducting independent scientific peer reviews, establishing and utilizing science advisory boards and workgroups, conducting science consistency reviews, documenting the use of science in planning, and acknowledging risk and uncertainty. They were estimated using methods identical to other *Activity Costs.*

8.2 Estimated Total Cost of Plan Revision

The average total cost of a Plan Revision under the Proposed Rule, regardless of which ecological sustainability option might be selected, is significantly less and requires substantially less effort than the 2000 Rule.

As Figure 2 illustrates, the average per forest total cost of Plan Revision under the guidance of the 2000 Rule is expected to be $12.9 million while the comparable per forest costs of the Proposed Rule are $8.9 million (assuming Ecological Sustainability Option 1) and $9.5 million (assuming Ecological Sustainability Option 2). Generally speaking, the Proposed Rule is about 30% less costly than the 2000 Rule. Based on the estimates derived from seventeen National Forests, the mean total costs of the two Rules are statistically different.

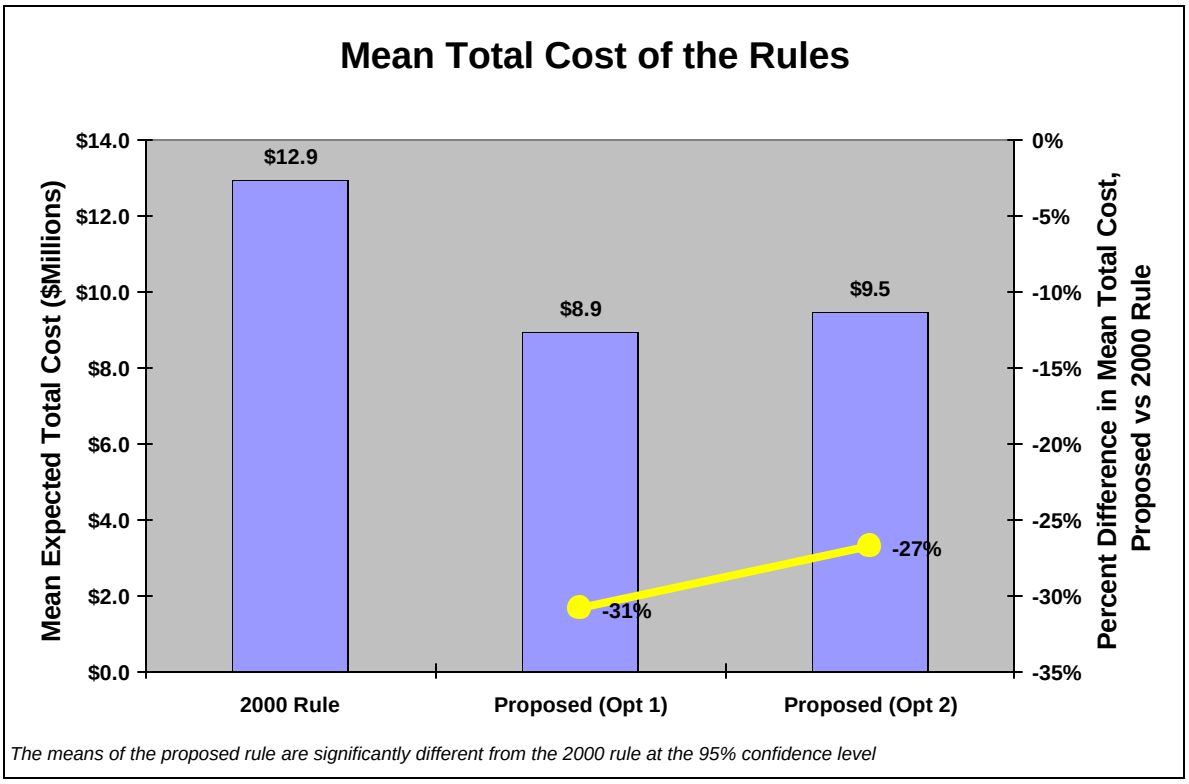
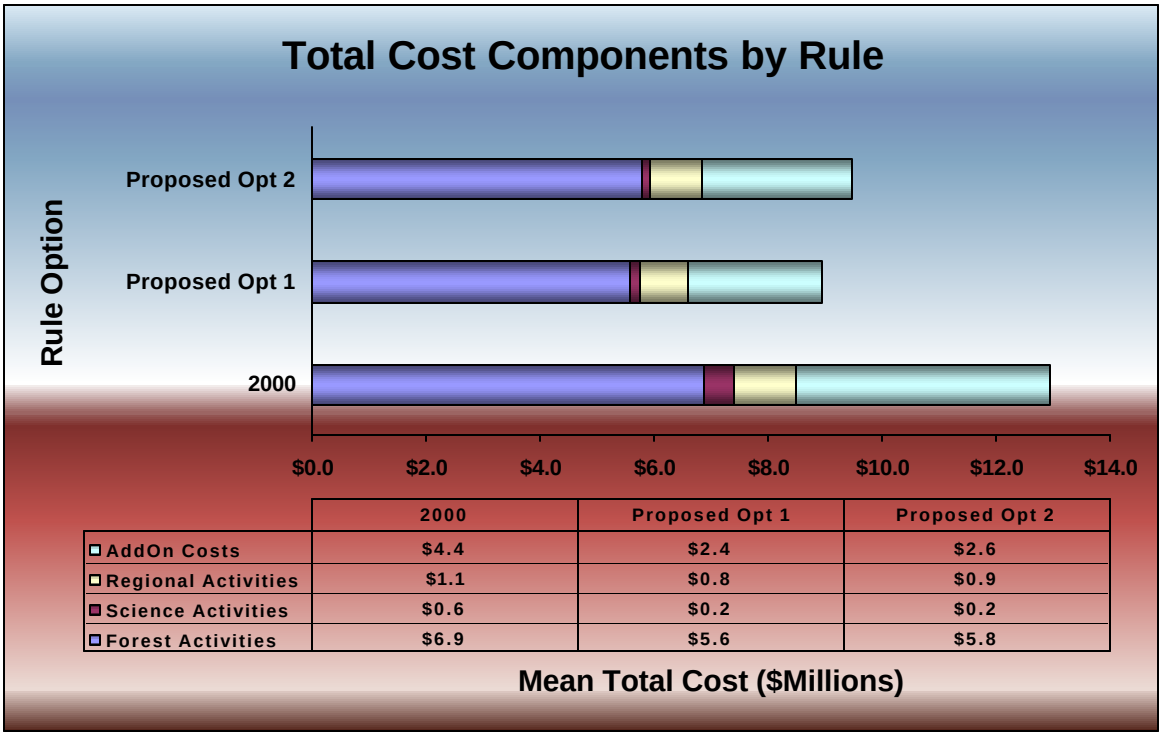


Figure 2. Mean Total Cost of the Rules

8.2.1 Total Cost Composition

Figure 3 illustrates the composition of the average total cost of each Rule in terms of *Forest Activity*, *Regional Activity*, *Science Activity* and *Add-On Costs.* The proportions of these costs are quite similar between the two Rules although *Science Activity Costs* are a somewhat higher portion of total costs in the 2000 Rule. The largest component of total cost is clearly related to Forest activities. *Add-on Costs* make up the second largest component and the majority of these costs are borne by Forests as well, although some of these costs involve contracts initiated by the Regional Offices. In general, *Add-on Costs* are proportional to the level of effort. This, along with more frequent expected use of contracts under the 2000 Rule, explains the greater amounts of *Add-on Costs* for the 2000 Rule compared to the Proposed Rule. *Regional* and *Science Activity Costs* together comprise about 10% of total cost for the Proposed Rule and about 15% for the 2000 Rule.



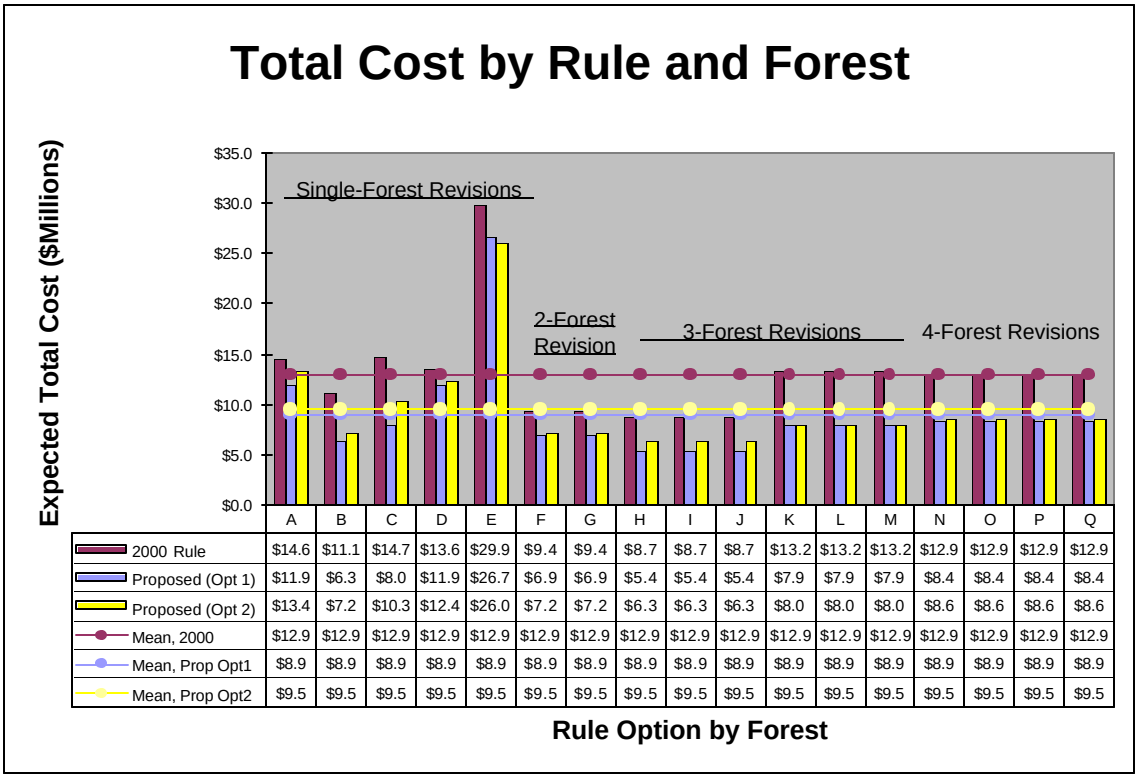
	2000	Proposed Opt 1	Proposed Opt 2
AddOn Costs	$4.4	$2.4	$2.6
Regional Activities	$1.1	$0.8	$0.9
Science Activities	$0.6	$0.2	$0.2
Forest Activities	$6.9	$5.6	$5.8

Figure 3. Total Cost Components by Rule

8.2.2 Cross-Sectional Comparison of Total Costs

Figure 4 displays the expected total costs of Plan Revision for each of the seventeen National Forests addressed in the effort survey. The expected Total Cost for each Forest under each Rule is given, along with the averages for each Rule. (See the accompanying Table 2 for the Forest Key.)

Four of the nine planning efforts surveyed involved multiple National Forests with planning teams working cooperatively to revise their Plans. While it was not a principal intention of the study to compare the differential costs of single- and multi-forest planning efforts, it is apparent that the total costs per Forest were influenced by these cooperative efforts. That is, multi-Forest efforts generally demonstrated cost efficiencies when viewed on a per-Forest basis. To show this, the total cost estimates in Figure 4 are ordered according to the number of Forests involved in the effort. Even so, many other factors (see the Cost Center discussions below) influence the variations in costs. As previously noted the means of total cost for the two Rules are statistically different. A *t*-test shows that the means of the two variants of the Proposed Rule are not statistically different. That is, the average cost of the Proposed Rule with Option 1 compared to the average cost of the Proposed Rule with Option 2, when considering the variability of the estimates within the sample of 17 Forests, were essentially the same more than half the time.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
2000 Rule	$14.6	$11.1	$14.7	$13.6	$29.9	$9.4	$9.4	$8.7	$8.7	$8.7	$13.2	$13.2	$13.2	$12.9	$12.9	$12.9	$12.9
Proposed (Opt 1)	$11.9	$6.3	$8.0	$11.9	$26.7	$6.9	$6.9	$5.4	$5.4	$5.4	$7.9	$7.9	$7.9	$8.4	$8.4	$8.4	$8.4
Proposed (Opt 2)	$13.4	$7.2	$10.3	$12.4	$26.0	$7.2	$7.2	$6.3	$6.3	$6.3	$8.0	$8.0	$8.0	$8.6	$8.6	$8.6	$8.6
Mean, 2000	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9	$12.9
Mean, Prop Opt1	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9	$8.9
Mean, Prop Opt2	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5	$9.5

Figure 4. Total Cost by Rule and Forest ***(Forest Key provided below – see Table 2)***

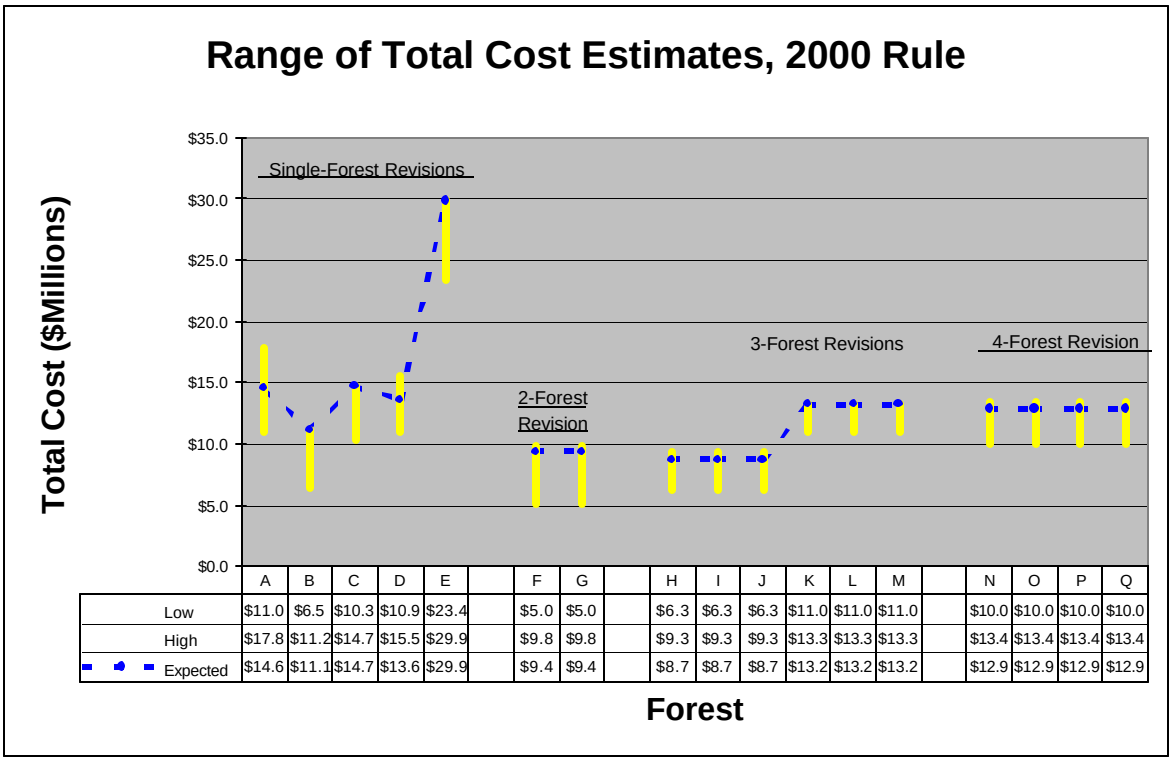
Table 2. Forest Key: Ordered by Region within the Forest Grouping Categories

