An Assessment of Indian Forests and Forest Management in the United States

November 1993

By the Indian Forest Management Assessment Team
For the Intertribal Timber Council

For more information regarding the report *An Assessment of Indian Forests and Forest Management in the United States*, contact the Program Manager at the following address: Program Manager, Intertribal Timber Council, 4370 NE Halsey Street, Portland, Oregon, 97213; phone (503) 282-4296: fax (503) 282-1274.

AUTHORS

photo by: Michael Moreland

John Gordon, Ph.D., Chairman of IFMAT; Pinchot Professor and former Dean of the Yale School of Forestry and Environmental Studies; member, Scientific Panel on Late-Successional Forest Ecosystems; former Head, Department of Forest Science, College of Forestry, Oregon State University; numerous chair positions including the 1984 Society of American Foresters' Old Growth Task Force and National Research Council's Committee on Forestry Research. Expertise includes tree physiology, physiological ecology, research planning, management.

photo by: Mary Randlett

Jerry Franklin, Ph.D., member of IFMAT; Professor of Ecosystems Analysis, College of Forest Resources, University of Washington; member, Scientific Panel on Late-Successional Forest Ecosystems; member, Forest Ecosystem Management Assessment Team (FEMAT); former Research Scientist and Chief Plant Ecologist, USDA Forest Service, Pacific Northwest Research Station; National Science Foundation Division of Ecosystem Studies Program; President, Ecological Society of America. Expertise includes New Forestry, old growth ecology, landscape ecology, silviculture.

K. Norman Johnson, Ph.D., member of IFMAT; Professor, Department of Forest Resources, College of Forestry, Oregon State University; member, Scientific Panel on Late-Successional Forest Ecosystems; member, Forest Ecosystem Management Assessment Team (FEMAT); developed and designed forest planning models including FORPLAN; former advisor to Governor of Oregon. Expertise includes forest management planning, harvest scheduling, policy analysis.

David Patton, Ph.D., member of IFMAT; Professor, Forest Wildlife Ecology, Department Chair and Associate Dean, School of Forestry, Northern Arizona University; former Project Leader and Principal Wildlife Biologist, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Arizona State University; recent author of a textbook on wildlife habitat relationships in forested ecosystems. Expertise includes wildlife ecology, range management.

Jim Sedell, Ph.D., member of IFMAT; Research Ecologist, USDA Forest Service Pacific Northwest Research Station; Professor, Department of Fisheries and Wildlife, Oregon State University (courtesy); member, National Research Council, National Academy of Science Committee on Forestry Research; member, Forest Ecosystem Management Assessment Team (FEMAT); co-leader for joint Forest Service--BLM PacFish effort to devise a fish and watershed conservation strategy for all anadromous fish on federal lands. Expertise includes stream ecology, fish habitat management, ecological history.

John Sessions, Ph.D., Vice Chairman of IFMAT; Professor, Department of Forest Engineering, College of Forestry, Oregon State University; Chairman, International Union of Forestry Research Organizations' Group on Forest Operations in Mountainous Terrain; former manager of one of the world's largest logging operations; developed and designed forest management planning model SNAP. Expertise includes harvest planning, forest engineering, economics.

Ed Williston, B.S., member of IFMAT; Principal Officer, Ed Williston Associates, Inc., consultants to the forest-products industry; former manager of Product and Process Development for Softwood Lumber Division, Weyerhaeuser Co.; taught lumber manufacturing at the University of Washington and overseas. Expertise includes forest products manufacturing, marketing.

THE RESOURCE TEAM

The following individuals provided support and expertise to IFMAT, visited many reservations, and contributed valuable insights in IFMAT meetings and in preparation of this report.

Joyce Berry, Assistant Professor, Colorado State University, Fort Collins, CO. Expertise includes natural resource policy, human dimensions, social survey research.

Karen Gabriel, consulting biologist, Corvallis, OR. Expertise includes stream ecology, fisheries.

Debbie Cummings, forester, Oregon State University, Corvallis, OR. Expertise includes timber inventory, growth and yield, report preparation.

Cal Mukumoto, Senior member of Mukumoto Associates, Bend, OR. Expertise includes marketing, Indian forestry. Served as overall fiscal operations coordinator.

Sue Grainger, consulting forester, Corvallis, OR. Expertise includes reforestation, forestry.

Jim Spitz, consulting forester, Bend, OR. Expertise includes appraisal, Indian forestry.

ACKNOWLEDGEMENTS

IFMAT gratefully acknowledges the tribal governments who allowed us to visit their lands. We would especially like to acknowledge the tribal leaders, elders, and other tribal people who interpreted their forest and shared their concerns. We would also like to express our appreciation to the tribal and BIA employees who made time in their work day to discuss and explain their experiences at the many different reservations we visited. These include:

Alabama-Coushatta
Augustine
Cabazon
Cahuilla
Colville
Eastern Band of Cherokee
Flathead
Hoopa Valley
La Jollai
Lac du Flambeau
Leech Lake
Los Coyotes
Makah
Menominee
Mescalero Apache
Morongo
Mississippi Choctaw
Navajo
Nez Perce
Pala
Penobscot
Quinault
Red Lake
Santa Rosa
Santa Ysabel
Spokane
Swinomish
Tulalip
Warm Springs
White Earth
White Mountain Apache
Yakima
Zuni

We thank the Native Alaskan corporations who hosted our visit to Alaska: Ahtna, Inc.; Copper River Native Association; Doyon Corp.; Gana-a'Yoo Ltd.; Klukwan Forest Products, Inc.; Tanana Chiefs Conference, Inc.; Tlingit and Haida Central Council.

Our thanks is also extended to the BIA employees at the area offices that we visited, Portland, Phoenix, Navajo, Juneau and Minneapolis, and those at the Aberdeen, Albuquerque, Anadarko, Billings, Eastern, Muskogee and Sacramento who patiently answered our many queries. We also thank those at the Central Office of the BIA, Branch of Forest Resource Planning, National Interagency Fire Center, Geographic Data Service Center, the Office of American Indian Trust and the Administration for Native Americans, U.S. Department of Health and Human Services who helped us with our study.

Many, many other people spoke with us, provided data, analysis, and helped us understand Indian forests and forestry. Among these we wish to acknowledge:

Susan Bilo, Graduate Research Assistant, Colorado State University. Fort Collins, CO.

Jim Meteer, consulting forester. Superior Forest Systems. L'Anse, MI.

Ron Trosper, Northern Arizona University. Flagstaff, AZ.

White Earth Land Recovery Project. White Earth, MN.

Dine' C.A.R.E. Tsaile, AZ.

Quinault Allottees Association. Oakville, WA.

Stephen Beckman, Lewis and Clark College. Portland, OR.

Dennis Lynch, Colorado State University. Fort Collins, CO.

Stan Gregory, Professor, Department of Fish and Wildlife, Oregon State University. Corvallis, OR.

Don Sampson, Columbia Basin Fish and Wildlife Authority. Portland, OR.

Mark Philips, Political Analyst. Washington D.C.

James Sizemore, CPA. Portland, OR.

Carol Perry, Consulting editor. Corvallis, OR.

Gary Hanson, Washington Timberland Management Inc. Union WA.

Sam Radcliffe, George Banzoff Co. Milwaukee, WI.

Lloyd Irland, The Irland Group. Winthrop, Maine.

Jim Johnson, Department of Forestry, Virginia Technical Institute and State University. Blacksburg, VA.

Bob Simeone, Forestry Consultant. Eagle River, WI.

List of Abbreviations

ANCSA	Alaska Native Claims Settlement Act
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CFI	Continuous Forest Inventory
FTE	Full Time Equivalent
FY	Fiscal year
GIS	Geographic Information System
IFMAT	Indian Forest Management Assessment Team
ITC	Intertribal Timber Council
MBF	Thousand board-feet
MMBF	Million board-feet
NHPA	National Historic Preservation Act
NIFRMA	National Indian Forest Resources Management Act
P.L.	Public Law

CONTENTS

FIGURES

TABLES

EXECUTIVE SUMMARY

Introduction

Indian forests are vital to tribal communities. They are a source of employment and income and a setting for recreation. They provide habitat for fish and wildlife and sanctuaries for worship and religious ceremonies. They provide materials for shelter, fuel, canoes, clothing, housewares, native medicines and foods, artistic expression, and tribal forest-products enterprises.

Sixteen million acres on 214 reservations in 23 states are forested. Nearly half are timberland, and the rest woodland (forestland with less than 5% crown cover by commercial timber species). Management of these forests provides the backbone of economic activity in many locations. For instance, the BIA estimated that, in 1991, Indian forests and related programs generated over 465 million dollars and supported 40,000 jobs. Of this total, over 180 million dollars and 9,000 jobs benefited non-Indians in areas adjacent to reservations.

Moreover, Indians live with both the environmental and economic consequences of their forest management more intimately than most other people in the U.S. They directly experience the impacts of cutting practices, prescribed fire, grazing, and other potentially controversial activities. They often see the direct relationship between tribal revenue and the economic use of their forests.

The U.S. government has a trust responsibility for managing Indian forests--a responsibility largely carried out by the Bureau of Indian Affairs (BIA) with the involvement of tribal governments. Although the BIA has long contended with vacillating and vague federal policies toward Indian affairs, complex land-ownership patterns, and the inability to secure the resources necessary to meet its obligations, many dedicated BIA professionals have contributed significantly to Indian forest management.

Throughout the BIA's 80-year history, its administrators and other people and organizations have expressed concern that the Indian forestry program has been seriously understaffed and underfinanced. Over the past two decades, Congress, the Administration, and tribal governments have dedicated substantial resources to improving Indian forest management. Significant increases in Congressional appropriations have come about within the last 15 years. Yet concern about Indian forestry remains, shared by both Indian communities, whose well-being is often intimately tied to the health of their forest resources, and the BIA, which has expressed misgivings about its ability to provide necessary forest-management services.

In response to these concerns, the National Indian Forest Resources Management Act (NIFRMA), Title III, Public Law (P.L.) 101-630, directed the Secretary of the Interior, in consultation with the affected Indian tribes, to obtain an independent assessment of the status of Indian forest resources and their management. To meet this mandate, the Secretary contracted with the Intertribal Timber Council (ITC), which selected seven nationally recognized forestry experts to serve as an Indian Forest Management Assessment Team (IFMAT) (see pages i to iii for a description of the IFMAT team and the resource team that assisted it).

J. Franklin

Discussion on ponderosa pine management. White Mountain Apache Reservation

IFMAT's investigation targeted the following eight tasks stipulated for assessment in NIFRMA:

(A) An in-depth analysis of management practices on, and the level of funding for, specific Indian forestland compared with similar federal and private forestlands;

(B) A survey of the condition of Indian forestlands, including health and productivity levels;

(C) An evaluation of staffing patterns of forestry organizations of the BIA and of Indian tribes;

(D) An evaluation of procedures employed in timber-sale administration, including preparation, field supervision, and accountability for proceeds;

(E) An analysis of the potential for reducing or eliminating relevant administrative procedures, rules, and policies of the BIA consistent with the federal trust responsibility;

(F) A comprehensive review of the adequacy of Indian forestland management plans, including their compatibility with applicable tribal integrated resource management plans and their ability to meet tribal needs and priorities;

(G) An evaluation of the feasibility and desirability of establishing minimum standards against which the adequacy of the forestry programs of the BIA in fulfilling its trust responsibility to Indian tribes can be measured; and

(H) A recommendation of any reforms and increased funding levels necessary to bring Indian forestland management programs to a state-of-the-art condition.

J. Franklin

Makah Reservation

Discussion on woodland planning. Navajo Reservation

J. Franklin

As part of its charge, IFMAT also considered special management issues dealing with allotments, Alaska, other ownerships within Indian reservations, and off-reservation lands.

Over 2 years, IFMAT carried out its charge by (1) visiting 33 reservations with timber programs of varying sizes (Figure 1); (2) surveying (through a questionnaire) tribal communities and BIA staff about Indian forest issues; (3) conducting focus groups during reservation visits to further assess tribal perspectives about Indian forestry; (4) comparing forest management on Indian lands with that practiced on similar federal and private lands; (5) surveying reservations about staffing patterns of natural resource professionals other than foresters, and (6) visiting national, area, and agency offices of the BIA.

All photographs in this report are from IFMAT visits.

Findings

1) Tribal members emphasize different visions and goals for their forests than do BIA forestry employees.

- For example, tribal members value resource protection most. Yet BIA forestry employees place relatively less emphasis on these goals and more on the forest's economic benefits.
- The forest's scenic beauty is much more important to tribal members than to BIA forestry employees.
- Tribal members emphasize that an integrative, holistic approach be taken in managing all forest resources, recognizing a multiplicity of use and values. Through funding, staffing, and approach, the BIA has tended to emphasize commercial timber production.
- Both tribal members and BIA agree that better communication and understanding are required.
- Tribal members emphasize that Indian people should play the primary role in making decisions about their forests.

2) Generally, a small proportion of tribal members or BIA forestry employees believe that current resource management is good or excellent, but these results varied significantly by activity or resource.

- Less than 25% of tribal members rated management of the following activities or resources as good or excellent: grazing, recreation, water quality and quantity, nontimber forests products, tribal employment, creation of new enterprise, food gathering, spiritual values, visual quality, overall management, and protection from pollution, waste, poaching and trespassing.
- From 25 to 40% of tribal members rated management good or excellent for wildlife, fisheries, wood for tribal use, timber for sale or enterprise use, cultural site protection, and forest resource protection. Wood for tribal use and timber for sale or enterprise use scored the highest at 40%.
- In general, tribal members and BIA forestry employees were in greater agreement on management quality than on management goals, although differences in ratings of management quality showed up on a number of activities and resources.

3) The administrative relationship between the United States government and each tribal government is the key factor affecting the ability of tribes to achieve their forest management goals.

- The concept of trust responsibility in relation to the management of Indian forests has not been clearly defined in law or regulation, although draft trust standards exist for several forest resources and activities. Lack of definition contributes to poor communication between the BIA and the tribes and can make it difficult to evaluate the adequacy of forest management.
- Tribal governments have embraced the concept of self-determination and increasingly are assuming more of the forestry functions previously performed by the BIA. Parallel BIA and tribal lines of authority undermine the prospects for coordinated forest-resource planning and management, in which the suite of forest values of interest to the tribes--timber, water, fish, wildlife, range, and cultural resources--is considered in decision-making.

Flathead Reservation K. Gabriel

Indian logging crew. Yakima Reservation J. Franklin

- The BIA has had difficulty in providing Indians with the variety of technical assistance and management guidance needed for tribes to meet their goals.

- Placing trust oversight and technical assistance and management guidance in one federal agency--the BIA--has made it difficult to obtain impartial assessment of the quality of this assistance and guidance.

4) Indian forestry is seriously underfunded and understaffed compared with forestry on similar federal and private lands. Inventories, staffing, and budgets are inadequate for biodiversity assessments and for coordinated resource planning and management on Indian lands.

- Current funding for Indian forestry is only 63% of that for timber production for the National Forests, only 50% of that for timber production for private forestry in the Pacific Northwest, and only 35% of that for coordinated resource management for the National Forests.

- Foresters and engineers working on Indian lands are fewer in number and have greater workloads than their counterparts on National Forests. Professionally trained forest-road engineers are in especially short supply.

- The BIA forestry program is not adequately staffed to support coordinated resource planning and management. There are virtually no staff from specialties such as fisheries, wildlife, range, and cultural resources.

- The grade level for BIA foresters and technicians is lower than that for similar positions within the Forest Service or Bureau of Land Management (BLM). On average, the budget per person for BIA and tribal foresters and technicians is less than four/fifths that of their National Forest counterparts. Moreover, tribal and BIA foresters have significantly less access to continuing education than their Forest Service counterparts.

- The BIA and tribes are experiencing substantial problems in recruiting and retaining natural resource professionals, in part, because of lower pay, budgets, and benefits than comparable agencies.

- Indians have clearly stated that they would like more Indians managing their lands. Yet, relatively few Indians are in managerial positions within the Indian forestry program.

Patch cut for timber and wildlife. Penobscot Reservation K. Gabriel

5) Managers of Indian forests are practicing more ecosystem management now than in the past. That is, they have begun to shift from a focus on producing commodities to one on maintaining ecological processes critical to sustaining forests.

- Despite funding and staffing difficulties, many Indian forests are places of experimentation and innovation. Some of the most highly developed uneven-aged management anywhere is found on Indian forestlands.

- Timber management practices on Indian forests are generally comparable to those on the National Forests with some qualifications:

  Uneven-aged management has been more widely used on Indian forests than on the National Forests, although the National Forests are now rediscovering uneven-aged management.

  In general, natural regeneration is relied upon for reforestation more on Indian lands than on the National Forests reflecting, in part, the heavier use of uneven-aged management in Indian forestry.

  Even-aged management with clearcutting is used extensively on Indian forests on the west-side of the Cascades in the Pacific Northwest and also in the aspen stands of the Lake States. Clearcutting is also used in mixed-conifer forests of the Intermountain West in stands badly damaged by insects and disease. These practices are similar to those on National Forests and private lands in these areas.

  In addition, even-aged management with shelterwood techniques is employed on Indian forests and the National Forests in many regions.

  The retention of forest structures at regeneration harvest, such as snags, down logs, and wildlife trees and patches, is being incorporated in forest practices on Indian lands somewhat faster than is occurring on private land, but not as rapidly as on the National Forests.

  Recent plantation survival on Indian lands approaches that on the National Forests. Indian lands, though, have a proportionately larger reforestation backlog than do the National Forests. Mechanical control of competing vegetation predominates on both Indian lands and the National Forests while chemical control predominates on private land.

  Harvest practices, fire suppression, and lack of development funds have all contributed to a buildup of dense stands on Indian forests. Many acres would benefit from release and thinning in terms of improved growth and reduced chance of catastrophic loss. This thinning backlog is proportionately larger than that of the National Forests.

  Silvicultural prescriptions on Indian lands, which guide stand treatments, are sometimes less well developed and provide less justification for treatment choices than on the National Forests.

- Management of roads, water, fisheries, wildlife, and grazing is seriously deficient compared with that on the National Forests (as discussed below).

- Tribes and the BIA lack sufficient access to research-based information tailored to their needs. Many of the complex and often unique forest-management issues on Indian lands will require research before they can be resolved.

6) The health and productivity of Indian forests are mixed, and vary by forest type and geographic location.

- Ponderosa pine forests, the most widespread commercial forest type on Indian lands, are generally in relatively good ecological condition. Ecological concerns on these forests include low levels of some structural features (e. g., snags), continued emphasis on the harvest of large, old trees, and effects of fire suppression.

- Ecological conditions in mixed-conifer forests vary. Although uneven-aged management has allowed structurally complex, productive forests to persist in many places, conditions generally are less than ideal and, in most cases, are deteriorating. The major ecological concern is forest health; other concerns include further simplification of stand structure by current harvest practices, effects of fire suppression, and watershed protection.

- Most pinyon-juniper woodlands are in a deteriorated ecological and economic condition as a result of over-grazing and other agricultural uses, fire suppression, and unregulated harvest of firewood and other forest products. Other woodland types have similar problems.

- Ecological conditions of Northwest coastal conifer forests are mixed. These highly productive, resilient types are usually clearcut. Brush and logging slash have sometimes delayed regeneration. Thrifty second-growth stands usually develop after har-

Forested reserve. Warm Springs Reservation

J. Franklin

vest, though, if they are promptly regenerated, but the resulting stands generally lack structural complexity and species diversity. Forest-health issues are minimal.

- Structural complexity and species composition of many eastern hardwood-pine stands have been substantially reduced although there are some significant exceptions. Concerns include low economic value of the current forest, complex ownership patterns, and difficulties in regenerating desired species.

- Overall, on sampled reservations, timber volume growth equals or slightly exceeds recent harvest volumes in the Northwest (east-side) and the East, whereas recent harvest exceeds growth in the Northwest (west-side), the Southwest, and, perhaps, the Lake States.

- Some plants used for craft, subsistence, and medicine are becoming increasingly limited. Decreased availability of appropriate forest conditions hampers traditional practices.

- Sufficient structural complexity, in terms of tree species and size, still exists on many reservation forests to provide options for developing a wide range of forest structures. However, this flexibility could disappear within a decade under some BIA-proposed management plans, which emphasize harvesting large, old trees and stands.

- Populations of big-game species, such as deer and elk, generally appear to meet the needs of the larger reservations. However, long-term population trends or habitat conditions rarely are monitored, and sensitive, threatened, and endangered species sometimes receive inadequate attention.

- Watershed, riparian (streamside) areas, and stream channels often show signs of deterioration from past timber harvest, roading, and grazing.

- Many aquatic species are less plentiful and diverse than in the past.

- Livestock grazing on reservations is largely uncontrolled, with resulting adverse effects on streams and upland areas.

- Monitoring the consequences of resource management activities is fundamental to any management program; yet monitoring programs are largely absent on Indian forestlands.

- Prescribed burning needs to receive considerably more attention as a tool for reestablishing and maintaining healthy mixed-conifer stands in the Intermountain West and for managing pinyon-juniper woodlands.

7) Roads have contributed to a number of environmental problems.

- Many reservations show extensive soil compaction from roads and skid trails.

- Most reservations visited had numerous roads that were poorly designed and inadequately drained. Roads sometimes were placed up stream channels, where they constrict water flows and preclude streamside vegetation.

- The lack of an all-weather road system is a major obstacle to implementing coordinated resource management.

J. Franklin

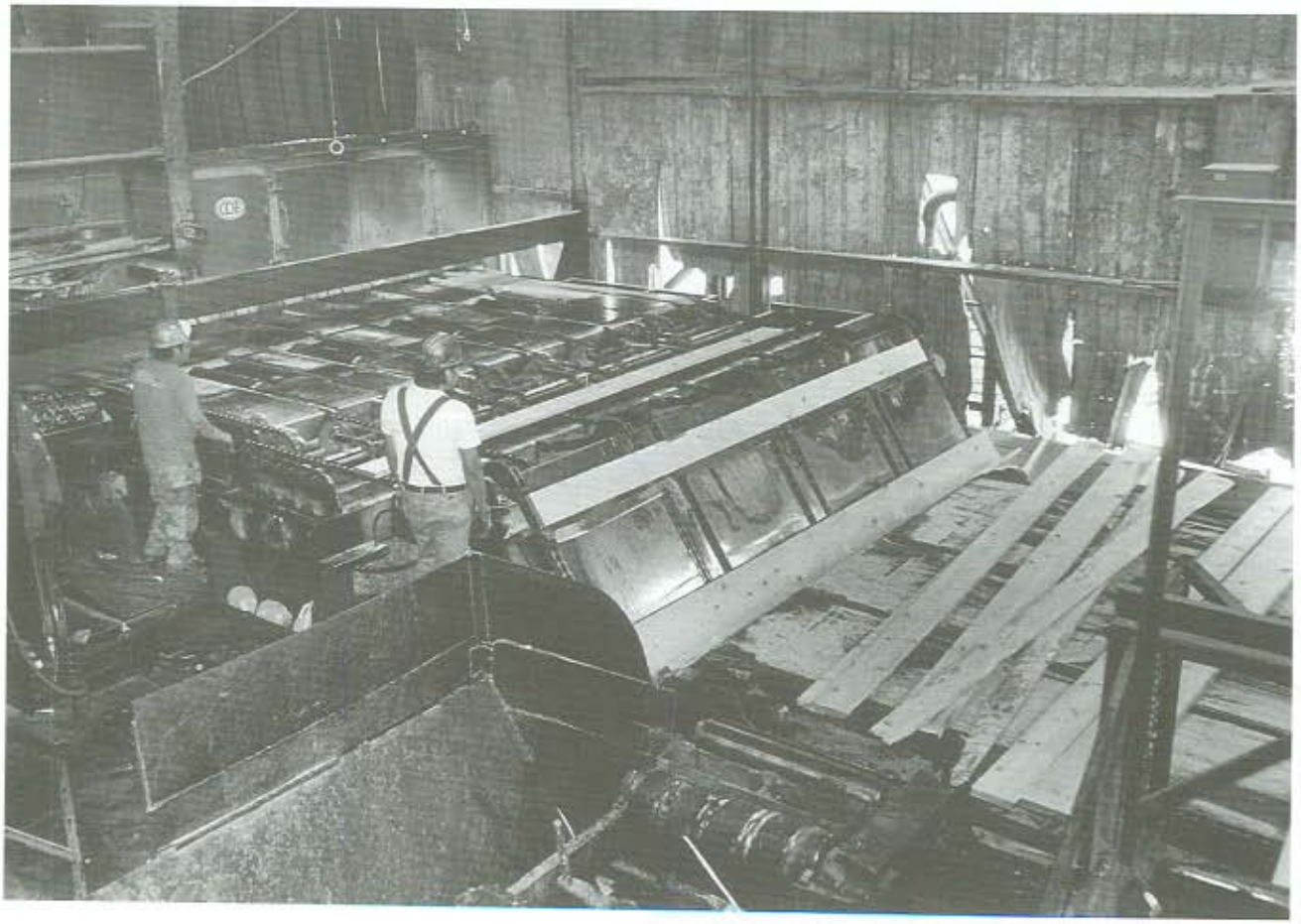
Many reservations have extensive road systems. Navajo Reservation

8) Opportunities exist to substantially increase income and other benefits from timber harvests.

- On average, timber-sale planning is inferior to that in the Forest Service and BLM because of insufficient or inadequately trained personnel, or lack of funds.
- Information on markets and the characteristics of future timber supply often is not available to managers of forest-products enterprises to help them make good log-allocation decisions.
- Some logging contracting procedures, such as not allowing competitive bidding, can result in passing on excessive costs to the tribe.
- Some timber-sale policies do not encourage full utilization of raw material. As an example, the common practice of assigning an average price for each species discourages utilization of smaller logs which are worth less to the purchaser than the average price.
- Better quality control in tribal forest-products enterprises could increase the value added through manufacture. Few such enterprises have professional quality-control personnel.
- Some stumpage transfer policies underestimate log value and thus do not provide appropriate incentives or enable accurate evaluation of log-processing decisions.

9) Forest management plans for reservation forests have the potential for meeting many tribal goals and priorities but a narrow definition of sustained yield management, inadequate analysis in some cases, and lack of funding and personnel make attainment of goals difficult.

- Forest management plans contain comprehensive objectives for management of commercial forests. A standard set of goals is provided by the federal government which address maintenance of forest productivity, forest regulation, economic contributions to tribal self-sufficiency, and the protection and management of the forest resource to benefit recreational, cultural, aesthetic, water quality,



Tribal forest products enterprise. White Mountain Apache Reservation J. Franklin

Aspen stands on the shores of Red Lake. Red Lake Reservation N. Johnson

wildlife, and other resources. These goals have evolved through time with increasing involvement of the tribes themselves. In addition, each tribal government can add an additional, individually-tailored set of goals.

- On most reservations sampled, the tribal government has endorsed the current forest management plan. Before endorsement, however, the tribes often add additional goals and limits, especially those relating to forest protection.

- Federal guidance for forest planning increasingly calls for the tribes to take a strong leadership position in development of forest plans. Current regulations for forest planning call for tribal endorsement of forest plans. New draft regulations, based on NIFRMA and prepared with tribal involvement, also call for active tribal participation and leadership in developing the plans.

- An overly restrictive definition of sustained yield management can prevent attainment of tribal goals. Federal regulations currently call for harvest schedules to be directed toward achieving an approximate balance at the earliest practical time between maximum net growth and harvest. This definition of sustained yield management can result in overly rapid conversion of existing stands, erratic harvest levels, and a future forest at odds with tribal goals. New draft regulations would deal with some, but not all, of these potential difficulties.

- Harvest-scheduling techniques used by the BIA generally have not kept up with those of other agencies and are inadequate to support coordinated resource planning. Lack of an adequate sustainability check in these techniques has allowed higher-than-sustainable harvest levels to be developed without adequate review.

- The BIA's Continuous Forest Inventory (CFI) system for planning and policy analysis rates highly in comparison to similar systems in other federal agencies. Some problems exist, however, in collecting and using CFI data, including the lack of a central repository for CFI data and a system to make the data readily available, incon-

sistencies in CFI design among reservations, neglect of noncommercial aspects of forest resources, and slow turn-around in inventory analysis at BIA area and national offices.

- An overly technical presentation of the forest plans largely precludes anyone but planners from understanding their results. Few pictorial or graphical descriptions are provided that address the future forest that will be created under the plan or the aggregate harvest/growth/inventory conditions over time.

- Alternatives developed in forest planning often are highly limited in the choices provided. Some forest management plans provide very few alternatives. Others describe land use choices but do not also describe choices for future forest structure.

- Consideration of all forest resources, as called for in forest plan goals, has been difficult to achieve. Concentration on commercial timber production, including the overly restrictive definition of sustained yield, lack of funding, and lack of natural resource professionals other than foresters have all contributed to the problem. The new draft regulations, however, could help broaden the focus and could help forest management plans fit better into the coordinated resource plans of the future.

Warm Springs Reservation. J. Franklin

- Integrating cultural values and traditional knowledge into forest management needs special attention. Lack of knowledge and/or interest on the part of forestry staffs, combined with the sensitive and somewhat confidential nature of traditional knowledge, has led to planning deficiencies. Tribal cultural staffs, where they exist, generally are small and barely able to keep up with timber-sale requirements and off-reservation concerns, let alone establish baseline data necessary for planning.

- Recent BIA policy calling for development of "integrated resource management plans" has not generally been successfully implemented. These coordinated plans would provide overall direction for land use on reservations, and would have forest management plans as one component. Completion of coordinated (integrated) resource management plans has been difficult to accomplish on most reservations, in part, due to lack of clear examples of the purpose, content, and use of these plans, a relatively low priority for their development in the BIA, and the absence of adequate funding and resource management expertise.

10) A number of issues require special planning and management.

- **Allotments.** The allotment of substantial portions of forest trust lands to individuals on some reservations has greatly complicated land management and increased the difficulty of coordinating management. This situation frustrates both allottees and tribal natural resource managers. Management costs for individual allotments are greater and, in many cases, services to allotments are poorer than those enjoyed by tribal trust lands.

- **Alaska.** The BIA has trust responsibilities in Alaska for trust lands of individual allottees and the Annette Islands reservation. Obstacles to forest management in Alaska include difficult topographic and seasonal operating conditions; poorly developed or nonexistent transportation systems; long distances to markets; limited forest inventories, particularly in the interior; few forest-management plans; and an insufficient silvicultural research base. Staffing and funding for trust lands are inadequate to provide for planning, sale prepa-

Figure 1.

Reservations with Significant Timberla

ANCSA Lands (Alaska)

13 Regional Corporations
200+ Village Corporations

ınd Resources

y IFMAT

ed by IFMAT

Major Timberland Resources (Category 1)

(Over 10,000 acres of commercial timberland or over 1 million board feet allowable cut)

1. Jicarilla
2. **Mescalero Apache**
3. Southern Ute
4. Blackfeet
5. Crow
6. Northern Cheyenne
7. **Eastern Band of Cherokee**
8. **Mississippi Choctaw**
9. Passamaquoddy
10. **Penobscot**
11. Bad River
12. Bois Forte
13. Grand Portage
14. Lac Courte Orielles
15. **Lac Du Flambeau**
16. **Leech Lake**
17. **Menominee**
18. **Red Lake**
19. Stockbridge/Munsee
20. **White Earth**
21. **Navajo**
22. **White Mt. Apache**
23. Hualapai
24. San Carlos
25. Uintah and Ouray
26. Annette Islands
27. Coeur D'Alene
28. **Colville**
29. **Flathead**
30. Grand Ronde
31. **Makah**
32. **Nez Perce**
33. **Quinault**
34. Siletz
35. **Spokane**
36. **Tulalip**
37. Umatilla
38. **Warm Springs**
39. **Yakima**
40. **Hoopa Valley**
41. Tule River

Boldface indicates those reservations that have been visited by IFMAT.

Minor Timberland Resources (Category 2)

(Other reservations with economically viable timberlands)

42. Omaha
43. Pine Ridge
44. Rosebud
45. Turtle Mountain
46. Winnebago
47. Acoma
48. Isleta
49. Jemez
50. Laguna
51. Picuris
52. Santa Clara
53. **Zuni**
54. **Alabama/Coushatta**
55. Fort Belknap
56. Rocky Boy's
57. Wind River
58. Big Cypress/Brighton
59. Narragansett
60. Pequot
61. Fond Du Lac
62. L'Anse
63. Mille Lacs
64. Potawatomi
65. Red Cliff
66. Cherokee
67. Chickasaw
68. Choctaw
69. Chehalis
70. Fort Hall
71. Kalispel
72. Lummi
73. Muckleshoot
74. Nisqually
75. Port Gamble
76. Port Madison
77. Quileute
78. Skokomish
79. Squaxin Island
80. **Swinomish**
81. Ford Bidwell
82. Round Valley
83. Yurok

Other Trust Lands Visited

84. **Alaska Trust Properties**
85. **Southern California Agency (Santa Rosa, Los Coyotes, La Jollai, Santa Ysabel, Cabezon, Augustine, Pala, Cahuilla, Morongo)**

Discussion on Eastern white pine management. Menominee Reservation J. Franklin

ration, administration, and forest development on both the reservation and allotments. In addition to the trust lands, the federal government, under P.L. 101-630, has technical assistance obligations to native corporations formed under the Alaska Native Claims Settlement Act. Currently, no funds have been appropriated to provide this technical assistance.

- **Other ownerships within Indian reservations.** A variety of owners control forestland within Indian reservation boundaries, including federal agencies (Forest Service, BLM, Fish and Wildlife Service), states, counties, private forest industry, and nonindustrial private owners. This mixture greatly complicates planning and management of Indian forests, especially with the new emphasis on ecosystem management. There often is little rationale for maintaining federal land ownership within the boundaries of Indian reservations.

- **Off-reservation lands**. Monitoring and participation in the management of off-reservation lands, where many tribes have treaty rights, greatly increase the cost and staffing needs of tribal programs.

Findings Summary

There is a striking potential for managed Indian forests to serve as models of sustainability. Reservations are permanent homelands where Indians live intimately with the environmental and economic consequences of forest-management actions. Indians want their forests for a complex mix of uses--timber harvest, livestock grazing, hunting, plant gathering, firewood, fishing, scenic beauty, spiritual sanctuary--and have a compelling need to balance competing interests. They have a well-recognized commitment to protect the resources that are both their heritage and legacy.

However, problems exist. IFMAT's four most significant findings are (1) the gap between the visions that Indians express for their forests and how these forests have been managed, (2) the gap in funding between Indian forests and comparable federal and private lands, (3) the lack of coordinated resource planning and management, and (4) the need for a better method of setting and overseeing trust standards for Indian forestry.

Recommendations

The following recommendations are intended to lay the foundation for the future--to help tribes realize the full potential of their valuable, renewable forest resources. They are not meant to demean the contributions of the many dedicated people who have managed Indian forests.

Major Recommendation

Redefine the U.S. government's role in discharging its trust responsibility so that tribal governments have primary responsibility for directing Indian forestry. The U.S. government should provide financial support, technical assistance, research access, and trust oversight. Technical assistance and trust oversight should be independent of each other.

The new arrangement should reflect the following:

- Each tribe should be the principal agent responsible for crafting, implementing, and monitoring a coordinated resource management plan congruent with its vision for forests and forest management.

- Standards for evaluating performance in meeting the trust responsibility should be agreed upon between each tribal government and the Secretary of the Interior. Ultimately, the Secretary's responsibility should move from signing off on individual timber sales, as is now done, to signing off on coordinated resource plans. Each tribe would then be responsible for preparing standards as part of the plans against which its performance could be measured through both tribal monitoring and trust oversight.

- BIA forestry should be reorganized to separate technical assistance from trust oversight. The BIA should retain technical assistance, but trust oversight should be delegated to an independent commission.

- Technical assistance from the BIA should include full support for coordinated resource planning and management and also research access.

- A single manager should be responsible for delivering the entire natural-resource program at the local level.

In one possible rearrangement (Figure 2), the tribal vision for forests is transmitted through the tribal government to the tribe's natural-resource manager. With technical assistance from the federal government, the tribe's natural resource staff then develops a coordinated resource management plan defining objectives, standards, operations plans, and monitoring procedures. U.S. government funds are provided to tribal governments under the conditions of the trust standards agreed upon between the Secretary of the Interior and the tribe. Federal oversight is via an independent trust oversight commission, which reviews the initial coordinated resource plan and periodically assesses whether the standards agreed to by the tribe and the Secretary of the Interior are being met. This commission might operate largely through regional boards formed from local technical experts sensitive to regional differences.

One challenge is managing the transition to this new arrangement. The shift and how it occurs rest primarily with the tribes themselves; their degree of preparedness and comfort levels will dictate the timetable and mechanisms.

Supporting Recommendations

1) Develop tribally defined trust standards that are easy to monitor and that clarify trust oversight. We believe the following principles should underlie those standards:

(a) A tribal vision for forests and their management should be articulated where one does not now exist;

(b) Trust standards should be established and relate to this tribal vision;

(c) Each tribe should write and approve the standards with local involvement;

(d) The agreed-upon standards should have yardsticks for measuring the achievement of trust responsibility, with measurement techniques determined before standards are approved;

(e) To the degree possible, standards should measure achievement of desired conditions and outcomes (performance) rather than inputs, techniques, or technologies; and

(f) Standards should encourage and reward compliance and promote efficient use of resources.

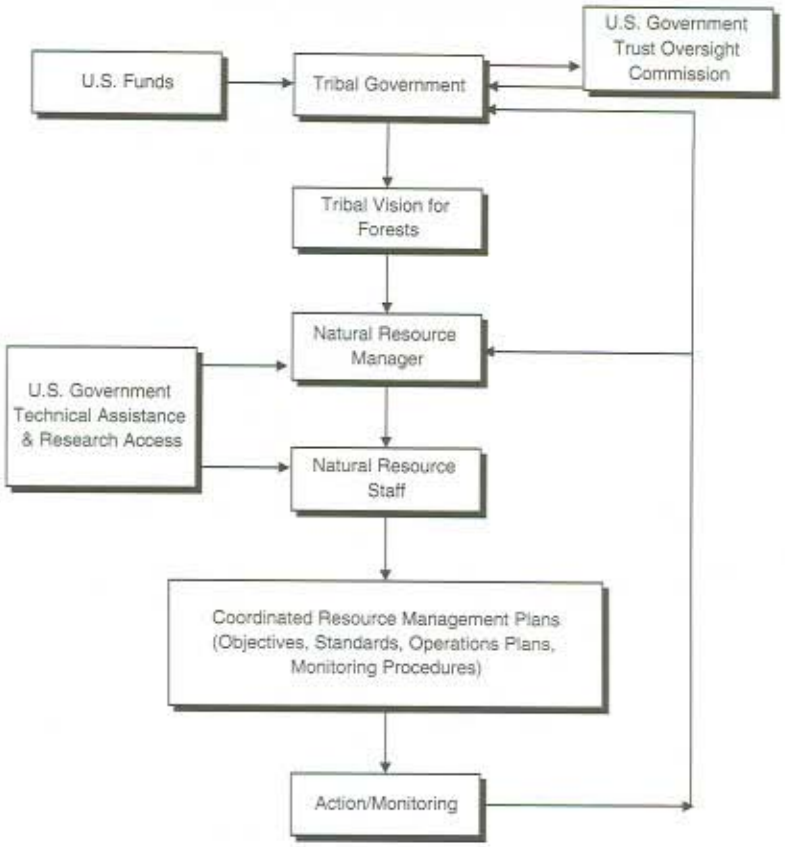


Figure 2. One possible form of the recommended organization of federal trust responsibility to Indian forest management.

K. Gabriel

Allottee's cabin. Copper River, Alaska.

In addition, the U.S. government should provide, as part of the trust responsibility, technical assistance to tribal forest-products enterprises and reports to the tribes on enterprise performance.

2) Increase base-line funding and investment for Indian forest management to levels comparable to those of the National Forests.

- An increase in baseline funding of $121 million per year (that is, a 182% increase) is required to put coordinated resource planning and management on Indian reservations on par with that of the National Forests (see Table 1).
- This level of funding would include an increase of over $34 million per year to put per-acre funding for timber production on Indian reservations on a par with that of National Forests. This additional money would be used primarily to provide increased resources for timber sale preparation, environmental coordination, timber sale administration, engineering support, and transportation development and maintenance. At recent harvest rates this increase amounts to about $40 per thousand board feet.
- Investments of over $200 million are required to correct deficiencies in road systems which will promote a stable transportation network and improve watershed conditions.
- Significant investments are required to address forest development backlogs (that is, forested acres requiring additional regeneration or thinning), especially where overly dense stands increase the probability of catastrophic loss. To maximize wood production, $150 million dollars might be needed. Coordinated resource plans, though, should define the investment level that best meets tribal goals.

3) Protect the health and productivity of Indian forests through ecosystem management.

- Forest health and productivity should be monitored over the long term, and inventorying and monitoring of wildlife habitats and populations greatly increased (See Footnote 1, Table 1).
- More thorough and sophisticated silvicultural prescriptions should be written to guide stand treatment.

Table 1. Summary of major funding recommendations[1]

	Existing Funding MM $/yr	Recommended Funding MM $/yr	Increase MM $/yr	Percent Increase %
Continuing Base Program for Coordinated Management	66.2[2]	187.0	120.8[3]	182
Prescribed Burning to Maintain Forest Health	—	5.0	5.0	—
Trust Oversight Commission[4]	—	1.0	1.0	—
Total	66.2	193.0	126.8	192

1 In addition, a one-time investment of $200 million is needed for forest roads, a one-time investment of $5 million is needed to set up a monitoring program, and a significant investment is needed to reduce the forest development backlog and restore streams.

2 Contains BIA Forestry Base funding of 40.8 million, Indian forestry contributions of 17.9 million, and an estimated 7.0 million combined additional federal and tribal funding for other natural resource support, and 0.5 million for woodlands.

3 Increases funding to levels comparable to the National Forests, including an increase of 34 million for timber production.

4 First estimate of cost of operating the trust oversight commission.

Stream restoration work. Colville Reservation

K. Gabriel

- Thinning and partial cutting of mixed-conifer stands should be accelerated to reduce the presence of disease and insect-resistant species.

- Watershed and stream protection should have increased priority, as should improving forest roads.

- Significant investments are required to restore streams. Sediment reduction programs, riparian shrub development, streamside forest silvicultural prescriptions (thinning, planting, fencing) and inchannel reconstruction are a necessary part of ecosystem restoration. Such actions will require a watershed assessment before commencing.

- Use of fire--prescribed burning--to maintain forest health should be increased, especially in the ponderosa pine, mixed-conifer, and pinyon-juniper forest types (See Table 1).

- Efforts to protect and enhance habitat for plants of special cultural significance should be increased.

- Where allotments form a large fraction of trust lands, incentives should be provided to encourage allottees to join with tribes or form associations to do coordinated resource planning.

- BIA and tribal access to research-based information tailored to their needs, and to the people and organizations who undertake the research, should be improved.

- An adaptive management approach, in which monitoring provides feedback on operational practices, should be built into forestry on Indian lands. Ecosystem management demands an approach that is flexible (responding to new information) and site specific. To capitalize on such efforts already underway on Indian forests will require a much greater emphasis than currently exists on training, education, and communication.

4) Bring staffing levels to parity with those of National Forests having similar resource management objectives.

- Deficiencies in staffing for ecology and natural resources such as wildlife, range, soils, archeology, fisheries and hydrology should be eliminated.

- Professional engineering staff should be increased to support coordinated resource planning and address deficiencies in reservation road systems.
- Recruitment and retention measures should be developed, with special emphasis on natural resource specialties other than forestry.
- Training and education programs authorized by NIFRMA should be fully funded.

5) Increase tree value through improved forest management, timber harvest and forest enterprise performance.

- Train planning personnel in the value of improved tree-inventory information.
- Improve communication between forest planning personnel and forest enterprises.
- Train forest administrators and harvesting managers to recognize the importance of improved log cutting practices.
- Review timber sale policies to verify that sale procedures lead to maximum benefit for the tribe.
- Promote competitive bidding for tribal logging.
- Transfer stumpage at market value to forest enterprises to provide useful value signals to enterprise managers.
- Develop auditing procedures to document the competitiveness of the forest product enterprise.

6) Greatly strengthen coordinated forest resource planning and natural resource inventorying.

- Forest resource planning and management should be based on tribal goals and objectives derived from each tribe's vision for its forest.
- Coordinated resource plans should guide Indian forest management via clearly defined objectives, standards, operations plans, and monitoring procedures. Such documents should be the centerpiece of forest planning and the guide for implementing ecosystem management. Technical assistance from the federal government should aid in the preparation and implementation of these plans.

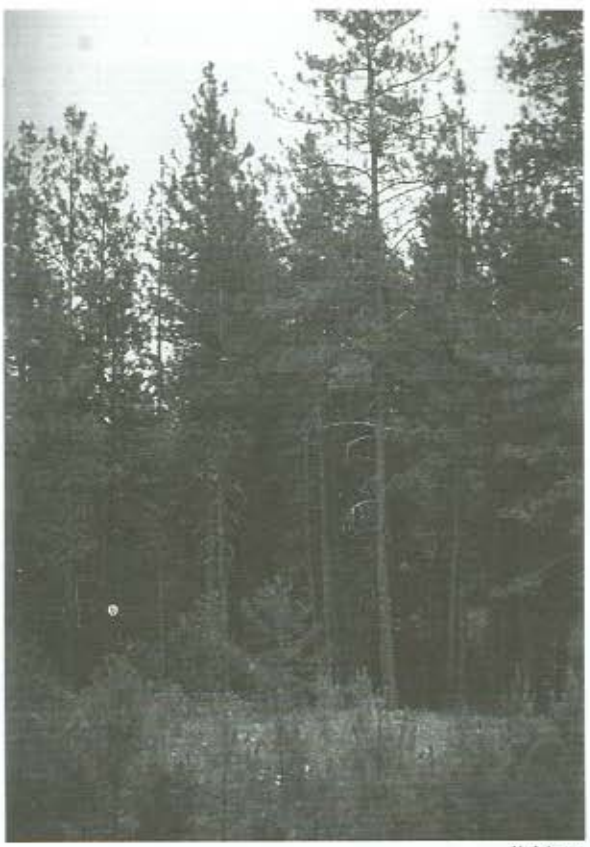
Uneven-aged management. Yakima Reservation J. Franklin

- The current and proposed interpretation of sustained yield management should be changed to one that focuses on the protection of underlying ecological processes and forest productivity.

- Plan results should be accessible to the lay reader. Graphs, figures, pictures and charts should clearly display the type of the forest that will be produced under the plan, the proposed harvest level over time, and the associated growth and inventory.

- Alternatives for forest management should be developed in planning that systematically vary both the land use allocations and the forests that could be developed under a particular land use.

- Harvest-scheduling techniques should be modernized and should include an up-to-date sustainability check. Inventory/planning support should be allocated to helping reservations in harvest scheduling. Some reservations and BIA area offices have started using modern operations-research tools for harvest scheduling; this work should be encouraged.



N. Johnson

Overstocked stand. Yakima Reservation

- The BIA's CFI system should be improved by (a) developing standards for maintaining or improving the integrity of CFI data, (b) allowing the large reservations to process their own data, (c) consolidating inventory support staffs at the national and area offices, (d) increasing the number of support staff educated and experienced in biometrics, computer programming, and database design and management, (e) working toward creating common data structures and reporting systems, and (f) broadening the scope of the data collected to include measures of ecosystem performance such as understory vegetation, snag characteristics, and dead and down wood.

7) Address issues requiring special planning and management.

- **Allotments**. The greater demands on staff and funding to manage allotments should be recognized. Financial mechanisms should be considered for tribes to purchase allotments for common ownership from allottees who wish to sell.

- **Alaska**. The level of federal funding necessary to provide management services for similar trust lands in other regions should be compared to that in Alaska and differences evaluated. Owners of trust lands and native corporations should be assisted in developing visions for their forests and encouraged to work cooperatively toward their goals. Trust rights of allottees should be safeguarded through agreed upon trust standards between the Secretary of the Interior and regional or village corporations that want to provide forestry services to allottees. Regional expertise in forestry services should be bolstered by encouraging regional corporations with substantial timber holdings to develop natural resource staffs through natural resource education and technical training. The technical assistance program to native corporations authorized under P.L. 101-630 should be developed and funded.

- **Other ownerships within Indian reservations.** Federal forestland within reservations should be returned to the tribes if they wish to claim it. The U.S. government also should help facilitate cooperative management of all forestlands within reservations.

- **Off-reservation lands.** Off-reservation planning and management tasks should be recognized as part of coordinated resource planning to determine funding and staffing needs.

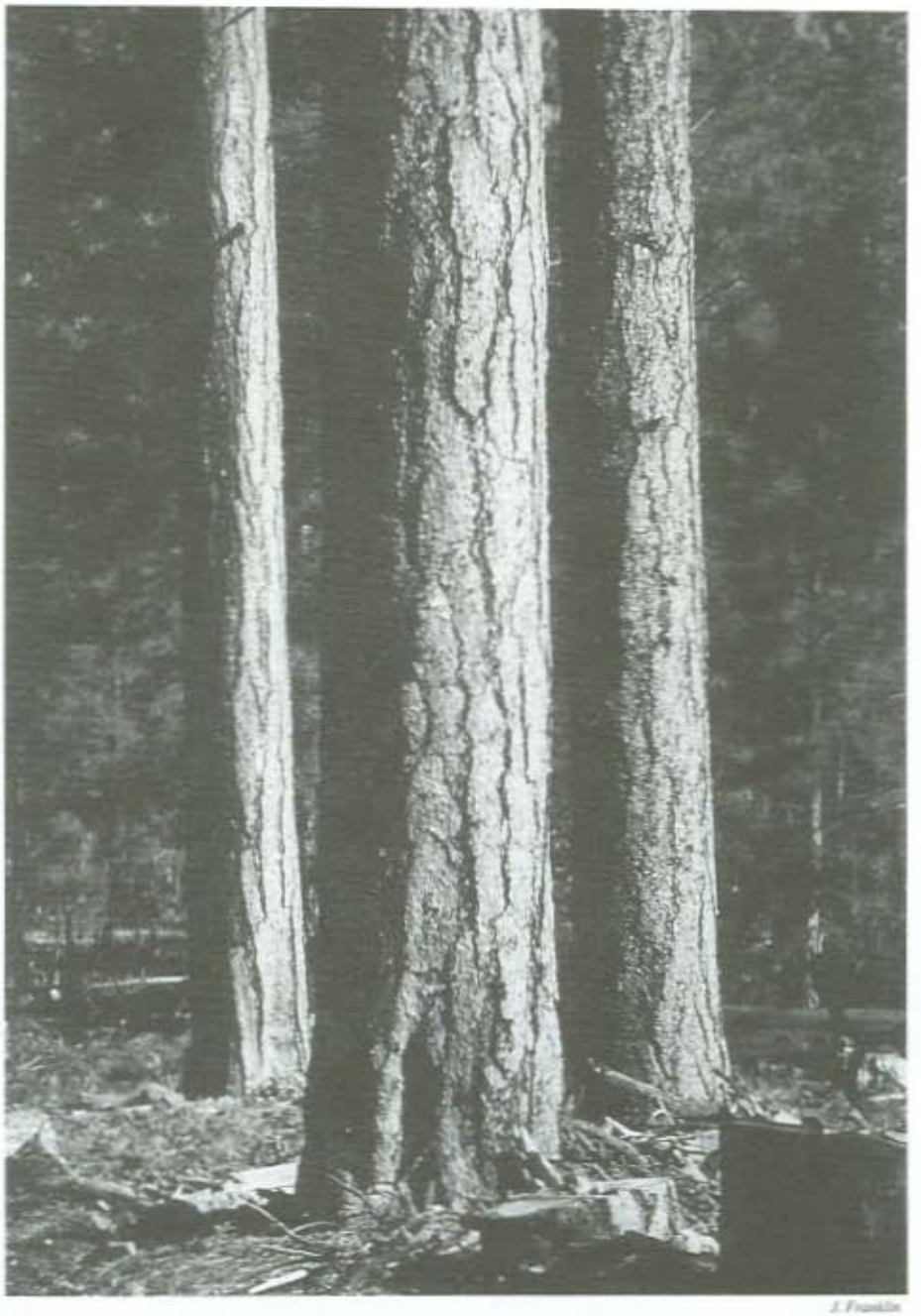
Recommendations Summary

Management of Indian forests can be substantially improved by reconfiguring the relationship between the U. S. government and the tribes, supported by increased funding and other measures. These actions place Indians firmly in control of their forests and provide the technical and financial means for them to reach their visions for these lands.

We believe that considerable management flexibility still exists on Indian forestlands, where many innovative approaches are already being tried. Further, we believe that others have much to learn from Indian forestry and the holistic Indian view of forests and people. But, it is urgent that more attention and resources be directed soon to Indian forests by Congress. Otherwise, options will be irretrievably lost and, with them, a major opportunity to bring Indian forests up to management standards of federal lands such as the National Forests and to provide widely useful examples of integrated forest management.