Region	*Code*	*Forest*
2	A	San Juan
3	B	Kaibab
8	C	Nanatahala-Pisgah
9	D	Huron-Manistee
10	E	Chugach
1	F	½ of Idaho Panhandle-Kootenai
1	G	½ of Idaho Panhandle-Kootenai
4	H	1/3 of Sawtooth, Payette, Boise
4	I	1/3 of Sawtooth, Payette, Boise
4	J	1/3 of Sawtooth, Payette, Boise
6	K	1/3 of Colville, Wenatchee, Okanogan
6	L	1/3 of Colville, Wenatchee, Okanogan
6	M	1/3 of Colville, Wenatchee, Okanogan
5	N	¼ of El Dorado, Stanislaus, Tahoe, Lake Tahoe Basin Management Unit
5	O	¼ of El Dorado, Stanislaus, Tahoe, Lake Tahoe Basin Management Unit
5	P	¼ of El Dorado, Stanislaus, Tahoe, Lake Tahoe Basin Management Unit
5	Q	¼ of El Dorado, Stanislaus, Tahoe, Lake Tahoe Basin Management Unit

8.2.3 Variability in Total Cost Estimates

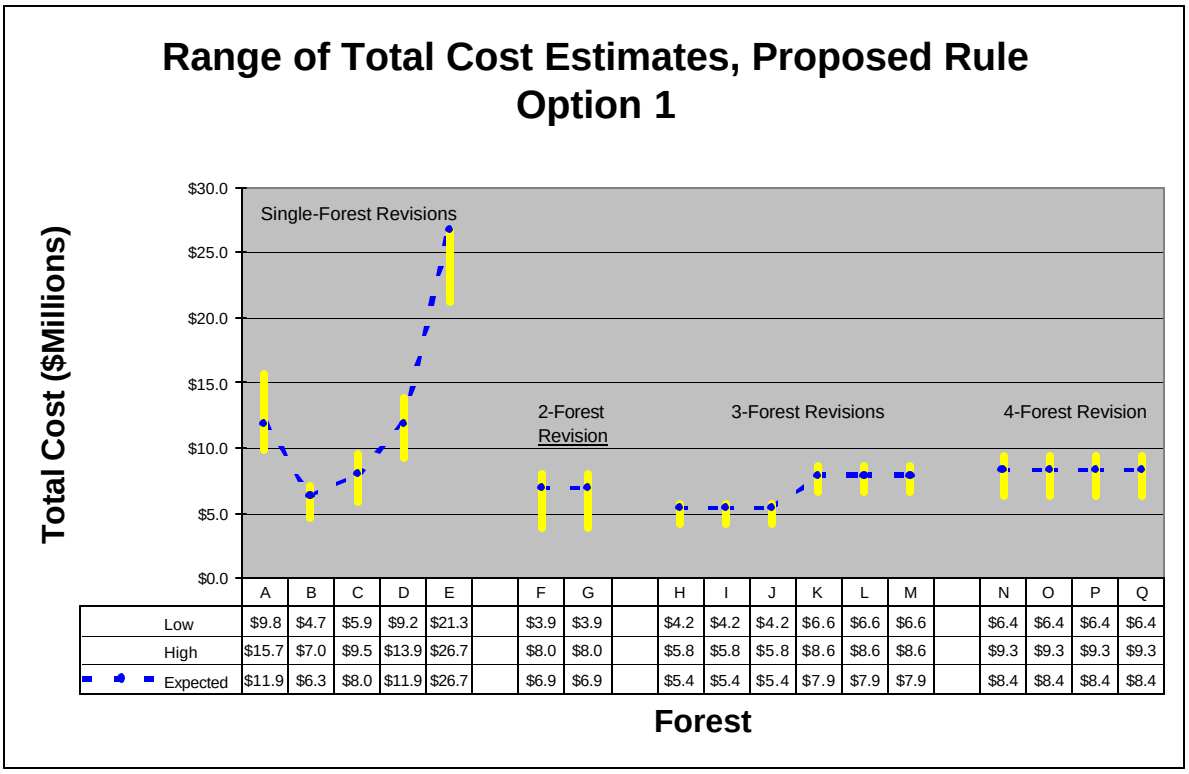
Figures 5-7 illustrate the variability in total cost estimates among the Forests participating in the effort survey. This variability is given by the range, high to low, in estimated total costs for each Forest. Expected total cost is also denoted in the figures. As with Figure 4 the estimates are ordered according to the number of Forests involved in the effort.

Both Rules show similar patterns of variability across the Forests. It is interesting to note that the estimates denoted as “most likely” tend to be the high estimates for the 2000 Rule (with somewhat wider low-high ranges) while the Proposed Rule is characterized by “most likely” estimates at the mid-point with much narrower low-high ranges. This may demonstrate higher degrees of confidence in estimates for the Proposed Rule compared to the 2000 Rule.



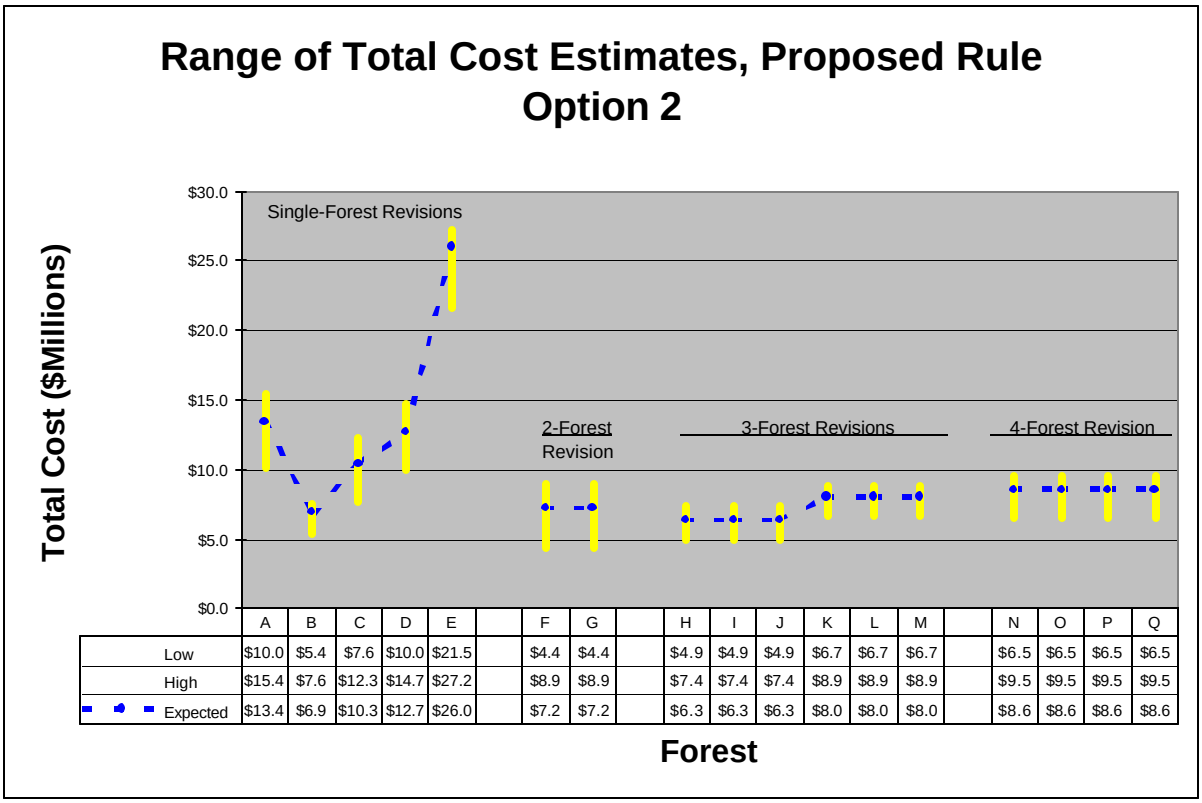
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Low	$11.0	$6.5	$10.3	$10.9	$23.4	$5.0	$5.0	$6.3	$6.3	$6.3	$11.0	$11.0	$11.0	$10.0	$10.0	$10.0	$10.0
High	$17.8	$11.2	$14.7	$15.5	$29.9	$9.8	$9.8	$9.3	$9.3	$9.3	$13.3	$13.3	$13.3	$13.4	$13.4	$13.4	$13.4
Expected	$14.6	$11.1	$14.7	$13.6	$29.9	$9.4	$9.4	$8.7	$8.7	$8.7	$13.2	$13.2	$13.2	$12.9	$12.9	$12.9	$12.9

Figure 5. Range of Total Cost Estimates, 2000 Rule



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Low	$9.8	$4.7	$5.9	$9.2	$21.3	$3.9	$3.9	$4.2	$4.2	$4.2	$6.6	$6.6	$6.6	$6.4	$6.4	$6.4	$6.4
High	$15.7	$7.0	$9.5	$13.9	$26.7	$8.0	$8.0	$5.8	$5.8	$5.8	$8.6	$8.6	$8.6	$9.3	$9.3	$9.3	$9.3
Expected	$11.9	$6.3	$8.0	$11.9	$26.7	$6.9	$6.9	$5.4	$5.4	$5.4	$7.9	$7.9	$7.9	$8.4	$8.4	$8.4	$8.4

Figure 6. Range of Total Cost Estimates, Proposed Rule Option 1



	A	B	C	D	E		F	G		H	I	J	K	L	M		N	O	P	Q
Low	$10.0	$5.4	$7.6	$10.0	$21.5		$4.4	$4.4		$4.9	$4.9	$4.9	$6.7	$6.7	$6.7		$6.5	$6.5	$6.5	$6.5
High	$15.4	$7.6	$12.3	$14.7	$27.2		$8.9	$8.9		$7.4	$7.4	$7.4	$8.9	$8.9	$8.9		$9.5	$9.5	$9.5	$9.5
Expected	$13.4	$6.9	$10.3	$12.7	$26.0		$7.2	$7.2		$6.3	$6.3	$6.3	$8.0	$8.0	$8.0		$8.6	$8.6	$8.6	$8.6

Figure 7. Range of Total Cost Estimates, Proposed Rule Option 2

8.3 The Cost Centers

The effort survey elicited estimates of the person-days required to complete each activity defined in the business process model created for each planning Rule. Cost Centers are groupings of these activities related to a common theme and whose summary costs can be considered a "package" defined in terms of milestone planning events or types of activities. Cost Center costs are composed of *Forest Activity Costs*, *Regional Activity Costs*, *Science Activity Costs* and *Add-On Costs*, which, taken together, equal the total cost estimates for each Rule. Cost Centers consisted mainly of coarse or "High Level" activities from the xBML^{SM} Business Activities Models with some adjustments for "lower level" planning activity costs due to differences between the Rules (e.g. for Sustainability.) Nine Cost Centers were identified:

1) Collaboration
2) Best Available Science
3) Analyze Current Management Situation
4) Identify Issues and Opportunities/Develop and Interpret Information
5) Public Notification/Comments/Issue ROD
6) Analyze Effects/Develop Plan Decisions
7) Assess Decisions for Sustainability
8) Document the Plan
9) Consider and Resolve Objections

To show the variance between forests within each Cost Center, the data points used for analysis are the average per forest low cost, average per forest high cost and the average per forest expected cost.

The following charts (see figures 8 and 9) reflect the distribution of per forest average total cost attributed to the Cost Centers for each Rule. All nine Cost Centers occur in both Rules, although the activities that compose some of the Cost Centers vary between the Rules, as is explained below.