K. Gabriel

Pinyon-juniper woodlands. Zuni Reservation



J. Franklin

Ponderosa Pine. Navajo Reservation

I. INTRODUCTION

Over the past two decades, Congress and Indian tribes have dedicated substantial resources to improving the management of Indian forests and to strengthening and clarifying trust and sovereignty issues. Although significant investments have been made, concern about current management and the future of Indian forests continues to be expressed by many tribes and BIA officials.

In response to this concern, the U. S. Congress mandated, through the National Indian Forest Resources Management Act, Title III, P.L. 101-630, (Appendix I), that the Secretary of the Interior, in consultation with affected Indian tribes, enter into a contract with a non-federal entity knowledgeable in forest management practices on federal and private lands to conduct an independent assessment of Indian forestlands. This assessment was to be national in scope and completed within 3 years after the enactment of NIFRMA. The Secretary of the Interior contracted with the Intertribal Timber Council for the mandated assessment. In turn, the ITC formed IFMAT to carry out the assignment. IFMAT selected a resource team to provide additional expertise and assistance.

ITC and Its Working Relationship with IFMAT

The ITC was founded in 1976 for the purpose of improving the management of Indian forest resources by working cooperatively among Indian tribes, the BIA, academia, government, and industry. The Council's general membership includes 65 Indian tribes from across the United States and Alaska native organizations.

In this project, ITC served as contract administrator to ensure fiscal accountability and facilitate completion of the IFMAT study through its working relationship with the tribes and BIA.

The ITC Executive Board selected a liaison committee to ensure fiscal and contractual accountability and provide assistance to IFMAT as requested. Members of the ITC liaison committee, Larry Blythe (Chair), Gary Morishima, and Dexter Gill, were chosen for their knowledge of and familiarity with Indian forestry in the eastern, northwestern, and southwestern sections of the country, respectively.

BIA and Its Working Relationship with IFMAT

The BIA cooperated with IFMAT by locating records and policy manuals, summarizing databases, and other similar matters. In addition, BIA employees spent long hours working with IFMAT explaining their mission and operations, and accompanied team members on numerous tours to see the forests the BIA helps manage.

Although we recommend in this report ways in which federal policy on Indian forestry could be improved, we do not intend to demean the contribution of the many dedicated BIA employees we met in our travels. Both by itself and in cooperation with ITC, the BIA has attempted to improve the policies guiding Indian forestry and their implementation. We commend these efforts and hope our recommendations can add to this work.

II. IFMAT's ASSIGNMENT

Assessment Focus

The National Indian Forest Resources Management Act (Appendix I) stipulates that IFMAT's assessment must include the following eight tasks (wording taken directly from the Act):

(A) An in-depth analysis of management practices on, and the level of funding for, specific Indian forestland compared with similar federal and private forestlands. (See subsection, "Comparative Analysis of Management Practices and Funding.")

(B) A survey of the condition of Indian forestlands, including health and productivity levels. (See subsection, "Survey of Forestland Conditions.")

(C) An evaluation of staffing patterns of forestry organizations of the BIA and of Indian tribes. (See subsection, "Evaluation of BIA and Tribal Staffing Patterns.")

(D) An evaluation of procedures employed in timber-sale administration, including preparation, field supervision, and accountability for proceeds. (See subsection, "Evaluation of Timber-Sale Administration.")

(E) An analysis of the potential for reducing or eliminating relevant administrative procedures, rules, and policies of the BIA consistent with the federal trust responsibility. (See subsection, "Analysis of BIA Administrative Procedures.")

(F) A comprehensive review of the adequacy of Indian forestland management plans, including their compatibility with applicable tribal integrated resource management plans and their ability to meet tribal needs and priorities. (See subsection, "Review of Forestland Management Plans.")

(G) An evaluation of the feasibility and desirability of establishing minimum standards against which the adequacy of the forestry programs of the BIA in fulfilling its trust responsibility to Indian tribes can be measured. (See subsection, "Evaluation of Establishing Standards.")

(H) A recommendation of any reforms and increased funding levels necessary to bring Indian forestland management programs to a state-of-the-art condition. (See subsection, "Recommendations for Reform and Increased Funding.")

The main body of this report (Section V) summarizes the team's findings for each of the eight legislative tasks and its recommendations based on those findings. However, IFMAT strongly believes that the issues can best be addressed, perhaps can only be addressed, *within the context of the visions Indian people have for their forests*. Therefore, we offer our understanding of these visions (Section III). We also briefly describe the benefits Indian forests provide (Section IV).

Commercial thinning, Warm Springs R. J. Franklin

Methodology

The task of assessing the status of Indian forests is daunting: 16 million acres on 214 reservations in 23 states are forested. Moreover, assessment demands more than quantitative data. Ideally, IFMAT would have visited all BIA offices and forested trust lands throughout the United States. However, constrained by time and money, IFMAT employed a five-part sampling method designed to provide a representative view of Indian forests and their management.

Reservation visits

Reservations were selected based on regional location, amount of commercial timber volume, the need for a representative sample, and tribal interest in participating in the study (Appendix II, IFMAT travel log).

IFMAT set the goal of visiting 10 of the 15 reservations with the largest timber programs and, at the same time, attempting to visit smaller reservations near the larger ones. For example, in northeast Washington, IFMAT visited the Colville Reservation (which has a relatively large timber program) and the Spokane Reservation adjacent to it (which has a relatively small program). In Minnesota, the team visited the Red Lake reservation (which has a relatively large timber program) and the nearby White Earth Reservation (which has a relatively small program). Ultimately, 33 reservations were visited by at least one IFMAT member (Figure 1). These sample reservations, in 8 of the 12 BIA regional areas, represent 61% of total Indian forested reservation/trust property acres.

Once a reservation was selected for an IFMAT visit, the tribal government was contacted by a member of the resource team, typically by telephone and letter. If the tribal government was interested, a previsit team usually was sent to the reservation to gather data, meet the natural resource staff, and learn about significant forest-management issues. The previsit team then put together workbooks for IFMAT members summarizing major issues, inventories, and plans from the reservation, and other reports and data summaries obtained from tribal resource managers and the BIA. They also set the agenda to be followed during the forthcoming IFMAT visit, including arranging meetings with tribal leaders, forest managers, and resource specialists.

During reservation visits, IFMAT members interviewed tribal members, tribal government leadership, tribal enterprise personnel, tribal forestry and natural resource staff, and BIA foresters; gathered first-hand information by examining records and facilities; and toured the tribal forest with tribal members and leaders, tribal forestry and natural resource staff, and BIA foresters. Generally, visits to larger reservations lasted 2 to 5 days and those to smaller reservations 1/2 to 2 days. During that time, individual IFMAT members obtained information relative to their respective specialties, often through a standard set of questions (Appendix III). Members usually flew over the reservation to gain an overview of forest conditions, (as well as used aerial photo interpretation) and often went on a group field trip.

Windthrow. Warm Springs R. J. Franklin

In the report, we present pictures taken on IFMAT visits organized into a sequence reflecting the chronology of those visits. Thus the pictures are presented reservation-by-reservation from Warm Springs to Nez Perce, with pictures included from many of the reservations visited.

Questionnaire

A questionnaire identifying significant issues and individual perspectives on Indian forests and their management was developed with major input from the ITC. The questionnaire was pretested with a small

group of tribal members and resource managers in two locations and then refined. Two variants of the questionnaire were developed--one for tribal members, tribal foresters and tribal natural resource staff (Appendix IV), another for BIA forestry employees (Appendix V)--and distributed to councils of all tribes with forested reservations by the ITC and to BIA personnel through the BIA mail system. Questionnaires were also distributed during focus group sessions (see next subsection).

Ponderosa pine/Douglas-fir forest. Warm Springs R. J. Franklin

The questionnaire elicited 308 responses from 43 tribes: 100 tribal members from outside of natural resource occupations, 23 tribal members who did not specify whether they worked in natural resources, 31 tribal foresters, 28 tribal natural-resource managers, 65 tribal youth, and 61 non-Indian tribal employees. The questionnaire elicited 111 responses from BIA personnel: 55 Indian forestry employees and 56 non-Indian forestry employees.

Focus groups

Focus groups were held with tribal members during IFMAT visits at 10 tribal locations (White Mountain Apache, Lac du Flambeau, Quinault, Makah, Warm Springs, Eastern Band of Cherokee, Spokane, Colville, Menominee, Navajo).

Tribal councils were asked to suggest members and arrange a place and time to meet. Focus groups consisted of 7 to 15 people who were asked how they viewed their forest and its management; often, they were given the previously described standard questionnaire to complete and discuss (see Appendix IV).

Comparison studies

Two studies were contracted to outside consultants to compare the management of Indian forested trust lands with other similar federal forest and private forestlands. One study tabulated data nationally to compare major input and output factors (such as funding, personnel numbers, timber production) with those of other federal agencies and private landowners. The other study selected four reservations and directly compared their forestlands with other federal and private lands. The four reservations, located in the Portland, Minneapolis, Navajo, and Eastern Areas, were also visited by IFMAT.

Wildlife habitat patch. Warm Springs R. J. Franklin

Telephone survey of non-forestry resource professionals

A telephone survey of 89 of the 214 forested reservations was conducted to determine the amount of time assigned to forestry-related projects and issues by natural-resource professionals other than foresters and engineers (archaeologists; fish, wildlife, and general biologists; hydrologists; soil scientists; botanists; geologist; landscape architects). Forty-one reservations with major timberland resources (100% of Category 1 reservations), 32 with minor timberland resources (56% of Category 2 reservations), 16 other reservations (13% of Category 3, 4), and 12 Area Offices were contacted. Estimates were then totaled to obtain the number of full-time equivalents (FTE) available. Natural-resource professionals whose work was not associated with forest planning and management (i.e., fisheries biologists working on hatcheries) were not included (see Appendix VI for a list of reservations by category).

BIA office visits

The Central Office (Washington, D.C.), Branch of Forest Resource Planning (BOFRP), and five area offices (Phoenix, Portland, Minneapolis, Juneau, and Navajo) were visited by IFMAT, as were agency offices during reservation visits. These visits provided IFMAT an opportunity to interview BIA forestry personnel (often using the set of questions in Appendix III) and gain information from forest databases.

J. Franklin

Douglas-fir, hemlock and true fir forest. Warm Springs R.

III. INDIAN PEOPLES' VISIONS FOR THEIR FORESTS

We have attempted to learn what Indian people want from their forests and what they want their forests to be. This is difficult and in some ways presumptuous. But it is a necessary step in determining how well tribal forests are managed because management effectiveness can only be judged if its long-term goals are known. The "vision" that people have for forests of the future is key to planning what needs to be done to move toward it. Visions of the future are not forecasts, nor are they usually achievable in any perfect sense. Rather, they serve as indicators of direction and, as such, provide important means of communication between natural resource managers and their clients.

To capture the visions of any diverse group of people is difficult. The Indian people, like the rest of society, represent a wide range of viewpoints and value systems. Tribal societies vary greatly because of history, politics, and culture. We have attempted through focus groups, questionnaires, and personal interviews to speak to as many Indians as we could about how they see their forests, and it is through these measures that we have shaped our understanding.

Findings

Overall, the questionnaires identified a considerable gap between what Indians say they want from their forests and how these forests have been managed (Tables 2-7). Tribal members consistently expressed their desire to protect forest resources above all else, as well as strong concern for the aesthetic and cultural values of the forest. BIA forestry employees place relatively less emphasis on these values and more on economic benefits from the forest including timber production. Non-Indian BIA forestry employees especially feel this way. The differences between BIA forestry employees and Indian people reflect a fundamental difference between foresters and publics in many places, not only on Indian lands. Increasingly, public pressures move management away from sustaining timber production and toward sustaining the integrated set of resources that together constitute a healthy, productive forest. It is this concern for a healthy, beautiful, and sustainable forest that was most often expressed by Indian people responding to the questionnaire.

Table 2. In general, how concerned are you about what happens on your tribal/association forests? IFMAT survey question results.[1]

Position[2]	Not Concerned 1	2	3	4	Very Concerned 5	Don't Know /Missing
	percent response by group					
Tribal Member	0	1	4	16	67	12
Tribal Forestry	0	0	0	13	71	16
Tribal Natural Resources Staff	0	0	0	21	61	18
Unspecified Tribal Member	0	0	4	26	57	13
TribalYouth	6	2	17	32	32	11
Non-Indian Tribal Employees	0	0	3	20	62	15

[1] Rows and columns that do not add up to 100 in tables 2 through 7 reflect rounding errors or missing/unanswered responses.

[2] See Section II "Questionnaire" for a more detailed description of positions.

Table 3. What do you (your clients) want from your tribal forest? IFMAT survey results.

Position	Low Value 1	2	3	4	High Value 5	Don't Know/ Missing
	percent response by group					
Recreation						
Tribal Member	5	11	31	19	29	5
Tribal Forestry	3	3	35	23	29	7
Tribal Youth	6	9	14	21	48	1
BIA Indian	9	2	23	25	36	5
BIA Non-Indian	7	20	36	18	13	6
Income						
Tribal Member	11	7	23	18	31	10
Tribal Forestry	0	16	13	36	29	6
Tribal Youth	9	12	29	19	15	15
BIA Indian	7	11	23	32	21	6
BIA Non-Indian	5	15	16	24	36	4
Subsistence						
Tribal Member	6	6	23	19	32	14
Tribal Forestry	6	10	32	19	26	6
Tribal Youth	6	12	25	26	20	11
BIA Indian	5	14	25	20	29	7
BIA Non-Indian	13	20	27	20	9	11
Forest Resource Protection						
Tribal Member	0	0	5	17	75	3
Tribal Forestry	0	0	6	23	65	6
Tribal Youth	1	1	9	20	65	3
BIA Indian	4	4	20	20	46	6
BIA Non-Indian	2	4	22	38	29	5
Spiritual Values						
Tribal Member	4	0	14	28	46	8
Tribal Forestry	0	0	19	26	48	6
Tribal Youth	5	15	23	18	34	5
BIA Indian	4	2	18	27	45	4
BIA Non-Indian	0	7	29	20	33	11
Cultural Values						
Tribal Member	0	2	11	26	53	8
Tribal Forestry	0	0	19	23	52	6
Tribal Youth	5	5	21	17	48	5
BIA Indian	4	2	20	30	37	7
BIA Non-Indian	0	7	25	27	31	9
Beauty/Scenery						
Tribal Leader	0	1	4	20	70	5
Tribal Forestry	0	0	16	23	55	6
Tribal Youth	3	5	6	14	71	1
BIA Indian	4	4	14	25	48	5
BIA Non-Indian	2	11	11	42	24	10

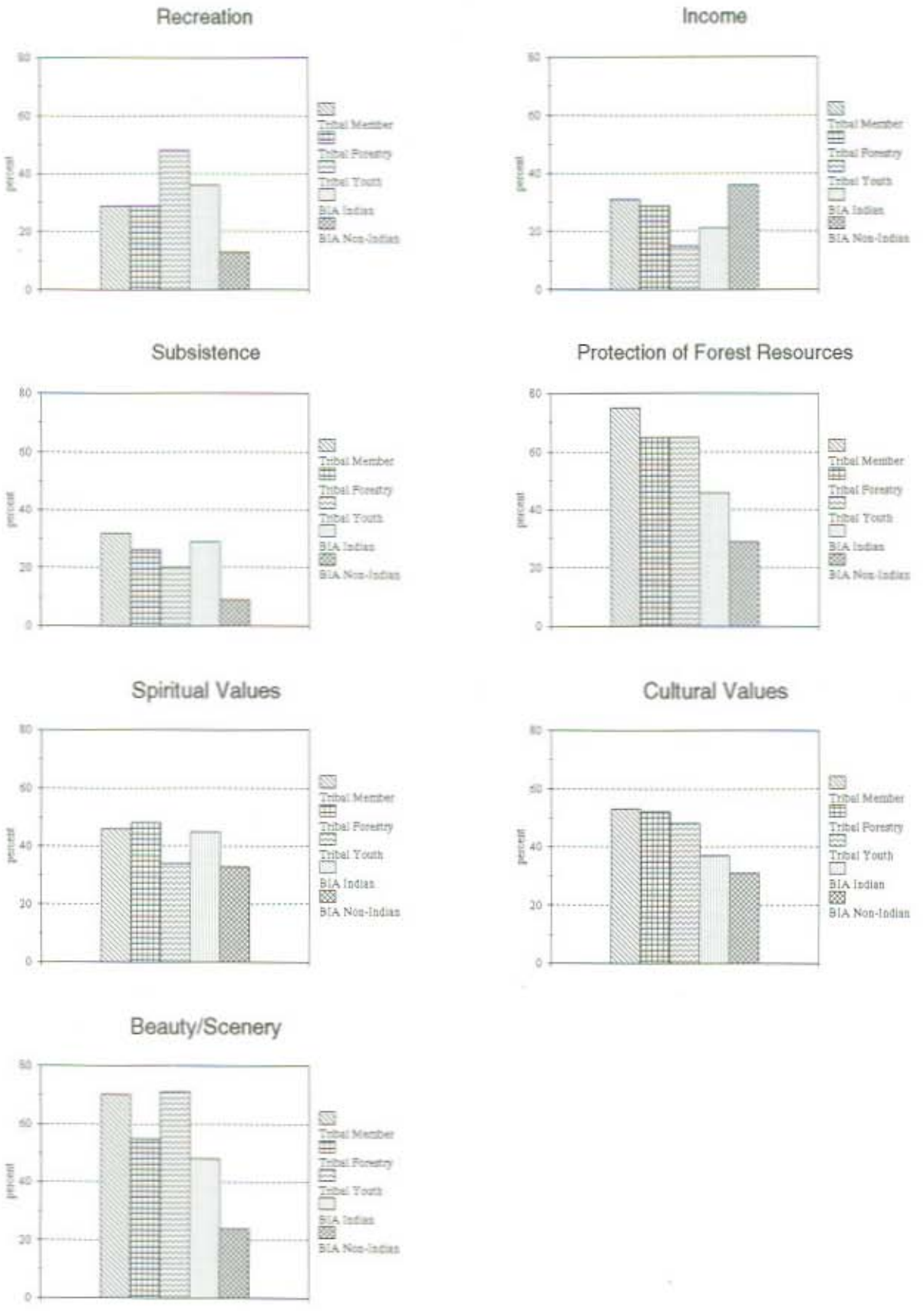


Figure 3a. What do you (your clients) want from your tribal/association forests? Bar height indicates the percentage assigned to high values (5); organized by activity/use.

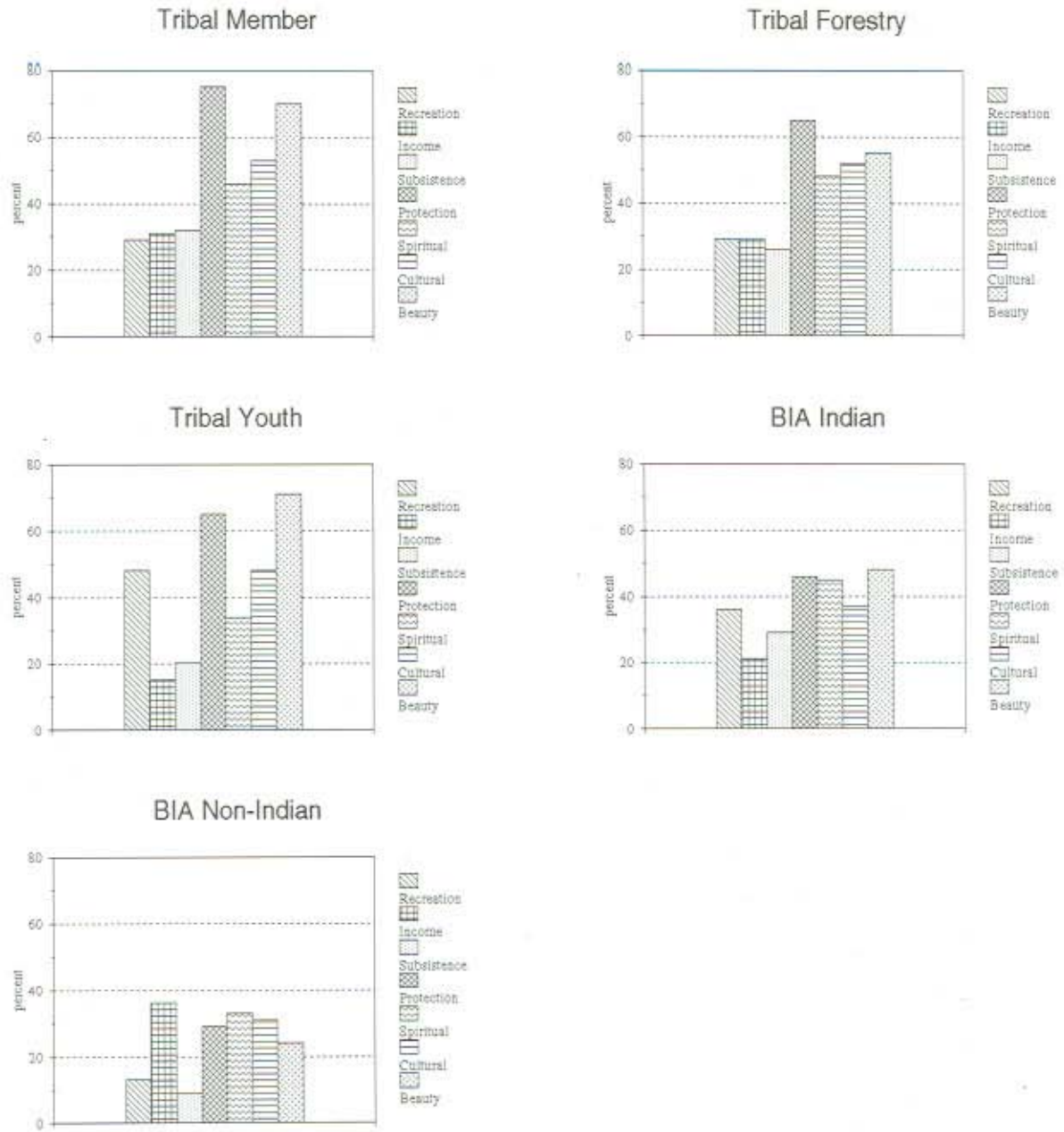


Figure 3b. What do you (your clients) want from your tribal/association forests? Bar height indicates the percentage assigned to "most valued"; organized by groups of respondents.

Table 4. What uses/benefits of the forest do you (your clients) value most? IFMAT survey results.

Position	Recreation	Income	Subsistence	Protection	Spiritual Values	Cultural Values	Beauty/ Scenery	Other
	----------percent response by group----------							
Tribal Member	6	16	5	43	8	6	11	0
Tribal Forester	13	13	3	35	6	10	10	3
Tribal Natural Resource Staff	11	7	7	25	21	4	7	4
Tribal Unspecified	4	17	4	35	17	4	13	0
Tribal Youth	23	0	5	35	8	9	18	1
Tribal Non-Indian Employee	3	23	5	46	5	5	13	0
BIA Indian Employee	5	20	7	23	9	20	4	5
BIA Non-Indian Employee	9	36	4	5	16	9	1	16

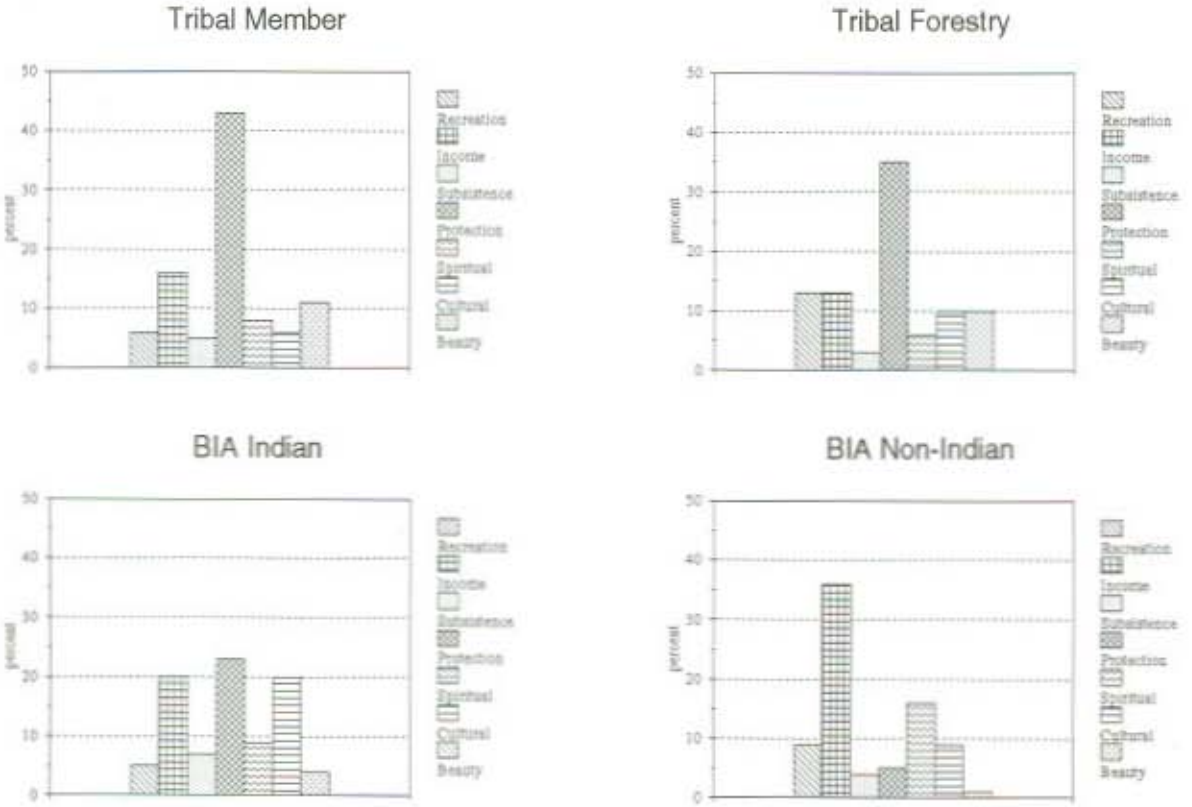


Figure 4a. What uses/benefits of the forest do you (your clients)value most? Bar height indicates the percentage assigned to "most valued"; organized by groups of respondents.

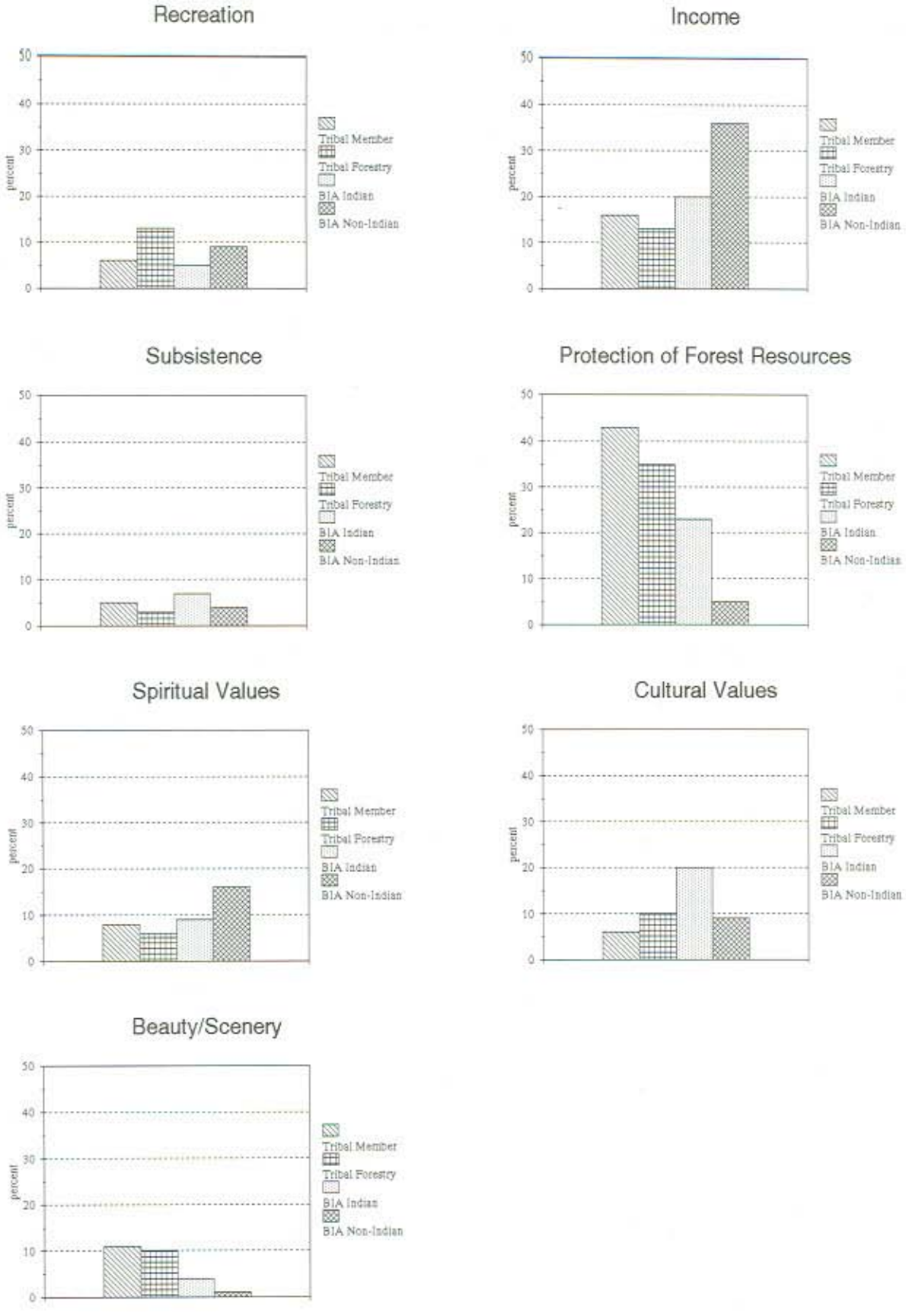


Figure 4b. What uses/benefits of the forest do you(your clients) value most? Bar height indicates the percentage assigned to "most valued"; organized by resource/use.

Table 5. How well do you think your forests are being managed? IFMAT survey results.

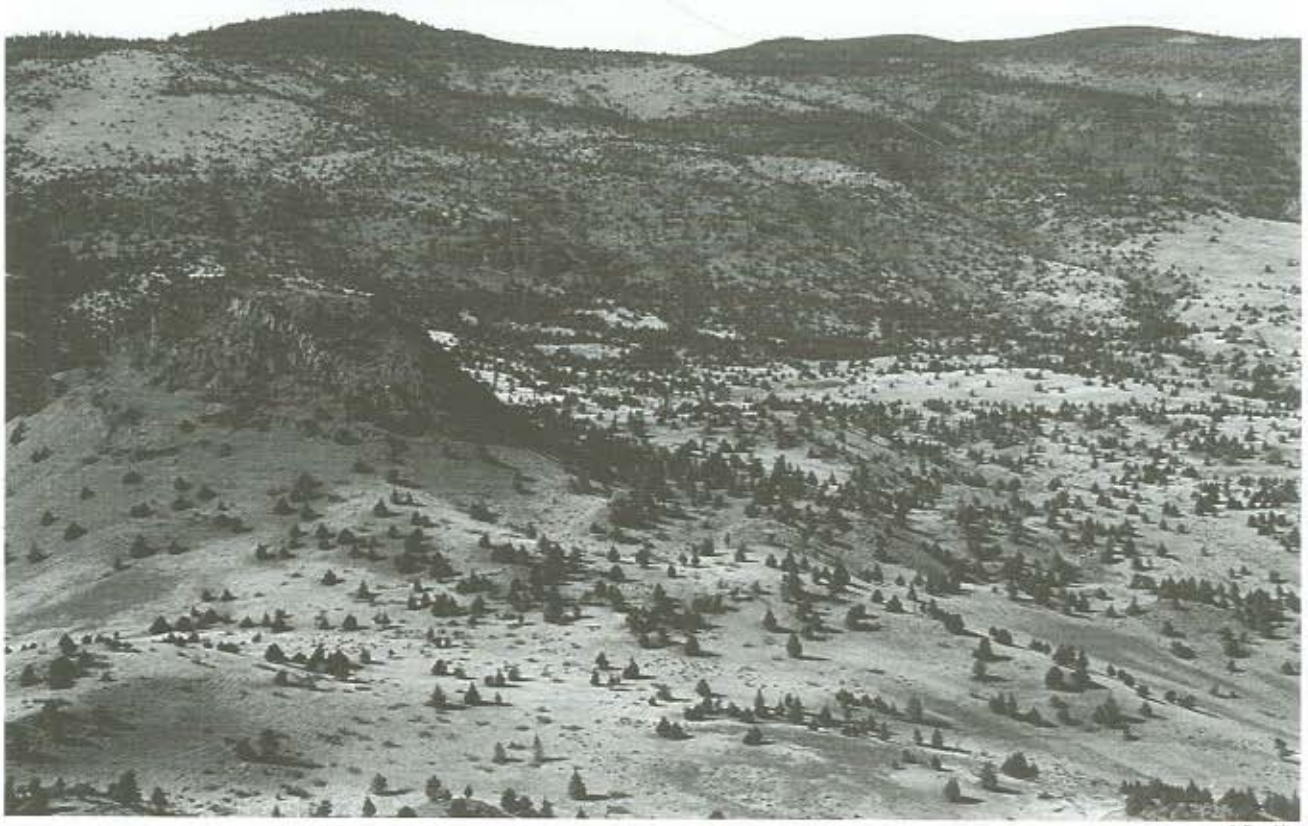
Position	Poor 1	2	3	4	Excellent 5	Don't Know/ Missing
	percent response by group					
	Wildlife					
Tribal Member	17	8	35	24	6	10
Tribal Forestry	6	13	58	19	3	0
BIA Indian	23	14	25	23	7	8
BIA Non-Indian	15	25	25	25	2	7
	Fisheries					
Tribal Member	10	21	26	20	11	12
Tribal Forestery	13	23	42	13	6	3
BIA Indian	13	21	34	18	5	9
BIA Non-Indian	7	16	25	33	0	15
	Livestock Grazing					
Tribal Member	20	20	18	8	5	29
Tribal Forestry	32	19	26	10	3	10
BIA Indian	29	16	27	9	2	17
BIA Non-Indian	11	18	31	15	0	25
	Timber/Firewood for Tribal Use					
Tribal Member	19	14	19	26	14	8
Tribal Forestry	16	19	39	16	6	3
BIA Indian	7	23	38	20	5	7
BIA Non-Indian	5	31	36	18	4	6
	Timber for Sale/Enterprise					
Tribal Member	16	13	19	28	12	12
Tribal Forestry	26	10	22	32	10	0
BIA Indian	16	18	21	20	12	13
BIA Non-Indian	13	5	22	44	11	5
	Recreation					
Tribal Member	24	15	27	11	8	15
Tribal Forestry	16	29	39	10	0	6
BIA Indian	14	14	34	9	5	11
BIA Non-Indian	20	20	24	13	2	12
	Cultural Resources					
Tribal Member	16	9	24	24	5	22
Tribal Forestry	3	6	39	39	16	10
BIA Indian	11	11	32	32	9	3
BIA Non-Indian	0	11	29	29	13	11
	Forest Resource Protection					
Tribal Member	12	18	24	18	9	19
Tribal Forestry	6	13	42	23	13	3
BIA Indian	7	12	29	36	11	5
BIA Non-Indian	4	14	18	44	14	6

Table 5. (Continued)

Position	Poor 1	2	3	4	Excellent 5	Don't Know/ Missing
	percent response by group					
Non-Timber Forest Products						
Tribal Member	9	16	21	4	5	45
Tribal Forestry	16	35	26	6	0	16
BIA Indian	23	27	16	5	0	29
BIA Non-Indian	11	35	18	5	2	29
Employment of Tribal Members						
Tribal Member	21	17	28	9	11	14
Tribal Forestry	6	23	35	23	13	0
BIA Indian	20	12	27	20	14	7
BIA Non-Indian	13	7	33	25	15	7
Creation of New Enterprises						
Tribal Member	21	20	22	3	4	30
Tribal Forestry	23	35	19	3	6	13
BIA Indian	18	45	16	7	5	9
BIA Non-Indian	20	24	29	11	2	14
Food Gathering						
Tribal Member	10	14	29	11	4	32
Tribal Forestry	13	26	35	13	3	10
BIA Indian	14	34	29	9	0	14
BIA Non-Indian	5	15	38	5	2	34
Visual Quality						
Tribal Member	18	17	26	13	11	15
Tribal Forestry	13	29	32	23	3	0
BIA Indian	9	27	30	25	4	5
BIA Non-Indian	2	14	38	34	4	8
Protection from Pollution/Waste						
Tribal Member	19	18	19	12	10	22
Tribal Forestry	10	35	39	6	6	3
BIA Indian	25	13	25	21	0	16
BIA Non-Indian	5	15	38	22	7	13
Poaching						
Tribal Member	30	14	22	5	3	26
Tribal Forestry	19	29	39	3	0	10
BIA Indian	25	23	23	16	2	11
BIA Non-Indian	27	18	11	15	2	27
Water Quality/Quantity						
Tribal Member	18	9	31	14	9	19
Tribal Forestry	10	23	35	19	6	6
BIA Indian	11	20	34	21	3	11
BIA Non-Indian	5	16	33	29	2	15
Obtain Fair Price for Timber						
Tribal Member	9	8	20	20	8	35
Tribal Forestry	16	6	19	32	13	13
BIA Indian	13	14	20	25	9	19
BIA Non-Indian	4	7	15	38	20	16

Table 5. (Continued)

Position	Poor 1	2	3	4	Excellent 5	Don't Know/ Missing
	percent response by group					
	Spiritual Value					
Tribal Member	10	17	27	14	11	15
Tribal Forestry	3	19	45	16	3	0
BIA Indian	5	21	34	25	4	5
BIA Non-Indian	4	9	18	4	4	8
	Trespassing					
Tribal Member	35	13	19	4	4	25
Tribal Forestry	16	48	19	10	0	6
BIA Indian	21	27	16	23	2	11
BIA Non-Indian	15	29	25	11	7	13
	Overall Management					
Tribal Member	15	12	35	16	2	20
Tribal Forestry	6	13	48	23	0	10
BIA Indian	7	18	48	20	2	5
BIA Non-Indian	2	20	34	38	4	2



J. Franklin

Woodland. Warm Springs R.

Table 6a. What forest activities /resources are most important to you? [1] IFMAT survey results.

Activity/Resource by Tribal Position	Number of Responses
Member	
Forest Resource Protection	16
Overall Management	12
Water Quality/Quantity	12
Wildlife	10
Recreation	6
Cultural Site Protection	6
Tribal Employement	5
Pollution/Waste Protection	5
Timber/Firewood for Tribal Use	3
Timber for Sale/Enterprise	3
Spiritual Values	2
Visual Quality	2
Poaching	2
Fisheries	1
Obtain Fair Price for Timber	1
Creation of New Enterprises	1
Non-Timber Forest Products	1
Food Gathering	1
Trespassing	1
Forestry	
Forest Resource Protection	6
Overall Management	6
Wildlife	3
Timber for Sale/Enterprise	3
Recreation	3
Water Quality/Quantity	3
Pollution/Waste Protection	2
Tribal Employment	1
Visual Quality	1
Spiritual Value	1
Natural Resource Staff	
Forest Resource Protection	5
Wildlife	5
Water Quality/Quantity	4
Overall Management	4
Fisheries	1
Cultural Site Protection	1
Obtain Fair Price for Timber	1
Spiritual Value	1
Pollution/Waste Protection	1
Poaching	1
Unspecified Member	
Wildlife	4
Forest Resource Protection	3
Overall Management	3
Tribal Employment	2
Timber for Sale/Enterprise	2
Timber/Firewood for Tribal Use	1
Water Quality/Quantity	1
Cultural Site Protection	1
Visual Quality	1
Pollution/Waste Protection	1
Poaching	1
Non-Indian Employee	
Forest Resource Protection	16
Timber for Sale/Enterprise	16
Wildlife	6
Water Quality/Quantity	4
Obtain Fair Price for Timber	3
Overall Management	3
Tribal Employment	2
Fisheries	2
Timber/Firewood for Tribal Use	1
Recreation	1
Food Gathering	1
Spiritual Values	1
Pollution/Waste Protection	1

[1] Respondent could list up to 3 activities.

Table 6b. What forest activities /resources are most important to your clients? IFMAT survey results.

Activity/Resource by BIA Forestry	Number of Responses
Indian	
Forest Resource Protection	12
Tribal Employement	7
Spiritual Values	6
Cultural Site Protection	5
Water Quality/Quantity	4
Timber/Firewood for Tribal Use	4
Wildlife	4
Overall Management	3
Timber for Sale/Enterprise	2
Recreation	2
Trespassing	1
Food Gathering	1
Livestock Grazing	1
Visual Quality	1
Non-Indian	
Tribal Employment	10
Timber for Sale/Enterprise	9
Wildlife	7
Cultural Site Protection	5
Livestock Grazing	4
Spiritual Values	4
Timber/Firewood for Tribal Use	3
Forest Resource Protection	3
Fisheries	2
Water Quality/Quantity	2
Overall Management	2
Visual Quality	1
Pollution/Waste Protection	1
Creation of New Enterprise	1
Trespassing	1

[1] Respondent could list up to 3 activities.

Table 7a. What activities/resources are being managed best on your forest? IFMAT survey results.

Activity/Resource	Tribal Member	Tribal Forestry	Non-Indian BIA	Indian BIA
	------percent response by group what activity/resource managed best--------			
Fish/Wildlife	1	2	2	2
Fisheries	3	5	5	3
Wildlife	13	13	10	9
Grazing	2	0	7	4
Timber/Firewood Use	3	2	2	4
Timber Sale/Enterprise	6	5	9	11
Timber Management	3	11	13	7
Recreation	4	3	3	3
Water Quality/Quantity	10	6	6	3
Forest Protection	5	2	5	10
Fair Price/Timber	3	2	2	1
Employment	2	3	2	1
Pollution Protection	4	0	0	0
Administration	1	0	2	2
Poaching	1	0	1	1
Trespassing	1	2	0	0
Forest Development	0	0	2	2
Overall Management	1	5	1	1
Fire	7	3	6	10
Communication	1	0	0	0
Financial Res./Funding	1	0	0	0
Erosion	1	0	0	0
Hunting	1	3	0	0
Staffing/Personnel	1	0	0	0
Inventories	1	2	1	2
Planning/Plans	1	0	1	0
Allotments	0	0	0	0
Insects/Disease	1	0	1	3
Harvesting	6	8	2	4
Stand Improvement	1	3	2	3
Reforestation	6	2	2	3
Slash	0	0	0	0
Cultural Protection	4	11	9	8
New Enterprises	0	2	0	1
Visual Quality	1	2	2	0
Roads	3	0	0	0
Tourism	0	0	0	0
Education	1	0	0	0
Non-Timber Products	0	0	0	0
Spiritual Values	0	2	2	3
Food Gathering	0	0	1	0
Training	1	2	0	0
Land Acquisition	0	0	0	0
Woodlands	0	0	0	0

[1] Respondent could list up to 3 activities.

Table 7b. Which aspects of forest management are most in need of improvement? IFMAT survey results.

Activity/Resource	Tribal Member	Tribal Forestry	Non-Indian BIA	Indian BIA
	------percent response by group activity/resource needing improvement-----			
Fish/Wildlife	0	0	0	0
Fisheries	0	0	1	0
Wildlife	3	5	5	3
Grazing	2	1	5	4
Timber/Firewood Use	3	3	1	2
Timber Sale/Enterprise	3	1	6	7
Timber Management	1	1	1	0
Recreation	2	3	2	3
Water Quality/Quantity	3	3	2	4
Forest Protection	8	3	0	2
Fair Price/Timber	0	0	1	0
Employment	4	1	3	2
Pollution Protection	4	0	1	2
Administration	2	4	4	5
Poaching	0	1	1	2
Trespassing	5	1	4	2
Forest Development	0	0	0	0
Overall Management	2	4	1	3
Fire	3	3	3	4
Communication	11	16	12	7
Financial Res./Funding	3	6	11	2
Erosion	2	0	1	0
Hunting	0	0	1	1
Staffing/Personnel	3	4	4	6
Inventories	2	5	7	5
Planning/Plans	4	6	5	5
Allotments	0	1	1	1
Insects/Disease	0	1	1	2
Harvesting	6	4	0	5
Stand Improvement	1	4	1	3
Reforestation	6	1	2	2
Slash	0	3	0	3
Cultural Protection	3	1	2	2
New Enterprises	1	3	4	1
Visual Quality	2	3	0	2
Roads	7	4	2	3
Tourism	0	0	2	0
Education	1	1	2	0
Non-Timber Products	1	0	1	0
Spiritual Values	0	1	0	0
Food Gathering	0	0	0	0
Training	0	1	2	0
Land Acquisition	2	0	0	0
Woodlands	0	1	0	0

[1] Respondent could list up to 3 activities.

A number of important questionnaire results are summarized below:

(1) All tribal members, forestry, and natural resource employees, and non-Indian employees expressed great concern for tribal forests, with the notable exception of tribal youth (Table 2).

(2) When tribal members were asked what they want from their forests and BIA employees asked what their clients want from their forests, non-Indian BIA forestry employees consistently rated resource protection, cultural values, and spiritual values lower, and income higher, than Indian forestry employees and tribal members (Table 3, Figure 3). Tribal members and non-Indian BIA forestry employees markedly differed when asked about the importance of forest resource protection; 75% of tribal members placed a high value on resource protection, compared to 29% of BIA non-Indian forestry employees and 46% of Indian forestry employees.

Similarly, 70% of tribal members placed a high value on beauty and scenery. However, only 24% of non-Indian BIA forestry employees and 48% of Indian forestry employees thought their clients highly valued beauty and scenery (Table 3 , Figure 3). When asked to rank which specific item they most valued, forest resource protection was listed most often by all Indian respondents. However, non-Indian BIA forestry employees most often identified income as most valued by their clients; only 5% thought their clients most valued resource protection (Table 4, Figure 4).

(3) Differences between tribal members and BIA forestry employees were less marked when both were asked how well they think their forests are being managed (Table 5). In general, management was not rated good or excellent by either group. Specifically, less than 25% of tribal members rated management of the following activities or resources as good or excellent: grazing, recreation, water quality and quantity, nontimber forest products, employment of tribal members, creation of new enterprise, food gathering, spiritual values, visual quality, overall management, and protection from pollution, waste, poaching, and trespassing. Timber or firewood for tribal use and timber for sale or enterprise were the two activities tribal members thought were being managed best.

Timber for sale or enterprise, obtaining a fair price for timber, and forest resource protection were the three activities BIA non-Indian forestry employees rated best managed. Tribal members rated obtaining a fair price for timber, employment of tribal members, cultural site protection, overall management, and forest resource protection much lower than did non-Indian BIA forestry employees.

When people were asked to develop priorities as to which activities or resources were most important to them (tribal members/employees) or to their clients (BIA), forest resource protection was ranked first by Indian respondents. In sharp contrast, tribal employment and timber for sale or enterprise were ranked first by non-Indian BIA forestry employees (Tables 6a, 6b).

(4) Tribal members/forestry employees and BIA Indian/non-Indian forestry employees identified a number of different activities and resources as being managed best (Table 7a). However, no one activity or resource was identified by a large percentage of respondents. Everyone agreed that communication about forests and forest management is the area most in need of improvement (Table 7b). Respondents repeatedly described the need for all tribal members to develop a better understanding of forests and natural resources and to become more involved in planning. All respondents also encouraged resource managers to improve communication and outreach efforts and to include tribal members more regularly in forest planning and management.

Questionnaire results were consistent with views expressed by both resource managers and tribal members during focus-group meetings.

Overall, tribal members see the forest as an integrated asset that requires coordinated management whose primary focus is on long-term protection and sustainability. Pervasive themes were (1) that all aspects of the forest be protected, (2) that an integrative, holistic approach be taken in managing all resources, recognizing a multiplicity of uses and values, and (3) that the Indian people play the primary role in making decisions about their forests.

We present on the next page our understanding of an overall "vision" for guiding forest management. This statement both illustrates what we mean by a "vision" and mirrors the themes consistently expressed in questionnaires and focus-groups. Indeed, all quotations in the statement are taken directly from focus group proceedings, and echo other statements made in other groups. No quotation used here represents an isolated point-of-view. We fully recognize that a vision for forestry developed by a tribe will reflect its own unique goals, but believe the following reflects common themes and perspectives that we heard:

A Vision for Indian Forests Compiled from Our Questionnaires and Focus Groups

Indian forests will be healthy, natural places where large, beautiful trees grow and all resources are respected. "In my short lifetime I have watched the forest deplete. My children no longer have the same opportunity to see beauty." Cultural sites will be preserved and forest resources used for food and wood gathering, medicines, ritual, and other traditions important to the people. "I'd like the forest to be 100 years from now like it was 100 years ago."

The forest will be managed as a whole entity. "Former management practices had a narrow approach. Now we need a collective focus." Past practices concentrating on timber production, income, and employment, which met important needs, will be broadened to better reflect the full range of forest values desired by tribal members. "Management is changing for the better." "Now we have to find other sources of income besides timber and not rely so much on the forest for revenue. We have to look at the whole environment." Improved mill operations and timber-sale programs will allow tribal governments to better manage the forest as a total asset. "We need to protect the forest as a complete forest."

"OUR LAND IS WHAT MAKES US WHO WE ARE"

Selective harvesting of trees increasingly will be used instead of clearcutting. "To preserve their beauty, areas should not be clearcut." "Scenery alone can heal your spirit."

Wildlife, watersheds, and streams will be protected and roads maintained; forests will be free of pollution and waste. "Whatever we do travels in a circle. Somewhere down the road good or bad comes back." "We have to look ahead and take care of what we have."

Indian people will manage their own forests. Tribal councils, members, and resource managers will work together to develop and update forest goals and objectives. "Before we had two forestry operations: Bureau of Indian Affairs and tribe. Now we are combining operations into one with other resources under the umbrella of ecosystem management."

The U.S. government will continue to meet its trust responsibilities by providing program funding and technical assistance. "We need more money and personnel because there is more to do."

Communication about forests and forest management among resource managers, tribal councils, and the people will be open and frequent. "Public involvement was not part of management in the past." "Every tribal member needs information and knowledge." "We all need to be leaders and work together as a team for the forest."

Indian experience and values toward the land will be incorporated in environmental education programs and together will become a core component of all education programs. "The missing link is education. Now we are developing education programs that will work for future generations."

Recommendations

(1) Each tribal government should consider developing a collective tribal vision where one does not now exist to guide management of tribal forests.

(2) Tribal governments should periodically reevaluate their visions to reflect changing conditions and desires.

IV. THE INDIAN FOREST RESOURCE AND THE BENEFITS IT PROVIDES

Indian forestlands are extremely diverse. They include coastal Douglas-fir and hemlock forests of the Olympic Peninsula, ponderosa pine and pinyon-juniper forests of the Southwest, aspen and white pine forests of the Lake States, and eastern hardwoods on the East Coast. Likewise, Indians' needs from their forestlands are diverse: forests provide everything from stumpage revenue to employment to game to religious sanctuaries. Clearly, managing for such a broad range of environments and human needs is challenging.

Almost sixteen million acres of forest exist on Indian reservations in the United States. Approximately 7.3 million of these forested acres are classified as timberland, the remaining 8.6 million as woodland (that is, forest with less than 5% commercial timber species but at least 10% crown cover) (Table 8, Figure 5). Timberland and woodland may be commercial or noncommercial; noncommercial acres include those that are unproductive, inaccessible, or reserved.

We have classified the 12 BIA Area Offices into 5 regions for the purposes of forest analysis (see Figure 1 for location of the Areas):

Northwest (Portland, Billings, Sacramento)
Lake States (Minneapolis, Aberdeen, Anadarko, Muskogee)
Southwest (Phoenix, Navajo, Albuquerque)
East (Eastern)
Alaska (Juneau)

Only limited information was available for Alaska.

Most timber harvested for industrial use comes from the 5.6 million acres of commercial timberland. The Northwest Region contains the most commercial timber acreage (over 40% of total) of any region in our study. These 5.6 million commercial acres contain 45 billion board feet, almost 65% of which is in the Northwest (Table 9, Figure 6). Much of that volume is ponderosa pine.

Total industrial wood harvest averaged close to 750 million board feet in the 1980s and 800 million board feet in the early 1990s (Table 10, Figure 7), with the Northwest providing more than half the total national harvest from Indian lands during these periods.

Fuelwood, pinyon nuts, range forage, and other items come from Indian woodlands. The pinyon-juniper type of the Southwest, at 92% of total woodland acres, is the most prevalent forest type within woodlands. Others are the juniper types of eastern Oregon; the oak woodlands of California, the Southwest, and Oklahoma; the aspen types of the northern Rockies; the mesquite types of the Southwest; and the Sabal Palm type of Florida. In total, 150 tribes have woodlands; for 27 tribes, woodlands are the only forestlands.