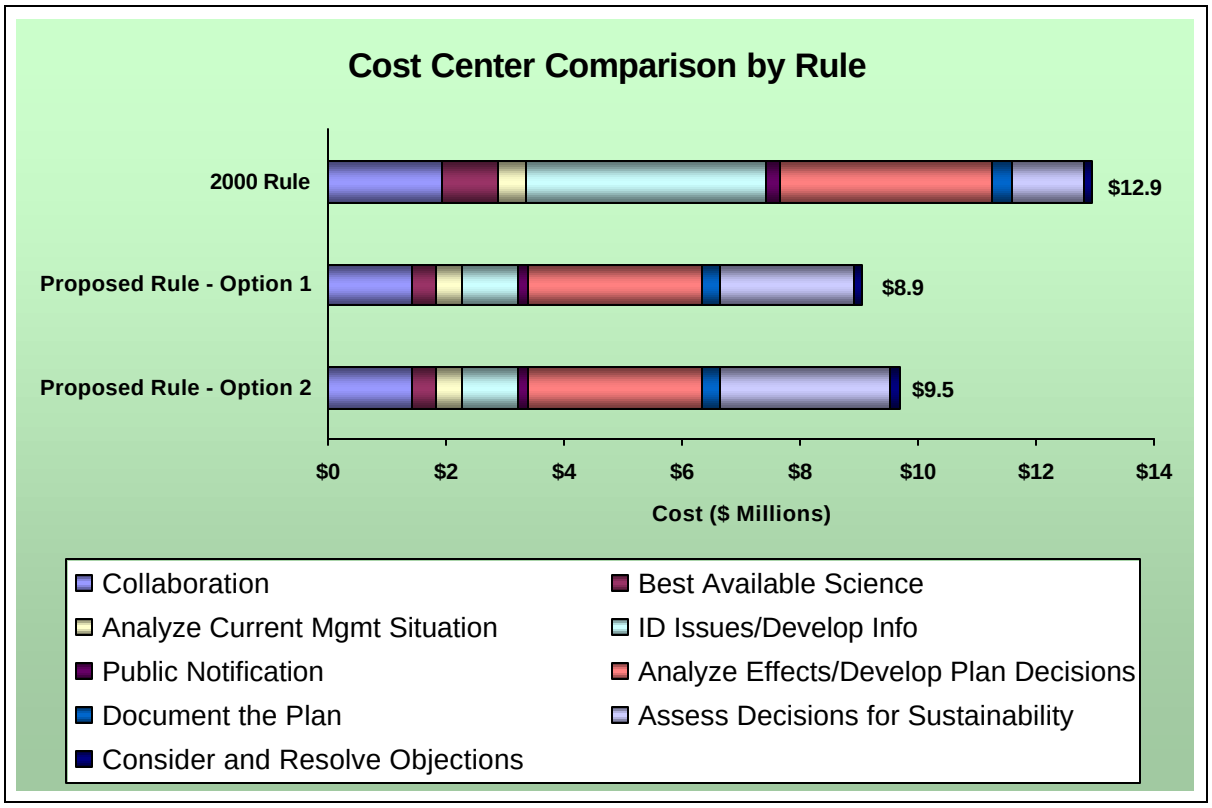


Figure 8. Cost Center Comparison by Rule

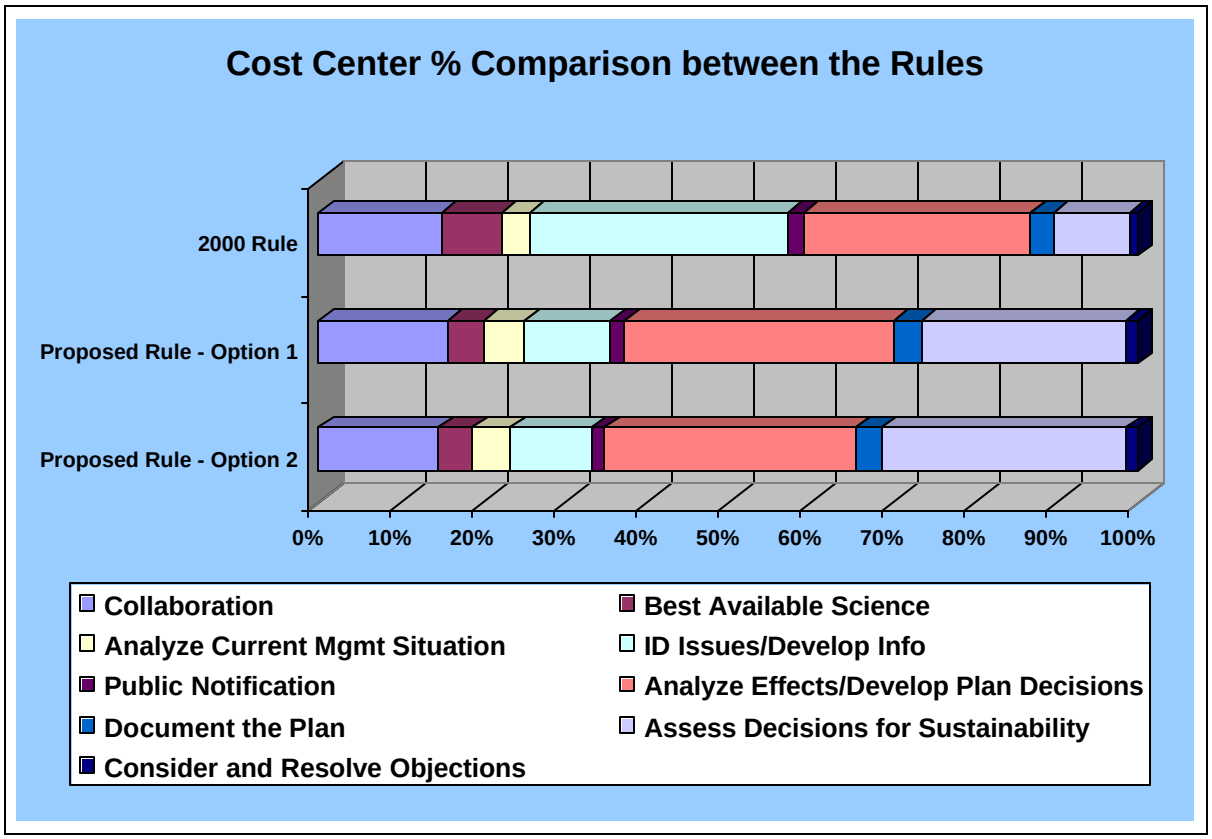


Figure 9. Cost Center % Comparison between the Rules

Some caution must be used when attempting to compare Cost Centers between the two Rules. While the definition of any particular Cost Center remains somewhat constant between the two Rules, some of the lower-level activities that make up the Cost Centers shifted in the transition from the 2000 Rule to the Proposed Rule.

For instance, activities associated with roadless area analysis were described as occurring pre-Notice of Intent (NOI) for Plan Revisions under the 2000 Rule during the identification of issues and development/interpreting of information phase. In the Proposed Rule similar roadless area analysis activities are described as occurring post-NOI during the analyze effects and develop plan decisions phase. In shifting where these activities occurred from one Rule to the next, the intent of the roadless area analysis activities did not change, nor did the intent of the Cost Centers change. For instance, *Develop and Interpret Information* and *Analyze Effects* remain fairly constant in interpretation between the two Rules. The only change was the location of where these activities would occur in the cost analysis of the two Rules.

Likewise, Conducting Broad Scale Assessments went from a pre-NOI set of activities during the *Identification of Issues* and *Development/Interpreting of Information* phase for the 2000 Rule to post-NOI set of activities in the *Sustainability Assessment* phase for the Proposed Rule.

These shifts in selected activities account for much of the differences between the Rules shown in Figures 8 and 9 for the *Identify Issues/Develop Information*, *Analyze Effects/Develop Plan Decisions*, and *Assess Decisions for Sustainability* Cost Centers.

Further caution must be used in viewing the Cost Center data because some forests chose to account for certain costs in different places. For instance, the 2000 Rule described sustainability as occurring at two points; a "lite" sustainability analysis pre-NOI to aid in analyzing the current management situation and identification of issues, and a "supplemental" sustainability analysis while analyzing the effects of plan decisions. The costs of activities associated with sustainability analysis were intended for the *Assess Decisions for Sustainability* Cost Center. However, some forests had difficulty separating out sustainability analysis costs for the "lite" sustainability analysis that occurs pre-NOI, since the purpose of this analysis was to aid analyzing the current management situation and identifying issues. They instead reflected sustainability activity costs within the *Analyze Current Management Situation* and *Identify Issues/Develop Information* Cost Centers, indicating they were unable to distinguish sustainability costs from the other costs associated with these Cost Centers. In these instances the *Assess Decisions for Sustainability* Cost Center costs may be under estimated, consequently the other two Cost Center costs may be over estimated. Other minor examples of this occurred with other costs centers in both Rules. While this had some effect on the reported Cost Center costs, it had no effect on the reporting of total costs.

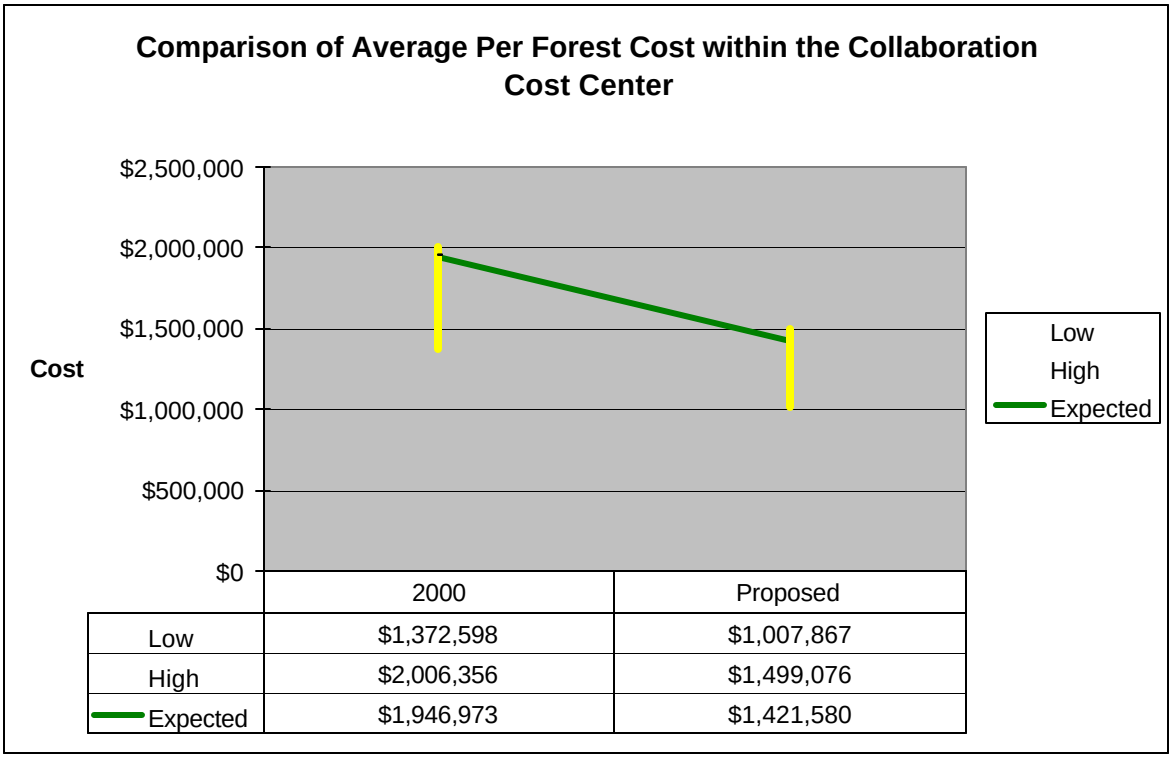
Each of the nine identified Cost Centers for the 2000 Rule and Proposed Rules are individually discussed on the following pages.

8.3.1 Collaboration

8.3.1.1 Context

Collaboration activities involve the interdisciplinary, collaborative approach to planning. These activities occur throughout the planning process. Collaborative Public Involvement activities are included in this Cost Center.

8.3.1.2 Results



	2000	Proposed
Low	$1,372,598	$1,007,867
High	$2,006,356	$1,499,076
Expected	$1,946,973	$1,421,580

Figure 10. Comparison of costs within the Collaboration Cost Center

8.3.1.3 Analysis/Findings

Costs in the *Collaboration* Cost Center will vary dependent upon the number of communities, public groups, and other governmental agencies involved and interested in the process, and the disparities over issues that may occur. There may also be cultural differences in how local publics prefer to engage in planning for public lands. The expectations of the public and success in previous engagements, both locally (previous Forest efforts) and regionally (e.g., Quincy Library Group, Sierra Provinces, etc.) may also increase participation and add to the complexity of this task.

8.3.1.4 Comparison between the Rules

This Cost Center represents approximately 15% of the total cost of the 2000 Rule, and approximately 15% - 16% of the total cost of the Proposed Rule when considering the expected average.

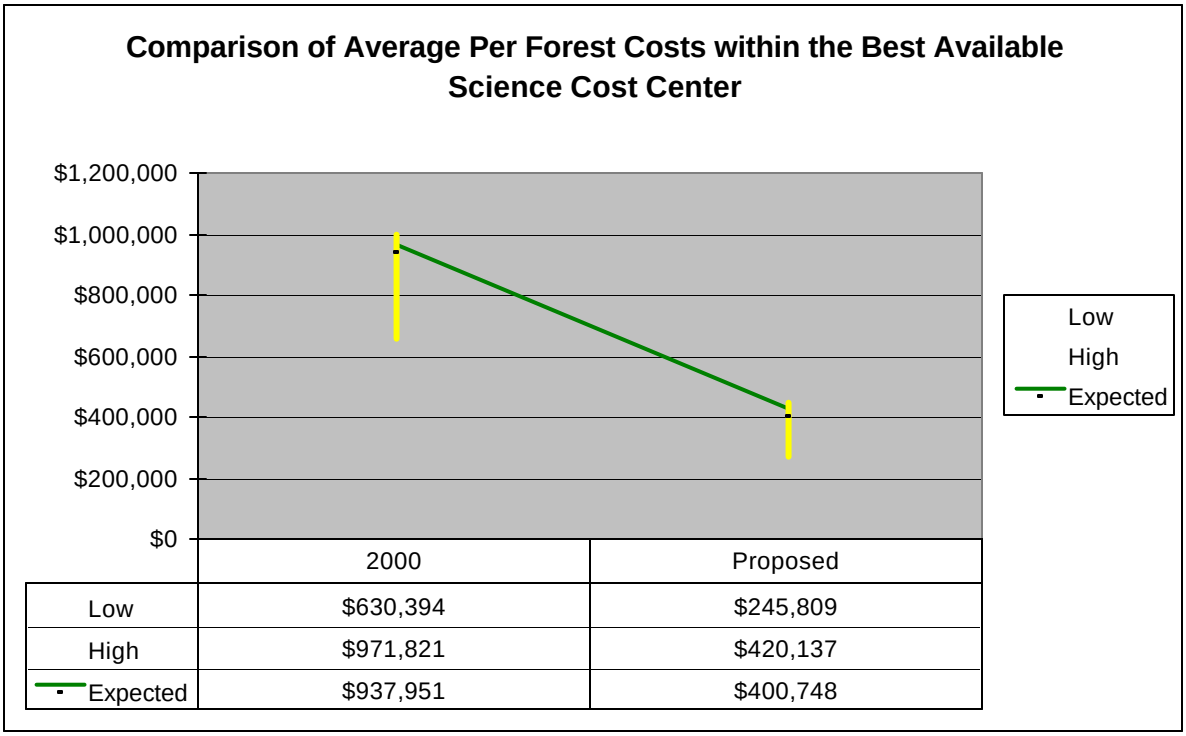
Both the 2000 Rule and the Proposed Rule offer a collaborative approach, but the 2000 Rule is more prescriptive. These prescriptive processes probably add costs without necessarily increasing the likelihood of success. The 2000 Rule included costs for the development of cooperatively developed landscape goals that are not required by the Proposed Rule, thus accounting for some of the cost differences between the Rules.

8.3.2 Best Available Science

8.3.2.1 Context

Best Available Science activities involve the application of the best available science to planning. These activities occur throughout the planning process.

8.3.2.2 Results



	2000	Proposed
Low	$630,394	$245,809
High	$971,821	$420,137
Expected	$937,951	$400,748

Figure 11. Comparison of costs within the Best Available Science Cost Center

8.3.2.3 Analysis/Findings

Costs in the *Best Available Science* Cost Center vary depending upon the level of public interest in the conclusions and the uncertainty of the Plan's desired conditions. The availability of scientists may also affect costs. For some forests, the complexity of the issues may require a broader set of scientific disciplines, which would increase their costs. Costs for forests in regions where there is a history of strong science involvement in the past (i.e. science involvement in Interior Columbia Basin, Sierra Provinces, Northwest Forest Plan, etc.) are likely to be greater because of the science involvement expectations that have been set by these previous efforts.

8.3.2.4 Comparison between the Rules

This Cost Center represents approximately 7% of the total cost of the 2000 Rule, and approximately 4% of the total cost of the Proposed Rule when considering the expected average.

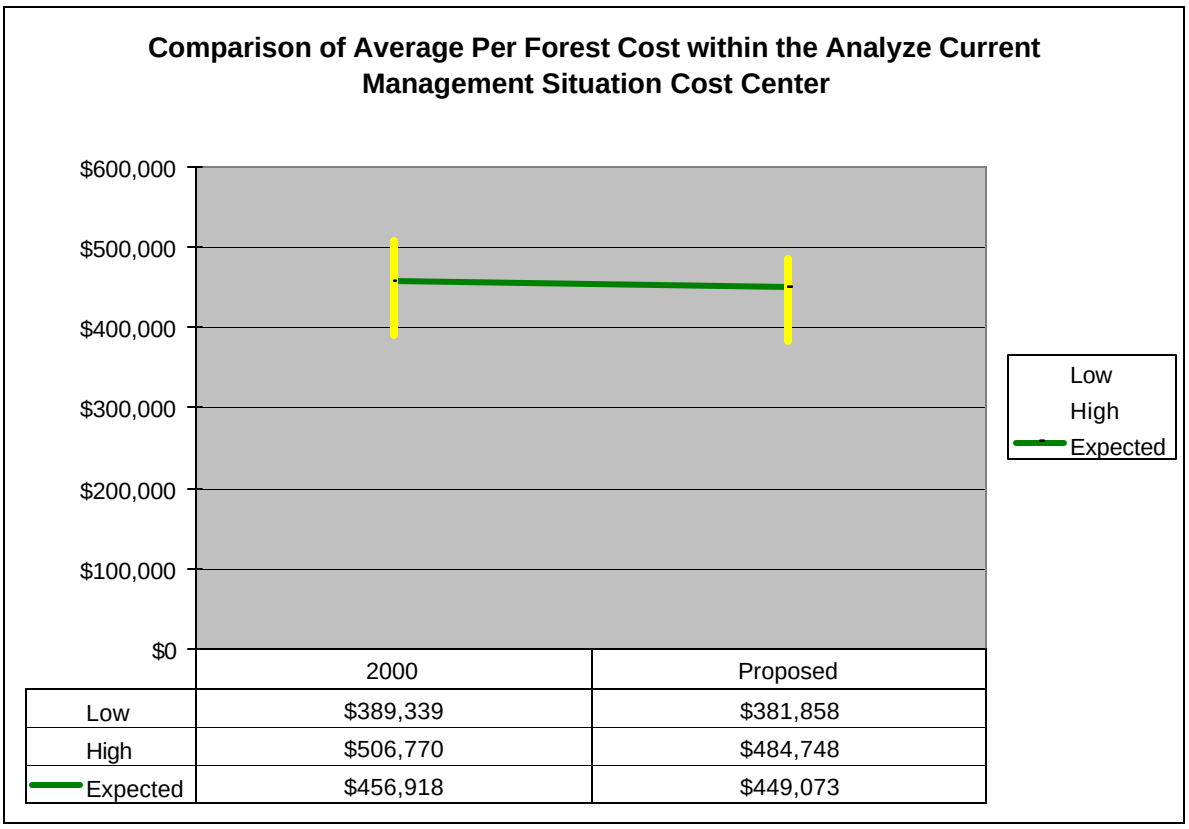
The expected outcomes resulting from the application of science are similar in both Rules. However, the two Rules differed in how the outcomes can be achieved. The 2000 Planning Rule dictates numerous procedural requirements for using science reviews and science boards without discretion. The Proposed Rule gives greater discretion to the Responsible Official in the choice of the type, timing and methods of science involvement. Therefore, the *Application of Best Available Science* in the Proposed Rule, while achieving similar outcomes to the 2000 Rule, is significantly less costly to implement.

8.3.3 Analyze Current Management Situation

8.3.3.1 Context

Analyze Current Management Situation activities describe the current management situation for the plan area, and analyze the adequacy of existing plan direction. These activities occur pre-NOI.

8.3.3.2 Results



	2000	Proposed
Low	$389,339	$381,858
High	$506,770	$484,748
Expected	$456,918	$449,073

Figure 12. Comparison of costs within the Analyze Current Management Situation Cost Center

8.3.3.3 Analysis/Findings

The costs in the *Analyze Current Management Situation* vary under both Rules depending on the currency and completeness of resource data. If monitoring data for the current plan has been routinely evaluated and the results are easily retrievable and understood, the current management analysis will be easier and less costly.

There are often new issues resulting from shifting public demands or political considerations that require analysis of current resource conditions in different ways. The complexities of the issues or the attention placed on data and analysis processes can increase costs in this Cost Center. The number of acres contained in the area of analysis also influences the costs for this Cost Center.

8.3.3.4 Comparison between the Rules

This Cost Center represents approximately 4% of the total cost of the 2000 Rule, and approximately 5% of the total cost of the Proposed Rule when considering the expected average.

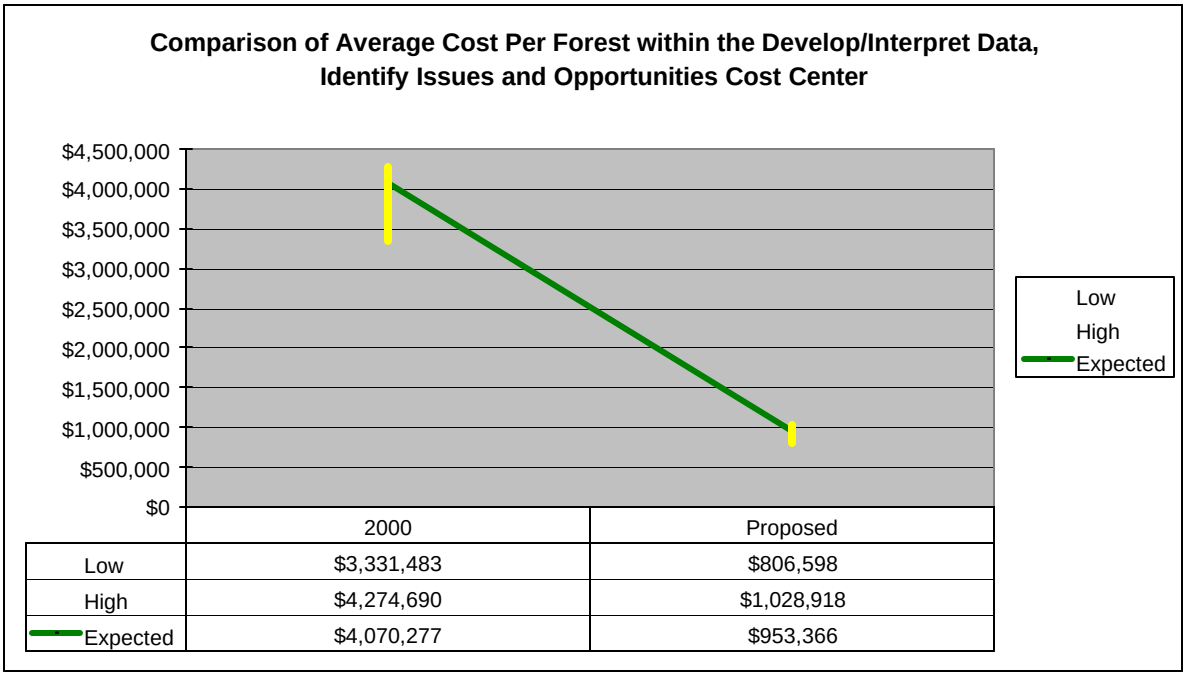
The costs for this Cost Center are essentially the same between the two Rules.

8.3.4 Identify Issues and Opportunities/Develop and Interpret Infomation

8.3.4.1 Context

Identify Issues and Opportunities/Develop and *Interpret Information* activities consider the identification of issues, problems, and opportunities, and the development of information regarding relevant issues, problems, and opportunities.

8.3.4.2 Results



	2000	Proposed
Low	$3,331,483	$806,598
High	$4,274,690	$1,028,918
Expected	$4,070,277	$953,366

Figure 13. Comparison of costs within the Identify Issues and Opportunities/Develop and Interpret Data Cost Center

8.3.4.3 Analysis/Findings

The costs in the *Identify Issues and Opportunities/Develop and Interpret Information* Cost Center vary under both Rules dependant on the currency and completeness of inventory data; similar to the situation in the *Analyze Current Management Situation* Cost Center.

The activities involved in this Cost Center include assessments at varying scales. When broad scale assessments are completed at the Regional scale, there are costs involved to adapt the information to local conditions. When the assumptions for the broad scale assessment don't match the refined data at a smaller scale, or when broad scale assessments become out of date, these costs can be higher. Forests that can tier to broad scale assessments that are already in place, both large (i.e. Interior Columbia Basin, Southern Appalachian Assessment, Sierra Provinces, etc.) and small, will have reduced costs in developing and interpreting information. For the 2000 Rule, the costs associated with conducting broad scale assessments are contained within this Cost Center, while for the Proposed Rule, they are contained in the *Assess Decisions for Sustainability* Cost Center.

The population of databases and production of basic GIS (Geographic Information Systems) data can also be a significant cost. The Forest Service has spent considerable time and effort building NRIS (Natural Resource Information Systems), a national data base system for basic resource information. However, NRIS only contains a portion of the data needed for Planning and some forests may not have NRIS data available as they start their Plan Revision.

There is also a concern about what data is needed to address diversity and species viability issues. Many forest units have monitoring programs based on older plans, which don't address some of the analysis needs in either of the Rules. Because some information systems or analysis techniques may be lacking to address these issues, costs will be higher. For forests that have an existing information base due to other flora and fauna planning efforts, these costs may be lower.

Costs in this Cost Center can also vary dependent on the size of the study area.

8.3.4.4 Comparison between the Rules

This Cost Center represents approximately 31% of the total cost of the 2000 Rule, and approximately 10% - 11% of the total cost of the Proposed Rule when considering the expected average.

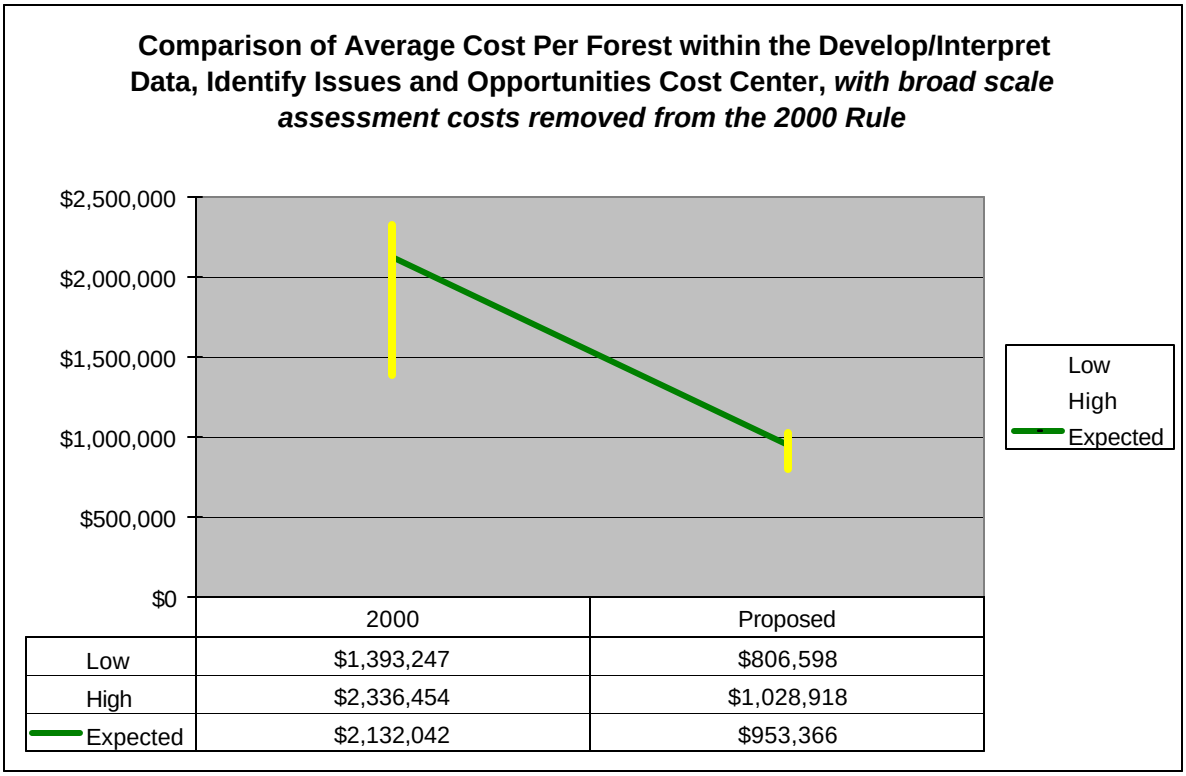
The costs for this Cost Center are much higher for the 2000 Rule than for the Proposed Rule. This is in large part due to:

? Broad scale assessments are much more prescribed in the 2000 Rule as the means for collecting/analyzing data as input into the revision process. Activities associated with broad scale assessments make up nearly half of the costs of this Cost Center for the 2000 Rule. For the Proposed Rule, broad scale assessments are handled in the *Assess Decisions for Sustainability* Cost Center, reducing the Proposed Rule costs in this Cost Center.

? Another reason contributing to higher costs in this Cost Center is how Roadless areas are addressed. For the 2000 Rule the costs for evaluating Roadless areas were contained within this Cost Center, while they were contained in the *Analyze Effects/Develop Plan Decisions* Cost Center for the Proposed Rule, again lowering the costs in this Cost Center for the Proposed Rule.

8.3.4.5 Effects of Broad Scale Assessment Costs

As mentioned above, broad scale assessments are handled in this Cost Center for the 2000 Rule, while they are contained within the *Assess Decisions for Sustainability* Cost Center for the Proposed Rule. If broad scale assessment costs were removed from this Cost Center for the 2000 Rule, the comparison between the rules would look as follows in Figure 14. As can be seen by the below figure, even with the removal of broad scale assessment costs from the 2000 Rule, costs are still greater than that for the Proposed Rule.