Indian forests contribute a small proportion of the nation's total wood supply, but their timber can be important locally and regionally. For example, in Washington's east Cascades, Indian timber could assume a dominant role in local log markets with the contraction in federal offerings. Moreover, Indian reservations could produce a sizable proportion of the ponderosa pine logs and lumber available in the United States in the near future, and some of the most highly prized old-growth white woods grow on Indian reservations.

J. Franklin

Shelterwood. Warm Springs R.

Figure 5. Acreage summary on Indian forests by region. The non-commercial category includes unproductive, reserved, and inaccessible land (USDI BIA, 1992f).

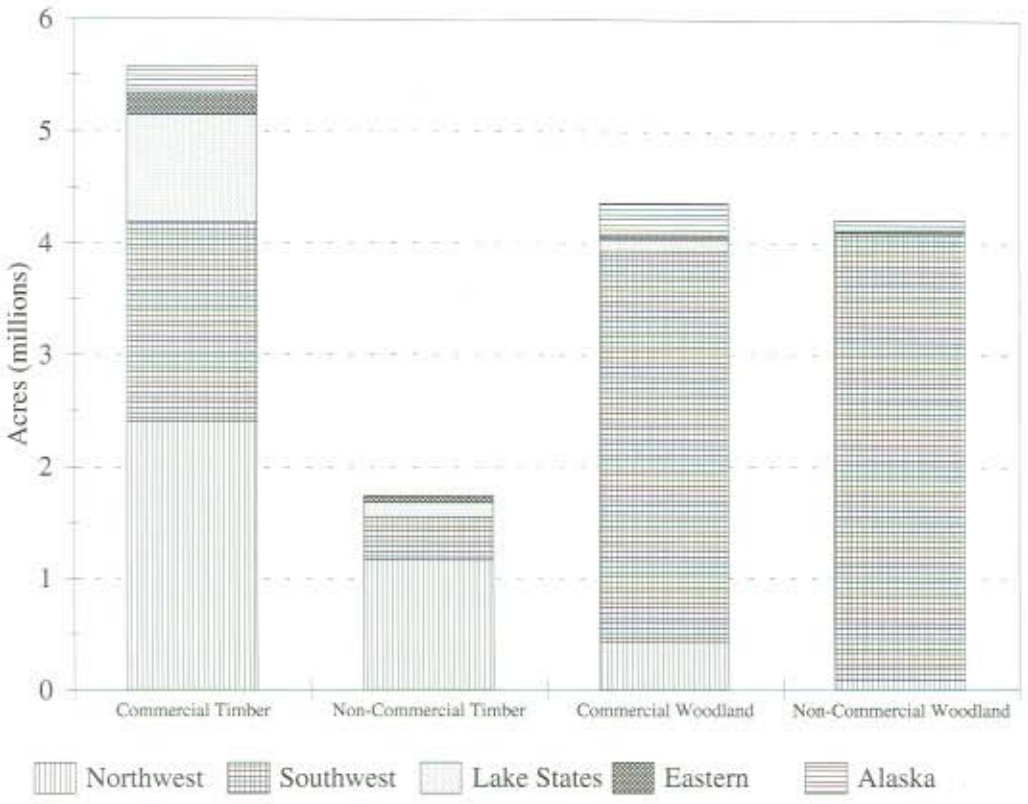


Table 8. Acreage summary on Indian forests by region. The non-commercial category includes unproductive, reserved, and inaccessible land (USDI BIA, 1992f).

	Commercial Timberland	Noncommercial Timberland	Commercial Woodland	Noncommercial Woodland	Total Acres
			Acres		
Northwest	2,400,699	1,159,515	420,191	92,354	4,072,759
Lake States	948,122	123,156	104,412	0	1,175,690
Southwest	1,792,733	393,718	3,514,744	4,010,297	9,711,492
Juneau	249,680	13,855	302,891	6,400	572,826
Eastern	186,517	50,519	20,680	108,097	365,813
Total	5,577,751	1,740,763	4,362,918	4,217,148	15,898,580

Figure 6. Total standing volume on commercial timberland on all reservations. (Does not include Alaska.)

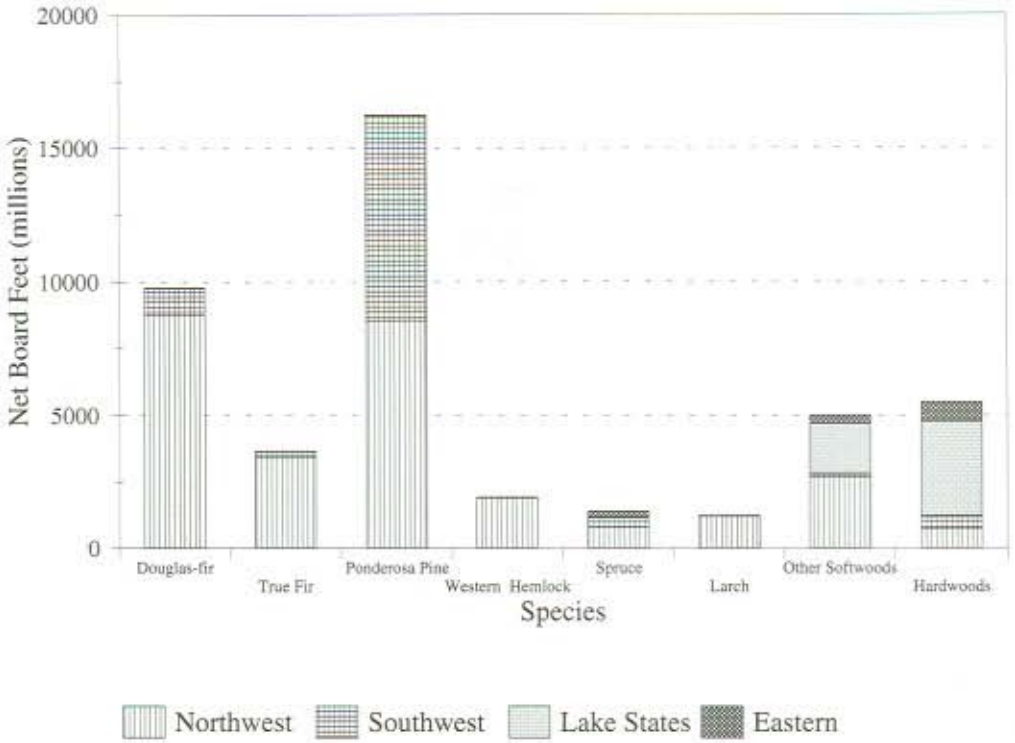


Table 9. Total standing volume on commercial timberland on all reservations. (Does not include Alaska.)

Region	Douglas-fir	True fir	Ponderosa Pine	Western Hemlock	Spruce	Larch	Other Softwoods	Hardwood	Region Total
	----------Scribner Board Feet (millions)----------								
Northwest	8737.8	3390.2	8530.1	1927.8	796.5	1226.3	2670.0	750.3	28029.0
Southwest	1032.9	273.5	7699.0	0	388.3	0	166.7	472.4	10032.8
Great Lakes	0	0	0	0	0	0	38.7	3512.6	5351.4
Eastern	0	0	0	0	207.7	0	313.5	749.7	1270.9
Total	9770.8	3663.7	16229.2	1927.8	1392.5	1226.3	4988.8	5485.0	44684.1

Source: Indian Forest Database (IFDB) developed by the Intertribal Timber Council, 1986. Revised 1987 - 1989 by Branch of Forest Resources Planning, Portland, OR. Release 10/92 supported by Tyler Marriot, Branch of Forest Resources Planning, Portland, OR.

Figure 7. Total harvest volume on commercial timberland on all reservations. (Does not include Alaska.)

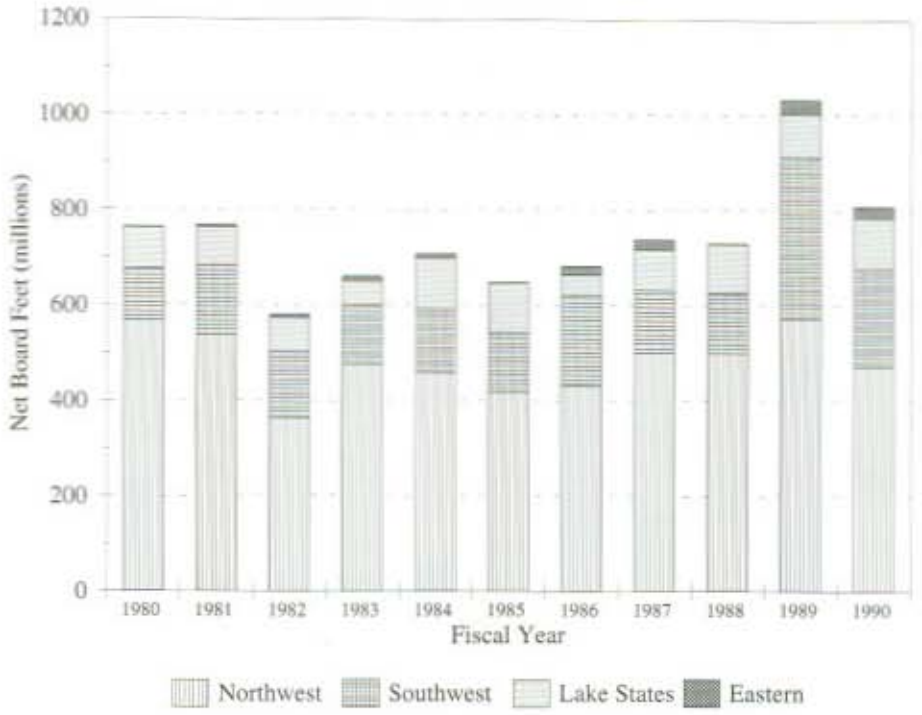


Table 10. Total harvest volume on commercial timberland on all reservations. (Does not include Alaska.)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
	----------Scribner Board Feet (millions)----------										
All reservations											
Northwest	566.61	537.46	363.81	476.46	458.35	416.77	430.29	501.05	499.44	572.27	470.90
Southwest	109.22	143.47	137.72	124.81	133.63	126.24	191.11	130.92	125.56	341.14	207.34
Great Lakes	86.09	80.80	70.99	48.33	106.29	103.91	40.57	84.68	105.01	89.17	106.77
Eastern	1.80	6.05	7.16	10.56	8.98	0.00	20.29	21.29	0.00	29.63	23.34
Total	763.73	767.78	579.65	660.16	707.25	646.92	682.26	737.94	730.00	1032.21	808.35
Sample reservations[1]											
Northwest	518.92	456.86	329.78	432.96	399.83	376.29	405.24	457.99	441.13	438.45	384.72
Southwest	94.07	105.32	103.67	96.91	113.25	100.75	169.25	110.03	109.21	306.34	162.93
Great Lakes	61.28	64.86	53.87	27.47	86.11	85.79	29.43	73.71	84.94	69.15	85.22
Eastern	1.74	5.09	5.80	4.74	2.61	0.00	17.69	18.32	0.00	24.48	19.08
Total	676.00	632.13	493.13	562.08	601.80	562.83	621.61	660.05	635.28	838.40	651.95

Source: Indian Forest Database (IFDB) developed by the Intertribal Timber Council, 1986. Revised 1987 - 1989 by Branch of Forest Resources Planning, Portland, OR. Release 10/92 supported by Tyler Marriot, Branch of Forest Resources Planning, Portland, OR.

[1] The sample reservations include: Alabama-Coushatta, Colville, Eastern Band of Cherokee, Flathead, Hoopa Valley, Lac du Flambeau, Makah, Menominee, Mississippi Choctaw, Navajo, Nez Perce, Penobscot, Quinault, Red Lake, Spokane, Tulalip, Warm Springs, White Earth, White Mountain Apache, and Yakima.

Economic Importance

In the 1991 fiscal year, according to the BIA, Indian forests and related forestry programs provided in excess of 464 million dollars in economic benefits to and supported over 40,000 full- and part-time jobs for Indians and non-Indians (BIA, 1992a).

Of those totals, economic benefits to Indians accounted for 284 million dollars (BIA, 1992a): tribal income was 92 million; Indian wages were 82 million; self-employment income was 21 million; and Indian personal use benefits were 89 million. Personal use benefits are an estimate of the nonmarket values realized by individual Indians as a result of their efforts to obtain and prepare nonmarket traditional forest products. Of the 40,000 jobs supported by Indian forests, over 28,000 part-time jobs and 3,000 full-time jobs were held by Indians.

Most of the economic return comes from the industrial harvest of commercial timberland, but some comes from reservation woodlands. For example, the BIA estimated that woodland products had an annual value of over 38 million dollars; fuelwood contributed almost 75%, followed by pinyon nuts, range forage, and other items (BIA, 1988).

Economic benefits to non-Indians from Indian timber harvests were estimated to account for 180 million dollars and support 9,000 full-time jobs. These estimates, derived via Forest Service regional multipliers for direct, indirect, and induced income and employment, represent a major contribution by Indians to the economies of regions adjacent to many reservations.

Other Forest Resources

Fish, wildlife, range, and water are prized by many tribes and individual tribal members because of their economic, recreational, cultural, and aesthetic values. In some areas they are key components of a subsistence lifestyle and economy.

Fishing and hunting are important recreational and cultural activities, and generate income for tribes whose members are commercial fishermen or professional hunting and fishing guides. Wildlife contributes to religious, cultural, and medicinal needs. Items such as elk and deer antlers are sold locally for carvings and (in several instances) internationally for medicines. The ability to hunt or fish a certain species is integral to the survival of the culture of some tribes. Water supports recreation, fish, wildlife, and livestock, provides aesthetic enjoyment, and is used domestically and industrially. The forest is a sanctuary for worship and religious ceremonies and offers a refuge for solitude. It is the source of traditional foods such as huckleberries and pinyon nuts and a place to gather traditional plants. Within it lie burial sites and other culturally significant areas.

Unfortunately, because of limited federal management programs and inventories, little regional or national information is available about other forest resources.

V. THE LEGISLATIVELY MANDATED TASKS

We summarize in the rest of the report our findings and recommendations for the eight tasks stipulated by NIFRMA. Within each section, findings and recommendations are identified in **bold type**. Brief elaboration often follows.

Comparative Analysis of Management Practices and Funding

(A) An in-depth analysis of management practices on, and the level of funding for specific Indian forestland compared with similar federal and private forestlands.

Findings

(1) Managers of Indian forests are practicing more ecosystem management (holistic management of all organisms and processes in the forest) now than in the past. Indian forests are places of experimentation where many examples of effective, innovative management can be found. Such innovation generally has been the result of tribal pressure. Forest inventorying, forest development activities (such as reforestation, thinning), uneven-aged management practices (in which a broad range of age classes are managed for by partial cutting), and integration and preservation of natural and cultural values all can be observed as state-of-the-art in some locations on Indian forestland--comparing favorably with nearby, similar public and private tracts. Indeed, some reservations are regional models for sustainable forestry. Opportunities abound, however, for improvement. For example: the development of silvicultural practices are needed which maintain higher levels of stand structural diversity and improve forest health.

(2) Timber management practices on Indian forests are generally comparable to those on National Forests with some qualifications. This discussion stresses comparisons between Indian forest management practices and those seen on the National Forests based on reservation visits, review of documents, and discussions with National Forests adjacent to sample reservations.. We chose the National Forests as the main comparative owner for three reasons: 1) the goals of Indian forestry appear closer to those of the National Forests than to other owners such as private industry (see finding (4) below for more discussion on this point), 2) Indian reservations are often located near National Forests, and 3) National Forest data is readily accessible.

Uneven-aged management has historically been a primary means by which harvesting has proceeded on Indian lands. In fact, Indian forestry can be seen to be ahead of its time, as the National Forests have begun to shift more to uneven-aged techniques. Currently, Indian forestry still uses proportionately more uneven-aged management than the National Forests, and uneven-aged management plays a significant role in the Northwest east of the Cascades, and in the Southwest and Eastern regions of the country.

Clearcutting is the primary regeneration harvest method for Indian forests, the National Forests and private lands west of the Cascades in the Northwest and in the aspen stands of the Lake States. In addition, all owners often prescribe clearcutting for disease and insect-ridden mixed conifer stands throughout the West.

Shelterwood regeneration harvest techniques, in which an overstory is maintained on an area during the early years of a new stand, are gaining in popularity on Indian forests in the West as is group selection in which very small patches of trees are removed at a time. These techniques can be seen as an attempt to find some middle ground between even-aged management using clearcutting and uneven-aged management using single tree selection. The National Forests are experimenting with shelterwood harvest and group selection in a similar manner and for similar reasons.

J. Franklin

Spruce Forest. White Mountain Apache R.

Retention of forest structures at regeneration harvest, such as snags, down logs, and wildlife trees and clumps, is being incorporated into forest practices on Indian forests. The use of the these "New Forestry" techniques falls somewhere inbetween that of the National Forests and private lands.

The heavier use of uneven-aged management in Indian forestry is reflected in a somewhat greater reliance on the natural regeneration as the primary means of reforestation. Slightly longer regeneration delay is sometimes allowed on Indian lands, in part because the Forest Service is mandated to achieve full-stocking in 5 years and may be more inclined to plant if adequate seed crops are not forthcoming within that time.

Recent plantation survival on Indian lands approaches that on the National Forests despite a somewhat lesser use of site preparation and animal control techniques. Limitations on some site preparation and animal control methods on some reservations are the result of tribal directives originating from cultural or environmental concerns. Where site preparation and control of completing vegetation occurs, mechanical means are the methods primarily used by both Indian forestry and National Forests with prescribed fire a close second. Chemical use for these purposes is limited on both National Forests and Indian lands; private industrial owners use chemicals extensively.

Both National Forests and Indian forestry identify forest development backlog needs. Understocked acres backlogged--.26 million acres on Indian lands and .5 million acres on National Forests--suggest a proportionally greater backlog on Indian lands.

Growth enhancement by means of density control is being carried out on both Indian lands and National Forests. Currently, the intensity of precommercial thinning and release occurring on Indian lands is similar to that occurring on neighboring National Forests. The primary technique on both ownerships is by use of chainsaw or brushsaw.

Prescribed burning as a means to thin or manipulate species distribution is used infrequently in both Indian lands and National Forests. Its use is primarily restricted to fuels management and site preparation. Smoke management is a major consideration in regards to its limited use on both ownerships .

The vast majority of forest development needs identified on both ownerships occur in precommercial thinning or release treatments -- 1.34 million acres on Indian lands (over 85% of backlog acres) and 1.2 million acres on the National Forests (over 80% of backlog acres). For both these ownerships, the backlogs reflect silvicultural considerations, where wider spacing would improve tree growth and vigor and reduce susceptibility to insect, disease and fire. These acreages suggest that backlog acres on Indian lands form a much higher percentage of commercial forest acres than on the National Forests. Substantial differences in measurement technique between the two owners, though, make comparison difficult.

A high proportion of the thinning backlog identified by the BIA and tribal forestry staffs can be traced to the Northwest, notably the mixed-conifer forest type, where harvest practices and fire suppression have contributed to denser stands than have been historically seen and shifts in species composition. Low budgets and limited emphasis on timber stand improvement until the late '80s have also contributed to the problem.

Silvicultural prescriptions, used to guide management of a forest stand over its rotation, tend not to be as thorough or sophisticated in Indian forestry as those seen on National Forests. Problems occasionally found include confinement of the analysis to stand establishment, limited growth modeling, use of blanket prescriptions over large land areas, and lack of integration with habitat typing.

A fair proportion of cutting on the National Forests now occurs as commercial thinning, primarily due to recent environmental restrictions. Indian forests, by contrast, have smaller commercial thinning programs, which are partially the result of the greater use of uneven-age management, but also reflects a predominant focus of forest management on the regeneration harvest of slow-growing, old-growth stands.

More intensive techniques, such as pruning and fertilization are practiced in a limited way on both Indian lands and National Forests but more often on the latter ownership.

(3) Other forest resources (water, fisheries, wildlife, range) are less well served. For example, although forest managers indicate that they are managing for featured species, tribal wildlife biologists may find that their recommendations are not being accepted. The integrating processes are working only in a few instances. In addition, tribes that allow livestock grazing generally do not have a professional range conservationist as a tribal employee, although, in a few instances, this service may be provided by the BIA or Soil Conservation Service.

(4) Indian forestry is seriously underfunded compared with federal and private forestry on similar lands.

(a) Current funding for Indian forestry is only 63% of that for timber production for the National Forests, only 50% of that for timber production for private forestry in the Pacific Northwest, and only 35% of that for coordinated resource management for the National Forests (Table 11).

Total annual funding for Indian timber production is 58.7 million dollars (40.8 million BIA, 17.9 million tribal), or $10.30 per commercial timberland acre (Tables 11, 12). In addition, since 1990 $500,000 have been provided for woodland management, or roughly $0.06 per woodland acre.

Total Forest Service annual funding for timber production on the National Forests is about 1.3 billion dollars, or $16.25 per suitable forest acre (Tables 11, 13).

BIA forester explains spruce management. White Mountain Apache R. J. Franklin

Table 11. Funding summary for Indian forests (FY91), the National Forests (FY91), and private forests (1989).[1]

Activity by Ownership	Annual Cost (million $)	Land Base		Harvest/acre/yr	
		Forest type	Acre (million)	$/acre	(bd ft)
Indian Forestry					
Direct timber production	58.7	Commercial timberland	5.7	10.30	140
All forestry including coordinating resource management	66.2	Timberland and woodlands	16.0	4.14	
National Forests					
Direct timber production	1265.0	Suitable for timber products in forest plans	77.8	16.25	129
Coordinated resource managment including timber production	2231.0	All acres	191.0	11.69	
Private Forests					
Direct timber production		Northwest forestlands	4+	20.41	

[1] Note: In this section we use 5.7 million acres of commercial timberland and 16 million acres of forestland as our best approximation of trust holdings of Indian forests. These totals are slightly higher (0.1 million higher) than those reported in section IV that came from a 1992 study.

Table 12. Cost of Indian timber program (FY91) (USDI BIA, 1992c).

Activity	Cost (million $)	Cost/Commercial Acre [1] ($)
Base Program	28.2	4.95
Inventory & Planning	1.5	0.26
Pest Control	0.6	0.11
Special Forest Development	10.3	1.81
Forest Product Marketing	0.3	0.05
Forest Management Deduction	7.7	1.35
Other Tribal Forestry Funds	2.3	0.40
Tribal/Allottee Deduction	7.8	1.37
Total	58.7	10.30 [2]

[1] Based on 5.7 million acres of commercial forestland.
[2] Does not include any fire costs.

Table 13. Cost of National Forest timber program (FY91) (derived from USDA Forest Service, 1992).

Activity	Cost (million $)	Cost/Commercial Acre[1] ($)
Timber/Sale Preparation & Administration	401	5.15
Other Resource Support	57	0.73
Reforestation	262	3.37
Timber Stand Improvement	141	1.81
Road Construction	263	3.38
Road Maintenance	28	0.36[2]
General Administration	113	1.45
Total	1265	16.25[3]

[1] Based on 77.8 million acres of lands identified as suitable for timber production in National Forest plans.
[2] Directly related to high-clearance vehicles.
[3] Does not include fire costs, facility maintenance, and that portion of road maintenance included in harvesting costs.

Table 14. Production costs on selected private forestlands in the Pacific Northwest (Arthur Anderson and Co., 1989; Sessions et al., 1990).

Activity	Cost/Acre ($)
Management[1]	10.12
Reforestation[2]	4.17
Timber Stand Improvement[3]	2.50
Road Construction & Reconstruction	3.00
Road Maintenance[4]	0.62
Total[5]	20.41

[1] Includes prescribing, contracting for, and supervising all silvicultural activities, timber-sale preparation and administration, and general administration.
[2] Site preparation and planting at $250/acre over a 60-year rotation.
[3] Precommercial thinning and one fertilization at $100 and $50/ acre respectively.
[4] Two miles/section at $200/mile.
[5] Does not include fire costs.

Table 15. Cost of National Forest coordinated resource management program (FY91) (derived from USDA Forest Service, 1992).

Activity	Cost (million $)	Cost/Commercial Acre[1] ($)
Timber Production	1265	6.62[2]
Wildlife and Fish	96	0.50
Recreation	215	1.13
Soil and Water	64	0.34
Range	43	0.23
Facilities Construction	64	0.34
Facilities Mantenance	25	0.13
Real Estate Management	41	0.21
Mineral Area Management	30	0.16
Road and Trail Construction	50	0.26
Road Maintenance	63	0.33[3]
Other	275	1.44
Total	2231	11.69[4]

[1] Based on 191 million acres.
[2] Total timber program from Table 13.
[3] Road maintenance for non-logging vehicles.
[4] Does not include land acquisition, fire costs, and stumpage payments to states.

Costs for managing comparable private lands were available only for the Pacific Northwest. The average annual cost of timberland management was $10.12 per acre for 20 firms whose lands totaled over 4 million acres (Table 11, 14). This cost included prescribing, contracting for, and supervising all silvicultural activities, timber-sale preparation and administration, and general administration. Added to this are $10.29 per acre for cost-effective forest development activities (such as planting, site preparation, precommercial thinning, and road maintenance) normally undertaken by private industrial landowners. Therefore, timber funding on private land totals on the order of $20.41 per acre. We found that management costs tended to decline as parcel size increased. Due to economies of scale, parcels under 100,000 acres could be $3 to $4 per acre more expensive to manage than parcels larger than 500,000 acres.

Coordinated resource management (integrated management of timber, water, fish, wildlife, range and cultural resources) on Indian reservations would include 5.7 million acres of commercial timberland (less than 35% of the total 16 million forested acres on Indian reservations), 1.7 million acres of timberland not available commercially, and 8.6 million acres of woodlands. Although a vision of what tribal members want from their forests, that we synthesized from questionnaires and focus groups, seems to call for coordinated management of all forest resources (recall Section III), very little federal funding is available for forests other than commercial timberland.

We have made an initial attempt to estimate the current level of funding needed for coordinated resource management on Indian lands. We estimate that not more than 100 FTE (full-time equivalent) specialists other than foresters and engineers--archaeologists, ecologists, fisheries and wildlife biologists, hydrologists, soil scientists, range conservationists, botanists, geologists, and landscape architects--are employed to work in forestry on the 214 forested reservations or in BIA Area offices. A survey that we conducted could, in fact, identify only 45 FTE resource specialists other than foresters and engineers (See section entitled "Evaluation of BIA and Tribal Staffing Patterns" for more details). Assuming 100 specialists and salary, benefits, and support of $70,000 per specialist totals 7 million dollars per

Table 16. Annual funding levels needed for Indian forestlands to reach parity with the National Forests.[3]

Activity	Land Base (million acres)	Existing $/ac	Existing million $	At Parity $/ac	At Parity million $
Commercial Timber Production[1]	5.7	10.30	58.7	16.25	93
Coordinated Resource Management[2]	16.0	4.14	66.2	11.69	187

[1] On commercial forest acres.
[2] On all acres, including timber production on commercial forestland.
[3] Trust Oversight Commission and prescribed burning costs are not included (see Table 1).

year. We consider this amount the upper limit of the funding beyond that already appropriated for timber production and woodlands. Adding the 7 million dollars for specialists and the $500,000 for woodlands to the 58.7 million dollars for timber production totals 66.2 million dollars annually for coordinated resource management, or $4.14 per forested acre (Table 11).