	2000	Proposed
Low	$1,393,247	$806,598
High	$2,336,454	$1,028,918
Expected	$2,132,042	$953,366

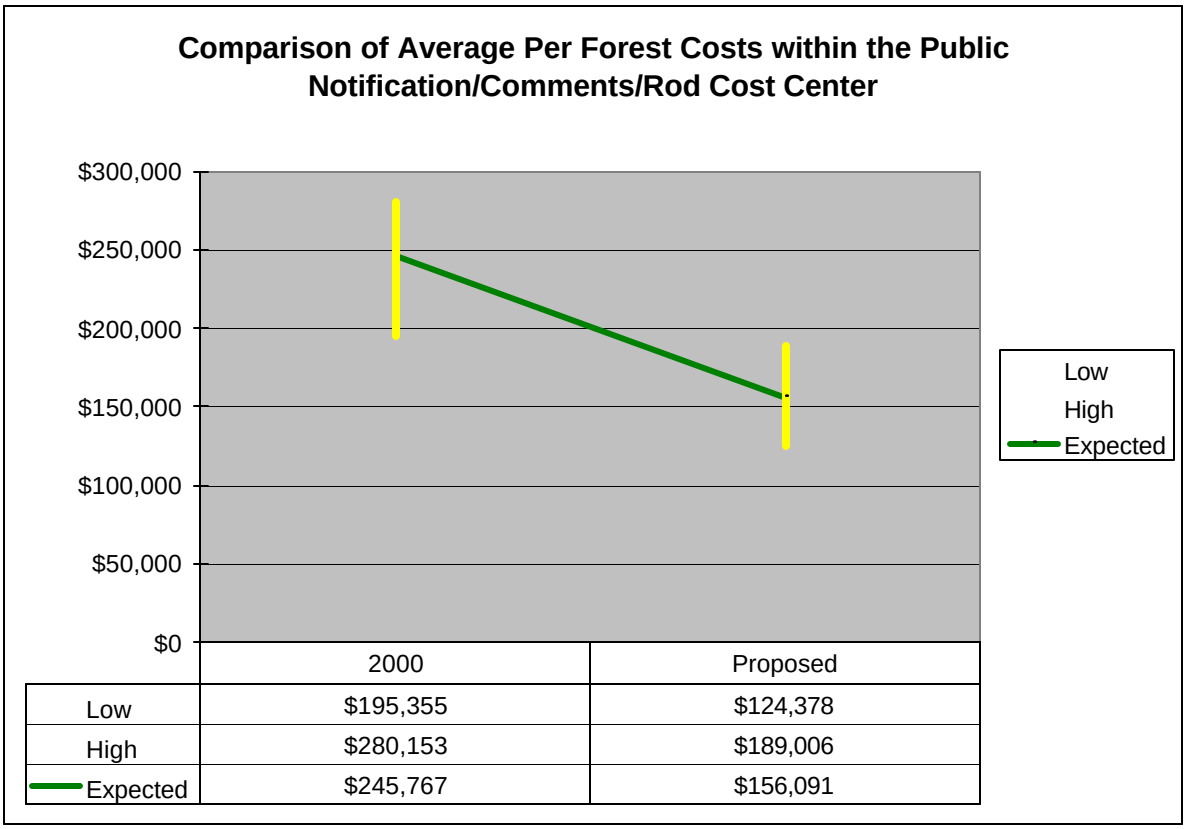
Figure 14. Comparison of costs within the Identify Issues and Opportunities/Develop and Interpret Data Cost Center, *with broad scale assessment costs removed from the 2000 Rule*

8.3.5 Public Notification/Comments/Issue ROD

8.3.5.1 Context

Public Notification/Comments/Issue ROD activities provide public notice about the proposed revised plan and planning process, and provide for and evaluate public comments regarding the proposed revised plan. These activities occur from NOI to revise the plan to issuance of the Record Of Decision (ROD) to implement the revised plan. This Cost Center does not contain collaborative public involvement activities, which are instead contained in the Collaboration Cost Center.

8.3.5.2 Results



	2000	Proposed
Low	$195,355	$124,378
High	$280,153	$189,006
Expected	$245,767	$156,091

Figure 15. Comparison of costs within the Public Notification/Comments/Issue ROD Cost Center

8.3.5.3 Analysis/Findings

The *Public Notification/Comments/Issue ROD* Cost Center contains the formal steps involving the public and largely varies based on the number of people and groups involved in the process. The complexity of multi-forest planning processes also increases costs. For the most part, the Forest Service has considerable experience in completing these activities and can do them quite efficiently.

8.3.5.4 Comparison between the Rules

This Cost Center represents approximately 2% of the total cost of the 2000 Rule, and approximately 2% of the total cost of the Proposed Rule when considering the expected average.

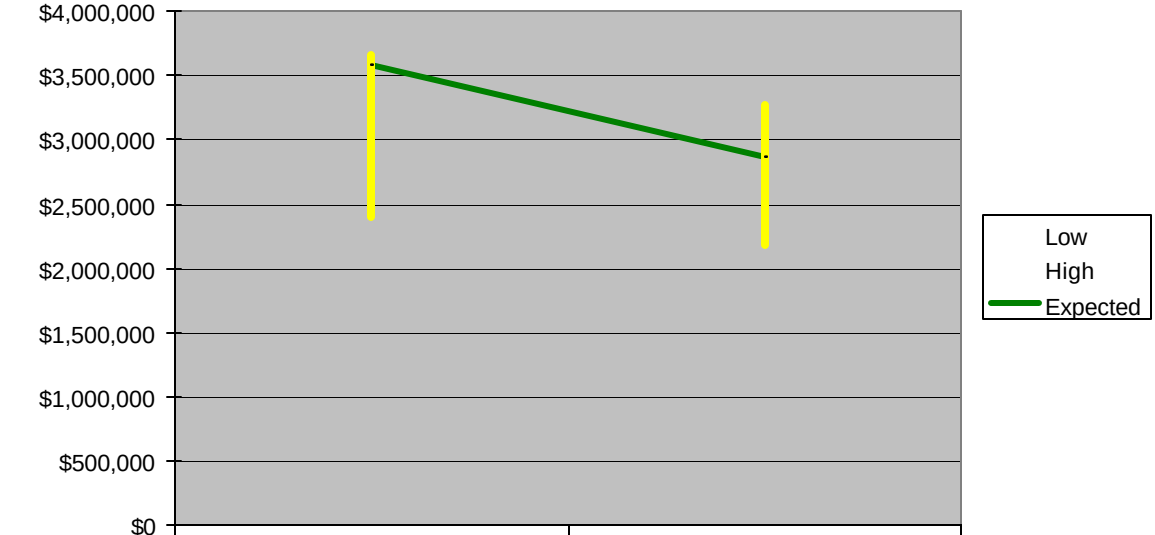
The 2000 Rule introduced some new, more complicated activities, so there is some uncertainty how they would be accomplished. The Proposed Rule is more straightforward and generally less expensive.

8.3.6 Analyze Effects/Develop Plan Decisions

8.3.6.1 Context

Analyze Effects/Develop Plan Decision activities develop/revise plan direction and analyze the effects of plan direction. These activities occur post-NOI and pre-NOA (Notice of Availability). These activities also ensure the planning process complies with NEPA (National Environmental Policy Act) and other applicable laws which are considered within this Cost Center.

8.3.6.2 Results



	2000	Proposed
Low	$2,394,999	$2,175,140
High	$3,660,059	$3,277,554
Expected	$3,581,549	$2,864,647

Figure 16. Comparison of costs within the Analyze Effects/Develop Plan Decisions Cost Center

8.3.6.3 Analysis/Findings

The *Analyze Effects/Develop Plan Decisions* Cost Center represents the bulk of the work in preparing a Revised Plan. It contains the environmental analysis and development of the Plan and alternatives. These costs are highly dependent on the legal and political environment that Forests face. Where it is necessary to "bulletproof" the analysis to withstand legal challenges of future implementation of the direction contained in the plan, costs will increase.

Like other Cost Centers, these costs are affected by the size of the area covered in the analysis. In addition to size, other factors that add complexity to the analysis, and hence cost, include the amount of management activity in the forest, location of unique or important habitats, social or economic considerations, and availability of information from Forest Service Research or other agencies. Revisions of plans that have been kept up to date through amendments have the potential to be less expensive. Also, strong leadership by the Forest Supervisor in keeping the analysis focused on only those elements of the plan that "need to change" has tremendous potential to reduce costs.

8.3.6.4 Comparison between the Rules

This Cost Center represents approximately 28% of the total cost of the 2000 Rule, and approximately 29% - 32% of the total cost of the Proposed Rule when considering the expected average.

Although the Proposed Rule provides an opportunity to consider an Environmental Assessment rather than an Environmental Impact Statement, most survey participants assumed that an EIS would be required based on past experience.

The two Rules essentially contain the same set of activities under this Cost Center. However, they are more precisely spelled out under the Proposed Rule than they are for the 2000 Rule. This lack of explicitness in the required analysis tasks in the 2000 Rule may have led the survey participants to provide higher costs for this Cost Center.

For the Proposed Rule the costs for evaluating roadless areas were contained within this Cost Center, while they were contained in the *Identify Issues and Opportunities/Develop and Interpret Data* Cost Center for the 2000 Rule. There was however an expectation that the roadless area evaluation for the 2000 Rule would need to be updated in order to analyze roadless area effects. This mitigated the cost differences between the two Rules.

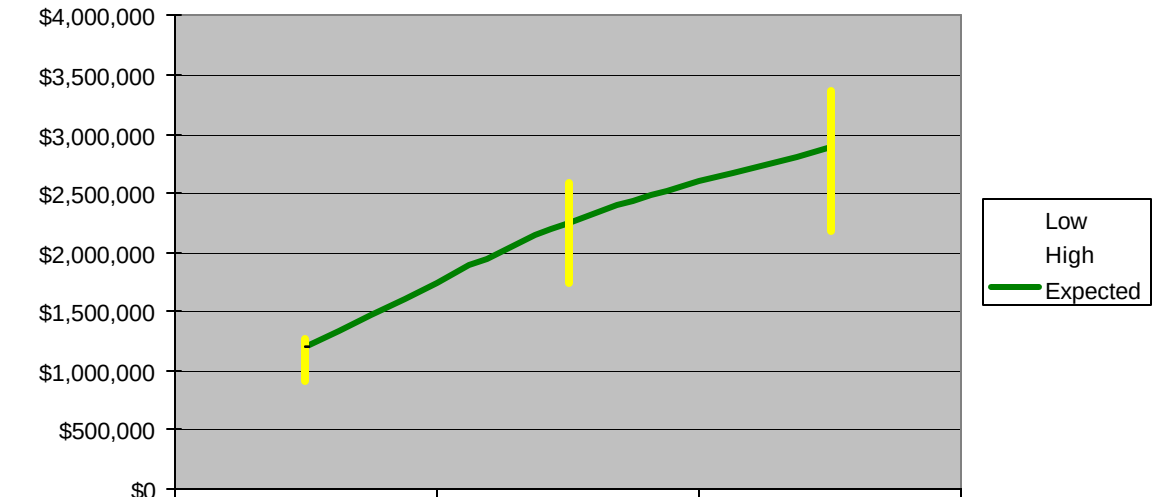
8.3.7 Assess Decisions for Sustainability

8.3.7.1 Context

Assess Decisions for Sustainability activities ensure sustainable ecosystems on NFS lands and the joint production of renewable resources contained on those lands.

Timing considerations for sustainability affected how the cost survey participants reflected effort in their survey responses. Consequently, it could not be as effectively or equitably represented within any of the other Cost Centers across the two Rules -- hence it is presented, as it's own Cost Center.

8.3.7.2 Results



	2000	Proposed Opt 1	Proposed Opt 2
Low	$910,444	$1,740,890	$2,189,914
High	$1,276,992	$2,584,933	$3,359,931
Expected	$1,196,514	$2,254,129	$2,892,765

Figure 17. Comparison of costs within the Assess Decisions for Sustainability Cost Center

8.3.7.3 Analysis/Findings

Many of the activities in the both the 2000 Rule and the two options of the Proposed Rule are not well understood, so the estimates of costs in this Cost Center are highly variable. Although both Rules address a staged process where ecosystem diversity is first addressed, followed by species diversity, most survey participants believe that there will be a large number of species to be analyzed in both Rules (including both options of the Proposed Rule). Therefore, the cost of this activity is related to the number of species considered to be at risk.

This Cost Center also varies in a similar manner to the *Analyze Effects/Develop Plan Decision* Cost Center. It is dependent upon legal and political risks, as well as the degree of interest and the size of the area under consideration. Since there is not agreement upon the technical aspects of the analysis, there are questions about the degree of analysis required to assure that biological diversity is provided for within the planning area. Given the lack of procedural guidance coupled with intense public scrutiny, it may be difficult to manage and contain costs for these activities. This may indicate that even the Proposed Rule could benefit from further refinement of the rule text governing this area

It is anticipated that public comment, wider internal review, and assessment of the results of a planned ecological sustainability workshop on how the two Proposed Rule options meet NFMA diversity requirements, will improve the clarity of the requirements of the activities contained in this Cost Center.

The direction for social and economic analysis seems to be less extensive than for ecological analysis, although there are also questions about the procedures to be used.

8.3.7.4 Comparison between the Rules

This Cost Center represents approximately 9% of the total cost of the 2000 Rule, approximately 25% of the total cost of the Proposed Rule Option 1, and approximately 31% of the total cost of the Proposed Rule Option 2 when considering the expected average.

While both Rules essentially address the same subject area in ecological sustainability, namely ecosystem/species diversity, the 2000 Rule is much more prescriptive in the methods that must be used to assess ecological diversity. The Proposed Rule (both ecological sustainability options) gives the Responsible Official much more leeway in the means for assessing ecosystem/species diversity, and is thus an opportunity for less costly implementation than the 2000 Rule.

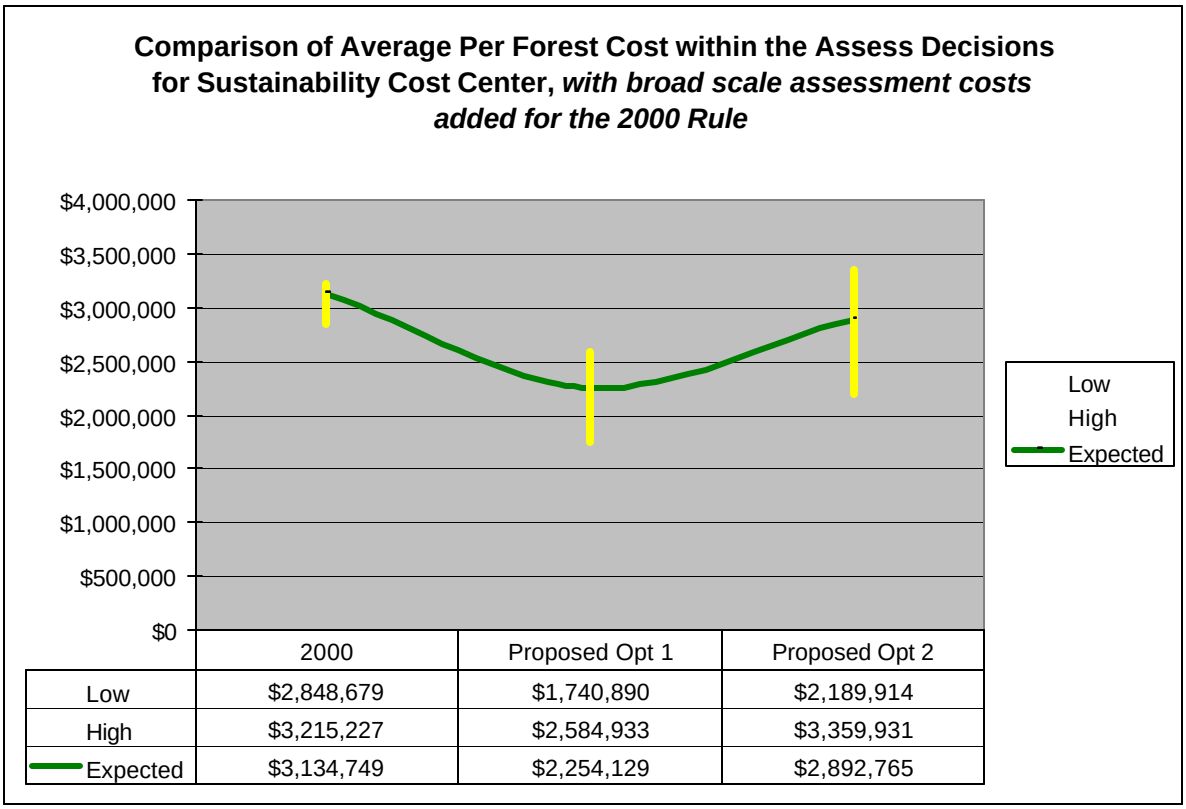
It should be emphasized that the cost of conducting broad scale assessments for the Proposed Rule is contained in this Cost Center (Ecological Sustainability Options 1 and 2) while they are contained elsewhere (*Identify Issues and Opportunities/Develop and Interpret Data* Cost Center) for the 2000 Rule. This accounts for much of the lowered costs in this Cost Center for the 2000 Rule.