Total annual funding for coordinated resource management on the National Forests is about 2.2 billion dollars, or $11.69 per acre over all acres for all resources (including timber production) (Tables 11, 15).

(b) A continuing level of 187 million dollars per year is needed to bring Indian funding for coordinated resource management to a par with National Forest funding (Table 16). Of this total, 93 million dollars per year is needed for parity in timber production on Indian reservations.

The Forest Service, through management of the National Forests, is the federal agency with responsibility for managing the bulk of the nation's federal forests. The National Forests have been created out of the public domain or through federal purchase and can be considered to be held "in trust" for the citizens of the United States. The level of federal investment in the National Forests is an indicator of the efforts of the federal government (through the Forest Service) to carry out its "trust" responsibilities on the National Forests.

Wood quality discussion at tribal forest products enterprise. White Mountain Apache R. J. Franklin

Road and stream sharing same bed. White Mountain Apache R.

The mission of the Forest Service has often been summarized as "to provide the greatest good to the greatest number in the long run". This is close to the mission of the BIA to manage Indian forests to provide the greatest benefits for their Indian owners.

Given what Indian tribes want from their forests (recall Section III), we believe that the Forest Service has a set of objectives for National Forest lands more comparable to those of Indian tribes than do private owners. Further, we believe that the Forest Service focus on coordinated resource management, rather than strictly timber production, more closely approximates tribal goals and priorities.

We therefore use comparisons of federal spending on National Forests to federal spending on Indian forests to gauge if these two sets of lands have been treated differently by the federal government.

We estimate that a baseline funding level approaching 187 million dollars will be needed for Indian forestry to achieve parity with forestry on the National Forests consistent with tribal goals (Table 16).

We acknowledge that some Forest Service expenditures for coordinated management, such as part of the recreation funding, may not be needed to achieve tribal goals. However, other expenditures, such as for cultural resources, may be greater on Indian reservations than on National Forests.

Allotment and off-reservation land management also add substantially to costs. In total, 187 million dollars per year is a realistic beginning estimate of what is needed for parity.

In both cases, we applied the dollar per acre for parity to the entire land base--16 million acres for Indian lands, 191 million acres for National Forests. Interestingly, the percentage of total area constituting commercial timberland is close to the same for both--approximately 35% for Indian lands and 40% for National Forests. Thus, acknowledging that commercial forest acres may cost more to manage than noncommercial acres does not change the results significantly.

In addition, we note that board-feet production per commercial acre is comparable on Indian lands and National Forests (Table 11). Thus, acknowledging that more productive timberland may cost more to manage does not change the results significantly either.

(c) ***In addition*, over 200 million dollars will be needed to recondition and/or relocate, surface, and adequately drain an all-weather road system to reach parity with the National Forests (Table 17).**

One major difference between National Forests and Indian lands is the road system management. On National Forests, all road operations are managed by a professional engineering organization. On Indian lands, the engineering organization is limited to BIA Branch of Roads offices responsible for coordinating operations on BIA system roads only. BIA system roads are multi-use public roads on reservations; the majority of reservation roads are not eligible for Branch of Roads' management.

Tribal engineering management is rare. On National Forests, roads are usually designed by engineering professionals, conform to comprehensive transportation plans, and are maintained to target levels of service. On Indian lands, only the small fraction of roads on the BIA Branch of Roads system are normally designed by engineering professionals, comprehensive transportation plans are the exception, and periodic road maintenance is limited to roads with major public use and forest roads when there is a timber sale.

Table 17. Estimated funding needed to improve the transportation system for Indian forestlands to reach parity with National Forests.[1]

Estimate	Cost/Mile ($)	Total (million $)
Lower	25,000 [2]	200
Upper	35,000 [3]	280

[1] Road density averages 4 to 6 miles/section. We estimate that at least 1 mile/section will need to be all-weather.
[2] 4" of aggregate surface.
[3] 6" of aggregate surface.

Eastern hardwoods. Menominee R. J. Franklin

Wolf River Dalles. Menominee R. J. Spitz

The long period of low investment in Indian forestry has created forests with a weak infrastructure that cannot easily respond to the complex demands of coordinated resource management and has contributed to much environmental damage. Whereas Forest Service managers have been investing $3 per acre per year in forest infrastructure, Indian investments have been less than $1 per acre per year, almost all diverted from tribal income.

Lac du Flambeau R. J. Franklin

Conservatively, we estimate that the road system on Indian reservations will need an investment of over 200 million dollars to reach parity with the National Forests (Table 17). This amount is additional to the funding previously added to achieve baseline parity.

(d) ***In addition*, a significant investment will be needed to reduce the forest development backlog.** According to the BIA, as discussed above, 1.6 million acres (24% of all Indian commercial timberlands) qualify as forest development backlog (BIA, 1993). By contrast, 1.7 million acres (2% of National Forest commercial acres) are so backlogged. There are differences in how the backlog is measured on Indian and National Forest lands, but it is still highly likely that the forest development backlog on Indian lands is a greater proportion of commercial acres than on the National Forests.

Most of the backlog on both Indian and National Forest lands--1.4 million acres on Indian lands (over 85% of backlog acres) and 1.2 million acres on National Forest lands (almost 80% of backlog acres)--requires thinning or release. The wider spacing improves tree growth and vigor and reduces susceptibility to insects, disease and fire. The rest of the backlog--.26 million acres on Indian lands and .5 million acres on National Forest lands--is understocked.

Logging activity. Lac du Flambeau R. S. Grainger

To reduce the backlog on Indian lands to 2% of commercial timberland (about 115,000 acres) would require thinning, or planting of almost 1.5 million acres (BIA, 1993). At $100 per acre (a conservative estimate), the cost would total approximately 150 million dollars. How much should actually be undertaken depends, in part, on tribal goals for these forests.

(5) Tribes and the BIA need better access to research-based information tailored to their needs. The Forest Service and BLM have relatively large, well-developed research

programs. Some of this research is relevant and available to Indian forest managers. But access is limited, and information is not usually adapted to Indian objectives and locations.

(6) Limited access to capital was frequently cited by tribal leaders and foresters as a barrier to economic development. It is often difficult for tribal governments to borrow against land and timber assets. This can and does lead to harvest and sale of timber to generate investment capital. The accelerated harvest is not always in the best interests of the tribes, economically or environmentally.

Recommendations

(1) To meet tribal visions for Indian forests, increase per-acre funding to what the National Forests incur for coordinated management--an increase of over 120 million dollars per year. This increase would provide the necessary funding to plan, implement, and monitor forest management practices under a coordinated resource management framework. Over one-quarter of the increase would be for improved timber-sale preparation and administration including environmental coordination, engineering support, and transportation system development and maintenance.

(2) Also, make major investments in remedial road work and the activities needed to reduce the forest development backlog. On many reservations, past low levels of investment in road development and maintenance severely restrict current management flexibility in scheduling forest operations. In addition, poorly designed or located roads are creating undesirable soil and water impacts in many locations. With respect to forest development practices, a combination of past practices and past funding have resulted in backlogs in reforestation and timber sale improvement activities which restrict the potential of Indian forests in many locations.

(3) Develop more thorough and site-specific silvicultural prescriptions to guide forest management practices.

(4) Convert the BIA to a technical services organization with strong ties to primary sources of research in the National Biological Survey, the Forest Service, and universities. Policy and management questions can be answered in a timely way through research access to science-based information. Adequate research access allows an organization to achieve its goals without greater information constraints than its competitors or comparable groups. Minimum research access consists of using databases, computer literature searches, and professional contacts that arise in the course of usual business. Sophisticated research access requires detailed knowledge of the policy and technical questions that are most critical to achieving objectives, and similarly detailed knowledge of research sources (see also "Analysis of BIA Administrative Procedures").

J. Spitz

Bottomland hardwoods. Mississippi Choctaw R.

5) Establish a venture capital fund for Indian forests. Such a fund, similar in purpose to the World Bank and the regional development banks, in effect serves as a lender to those who are resource rich and capital poor. This might well be a private-sector initiative, similar in some respects to the South Shore Bank in Chicago.

Survey of Forestland Conditions

(B) A survey of the condition of Indian forest lands, including health and productivity levels.

It is difficult to generalize about current ecological conditions of a natural resource as extensive and diverse as the Indian timberlands and woodlands. Obviously, conditions vary widely with different forest types and regions and, even within comparable forest types, among reservations that have different histories of human use. Given such caveats, it nevertheless is important to provide an overview of the ecological state of Indian forestlands. Our assessment is based upon documentary material supplemented by reservation visits and discussions with resource professionals.

Trees under pine beetle attack. Alabama - Coushatta R. J. Spatz

Findings

(1) We distinguish five major types of forest in this discussion. Most Indian forestlands are found in the Intermountain West, between the crest of the Sierra Nevada and Cascade Ranges and the Great Plains; the major forest types there are (a) ponderosa pine, (b) mixed conifer, and (c) pinyon-juniper. The major forest type along the Pacific Coast (e. g., west of the Cascade Range crest) we categorize as (d) Northwest coastal conifer. The primary type in the eastern United States, including the Lake States, is (e) eastern hardwood-conifer.

(a) Ponderosa pine. Ponderosa pine forests, the most widespread commercial forest type on Indian lands, generally appear to be in good condition with regard to tree health and still retain much of their original structural diversity. This finding was somewhat unexpected in view of the fact that ponderosa pine forests were generally the first to be logged, have been continuously logged (in some cases, for over 100 years), and generally are extensively roaded.

Traditionally, ponderosa pine has been selectively harvested based on insect risk rating of individual trees, rather than clearcut. Hence, many of these stands still retain larger diameter and older trees and therefore the potential to produce large snags and down logs. Furthermore, although ponderosa pine stands have been heavily logged by some standards, harvest has created stands of moderate density which have low levels of tree mortality due to bark beetles; such stands appear better able to deal with climatic and other stresses than more densely stocked stands. Indeed, IFMAT members flew over hundreds of square miles of ponderosa pine forests in which there were few dead overstory pines.

Ecological concerns for ponderosa pine forests include low levels of some structural features (such as large decadent trees, snags, and down logs), continued emphasis on harvest of large, old trees, and effects of fire suppression. Selectively harvesting ponderosa pine has created a forest with fewer dead standing and down trees; merchantable dead trees have been promptly salvaged and snags felled. However, eliminating large standing dead and down wood affects the distribution and abundance of cavity-nesting birds, small mammals, and other animals (including invertebrates), all of which perform essential

ecological functions and some of which are of special interest (e. g., threatened and endangered species). Dead and down wood also is important in maintaining soil nutrition and other aspects of site productivity.

A number of current forest plans, if implemented, will eliminate the remaining large, old trees during the next one or two cutting cycles (10 to 20 years). Such a strategy will simplify forest structure, reducing habitat diversity and affecting aesthetic and spiritual values. In some areas, the more open canopy resulting from the simplified stand structure has already diminished habitat quality for some forest birds.

Light, frequent wildfire--historically a very important element in ponderosa pine forests--has been effectively eliminated during most of this century, largely on the assumption that silvicultural treatments such as clearcutting could completely substitute for periodic wildfire. In some areas, fire suppression has resulted in dense stands of saplings and poles, which has reduced forage for livestock, deer, and elk. It has also contributed to declining forest health and to increased potential for catastrophic fire. Adequate attention has not been given the unique role of fire in maintaining productivity and diversity in this forest type.

(b) **Mixed conifer.** The mixed-conifer forests, found at mid-elevations in the Intermountain West, are extremely varied ecologically, including as major components Douglas-fir, western larch, ponderosa pine, lodgepole pine, Engelmann spruce, true firs, western white pine, and quaking aspen. Collectively, they represent substantial acreage and much of the existing merchantable wood volume and productive potential on Indian forestlands.

Conditions in the mixed-conifer forests are not ideal with regard to either ecological values or forest productivity and, in most cases, are deteriorating. Ecological concerns include high levels of pests and pathogens, further simplification of stand structure by current harvest practices and levels (e. g., loss of large, old ponderosa pine), effects of fire suppression, and watershed protection.

J. Franklin

Riparian management discussion. Quinault R.

Allottee sale in a cedar/hemlock stand. Quinault R. J. Franklin

Mixed-conifer forests in the western U.S. are the sites for most of the forest-health issues on Indian forestlands. Stands have suffered major outbreaks of insect defoliators (such as spruce budworm) and bark beetles; some reservations have serious problems with dwarf mistletoe and diseases such as root rots. The current view is that many forest-health issues are a result of fire suppression policies and, in some cases, past harvest practices.

Past and current trends in forest composition and stand density are contributing to deteriorating ecological conditions. Early-successional species, such as ponderosa pine and western larch, are gradually being replaced by more shade-tolerant species, such as Douglas-fir and true firs. Yet the early-successional species play important ecological roles, have greater economic value and suffer fewer problems with pests and pathogens. Overstocked stands are proving vulnerable to climatic stresses, leading to major outbreaks of insect defoliators and bark beetles.

Conditions are not uniformly negative, however. Many stands have been selectively harvested rather than clearcut; such stands still retain high levels of structural complexity and tree-species diversity.

In some cases, though, partial cutting has intensified problems with pathogens such as dwarf mistletoe by retaining infected overstory trees which then inoculate the young trees with the pathogen. On some Northwest reservations, substantial acreages of mature mixed-conifer forest could be commercially thinned to significantly reduce risk of insect outbreaks by eliminating more susceptible tree species and reducing stand densities to improve the vigor of remaining trees.

Maintaining desirable ecological conditions in mixed-conifer stands, including forest health, is one of the greatest management challenges on Indian forestlands. Most difficult is balancing the need to improve forest health in the short term with the equally important need to maintain stand diversity (tree composition and structure) in the

long term. The traditional approach to health issues in these forests has been clearcutting followed by planting; however, this approach can be expensive and eliminates some ecologically desirable biological legacies, such as large, old trees and snags, thereby simplifying forest structure. On the other hand, partial cutting, including single-tree selection, preserves biological legacies and structural complexity but may reduce forest productivity by accentuating problems with mistletoe and root rots.

The creative site-specific solutions needed to balance wood production and environmental objectives are just beginning to emerge on several reservations. The debate over even-aged management (generally by clearcutting) vs. multi-aged management (in which several distinct age classes are managed for by partial cutting) continues to be important, controversial, and largely unresolved in mixed-conifer forests. Solutions are likely to lie somewhere in between--for example, even-aged management in which appropriate numbers of green (live) trees, snags, and down logs are retained, and uneven-aged management in which small patches are selected for harvest. Some current forest plans, if implemented, will eliminate the remaining large, old trees in many stands, simplifying them during the next one or two cutting cycles (10 to 20 years) and reducing habitat and wildlife diversity as well as aesthetic and cultural values.

Controlling stocking levels in young and mature stands through thinning and prescribed fire is most likely to contribute to long-term forest health in the mixed-conifer forests. Vigorous pole and small-sawtimber stands should be commercially thinned. Prescribed fire has demonstrated strong potential as a management tool in both ponderosa pine and mixed-conifer forests. Although the BIA has historically been a leader in using prescribed fire, activities appear to have lagged on many reservations because of lack of funding, tribal concerns, and other factors including legal issues associated with smoke management.

A significant number of mixed-conifer stands include aspen and associated meadowland. As a result of fire suppression, many of these stands are losing their aspen, which will ultimately reduce aesthetic value, animal-species diversity, and habitat for game and non-game species. Mountain meadows associated with the mixed-conifer forests are often severely grazed, and erosion is evident from cattle trails and logging roads. The ecological integrity of these moist meadows is jeopardized on some reservations and should receive much more attention.

(c) **Pinyon-juniper.** Woodlands, primarily pinyon pine and juniper, cover about half of Indian forestlands and have great economic and cultural value to Indians. Yet there has been little active management of this forest type, and scientific knowledge about it is limited.

Most of the pinyon-juniper woodlands are in poor ecological and economic condition. Concerns include extensive human impacts--grazing and other agricultural uses, fire suppression, harvesting for wood (including firewood) and other forest products (including pinyon nuts or acorns), and conversion to housing.

Domestic livestock has intensively grazed much of the pinyon-juniper type for well over a century, reducing or eliminating desirable grasses, forbs, and shrubs, eroding soils, contaminating water, and promoting expansion of juniper cover. Fire suppression also has allowed junipers and pines to invade grasslands, with consequent loss of forage species.

Douglas-fir/hemlock/sitka spruce forest. Makah R. J. Franklin

Low herbage production, an increase in noxious plants, and slow recovery of desirable forage species attest to the relatively poor ecological condition of many woodlands. Moreover, pinyon-juniper stands often are devoid of dead standing and down wood because of intensive removal for fuelwood. As a result, many areas lack suitable habitat for small mammals, which provide food for indigenous prey species including raptors. Under current management, conditions on Indian woodlands are continuing to deteriorate. Although a start on assessment and management of woodland has been made, the resources directed to pinyon-juniper are grossly inadequate, given the scale of this forest type, the current state of knowledge, and the problems created over a century by uncontrolled human activities. The tribes could provide global leadership in responsible management of arid woodlands.

(d) **Northwest coastal conifer**. Forests dominated by evergreen conifers, such as Sitka spruce, Douglas-fir, western hemlock, and western redcedar, are the major forest resource on Indian lands along the Pacific Coast of North America from northern California to the Gulf of Alaska. Evergreen hardwoods are also a significant component of the forests of northern California and southwestern Oregon. The northwest coastal forests are extraordinarily productive and have high economic value. They also protect the quality of streams and rivers containing anadromous fisheries, another important economic and cultural resource of the tribes.

The ecological condition of Northwest coastal conifer forests is mixed. Concerns include consequences to stand structure of current harvest practices and impacts of roads, especially on fisheries; forest-health issues are minimal.

Because they are highly productive, these coastal forests typically are resilient and grow back quickly as long as provisions are adequate for tree regeneration. Currently, regeneration by planting seedlings is usually prompt and effective, although significant areas on some reservations remain nonstocked or understocked from regeneration failures following earlier logging activities.

J. Franklin

Discussion of benefits and costs of alder thinning. Makah R.

40-50 year old hemlock/spruce stand naturally regenerated after harvest. Makah R.

Harvesting in coastal forests has simplified stand structure and composition. Traditional clearcutting eliminates large, old trees, large snags and down logs, and large woody debris in waterways. The practice is controversial on all forestland ownerships in coastal regions--especially on public lands--for these and other reasons. Under clearcutting practices, riparian (streamside) areas and critical wildlife habitat, such as calving grounds, have received little protection, although clearcuts do provide forage for deer and elk. Road systems developed for harvest and other management activities have had major impacts on stream sedimentation and water quality, both of which affect anadromous and resident fish.

Practices over the last two or three decades have tended to produce vigorous, even-aged young stands of commercially important trees--an economic benefit. Conversely, structures and species have been lost from stands, and important stand types, such as old-growth forest, have been lost from landscapes; these losses have negatively affected fish and wildlife values and other ecological functions.

Management practices in coastal forests are currently undergoing rapid change in response to an expanding knowledge base and increased concern about nontimber forest values. Even-aged management is still viewed as the most appropriate approach where there are major economic concerns (with which IFMAT agrees), but its application is undergoing significant changes. For example, forest structures such as snags, down logs, and wildlife trees are being retained in harvested stands as legacies for new stands; critical wildlife habitat is being reserved; and significant protection for riparian zones is becoming the norm, although levels vary widely. The degree to which conventional forest practices are being modified for nontimber objectives varies widely on Indian reservations. In general, ecosystem concepts are being incorporated into management of Indian coastal forests at rates comparable to those on adjacent state and private forests but not as rapidly as on federal lands.

(e) **Eastern hardwood-conifer**. Indian forestlands east of the Great Plains vary widely in type and condition. Generally they are dominated by hardwoods, such as maples, oaks, basswood, birches, and aspen, but often have a significant component of conifers, such as eastern white pine or eastern hemlock. Conifer plantations are common. Most eastern forests have been substantially altered by past human activities, including clearing, harvest, and fire suppression.

Structural complexity and species composition of many eastern stands have substantially deteriorated from their original condition. Concerns include the low economic value of the current forest, complex ownership patterns, and difficulties in regenerating desired species. The major challenge is to restore these forests to more desirable economic and ecological conditions. Several factors, including the large array of tree species and potential for uneven-aged management, provide opportunities not available on many western forestlands.

A few reservations have maintained extraordinarily healthy, productive stands of eastern hardwoods and softwoods and are models of management. Foresters on these reservations use both uneven- and even-aged management systems and tailor silvicultural prescriptions to stand and site conditions.

Table 18. Annual allowable cut, harvest, and net growth, by region, for the sample reservations.

Region	Annual Allowable Cut[2]	1980s Average Harvest[2]	1990 Harvest[2]	Annual Net Growth[3]
	Scribner board feet (millions)			
Northwest - East Side[1]	399.4	346.5	314.1	347.8
Northwest - West Side[1]	69.9	79.2	70.6	37.7
Southwest	120.3	133.8	162.9	92.8
Lake States	151.4	65.7	85.2	68.5
East	17.5	9.0	19.1	35.9
Total	758.5	634.2	651.9	582.7

[1] East or west of the Cascade Range.
[2] Source: Indian Forest Database (IFDB) developed by the Intertribal Timber Council, 1986. Revised 1987 - 1989 by Branch of Forest Resources Planning, Portland, OR. Release 10/92 supported by Tyler Marriot, Branch of Forest Resources Planning, Portland, OR.
[3] Source: Net growth from CFI trend summary data provided by Branch of Forest Resources Planning, Portland, OR. for reservations with trend data. Other growth data came from Dibble (1992) or IFDB.

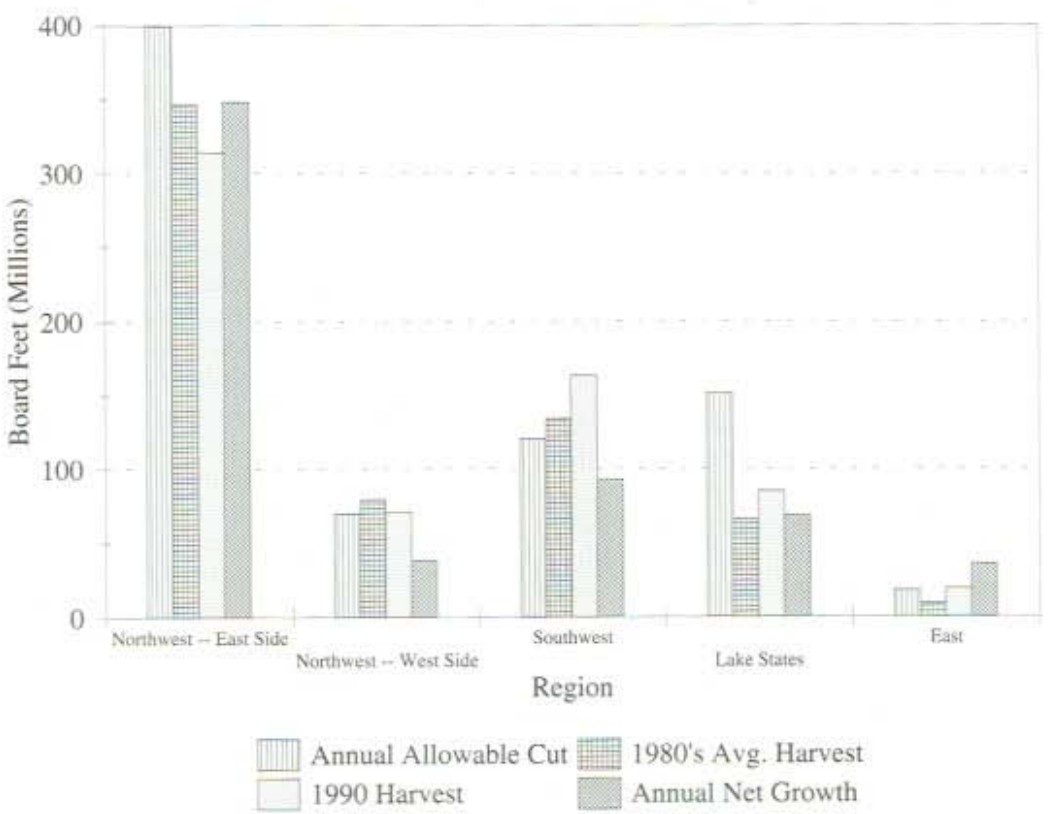


Figure 8. Annual allowable cut, harvest, and net growth, by region, for the sample reservations.

Note: Validity of the Lake States board foot values is difficult to determine since they have been derived from cordwood measurements through procedures that are not documented in these datasets.

Table 19. Gross board-foot volume per acre over time, by species and weighted by acres, for the sample reservations.[1]

Region	Year	Douglas-Fir	Ponderosa Pine	True Fir	Western Hemlock	Spruce	Larch	Other Softwood	Hard-wood	Region Total
					Scribner board feet/acre					
North-west	1971	3,369	4,318	1,660	203	219	535	814	0	11,117
	1977	3,266	3,859	1,759	232	228	490	948	0	10,781
	1987	3,620	3,632	2,146	277	228	462	1,002	0	11,367
South-west	1971	654	5,240	117	7	804	5	265	397	7,488
	1977	625	5,095	117	9	665	3	225	460	7,199
	1987	639	4,693	115	9	313	3	262	566	6,599
Midwest	1971							3,363	3,776	7,139
	1977							3,309	3,718	7,027
	1987							3,472	4,167	7,639

Note: The data were updated or backdated to three common base years (1971, 1977, 1987) that were the average year of inventory for the remeasurement period using gross board-foot growth rates. These growth rates were assumed to remain constant between the second and third (1977 and 1987) remeasurement periods.

[1] Source: CFI trend summary data provided by Branch of Forest Resources Planning, Portland, OR. for the sample reservations that have trend data.

J. Franklin

Seedling nursery. Makah R.

Table 20. Basal area over three remeasurement periods (approximately 16 years total), by size class and weighted by available acres, for the sample reservations.[1]

Region	Available Acres in Sample	Species or Wood Type, by Diameter Class (inches)											
		square feet of basal area/acre											
		Ponderosa Pine				Other Species				Total			
		6-12	14-24	26-30	32+	6-12	14-24	26-30	32+	6-12	14-24	26-30	32+
Northwest	1,285,671												
Period 1		6.1	8.0	2.0	1.3	23.4	21.6	6.1	4.2	29.5	29.6	8.1	5.5
Period 2		6.4	7.8	1.9	1.0	27.0	21.8	5.5	3.6	33.4	29.6	7.4	4.6
Period 3		7.0	8.1	1.8	0.8	28.1	22.6	4.9	3.4	35.1	30.7	6.7	4.2
Southwest	1,173,951												
Period 1		14.3	22.6	6.4	1.7	5.5	6.4	1.8	1.3	19.8	29.0	8.2	3.0
Period 2		16.1	22.0	6.2	1.9	6.5	5.9	1.6	1.1	22.6	29.7	7.8	2.9
Period 3		19.1	21.3	5.4	1.5	8.1	6.1	1.3	0.9	27.2	27.3	6.7	2.4
		Softwoods				Hardwoods				Total			
		6-12	14-24	26-30	32+	6-12	14-24	26-30	32+	6-12	14-24	26-30	32+
Lake States	218,810												
Period 1		18.9	17.3	3.6	1.2	35.2	21.6	3.0	0.4	54.1	38.9	6.6	1.6
Period 2		19.6	17.2	4.3	1.4	37.5	22.0	2.7	0.4	57.1	39.2	7.0	1.8
Period 3		19.4	16.7	4.6	1.7	36.9	24.7	3.2	0.7	56.3	41.4	7.8	2.4

[1] Source: CFI trend summary data provided by Branch of Forest Resources Planning, Portland, OR. for the sample reservations that have trend data.

(2) Species diversity and structural complexity on many reservation forests are still sufficient to provide numerous options for future management. For example, because large, old trees still exist in many stands, prescriptions can be developed which retain this structural component and ensure sources of future snags and down logs. Within a decade, however, continuing past harvest policies will sharply limit the choices available for the next generation.

(3) Analysis of forest inventory, growth, and yield information from our sample reservations shows some interesting regional trends. Sample reservations contain about 2/3 of the commercial forest acreage on Indian reservations and produced over 75% of the timber harvested in the 1980s. On these reservations, harvests in the 1980s and in 1990 were about 15% below the allowable cut (Table 18, Figure 8), although harvests in some regions were actually a little above it. In addition, harvest was slightly greater than growth, although in some areas (such as on the east side of the Cascade Range in the Northwest), growth equaled or exceeded harvest.

For the period 1971-1987, the Northwest and the Midwest had roughly the same standing board-foot volume at the end of the period as at the beginning, during, whereas the Southwest declined somewhat over the period (Table 19). Ponderosa pine volume per acre declined in the West, whereas that for other species, especially true fir, increased.

Basal area in large trees declined somewhat over three measurement periods (a total of about 16 years) in the West, especially the basal area in ponderosa pine, and increased in the Lake States (Table 20). Basal area in small trees generally increased, so, in balance, total basal area stayed constant or slightly increased.

(4) Watersheds, riparian areas, and stream channels often show signs of cumulative negative effects from historical and current timber harvest, roading, and grazing. Many reservations exhibit extensive soil compaction from roads and skid trails. Also, many reservations had numerous roads that were poorly designed and inadequately drained. Some roads placed up stream channels constricted the channels,

precluding development of streamside vegetation. Forests had been and were still being harvested within 50 to 100 feet of the stream, and grazing practices typically precluded reestablishment of streamside shrubs, trees, and sedges. Stream channels showed signs of instability, and habitat features had been simplified through building roads adjacent to streams, clearing streams of large woody debris, and/or erosion.

Watersheds at lower elevation have suffered the greater impacts; those at higher elevations generally were in good shape except where heavily grazed. Watershed conditions on larger reservations varied considerably, ranging from very good to very poor. Conditions on smaller reservations and on reservations reacquiring and consolidating land ownership suggest the need for restoration. Stream-restoration projects are currently being conducted on a few reservations.

(5) Assessing and managing for biodiversity on Indian lands--a key aspect of ecosystem management--is made difficult by inadequate inventories, staffing, and budgets. Inventories of wildlife and other nontimber resources are largely lacking.

(a) **The populations and habitats of featured species such as deer and elk generally appear to meet the needs of the larger reservations. However, there are few systematic inventories or surveys to assess long-term trends.** In addition, because of their workload or lack of help, wildlife biologists have insufficient time to review all activities affecting species that tribes may wish to feature. Smaller tribes without a wildlife biologist are managing their featured species or other wildlife mostly by default because of a lack of financial and technical support. For some tribes, managing wildlife is complicated by fragmented land ownership inside the reservation boundary. Many tribes do not have coordinated resource management plans, which further reduces the ability of wildlife biologists to have their recommendations included in timber-sale activities.

(b) **Sensitive, threatened, and endangered species generally receive inadequate attention.** Although one tribe has an exemplary program of managing for northern spotted owls by integrating their habitat requirements into stand prescriptions, many tribes perceive the current implementation of the Endangered Species Act as threatening tribal sovereignty. Tribes generally want to manage for threatened and endangered species, but want to do so in a manner consistent with their own culture. In addition, tribes are not well funded to inventory and monitor populations and habitats of sensitive, threatened, and endangered species.

(c) **Aquatic resources, an integral part of the tribal forest, depend on the condition of forestlands for sustained health and productivity.** It is difficult to generalize about the status of aquatic resources on tribal lands because aquatic habitats are not always monitored, and the number and diversity of aquatic species found in forest streams are not always known. Some tribes have fishery programs that aim to maintain health and productivity of aquatic ecosystems through stream and watershed restoration projects, monitoring habitat conditions and species, reintroduction of native species, and preservation of unique invertebrate communities. However, despite the general lack of data, it is apparent that aquatic species are less plentiful and diverse today, and that the condition of aquatic habitats has been degraded [recall (4) this section] by past management practices (e.g., road placement, removal of woody debris from streams) and factors beyond reservation lands (e.g., dam building, habitat degradation, acid rain, ocean conditions, and fish harvest).

Buffer leave strip. Makah R. J. Franklin

Fisheries resources present a special challenge when they are a major economic factor. Ecological considerations tend to be discounted when fisheries are perceived as a commodity. For example, when a certain fish species is considered economically valuable, management often focuses on producing as many of that species as possible, ignoring effects on other native species that share the same habitat. When production becomes the main focus, a species' integrity can be compromised if not carefully monitored, and the capability of the habitat to support the fishery may not be considered. When enhancement of recreational sport fishing is the primary objective and the natural habitat is in poor condition--that is, not capable of sustained production of valuable fish--planting hatchery fish in that habitat can maintain recreational fishing but neither considers nor resolves ecological problems.

Management practices on upland ecosystems impact forest streams, lakes, and aquatic resources. Protection of aquatic resources under the Endangered Species Act can affect how other upland forest resources are managed. One of the most complex examples of aquatic health and productivity issues which could influence other forest resources is the management of Pacific salmon and steelhead. Most of the management of these fisheries has focused on policy planning, dispute resolution, and coordinating hatchery and harvest management. Endangered Species Act protections for threatened species have not been factored into this complex issue, except in the Snake River. If additional stocks are listed as threatened and endangered, changes in management of hatcheries, harvest, and habitat will probably be needed.

Clearly, adequate freshwater habitat is necessary though not sufficient to prevent future listings. Hatcheries are a major tool for assuring both genetic diversity of stocks and increased production of fish. Currently, few tribal hatcheries manage both for genetic diversity and production. Harvest management can be adjusted to maintain the biodiversity of stocks. At present, however, habitat, hatcheries, harvest, and hydropower have not been integrated into a comprehensive fish-management plan for many tribes.

(d) There often is little control of numbers of livestock or areas used for livestock grazing on reservations. In several cases, grazing capacity is based on surveys done 30 to 40 years ago; in most cases, capacity has not been estimated. Indeed, on a majority of reservations, records of livestock use are non-existent or are of a quality that makes them of little value. In all cases, tribes with livestock were not staffed or funded to do an adequate management job.

(6) Monitoring the consequences of resource management activities is fundamental to any management program; yet monitoring programs are largely absent on Indian forestlands. We found monitoring programs on Indian forestlands limited in number and scope, fragmented rather than comprehensive, and grossly underfunded. We must add, however, that this is equally true of forests on all other ownerships including federal forestlands. Development and implementation of adequate monitoring programs--programs that address the full range of resources and at least a representative sample of each management activity--are absolutely essential to responsible future management of Indian forestlands. Information gleaned from monitoring is basic to "adaptive management"--that is, management in which feedback on the effectiveness of management practices helps identify those that are working and those that need to be modified to meet specified goals.

J. Franklin

Rugged terrain. Hoopa Valley R.

Brush invasion after harvest. Hoopa Valley R. S. Grainger

(7) **Prescribed burning needs to receive considerably more attention as a tool for reestablishing and maintaining healthy mixed-conifer stands in the Intermountain West and for managing pinyon-juniper woodlands.** The scientific evidence suggests that fire achieves ecological objectives that are difficult or impossible to attain with mechanical treatments such as thinning or harvest. For example, fire consumes considerable organic material and makes nutrients available as ash; moreover, some soil organisms require the intense heat of a fire to stimulate fruiting and reproduction.

The BIA was an early leader in developing and applying prescribed burning. Indeed, we expected to see widespread use of fire during reservation visits. In fact, prescribed burning appears to be languishing as a tool on many reservations because of lack of funds, lack of technically qualified personnel, and legal risks. We noted that many tribal members expressed negative views of prescribed burning, perhaps partially because of problems with smoke in the residential areas of reservations. Even though Indians once practiced prescribed burning extensively, many tribal members do not seem to understand the ecological basis for using fire as a silvicultural tool.

The BIA needs to reestablish its leadership in using prescribed burning, given the major forest-health issues associated with mixed-conifer forests and the expansion of pinyon-juniper cover in woodlands. Both the limitations and potential of mechanical treatments need to be explained to tribal members. Substantial increases in funding will be necessary to carry out all elements--research, development, education, application, and monitoring--of an expanded prescribed-burning program

(8) The use of ecological classifications to stratify forestlands (for resource management prescriptions) is an important issue on Indian forestlands. We were pleased to find that ecological classifications (that is, habitat or site types) are available on many reservations. Where such classifications exist, resource managers appear to use them appropriately in developing management prescriptions. In several important cases, however, the classifications used have been "imported" from adjacent federal lands, such as National Forests, rather than developed from on-reservation sampling. Furthermore, BIA and the tribes appear to have little in-house capability for developing and interpreting classifications and for training personnel in their use.

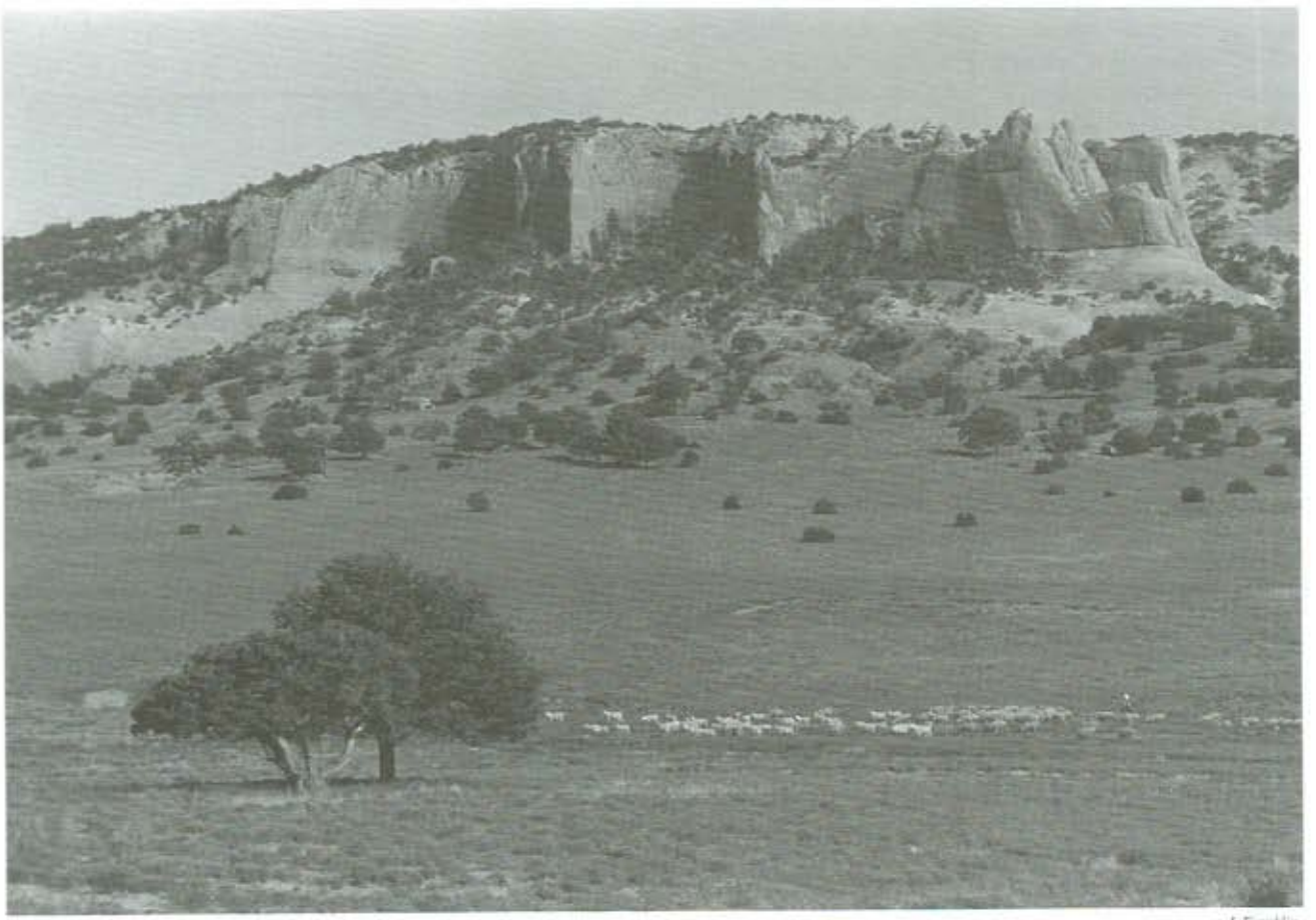
Recreational site. La Jollai R. S. Grainger

Resource managers on Indian forestlands need much more in-house ecological expertise than is currently available to meet the challenge of ecosystem management. A cadre of well-trained natural resource ecologists (comparable to Forest Service regional and area ecologists) could perform a variety of critical consultative, developmental, and training tasks including those involved with ecological classification as well as ecosystem management.

(9) Some plants used in crafts, subsistence, and medicine are becoming increasingly hard-to-find. Maintaining traditional ways--important to the identity and culture of Indian people--has become more difficult as the raw material for practices becomes more limited. For some uses, the quality of plant material is important, as is how and where the plants are grown. For example, plants grown under a tree canopy are better for some purposes than those grown in openings. Here, abundance of individual plants is less important than abundance and accessibility of appropriate ecosystems.

(10) The transportation system on Indian lands is of a lower standard and is less well maintained than that on adjacent federal lands. Most roads are unsurfaced and inadequately drained. Many roads are located along streams, affecting water quality. Periodic road maintenance outside of state and county roads is limited to the small fraction of roads managed by the BIA Branch of Roads system. Road maintenance, even on the Branch of Roads system, is not adequate; funding levels are at only about 1/3 of what the BIA estimates as adequate. Maintenance on the remaining thousands of miles of non-BIA system road is sporadic, usually done only in association with timber activities.

The lack of an all-weather road system, one of the main obstacles to implementing coordinated resource management, is degrading soil and water and severely limiting management flexibility in scheduling harvest operations. Dry-season harvest often conflicts with wildlife management. Moreover, in some areas, too many roads create conflicts with management priorities for deer and elk.



J. Franklin

Navajo R.

Recommendations

(1) Apply ecosystem management as an overall approach to protecting the health and productivity of Indian forests. Ecosystem management, an important element in the evolution of forestry concepts and practices, will better integrate the array of objectives envisioned for Indian forestlands than does conventional forest management. Ecosystem management views the forest holistically, recognizing the importance of all constituent parts--organisms, structures, and processes--to its sustained productive existence. Conventional management, on the other hand, focuses primarily or exclusively on "products" such as wood or elk or water. Any silvicultural approach--even-, multi-, or uneven-aged--can utilize the principles of ecosystem management.

A key objective of ecosystem management is to assure sustainability over the long term while providing for products in the short term. The concept of sustainability includes maintaining the *potential* for land and water ecosystems to produce a broad array of goods and services in perpetuity. We emphasize "potential" because it makes explicit the possibility of returning to or recreating a variety of future alternative conditions.

The basis for sustainability lies in maintaining the physical and biological elements of productivity. Specifically, ecosystem management requires that managers ensure (1) no degradation of the productive capacity of land and water--*no net loss of productivity*; and (2) no loss of genetic diversity, including species extinction--*no net loss of genetic potential*. Maintaining genetic diversity is basic to sustainability because it is the diversity of organisms that makes the ecosystem work.

If the sustainability goal is adopted, the principles of ecosystem management follow naturally: (1) as Aldo Leopold directed, "save all the parts"--that is, retain species and structures that might otherwise be eliminated; (2) recognize the importance of longer time scales (decades and centuries) and (3) use larger spatial scales (landscapes and watersheds) in planning and assessing management activities. And, natural ecosystem landscapes can often be used as models for designing managed ecosystems.

Ecosystem management does not mean managing everything in the same way. Nor does it favor either even- or uneven-aged approaches to forestry. For example, tribes differ in the specific mix of goods and services they want from their forestlands. Some emphasize economic objectives, others cultural or environmental objectives. Coordinated resource management plans will reflect these differences in emphasis and result in different on-the-ground activities. Ecosystem management is the scientific and philosophical basis for developing coordinated resource management plans and specific management prescriptions.

The concept of adaptive management and associated monitoring activities are critical elements in ecosystem management and, in fact, in all resource management. Resource management decisions will always be based on incomplete information; hence, management activities based upon such decisions are working hypotheses for which outcomes are uncertain. Effectively, managers are conducting full-scale experiments in the real world. This makes imperative the systematic collection and analysis of information on the effectiveness--the outcomes--of management activities. The results of such monitoring programs are used to assess how well resource managers are meeting their objectives and where they need to modify practices when objectives are not met.

We view scientifically credible monitoring as a major element in successful application of ecosystem management. None of the Indian forestlands we visited currently have adequate monitoring programs. Ecosystem management requires that this deficiency be rectified. Monitoring would prevent continuation of destructive practices as has happened too often in the past.

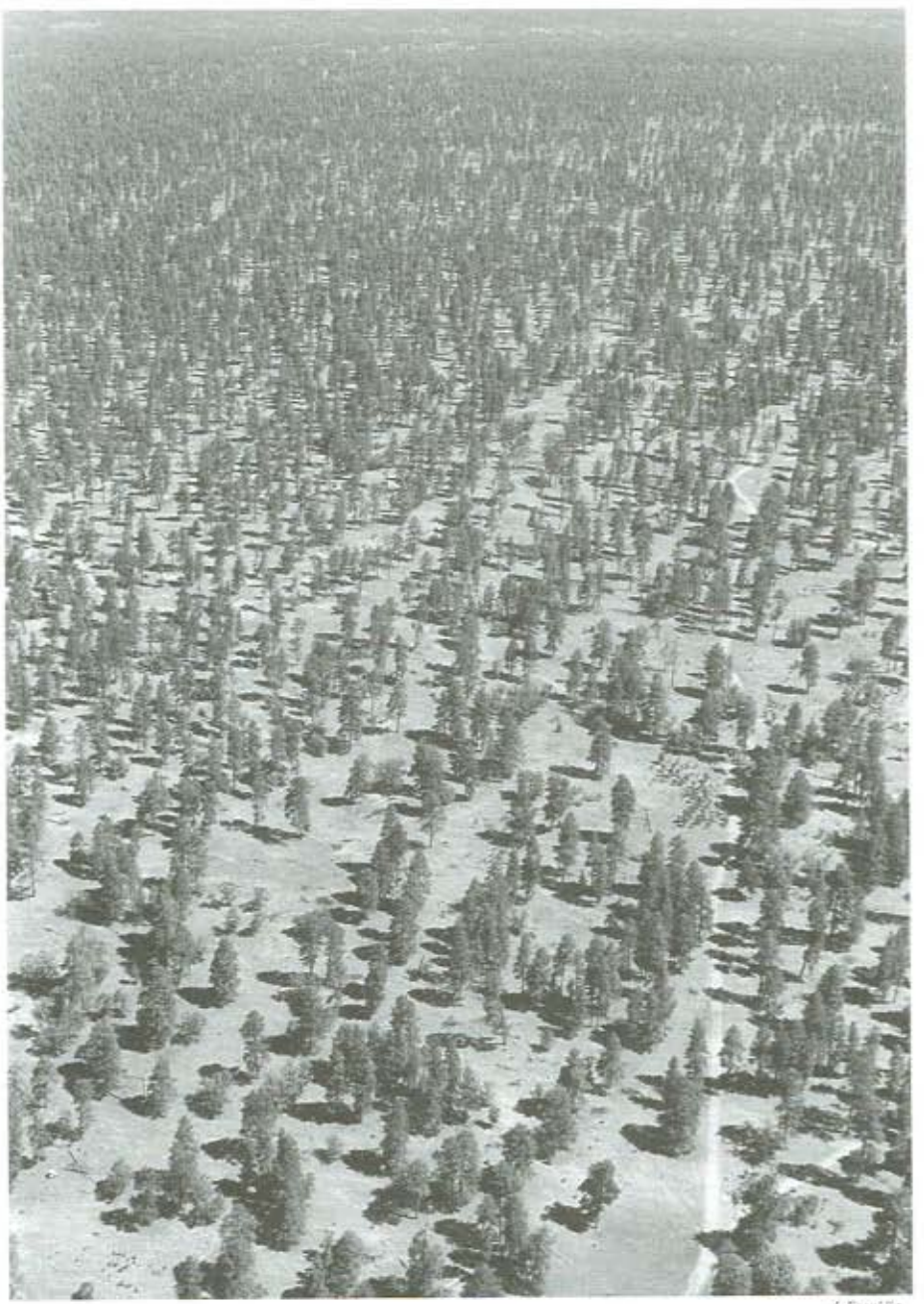
Once understood, the concept of ecosystem management should be a comfortable one for the tribes. Its underlying philosophy--the interlinked nature of ecosystem parts and the emphasis on long-term sustainability--is congruent with traditional Indian views of nature. Indeed, Indians understood and practiced the concept long before modern ecological science arrived.

Ecosystem management is already emerging as the central paradigm for managing Indian forestlands, and its development is accelerating with the move toward coordinated resource management. The degree to which ecosystem management is recognized does vary widely with locale. As with other aspects of forestry, the Indian tribes could be leaders in applying ecosystem management because of their close connection to their forests.

(2) Devise a plan for expanded application of prescribed burning for Indian forestlands, emphasizing the mixed-conifer forests and pinyon-juniper woodlands of the Intermountain West. This plan should address needs for research and monitoring, training, education, and public involvement; identify goals and objectives for the program; and set operational priori-

ties. We suggest five million dollars per year (see Table 1) as an initial funding level which, at $50-$100/acre, could treat up to 100,000 acres per year. Forest-health issues make this program a high priority.

(3) Develop, fund, and implement a program for monitoring the long-term effects of resource management activities. Monitoring must be mandatory, not optional; it is critical for responsible stewardship. **Many current problems are at least partly the result of inadequate assessments of past management practices.** The BIA should lead in developing a basic monitoring plan and in obtaining the necessary funding and expertise. There is substantial potential for training tribal members to carry out the dramatically expanded monitoring programs we envision. We estimate1.5 million dollars for developing an overall plan and general protocols, 1.5 million for on-the-ground testing and application, and 2 million for training Indians as scientific monitors for a one-time cost of about $5 million. Funding for monitoring should eventually be a basic cost built into all operational projects.



J. Franklin

Ponderosa pine forest. Navajo R.

(4) Expand commercial thinning and partial cutting of young and mature mixed-conifer stands in the Intermountain West to improve forest health. Thinning and partial cutting will reduce overall stand density, improve residual tree vigor, and lessen the propagation of susceptible tree species. Some reservations could shift harvest emphasis to commercial thinning of mature mixed-conifer stands, greatly improve forest health, and reserve old-growth stands for other values or future harvest.

(5) Design future silvicultural prescriptions to recreate and maintain stand structural elements that have grown scarce in recent times. Snags, down logs, and large trees are consistently present at much lower than historic levels or completely absent; future silvicultural prescriptions should encourage increases in these structural attributes.

(6) Recruit a corps of professional ecologists, comparable to Forest Service area and regional ecologists, to provide the necessary guidance for developing and applying ecosystem management, including ecological classifications. The program could begin with regional ecologists, who provide expertise on major forest types and

for several reservations. Eventually, however, each reservation with major forest or range resources should have at least one professional ecologist (with graduate training). BIA or ITC should consider developing cooperative training programs for professional ecologists with one or more western universities.

(7) Improve the state of the road system and integrate road management with protecting streams and watersheds. (See "Comparative Analysis of Management Practices and Funding" for more discussion.)

(8) Analyze and implement watershed and stream restoration programs. Sediment reduction programs, riparian shrub development, and streamside forest silvicultural prescriptions (thinning, planting, fencing) and in-channel reconstruction are a necessary part of ecosystem restoration. Such actions will require a watershed assessment before commencing. A high potential exits for training tribal members to define and identify watershed restoration opportunities and to implement watershed restoration programs.

Evaluation of BIA and Tribal Staffing Patterns

(C) An evaluation of staffing patterns of forestry organizations of the Bureau of Indian Affairs and of Indian tribes.

The energy of any organization is in its human resources. Whether goals are realized is heavily dependent on the quantity and quality of staff.

Determining the number of staff needed to adequately run a current or desired program is relatively straightforward. However, evaluating staff quality is difficult.

Table 21. Staffing levels supporting timber production for Indian and National Forest lands (The Irland Group,1993; USDI BIA, 1992c; USDA Forest Service, 1992).