There are no significant differences in the amount of work required between Ecological Sustainability Options 1 and 2 of the Proposed Rule. Option 2 costs more because it is more prescriptive and requires spatial analysis of information at more scales. It also requires analysis of data from other ownerships, which may not be readily available.

Both Rules give great flexibility in the means for assessing social and economic sustainability, so there is not much of a cost difference here between the Rules.

8.3.7.5 Effects of Broad Scale Assessment Costs

As mentioned above, broad scale assessments are handled in this Cost Center for the Proposed Rule, while they are contained within the *Identify Issues and Opportunities / Develop and Interpret Information* Cost Center for the Proposed Rule. If broad scale assessment costs were added to this Cost Center for the 2000 Rule, the comparison between the rules would look as follows in Figure 18. As can be seen by the figure below, the addition of broad scale assessment costs to the 2000 Rule, increases costs in this Cost Center (nearly triples the costs) to greater than that for the Proposed Rule. It should be further noted that the costs of broad scale assessments for the Proposed Rule are reduced over that of the 2000 Rule due to the greater discretion given to the Responsible Official in the means of conducting those assessments.



	2000	Proposed Opt 1	Proposed Opt 2
Low	$2,848,679	$1,740,890	$2,189,914
High	$3,215,227	$2,584,933	$3,359,931
Expected	$3,134,749	$2,254,129	$2,892,765

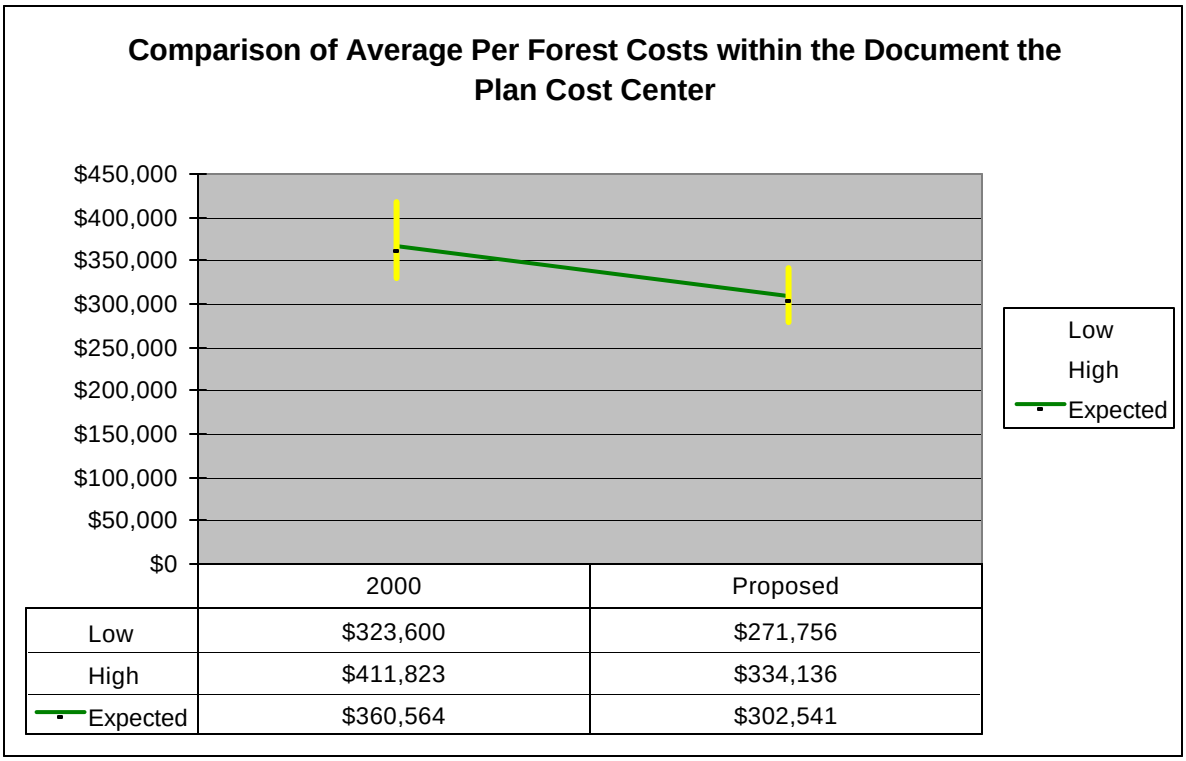
Figure 18. Comparison of costs within the Assess Decisions for Sustainability Cost Center, *with broad scale assessment costs added for the 2000 Rule*

8.3.8 Document the Plan

8.3.8.1 Context

Document the Plan activities establish the administrative record and document the revised plan direction and the effects of that revised plan direction. These activities occur post-NOI and pre-NOA.

8.3.8.2 Results



	2000	Proposed
Low	$323,600	$271,756
High	$411,823	$334,136
Expected	$360,564	$302,541

Figure 19. Comparison of costs within the Document the Plan Cost Center

8.3.8.3 Analysis/Findings

The costs of documenting the plan are dependent on the requirements of the respective Rules and the size of the planning effort. Multi-forest planning will likely have greater costs, since they may save on producing one EIS for the multi-forest effort but will still produce plan documentations for each of the individual forest involved in the multi-forest effort.

8.3.8.4 Comparison between the Rules

This Cost Center represents approximately 3% of the total cost of the 2000 Rule, and approximately 3% of the total cost of the Proposed Rule when considering the expected average.

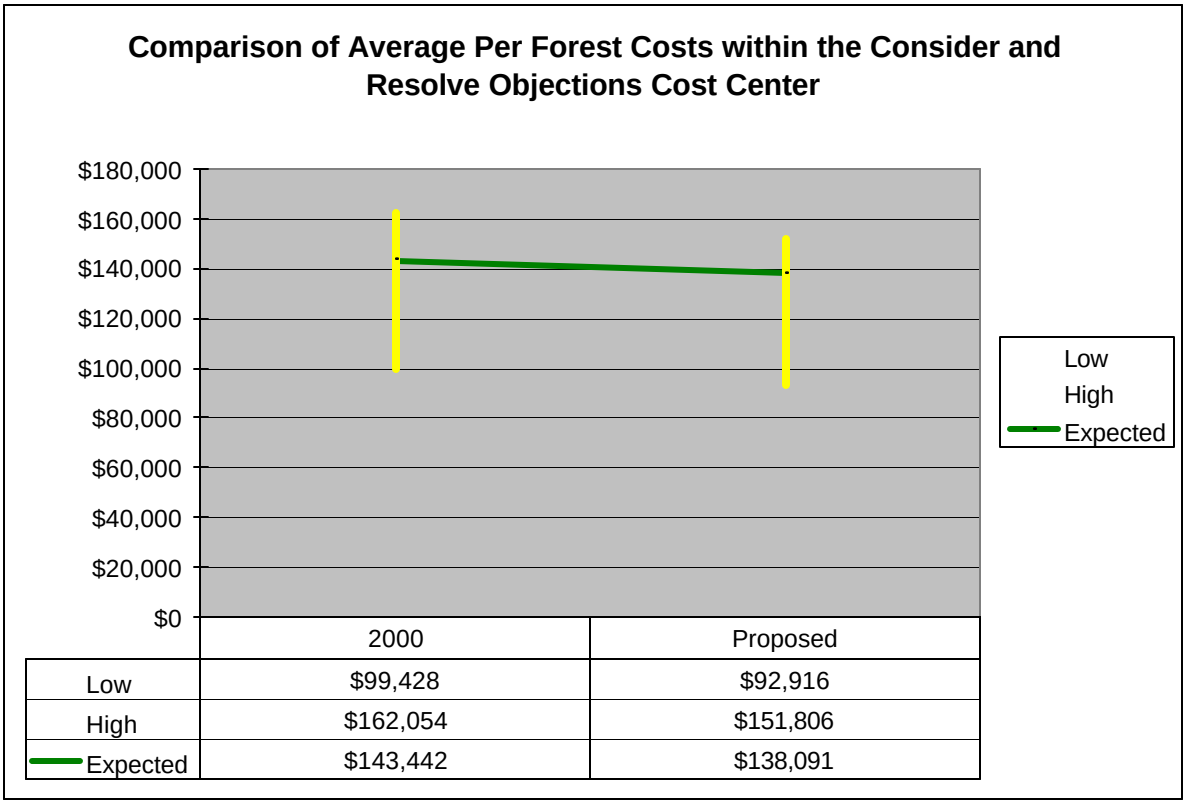
The 2000 Rule requires the production of a much greater variety of plan documents than the Proposed Rule does; hence the costs are slightly greater for the 2000 Rule.

8.3.9 Consider and Resolve Objections

8.3.9.1 Context

Consider and Resolve Objections activities provide the public the opportunity to object to proposed plan direction and to resolve objections to the proposed revised plan. These activities occur post-NOA.

8.3.9.2 Results



	2000	Proposed
Low	$99,428	$92,916
High	$162,054	$151,806
Expected	$143,442	$138,091

Figure 20. Comparison of costs within the Consider and Resolve Objections Cost Center

8.3.9.3 Analysis/Findings

Costs in the *Consider and Resolve Objections* Cost Center are likely to vary dependent upon the intensity of public scrutiny of the planning effort.

Multi-forest planning efforts are likely to incur greater costs because of the larger area they cover and the potentially greater diversity of publics they must serve.

8.3.9.4 Comparison between the Rules

This Cost Center represents approximately 1% of the total cost of the 2000 Rule, and approximately 1% - 2% of the total cost of the Proposed Rule when considering the expected average.

The activities in this Cost Center are very similar between the two Rules; thus the costs are nearly identical.

8.4 Duration Estimates for Plan Revisions

When the task was undertaken to model and cost Plan Revisions under the 2000 and the Proposed Planning Rules, the Core Team was asked to focus on the total effort called for by both Rules, rather than on the duration of Plan Revisions at the Forest scale. Naturally there is interest in what the duration of a Plan Revision would be under the Rules; unfortunately the cost surveys utilized to determine revision costs were not designed with that goal in mind. However the cost surveys do contain valuable information that can be utilized with other data to help estimate the duration of revision under both Rules.

8.4.1 Method for Determining Duration

From the cost surveys, the total effort of high-level activities was estimated as the percentage that the forest IDT leader participated in those high level activities. It was assumed that the IDT leader was basically 100% dedicated to the effort, so that her/his percentage would be a barometer of the amount of the total effort representing the elapsed time to accomplish an activity (i.e. if an activity required 1000 days of effort and the IDT leader was 5% of that total effort, then the elapsed time for that activity is 50 days: 1000 days X .05 = 50 Days). For all coarse or high-level activities in both Rules the high, low, and expected effort by the IDT leader was used.

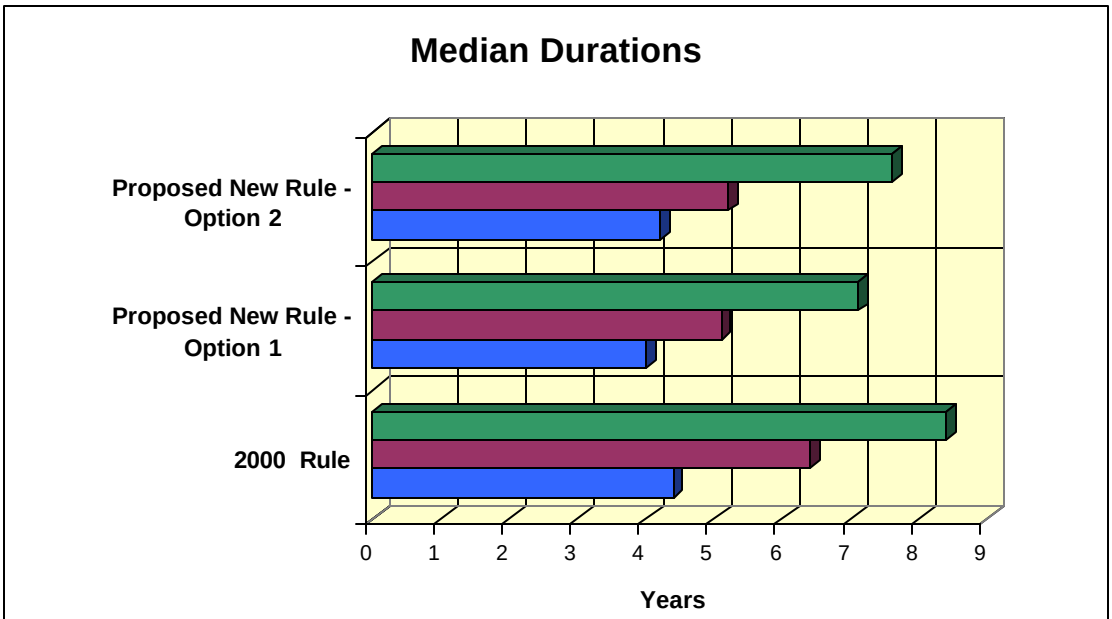
Using this information, the median high, median low, and median expected elapsed times were determined for each coarse or high-level activity, in order to estimate both the range (low to high) and expected duration within that range for those activities. The sum of the duration for each coarse or high-level activity was then calculated, and days for add-on time (training/holidays/sick leave/annual leave/etc.) and interruption time (days spent on other projects) were added to the totals. The add-on time was estimated to be approximately 51 days per year, while the interruption time was calculated as exponentially increasing as the revision progressed (i.e. the longer the revision took the more the interruption time increased – the rough approximation used to estimate this was the sum of the median low duration days increased by 5%, the sum of the median high days increased by 20%, and the sum of the median expected days increased by 10%). Once all the days were summed for all coarse or high-level activities, they were then divided by 261 days (a standard government working year) to determine the total estimated elapsed years for a Plan Revision under both Rules.

8.4.2 Duration Results

For the 2000 Planning Rule the expected range for conducting a Plan Revision is between 4 ½ (median low) and 8 ½ (median high) years with a median expected duration of 6 ½ years. For the Proposed Planning Rule (Ecological Sustainability Option 1), the range is between 4 and 7 years with an expected duration of 5 years, while for Ecological Sustainability Option 2 the range is between 4 ¼ and 7 ½ years with and expected duration of 5 ¼ years. See Figures 21 and 22 for a display of the median expected duration of Plan Revisions under both Rules.

The elapsed times presented above represent the expected median duration of conducting Plan Revisions at the Forest scale. Not contained within these timelines are Regional Office and Science activities. It was felt that these activities would occur concurrently with, prior to, or post the Forest activities.

Caution must be used in viewing Figures 21 and 22. Median values were used to calculate high, low, and expected durations for each coarse or high-level activity, which means that half the survey forest data fell above the median and half fell below the median. Where any particular forest will fall in the determination of Plan Revision elapsed time depends on the conditions they face. The ranges and expected durations presented below cover the "typical" conditions a forest might find itself in, but is not meant to represent all forests, as many forests will likely fall outside the bounds of what are "typical" conditions. A forest could fall below the median low point of the range if for instance they had little to no controversial issues or had all of their data in place before entering into revision, or a forest could fall above the median high point of the range if they had many controversial issues or had to collect and interpret much new data. However, most forests should fall within the range.



	2000 Rule	Proposed New Rule - Option 1	Proposed New Rule - Option 2
Median High Duration	8.4	7.1	7.6
Median Expected Duration	6.4	5.1	5.2
Median Low Duration	4.4	4	4.2

Figure 21. Median Durations

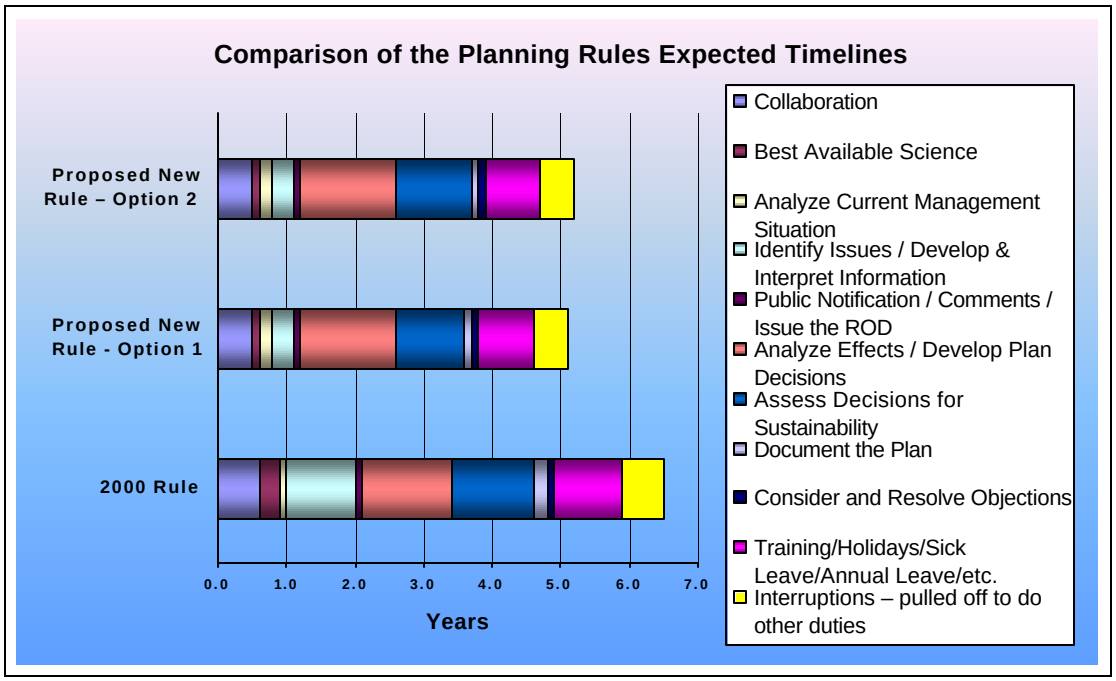


Figure 22. Comparisons of the Planning Rule Expected Timelines

8.4.3 Plan Revision Duration Comparisons between the two Rules

A comparative look at the high-level activities between the Rules, shows similarities in elapsed time for collaboration activities, public notification and comment periods, and for considering and resolving objections. This is not too surprising as the Rules are fairly similar in these areas.

The 2000 Rule has a much greater duration spent in applying the best available science than the Proposed Rule, as there is much less discretion in applying these activities by the Responsible Official for the 2000 Rule than for the Proposed Rule.

Developing and interpreting relevant information was a much more involved process in the 2000 Rule so this set of activities occur under a longer duration in the 2000 Rule than the Proposed Rule.

While there were differences in the elapsed time ranges for activities involved in analyzing effects and developing plan decisions (the 2000 Rule has lower elapsed time for both the median low and median high endpoints of the range), the expected median duration of those activities was essentially the same. Since these activities are more similar for both Rules than they are different this was not an unexpected result.

Forest activities involved with assessing sustainability were clearer in the Proposed Rule than in the 2000 Rule, which is reflected in lower duration to carry out the sustainability activities in the Proposed Rule. Ecological Sustainability Option 2 of the Proposed Rule included more broad-scale assessment type Forest activities than did Ecological Sustainability Option 1, so it is not surprising that it takes longer to complete Ecological Sustainability Option 2 activities.

On the surface, this appears to be a contradiction with the *Assess Decisions for Sustainability* Cost Center cost figures, which show both Ecological Sustainability Options of the Proposed Rule as having higher costs than the 2000 Rule. Much of the cost difference between the Rules was in which Cost Centers contained broad scale assessments (*Assess Decisions for Sustainability* Cost Center for the Proposed Rule and *Identify Issues/Develop Information* Cost Center for the 2000 Rule). The majority of these broad scale assessments were Regional activities, and since the estimation of duration was based only on Forest activities, this accounts for the shorter duration of the sustainability activities for the Proposed Rule. Regional activities associated with conducting broad scale assessments are assumed to occur prior to the forest's need for the associated data so are not part of the calculation of duration. Forest activities that supplement regional broad scale assessments are part of the effort estimates used to calculate duration. The Forest activities associated with assessing sustainability required less effort for the Proposed Rule than for the 2000 Rule, resulting in both Ecological Sustainability Options having a shorter duration than the 2000 Rule.

Documenting the plan was a much more involved process in the 2000 Rule, with a wide variety of documents that had to be produced. In the Proposed Rule this documentation requirement was much reduced, resulting in less duration for this set of activities.

Finally, as expected, activities associated with issue identification, information development and interpretation, plan effects analysis, plan decisions development, and sustainability analysis represented over 70% of the elapsed time of the Plan Revision activities (over 50% of the total elapsed time, inclusive of add-on and interruption time) for both the 2000 Rule and Proposed Rule. If the goal is to shorten the duration and reduce the cost of a Plan Revision, taking a close look at activities in these areas would seem to be most promising. On the other hand, activities associated with collaboration and applying best available science, while often cited as contributing to lengthened planning timeframes, were less than 15% of the total elapsed time for both Rules.

8.4.4 Cautions

As stated previously, the duration elapsed times were calculated based on Forest scale activities, not Regional Office and Science activities, which would occur concurrently with (i.e. science peer reviews), prior to (i.e. regional broad-scale assessments), or post (i.e. resolving of objections by the Regional Office) the Forest activities. If these activities occur when they are scheduled they should not affect the Forest timelines for completing revision. Experience has shown however that the potential exists for these activities to not to happen as scheduled, and thus there is strong potential for affecting (lengthening) the expected revision timelines. If data is not in place before revision starts, or regional broad-scale assessments are not conducted with Forest revision scheduling in mind, or science peer reviews and consistency reviews take longer than anticipated, or any number of other factors that come into play throughout the life of a revision, the potential always exists for increasing the expected duration of revision presented in this paper.

8.5 Insights Gained from the Cost Study

The cost study is the first of its kind in the Forest Service to apply a business process analysis modeling approach to the estimation of the cost of land management planning under NFMA regulations. The business analysis approach provided the basis for a high degree of analytical rigor to the cost study.

The study capitalized on the expertise of field level planning experts in each Region of the Forest Service to determine costs. These planning experts from representative forests worked locally with their resource specialists to estimate costs of planning under both the 2000 and Proposed Rules. The costs of the two Rules are considered substantial but realistic by those who worked on the cost study; given the requirements of the Rules and recent Forest Service experiences in land management planning.

There are clear opportunities to reduce the costs of planning associated with the Proposed Rule if the Forest, Grassland, or Prairie Supervisor is deeply involved in the planning process. The Responsible Official has flexibility to determine which issues are pertinent, what science is appropriate, which species need detailed assessments, what new information is necessary, the depth and rigor of analysis necessary to support the decisions to be made, and how detailed a monitoring strategy is needed. Through carefully applying the flexibility and control provided in the Proposed Rule, the Responsible Official could dramatically streamline the planning process.

8.5.1 Observations

The Proposed Rule is a quarter to nearly a third less costly than the 2000 Rule. The costs of planning under the 1982 Rule were not estimated in this study. This precludes directly comparing the costs between the 1982 and Proposed Rules. However, it is the opinion of the authors that the cost estimates for the Proposed Rule are similar in magnitude to the cost of recent Plan Revision efforts under the 1982 Rule.

The scope of planning under the Rules (and the resultant business models) is often different and frequently broader than the scope of activities funded by the Planning budget line-item (i.e., NFPN). For example, inventories are critical to planning but serve other equally important purposes. The costs of some inventories, and many similar activities, are included in this cost study but are typically funded by budget line-items other than NFPN. Numerous differences such as this make direct comparisons between planning costs estimated by this cost study and planning costs defined in a budgetary sense extremely difficult.

A number of factors influenced the cost study. Two key factors for all forests involved in the cost study were the uncertainty of planning rule requirements and the lack of agency experience in new requirements such as science reviews. When completing the cost survey, it is likely that the planning experts provided relatively higher cost estimates for those planning activities that they considered unclear or new.

The forests that participated in the survey represented the range of conditions found throughout the agency, with the variability in cost estimates between forests largely attributed to the unique conditions facing each forest. These conditions include local socio-political considerations, completeness and currency of data, Line Officer discretion, complexity of issues, size of Forest (acreage), size of effort (single vs. multi-Forest revision effort), and forest budget. There are numerous more subtle factors that influence the cost of planning for each forest but it was not possible to directly account for these factors in the cost estimates.

It is likely that the cost study participants were influenced by recent appeal and court decisions as well as public expectations. The costs of the analysis components of both Rules are high because the cost study participants did not believe that doing anything less than an extremely rigorous analysis would the supported within the agency or in court, even though the Rules allow the Responsible Official the flexibility to tailor the analysis to the issues and local circumstances.

It is interesting to note that the cost estimates denoted as "most likely" tend to be the high estimates for the 2000 Rule (with somewhat wider low-high ranges) while the Proposed Rule is characterized by "most likely" estimates at the mid-point with much narrower low-high ranges. This may demonstrate higher degrees of confidence by the cost study participants in estimates for the Proposed Rule compared to the 2000 Rule.

The planning experts, through completion of the cost survey, made it clear that few forests are entirely prepared to undertake Plan Revisions in terms of human resources. There are essential skills missing on most of the forests. Skills that were most often cited as missing were: sociologists, economists, analysts, and ecologists. Lack of these types of skills will be an issue given the emphasis on sustainability (ecological, social, economic) analysis in both Rules. Cited less often as missing skills, but no less important, are the need for personnel who have NEPA coordination skills, writer/editor skills and plan record administrative assistant (para-legal) skills.

Contracting for either missing or specialized skills is important to the forests' ability to complete Plan Revisions. The cost study participants identified contracting needs in the areas of collaboration, broad-scale assessments, effects analysis, and content analysis.

The costs of Plan Revision are highly variable, with the costs of different activities dependent upon conditions unique to each Forest. The concept of unit cost budgeting, one size fits all, for Plan Revision would be inappropriate. Instead a bottom-up approach to budgeting (like the Forest Service's current BFES budgeting system) would allow the forests the flexibility to set budget needs to fit their unique conditions.

The median expected duration of planning under the Proposed Rule is nearly a year and a half less than would be the case under the 2000 Rule (5 years for the Proposed Rule vs. 6 ½ years for the 2000 Rule). The actual duration of planning will depend on the conditions a forest faces while in the planning process.

8.5.2 How Costs of Planning Might be Reduced

Large disparities between High and Low estimates reflect uncertainty about what to do or how to do it. It is often said that the first round of planning was an effort of "building the bicycle while riding it". The uncertainty we see among experienced planners about what it will take to comply with the Proposed Rule, particularly sustainability, indicates the agency could be headed down the same path. Clarity and definitiveness about performance and expectations for Plan Revisions could pay huge dividends.

An important component for successful implementation of a new planning rule is the agency directive system. Forest Service manual and handbook direction will provide additional details to support implementation of a new rule. If the agency were to add substantially to the requirements of planning in the directives system beyond what is already provided in the Rules, without streamlining the analytical/decision process, the cost of planning could be substantially higher than estimated in the cost study.

Having data in place and current would significantly reduce the cost of Plan Revisions. The collection of data for broad-scale assessments and local analyses are costly endeavors, so reducing the data collected and maintained up to date to that necessary to revise Plans would reduce costs.

Providing greater discretion to the Responsible Official should further reduce costs. The Proposed Rule is less costly than the 2000 Rule in large part due to the flexibility given to the Responsible Official in carrying out many of the rule activities. The more active the Responsible Official is in the revision process in exerting management control, the less costly revisions should be.

The travel costs of Planning teams are substantial. Substituting computer-based networking and video conferencing offer opportunities to significantly reduce these costs. The printing and publication costs for Plan documents are also substantial. More documentation of plans on CD-ROM's and on the web would dramatically reduce printing costs. This would likewise increase the public availability of these documents.

The cost of planning depends not only on WHAT is done (accomplishing those activities prescribed by the Rule) but also HOW the work is done. It may be that the agency has achieved as much cost reduction as possible by rewriting the Rule. But significant additional cost reductions are likely through improved management control, increasing labor productivity, training, information sharing technologies, and lessons-learned programs. For example, saving just 1% of the time it takes to do a Plan Revision would save nearly $150,000 dollars – this is equivalent to saving less than 5 minutes per day throughout the course of a Plan Revision.

8.6 Terminology & Definitions

Activity

An activity is a discrete action called for by the explicit text of a planning rule.

Activity Based Costing

Activity Based Costing (ABC) simply derives the total cost of a process from the individual costs of each activity that comprises the process. In fact, indirect and add-on costs must be added to the activity costs to derive the total cost.

Cost Center

Cost Centers are groupings of activities related to a common theme and whose costs can be considered a "package". Cost Centers for this effort were defined in terms of milestone planning events or types of activities (e.g., issuance of the Notice of Intent, utilizing the best available science, etc.). The costs of the activities that compose the Cost Centers are generally those represented at the coarse level (high level) of planning, with occasional lower level planning activity costs represented as well where appropriate to the theme of the Cost Center.

Duration

Duration refers to the timeline within which an activity may be completed. For example, if it took 100 calendar days to complete a rule task and 5 people worked on that task (2 for the full 100 days, 1 for 75 days, 1 for 50 days, and 1 for 25 days), the duration of that task was the 100 days the 5 people needed to completed their combined work on that task. The effort would be higher.

Effort

Effort is the total amount of work required to complete an activity. For example, if a task took 100 calendar days to complete and 5 people worked on that task (2 for the full 100 days, 1 for 75 days, 1 for 50 days, and 1 for 25 days), the effort of that task is 350 days of combined work that the 5 people working on the task exerted to complete the task.

Expected Effort

The survey participants designated one point from the range (High, Low or Mid-Point) as the likely or *Expected Effort* estimate.

Forest Activity Cost

Forest Activity Costs were derived by: combining the estimated person-days of effort for each coarse-level activity, the distribution of skill-types required (identified by pay-schedule grade level in the effort survey) to complete the activity, and the applicable loaded daily rates. Simply put, *Activity Costs* were estimated by multiplying person-days of *effort* to complete an activity by the applicable *loaded daily rate.*

High Estimate of Effort

The *High Estimate of Effort* represents the largest number of person-days of effort required to complete an activity based on the unique conditions that apply to a Forest. Each survey participant was asked to provide this estimate taking into account the conditions that apply to their Forest (or group of Forests). Estimates of effort for Plan Revision activities carried out by the Regional Office and those involving the use of Science were derived in an identical manner.

Indirect and Add-On Costs

Indirect and Add-On Costs include a variety of indirect costs that were estimated as being proportional to total activity cost. These include indirect costs (asset and administrative cost pools, approximately 20% add-on), leadership costs (leadership team, approximately 3% add-on), travel costs (per diem, lodging and travel costs, 2-10% add-on), and other add-ons (contracts, transfer-of-station, OGC costs, printing costs).

Loaded Daily Rate

The *loaded daily rate* is the total per-day cost to the government for each Grade of labor, essentially salary plus benefits. Specifically, it is the annual salary rate (Step 5) from the General Schedule (adjusted as appropriate for locality pay and cost of living allowances) plus employer-contributed benefits (retirement, insurance, TSP) divided by net working days in a year (261 less holidays and leave).

Low Estimate of Effort

The *Low Estimate of Effort* represents the smallest number of person-days of effort required to complete an activity based on the unique conditions that apply to a Forest. Each survey participant was asked to provide this estimate taking into account the conditions that apply to their Forest (or group of Forests). Estimates of effort for Plan Revision activities carried out by the Regional Office and those involving the use of Science were derived in an identical manner.

Regional Activity Costs

Regional Activity Costs are costs associated with Plan Revision activities conducted by the Regional Office. These activities primarily include conducting of broad-scale assessments and considering and resolving objections. In order to make them commensurable on a "per Forest" basis, these regional costs are a Forest's proportionate share (i.e., the total cost of regional activities is typically shared among several Forests) necessary to complete that Forest's planning effort. They were estimated using methods identical to other *Activity Costs.*

Science Activity Costs

Science Activity Costs are associated with activities involving the use of the "best available science" in Plan Revision. They were derived separate from the Forest *Activity Costs* since the effort survey did not include estimates for these activities (they were estimated separately by the Forest Service Research member of the Implementation Team). These activities primarily include conducting independent scientific peer reviews, establishing and utilizing science advisory boards and workgroups, conducting science consistency reviews, documenting the use of science in planning, and acknowledging risk and uncertainty. They were estimated using methods identical to other *Activity Costs.*

Total Cost

Total cost is the sum of *activity* plus *Indirect and Add-On Costs.*

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APPENDICES

WORK PRODUCTS AND DELIVERABLES

A BUSINESS EVALUATION OF THE 2000 AND PROPOSED NFMA PLANNING RULES

USDA FOREST SERVICE/IMI/BUSINESSGENETICS CORE TEAM

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9 APPENDIX A – THE xBML[SM] BUSINESS MODELS

Table A1. 2000 Planning Rule xBML[SM] Business Models

Business Model	*Link*	*Description*
WHAT Model, Version 3.0 (PDF document)	www_e-link	Represents the interpretation and graphical depiction of business requirements / activities set forth in the 2000 Planning Rule. Business activities from the models were used in the 2000 Rule ABC Estimation Survey and were the basis for deriving Plan Revisions cost estimates. Not all activities (e.g., lowest level detail) were included in the survey.
Process Flow Model, Version 3.0 (PDF document)	www_e-link	Represents a process flow of the business activities. Business activities from the activity models were used in the 2000 Rule ABC Estimation Survey. The "high-level" or coarse-level activities are a process flow diagram to illustrate paths for completing Plan Revisions.
HOW Model Version, 3.0 (PDF document)	www_e-link	Represents a process flow of the business activities and graphical depiction of information requirements contained in the 2000 Planning Rule. Business activities from the activity models were used in the ABC Estimation Survey. The "high-level" or coarse-level activities are a process flow diagram to illustrate potential iteration paths for completing Plan Revisions.
WHO Model (PDF document)	www_e-link	Represents the list of skills necessary to complete the activities described in the business process model for the 2000 Rule. The Costing Teams used this list of skill to estimate the costs of the rule activities. The skill list was modified as needed to fit forest conditions. The distribution of the time each of the skills were involved in the activity (e.g. by percent) was also estimated.
Rule Text Cross Reference (PDF document)	www_e-link	Each of the business models produced for the 2000 Planning Rule included a cross-reference between the business activity (numbers) and rule text. This cross-reference provides a direct correspondence between the models and the rule text.

Table A2. Proposed Planning Rule xBML^{SM} Business Models

Business Model	*Link*	*Description*
WHAT and HOW - Aug 1 2001 Version (PDF document)	www_e-link	Represents the interpretation and graphical depiction of business requirements / activities set forth in the draft Proposed Planning Rule(s). This model set included two options for Ecological Sustainability and was the context for a "policy level" review to determine the "perceived agency capability" to implement the Proposed Rule.
WHAT Model V 1.0 - Oct 1 2001 Version (PDF document)	www_e-link	Represents the interpretation and graphical depiction of business requirements / activities set forth in the draft Proposed Planning Rule(s). activities are a process flow diagram to illustrate paths for completing Plan Revisions. Business activities identified in this model set were used in the Proposed Rule ABC Estimation Survey, and were the basis for deriving cost estimates. Not all activities represented in the models (e.g., lowest level detail) were used in the survey. Only one Ecological Sustainability Option was represented.
HOW Model V 1.0 - Oct 1 2001 Version (Word document)	www_e-link	Represents a process flow of the business activities and graphical depiction of information requirements set forth in the Proposed Rule. Business activities identified in the activity models were used in the Proposed Rule ABC Estimation Survey. The "high-level" or coarse-level activities are a process flow diagram of business process dimensions such as information requirements and required skills and illustrate paths for completing Plan Revisions.
WHO Model (PDF document)	www_e-link	Represents the list of skills necessary to complete the activities described in the business process model for the Proposed Rule. The Costing Teams used this list of skill to estimate the costs of the rule activities. The skill list was modified as needed to fit forest conditions. The distribution of the time each of the skills were involved in the activity (e.g. by percent) was also estimated.
WHAT Model V 1.1 - Jan 10 2002 Version (PDF document)	www_e-link	Represents the interpretation and graphical depiction of business requirements / activities set forth in the draft Proposed Planning Rule(s). Business activities identified in this model set were used in the Proposed Rule ABC Estimation Survey – Ecological Sustainability Option 2 Survey, and were the basis for deriving cost estimates. Not all activities represented in the models (e.g., lowest level detail) were used in the survey. This models were also used for a "policy level" review of Ecological Sustainability Option 2 to determine the "perceived agency capability" to implement the Proposed Rule.

10 APPENDIX B – IMPLEMENTABILITY ANALYSIS

Table B1. Implementability Analyses

Business Model	*Link*	*Description*
2000 Rule Implementation Review Report (Word Document)	www_e-link	Represents a summary of workshop findings. Workshop results were formally communicated to the Regional Planning Directors and the Director of EMC in April/May, 2001.
Overview Proposed Rule Implementability Review Results - 01Aug 2001 (PowerPoint Presentation)	www_e-link	Represents a summary of workshop findings. Workshop results were presented to the Directives Team during their drafting of the Proposed Planning Rule Directives.
Proposed Rule Implementability Review - 01Aug2001 DETAIL (PDF document)	www_e-link	Supplements the PowerPoint Presentation with detailed findings captured during workshop discussions. Workshop results were presented to the Directives Team during their drafting of the Proposed Planning Rule Directives.
Proposed Rule Implementation Review - Option 2 (Excel Spreadsheet)	www_e-link	Reflects detailed findings captured during workshop discussions. Workshop results were presented to the Directives Team during their drafting of the Proposed Planning Rule Directives.

11 APPENDIX C – COST ESTIMATION METHODS

Table C1. Cost Methods and Interim Documents

Business Model	*Link*	*Description*
Costing Methods v 5.0 (Word Document)	www_e-link	Represents final ABC Method, approach and related assumptions for Forest Level Costs of Plan Revisions. Established the methods to estimate effort and skill requirements.
Regional Cost Compilation – 21 Feb 2002 (Word Document)	www_e-link	A compilation of the activities in the 2000 and Proposed Rule models, which are inherently Regional Office activities in support of Plan Revisions. Served as the primary source for regional activity costs. The cost estimates represent proportionate share of the regional activities to the forest/forest groupings completing the survey.
Science Cost Estimates (Word Document)	www_e-link	Contains the detailed costs related to Science supported activities at the forest level. Provides the basis for identifying science activity cost that do not occur at the forest level.
2000 Rule Survey - Version 1.3. (Excel Spreadsheet)	www_e-link	Representative pages of the ABC Survey for the 2000 Rule. Served as the primary means by which Plan Revision information at the forest level was collected for the 2000 Rule.
2001 Rule Survey - Version 1.0 (Excel Spreadsheet)	www_e-link	Representative pages of the ABC Survey for the Proposed Rule with Ecological Sustainability Option 1. Served as the primary means by which Plan Revision information at the forest level was collected for the Proposed Rule with Ecological Sustainability Option 1.
Sustainability 2nd Option Survey (Excel Spreadsheet)	www_e-link	Representative pages of the ABC Survey for the Proposed Rule with Ecological Sustainability Option 2. Served as the primary means by which Plan Revision information at the forest level was collected for the Proposed Rule with Ecological Sustainability Option 2.
Loaded Daily Rates (PDF Document)	www_e-link	Represents the total cost to government per person day. Used to calculate Forest and Regional Activity Costs based on total person days of effort.
Cost Database v 3.0 (Access Database – WinZip format)	www_e-link	Raw cost database for the cost/effort survey.

12 APPENDIX D – ORGANIZATIONAL PROFILES

USDA FS Inventory and Monitoring Institute (IMI)
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The Inventory & Monitoring Institute is a Forest Service nationally chartered organization, guided by a Board of Directors.

Institute Mission

The mission of the Inventory and Monitoring Institute is to provide technical leadership and service in support of agency-wide collection, management and analysis of scientifically reliable social and ecological information used in ecosystem management.

Institute Scope

The scope of the Inventory and Monitoring Institute activity is focused on information flows needed to solve inventory, monitoring and planning problems at the national, regional, State and forest management unit scale. Information flow has Agency business requirements as a foundation and incorporates the components of information collection, classification, analysis, and management. The Institute will be proactive in providing international technical exchange within its mission.

The Institute will:

1) Facilitate the consistent implementation of national policy on inventory, monitoring and planning analysis at the regional, State and forest management unit scale.
2) Facilitate the understanding and application of information business requirements, collection, classification, analysis, and management technologies and knowledge from research and development;
3) Focus on improving internal Forest Service information compatibility; and
4) Seek increased collaboration with external agencies and international efforts.

For further inquiries regarding the USDA FS Inventory and Monitoring Institute please contact Tom Hoekstra (970-295-5710), Matt Turner (970-295-5722) or Greg Alward (970-295-5714).

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BusinessGenetics mission is to assist organizations with Business Simplification and Business Process Analysis efforts. The organization has developed industry leading Intellectual Property (IP) to support Business Simplification, which has been successfully used with many Government and Private Sector clients. The IP is based on sound Business Engineering principals and has been significantly refined to provide clients with an easy to use approach, which guarantees high quality deliverables in a very short time frame. The approach is based upon over 50 years of applied research and has won accolades from clients and academics alike.

BusinessGenetics is a subsidiary of Affinity Solutions, which currently consists of the following high-technology organizations:

- Momentum Resourcing – A leading IT staff augmentation company
- BusinessGenetics – A management consultancy focusing on business simplification, using a breakthrough business modeling language (xBML^{SM})
- Insight Resourcing – An executive search and IT recruiting firm.

The Group has also recently entered into a strategic alliance with Management and Engineering Technologies International, Inc. (METI), an 8(a) organization which has a solid reputation as being a significant provider of technology related services to government markets. This capability also ensures a combined total staff compliment of over 120, upon which both organizations can draw.

Some of the clients that have benefited from the Group's services include:

- QWEST
- USDA Forest Service
- JDEdwards & Co.
- IBM
- AT&T
- Xcel Energy
- Lucent
- Finale
- De Beers
- Colgate Palmolive
- LandNetworks
- USDI National Park Service
- StorageTek
- KPMG
- Microsoft
- LandInfo
- Ibelay/ipArchive
- Sun Microsystems
- Requisite
- Telcordia
- MCI
- Gambro
- On Command

The Group has also fostered close ties with the Daniels College of Business at Denver University and is collaborating on the joint publication of BusinessGenetics' breakthrough xBML? technology. Future plans include continued national expansion with managed growth.

For further inquiries regarding the Affinity Solutions group, or any of the Group organizations, please contact Cedric Tyler or Ann Morrison (720.266.1024).

13 APPENDIX E – WHAT IS XBML[SM]

Table E1. xBML[SM] Documentation

Business Model	*Link*	*Description*
BusinessGenetics Business Modeling xBML V5.0 – 29 January 2001 (Word Document)	www_e-link	To improve productivity within a business requires that we understand the business, but the complexity of most businesses makes this difficult. *Business modeling* provides a powerful approach to address this issue. Unfortunately, current business modeling approaches are not sufficient to formally, rigorously, and completely represent business operations. xBML™ (*eXtended Business Modeling Language*[1]), coupled with formal methods for developing and using business models, provides these characteristics, delivering the means to develop complete and precise models of business operations to support business improvement initiatives.

[1] "xBML™" and "BCF™" are registered trademarks and the property of BusinessGenetics, Inc.