	BIA and Tribes	National Forests
Professional Foresters	373	4,851
Forestry Technicians	454	7,676
Professional Engineers	–[1]	596[3]
Engineering Technicians	–[2]	976[4]
Direct Staff For Timber Production[5]	827	14,099
Acres/Direct Staff[6]	6,900	5,500
$/Direct Staff[7]	71,000	90,000
$/M bd ft[8]	73	127

[1] Estimated to be between 5 and 10 and assumed included in professional foresters.
[2] Included in forestry technicians.
[3] Estimated as 59% of total engineers. Factor derived as ratio of timber road budget/total road plus trails plus facilities budget.
[4] Estimated as 59% of total engineering technicians. Factor derived as ratio of timber road budget/total road plus trails plus facilities budget.
[5] Does not include support staff.
[6] Based on 5.7 million acres of commercial forestland for Indians and 77.8 million acres of suitable forestland for National Forests.
[7] Based on $58.7 million for Indians and $1265 million for National Forests.
[8] Based on 800 million board feet for Indians and 10 billion board feet for National Forests.

We can, however, assess whether staffing patterns generally are meeting tribal objectives and whether the qualifications and resources of BIA and tribal staffs are comparable to those in other forestry organizations.

Findings

(1) The BIA and tribes are understaffed in relation to their forest management tasks.

(a) **The BIA and tribes have fewer forestry staff, per thousand acres of commercial forestland, than do the National Forests.** BIA and tribal foresters and technicians manage 25% more acres than their counterparts on the National Forests (Table 21). The extent of understaffing may actually be higher in that the tribes often do not enjoy the Forest Service's economies of scale because of their small size and scattered land holdings.

(b) **The BIA forestry program is not staffed to support coordinated resource planning.** The BIA has relatively few natural-resource staff other than foresters to support forestry. Although the BIA's direction is to produce coordinated resource management plans, neither the BIA nor the tribes are adequately staffed for this task.

Our telephone survey of 89 of 214 forested reservations, including all Category 1 reservations, identified fewer than 46 FTE natural resource professionals, other than foresters and engineers, working in forestry (Table 22a). In contrast, the National Forests has over 2700 of these natural resource professionals, working in forestry (Table 22b)--more than five times as many per unit of forest area as BIA and tribes provide. Even though our survey did not include some of the smaller forested reservations, the results are quite clear.

(c) **The BIA forestry program is not supported by a professional road-engineering staff.** Road-engineering staff support for the BIA is limited to servicing BIA-system roads, which are the main public roads on reservations. Total tribal professional road-engineering support for the timber program is estimated to be less than 10 people nationally.

(d) **Currently, there are relatively few Indian forest managers.** The BIA estimates that Indians constitute approximately 22% of all forestry professionals in the bureau. Recruitment of Indians is especially problematic in the higher grade levels and area forestry positions. Few Indian foresters now work in the BIA's central forestry office in Washington, D.C.

(2) Current education statistics are not encouraging in terms of the number of Indians pursuing professional careers in natural resource management. According to the Society of American Foresters' annual education survey, 13 Indian foresters received undergraduate degrees in 1990, 3 received Master's degrees, and none received doctorates (Society of American Foresters, 1993). In 1991, 5 Indians received undergraduate degrees; none received Master's degrees or doctorates.

The U.S. Congress acknowledged the importance of education in section 314 of the NIFRMA, which authorizes the BIA to develop and administer (1) an internship program, (2) a cooperative education program, (3) a scholarship program, (4) forestry education outreach, (5) post-graduation recruitment, (6) post-graduate intergovernmental internships, and (7) con-

J. Franklin

Pinyon-juniper woodlands. Navajo R.

Table 22a. Numbers of natural-resource professionals working in Indian forestry.[1,2]

Specialist	BIA Forestry	BIA Other	Tribal	Grant[3]	Total
	----------Estimated # of full-time equivalents----------				
Archaeologist	1.9	2.8	2.4	0	7.0
Fish Biologist	0	2.2	2.8	1.6	6.6
Wildlife Biologist	4.8	7.1	3.6	.1	15.7
Biologist	1.2	.6	.8	.1	2.7
Hydrologist	0	3.0	1.3	.4	4.7
Soil Scientist	0	2.3	0	.2	2.5
Botanist	1.0	2.0	1.6	.3	5.0
Geologist	0	.1	.8	.1	1.0
Landscape Architect	0	0	0	0	0
Total	8.9	20.0	13.4	2.7	45.1

[1] Based on sample (phone survey) of 41 category 1 reservations (100%), 51 category 2 reservations (56%), 42 category 3 and 4 reservations (13%).

[2] Numbers do not include professional foresters and engineers.

[3] Grants are associated with specific projects and originate outside the tribe or BIA.

Stream management discussion. Navajo R. J. Franklin

Table 22b. Estimates of number of natural resource professionals on the National Forests including regional and central offices.[1,2]

Function	Number
Wildlife Biologists	900
Fisheries Biologists	300
Botanists and Ecologists	100
Hydrologists	230
Soil Scientists	220
Archeologists	200
Geologists	160
Landscape Architects	230
Range Conservationists	400
Total	2740

[1] Numbers do not include professional foresters and professional engineers.
[2] Derived from communication with Forest Service Washington Office resource staffs and USDA Forest Service Program Aid 1461, 1991.

tinuing education and training. Although the intent of this legislation moves in the right direction, funds have not yet been appropriated except for the internship program.

Other federal agencies administering natural resources are developing programs specifically for Indians. For example, the Forest Service has established an American Indian Education Program whose objective is to work with the BIA and Indian community colleges to establish natural resource curricula. The U.S. Fish and Wildlife Service is developing cooperative programs for Indians.

Some universities are establishing or expanding natural resource programs for Indians or creating direct agreements with individual tribes for degree programs and professional training (shortcourses and workshops). Indian community and junior colleges are an important link to successful completion of 4-year degree programs. For example, Haskell Indian Junior College works with agencies and universities to prepare freshman and sophomores to transfer to 4-year programs offering natural-resource degrees.

Central to the issue of college education is sufficient financial support for students. Financial support currently is available through the BIA, other federal and state aid programs, and tribal scholarships. In addition, the publication *Sources of Financial Aid Available to American Indian Students* (Indian Resource Development Fund, undated.) lists 27 other possible scholarship sources for undergraduates, 28 for undergraduates and graduates, and 23 for graduates. However, these scholarships generally are limited by area of study, tribe, or other requirement.

Some promising educational programs are developing at the elementary, junior-high, and high-school levels. Tribes, federal agencies, and universities are creating various types of cooperative arrangements to establish special science and math programs for young people as well as new environmental education curricula. The number of natural resource and ecology clubs and camps also is increasing. For instance, the Native American Fish and Wildlife Society, the Forest Service, and a number of tribes have begun Environmental Awareness Summer Youth Practicums. These programs provide a learning experience for Indian youth which emphasize a cultural understanding and appreciation for their environment, language, traditions, religions, and ceremonies. In 1993, 55 Indian high-school students from 10 Pacific Northwest tribes participated in the second annual Northwest Inter-

Pre-commercial thinning. Navajo R. J. Franklin

Table 23. Average grade level for three forest land-management agencies.

Classification	BLM	Forest Service	BIA
Technician	6.9	7.1	5.5[1]
Forester	10.4	11.1	9.9[1]

[1] Average grade level is based on Portland Area grade data plus that of Ft. Apache BIA. The Central office was not included, nor were tribal staffs. While this sample included most of the class I reservations, it was not complete; therefore, the Central office was not included because those grades may bias the result.

Tribal Youth Practicum. These efforts have been somewhat successful: Indian enrollment in undergraduate natural-resource programs increased from 111 in 1990 to 127 in 1991 (Sloan, 1992).

(3) The BIA and tribes report trouble in recruiting and retaining employees, both Indian and Non-Indian. The BIA 1991 report *Final Period Report of The BIA Recruitment and Retention Working Group* concludes that, "The Bureau of Indian Affairs is today seriously affected by its inability to attract and retain young career professionals at any level and within all disciplines of the organization."

(a) Bureau preference policies can make recruitment and retention difficult. The BIA identifies its Indian preference policy as a major deterrent in attracting young Non-Indian professionals to the bureau (BIA, 1992d). Equal-rights policies have pros and cons, but it is likely that, for non-Indian professionals, uncertainty about advancing may make the BIA positions less attractive.

Wildlife watering trough. Zuni R. K. Gabriel

(b) The grade level for BIA foresters and technicians is lower than that for similar positions in the Forest Service and BLM. A comparison of average grade levels for federal agencies shows that BIA forester positions are a grade lower than similar Forest Service positions, and BIA technician positions substantially lower (Table 23).

These lower grade levels: (1) suggest that the BIA is in a relatively poorer position to compete for employees, especially against the Forest Service; (2) explain their difficulty in retaining employees; and (3) imply that the qualifications for a BIA job may be lower than those for similar jobs in other agencies.

Although no data was available for tribal organizations, we observed that tribal salaries are even lower than those of the BIA without the added employee benefits, such as retirement plans.

(c) On average, the budget per person for BIA and tribal foresters and technicians is only 79% of that for their National Forest counterparts. Moreover, the cost per unit timber output per BIA and tribal employee is 57% of that for their National Forest counterparts. Both of these findings suggest that BIA and tribal employees are being asked to do more with fewer resources.

(d) **Relatively low priority is given to recruitment and retention in the BIA.** Although the BIA has recognized staffing as a major problem and one integral to program success, little has been done to promote recruitment and retention strategies. A BIA Recruitment and Retention Working Group commissioned for 6 months (in 1991-92) to look at staffing found that current personnel operations were not adequately staffed and funded to actively recruit professionals nor to provide any type of coordinated recruitment and retention program. They also found within their organization a degree of dissatisfaction with the overall treatment of employees (for example, lack of time and funding for training).

(4) Tribal and BIA forestry staffs have significantly less access to continuing education than their Forest Service counterparts. The BIA commits 3% of its personnel budget to continuing education, which includes internship programs as well as general job upgrading (BIA, 1992d). For an employee salaried at $30,000, this amounts to be only $900, hardly a week's travel and per diem. By contrast, the Forest Service commits from 9 to 13% of its personnel budget to continuing education, which includes leadership, management, and technical education, workshops, professional meetings, and related travel. This may amount to as many as 33 days per employee per year.

Recommendations

(1) Assist in developing natural resource staffs adequate to plan and implement coordinated resource management programs. Bring staffing levels to parity with National Forests with similar resource management objectives.

(2) Assist in developing a professional engineering staff to adequately support coordinated resource management. Use National Forest engineering staffing as a guideline.

(3) Fully fund implementation of the educational programs authorized under the NIFRMA and develop similar programs for non-forestry natural resource programs.

(4) Promote recruitment and retention in BIA and tribal programs, including upgrading positions, creating better benefits packages, and designing proactive recruitment techniques.

(5) Establish an education committee of selected universities, agencies, and companies to develop, implement, and coordinate a comprehensive national plan for recruiting and retaining Indian natural-resource professionals. Universities must better incorporate Indian culture and traditions into curricula and learning experiences. On-campus support programs also must be developed to make Indians feel comfortable and included.

Evaluation of Timber-Sale Administration

(D) An evaluation of procedures employed in timber-sale administration, including preparation, field supervision, and accountability for proceeds.

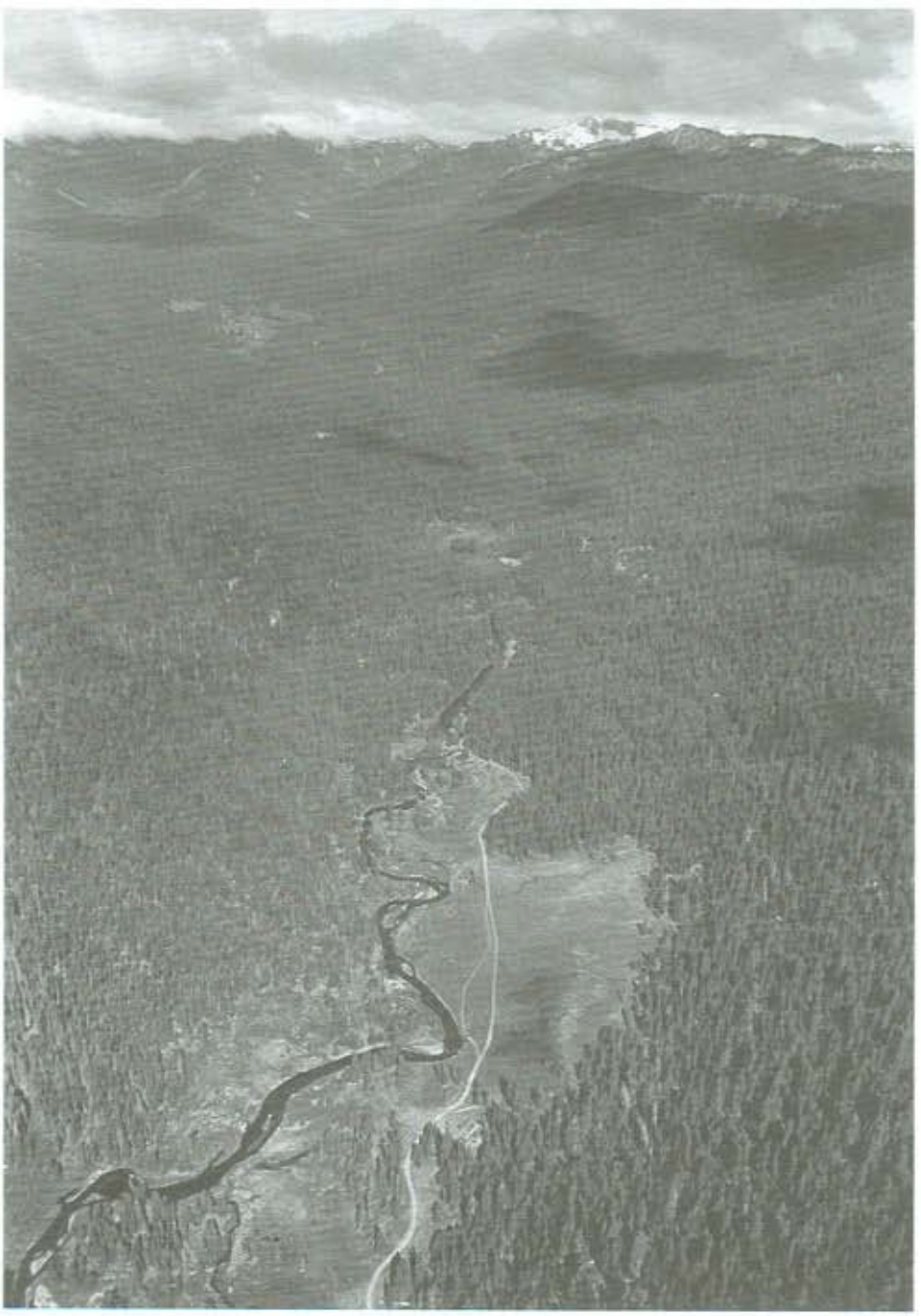
Six elements are required for tribes to get full benefit from timber harvested from their forests. First, timber-sale preparation should include the development of efficient harvesting and transportation plans. Second, the timber to be sold must be clearly identified before sale. Third, there must be open bidding for sales and logging contracts. Fourth, the size of timber sales should not excessively exclude bidders. Fifth, timber-sale policies must encourage efficient use of raw material and must be enforced through effective field supervision. Sixth, timber products removed from the forest must be accurately measured.

Findings

(1) On average, the level of detail for sale planning and administration is clearly below that of federal agencies because of lack of personnel, inadequately trained personnel, or lack of funds. In some cases, a single forester is responsible for timber sales on 20,000 acres or more each year. In most cases, there is a lack of transportation planning, leading to more costly harvests as well as undesirable environmental impacts.

On some reservations, timber was not being marked before sale. Because of inadequate management structures, increasing demands of coordinated resource management, and a shortage of personnel, timber was being sold without adequate preparation, including clear marking of sale timber. Uncertain of what timber

is actually being offered, buyers may bid low to reduce their risk. Where more than one species is being cut, timber buyers also may speculate on the amount of each species by selectively overbidding on species they think are not properly represented in the sale prospectus. If the timber for sale is not clearly known to a tribe or adjustment policies are not in place to prorate overbids among species, pressure is placed upon sale administrators to "find" the volume during the sale. After timber is harvested, the high bidder may not provide the tribe with as much return as a lower bidder might have with another total bid but different distribution among species.



J. Franklin

Klickitat River. Yakima R.

Mixed conifer, uneven-aged forest. Yakima R. J. Franklin

In some cases, we found that the size of the timber sales being offered was very large, potentially excluding bidders. The rationale for large sales was efficiency in sale preparation because of inadequate staffing.

In many cases, timber-sale administration staff were overloaded; they had to handle both their own work and part of the presale workload. This leads to a lack of on-site logging supervision, increasing the potential for damage to trees left after harvest, inefficient utilization of raw material, and undesirable environmental impacts. Inadequate staffing also increases the risk of theft.

(2) In most cases, we found that foresters, whether BIA or tribal, do not work in a coordinated management structure; this leads to conflicting priorities and inefficient allocation of human and financial resources. Most often, foresters report to managers in organizations that parallel those of other natural-resource specialists; these separate organizations sometimes do not have common goals. In such environments, work is being redone, undone, or not done through poor communication and disparate priorities. Much of the timber-sale preparation bottleneck is due to lack of coordination.

Forest-products enterprises are not being involved in long-term resource management planning. In few instances did we find that information on the 10-year harvest schedule was being provided to managers of forest enterprises (e. g., proposed harvest by species, diameter, and quantity), preventing tribes from making proper investment decisions.

(3) Where tribal logging and forest-products enterprises exist, protection from market forces can create inefficiencies. Tribal logging and forest-products enterprises increase on-reservation employment and provide on-the-job training and value-added manufacturing. However, some current policies which protect tribal enterprises from market forces can hamper the ability of tribes to meet their employment and income goals. Among these policies are transfers of timber to forest enterprises at below-market prices and awarding of logging contracts without competition.

Federal regulations permit transfer of timber from the tribe to a tribal forest-products enterprise without open bidding. A transfer price procedure is established, often using an appraisal approved by a BIA official. Normally, this appraisal is the minimum stumpage price to open bidding in free markets. Stumpage price strongly determines how the forest enterprise will use the logs it buys. If the stumpage price is low, full utilization of raw material is not as important as if the price is high. Thus, competitively priced stumpage provides important economic information to the enterprise and a yardstick against which enterprise managers and tribes can measure enterprise performance.

In no case did we find transfer prices at "market value"; they ranged from near "market value" to zero. In one instance, the manager of tribal forestry was also the manager of the tribal enterprise, responsible for both appraising stumpage and buying stumpage at the appraised rate. In another, the stumpage value was determined as a percentage of the profit earned by sales of mill products, rather than related to the value and volume of logs brought to the mill. The use of below-market stumpage prices may partially explain the absence of professional process quality control personnel in most forest enterprise mills. Low cost logs reduce pressure on the enterprise to fully utilize the raw material.

Logging payment practices also may be lowering returns to tribes. Logging costs are often directly passed on to the tribe by the forest enterprise without competitive bidding. In one instance, the logging contractors were on the board of directors of the forest enterprise, setting logging costs and allocating sales among themselves. In another, the loggers identified the timber they wanted to cut, brought the area to the attention of the BIA, and negotiated the price. In

another, logging costs exceeded off-reservation costs, even though the BIA pays workers compensation for loggers and the tribal forestry staff does all the sale preparation including skid-trail layout. In still another, loggers making log bucking and sorting decisions were being paid more per ton to cut and transport pulpwood than sawtimber; moreover, pulpwood was not scaled before leaving the reservation.

(4) Some timber-sale policies do not encourage full utilization of raw material. We found that timber is usually sold by species and quantity (measured most commonly in board feet and cords and scaled upon removal). Setting an average price by species does not encourage utilization of smaller diameter or less valuable logs because logs worth less than the average bid price are a loss to the purchaser. Alternatives for promoting fuller utilization of raw materials include pricing by diameter classes and/or log grades and selling "lump-sum." Lump-sum sales are particularly effective in clearcuts; having bought everything, the purchaser is far more likely to fully utilize all logs.

Recommendations

(1) Increase staffing and training for timber sale preparation and administration. Use National Forest staffing and training levels as a guide. Make training available in sale preparation and administration. Increase staff awareness of the value of improved log making and tree utilization.

(2) Adopt a management structure which can efficiently plan and implement a timber program as part of a coordinated resource plan. Place responsibility for delivering the natural resource program under a single manager.

(3) Promote competitive bidding for logging contracts. At a minimum, at least part of the contracts should be awarded competitively as a control.

(4) Review timber-sale policies to verify that sale procedures lead to maximum benefits for the tribe. Evaluate guidelines for timber-sale size, average log pricing, and lump-sum sales.

(5) Develop auditing procedures to document the competitiveness of forest-products enterprises. Use cost, value, and physical measures of logs into the mill and wood products out of the mill to help tribal governments and mangers understand and evaluate enterprise performance.

(6) Transfer logs to forest-products enterprises at market value. Transferring logs at market value provides essential value signals to enterprise managers and encourages full utilization.

(7) Train forest managers on modern process quality control procedures. The ability of tribes to reach income and employment goals is dependent upon efficient utilization of raw material.

Analysis of BIA Administrative Procedures

(E) An analysis of the potential for reducing or eliminating relevant administrative procedures, rules, and policies of the BIA consistent with the federal trust responsibility.

J. Franklin

Wood utilization discussion. Yakima R.

Findings

(1) The administrative relationships among the U.S. government, tribal governments, and resource management agencies are the most important factors affecting the ability of tribes to achieve their visions for their forests. The services the BIA offers tribes are limited in quantity and quality, compared with those of other federal resource-management agencies and in light of the demanding trust responsibilities with which the BIA is charged. Currently, the agency provides direction to develop coordinated resource plans but provides little or no funding and is supported by a technical organization with little natural resource expertise other than foresters. The BIA is not meeting its modern responsibility despite many positive actions such as streamlining the transfer of timber-sale receipts to tribes and providing flexibility in delivering technical services.

To complicate its task, the BIA is also responsible for not only providing technical assistance, but judging whether that assistance is adequate, in other words, providing both the trust service and trust oversight. Delivery of technical services needs to be separated from evaluation of trust services to clarify lines of responsibility and accountability.

(2) The dual lines of authority that currently exist (on all but one forest visited), for forestry on one hand and all other natural resource departments on the other, is hindering the coordination of resource planning and management. No single manager now has responsibility for delivering a coordinated natural resource program or controlling the priorities among different natural-resource departments to see that such a program is delivered in a timely manner. BIA foresters usually report to the area superintendent, whereas other natural-resource staff report to a tribal manager. BIA foresters are frequently pitted against tribal resource specialists which can bring planning and management to a halt.

(3) The tribes have increasingly embraced the concept of self-determination and are assuming forestry functions previously performed by the BIA. Through P.L. 93-638 ("Indian Self-Determination and Education Assistance Act") and P.L. 100-472 ("Indian Self-Determination Amendment of 1987"), tribes are taking over management of their forest programs through a variety of mechanisms: (1) 93-638 contracting allows the tribe to assume any or all of the federal programs pertaining to themselves and their associated budgets; (2) compacting (or the Self-Governance Demonstration Project) allows for a similar assumption of federal programs, plus discretionary power over how budgets are distributed among programs; and (3) cooperative agreements (under P.L. 95-313, "Cooperative Forestry Assistance Act of 1978") allow tribes to enter into service contracts with other governmental agencies. Tribes can and do assume any combination of self-determination mechanisms at a wide variety of levels and intensities--with the spectrum running from BIA-controlled management programs to compacting.

J. Franklin

Cable logging. Yakima R.

Nevertheless, substantial concerns about self-determination mechanisms--many of which are beyond the scope of this report--remain, including those over the equality of funding between tribal and BIA programs; over the attitudes of other federal agencies toward

tribes using compacting vis-a-vis cooperative agreements; and, in the minds of forest managers, over discretionary budget allocation by compacting tribes which might impair long-term resource management.

Recommendations

(1) Redefine the U.S. government's role in discharging its trust responsibility so that tribal governments have primary responsibility for directing Indian forestry. The U.S. government should provide financial support, technical assistance and research access, and trust oversight. The new arrangement should reflect the following:

(a) Each tribal government should be the principal agent responsible for crafting, implementing, and monitoring a coordinated resource management plan congruent with its vision for forests and forest management.

(b) Standards for evaluating the performance in meeting the trust responsibility should be agreed upon between each tribal government and the Secretary of the Interior. Ultimately the Secretary's responsibility should be moved from signing off on individual timber sales, as is now done, to signing off on coordinated resource management plans. Each tribal government then would be responsible for preparing standards against which its program's performance could be measured through both tribal monitoring and trust oversight.

(c) Technical assistance should be separated from trust oversight.

(d) The BIA should provide full support, including the appropriate range of natural-resource expertise, for coordinated resource planning and management and also provide research access.

(e) A single manager should be responsible for delivering the entire natural-resource program at the local level.

We propose one possible rearrangement in Figure 2. In this figure, a tribal vision for forests is transmitted through the tribal government to the tribal natural-resource manager. Tribal staff then develops a coordi-

Pine regeneration after partial cutting. Yakima R. J. Franklin

nated plan, which defines the objectives, standards, operations plans, and monitoring procedures to be followed, under the direction of the natural resource manager and with technical assistance and research access from the U.S. government.

Under this rearrangement, U.S. government funds are provided to tribal governments under the conditions of the trust standards agreed upon by the Secretary and the tribe. Federal oversight is via an independent trust oversight commission, which reviews the coordinated plan before the Secretary signs off and periodically assesses, by examining monitoring results and making site visits, whether the tribe is meeting the standards it established. This commission might operate largely through regional groups formed from local technical experts to ensure that the specific nature of each region is recognized.

(2) Evaluate the range of self-determination mechanisms (that is, direct BIA management, contracting, compacts, cooperative agreements) supporting the transition to tribal forest management and conduct a study that describes where all tribes with forests fall along this spectrum.

Ultimately, on-the-ground management of all Indian forests will be in tribal hands with the U.S. government presence providing only technical assistance and oversight. One challenge is managing the transition to this new arrangement. The shift and how it occurs rest primarily with the tribes themselves; their degree of preparedness and comfort levels will dictate the timetable and mechanisms. The various self-determination mechanisms noted in Finding (2), this section, suggest how such a shift is likely to proceed. A national comparison of self-determination mechanisms and their effect on forest management for all tribes with forests on their reservations should be an initial step in planning for the shift.

Review of Forestland Management Plans (including Allotments and Alaska)

(F) A comprehensive review of the adequacy of Indian forestland management plans, including their compatibility with applicable tribal integrated resource management plans and their ability to meet tribal needs and priorities.

The adequacy of an Indian forest land management plan depends on consideration and inclusion of at least ten elements: 1) a set of objectives that represent tribal goals for the management of its forests, 2) a future forest reflecting these goals that will become a long-term objective for the plan, 3) the collection end use of forest structure, growth, and yield information about the forests, 4) the collection and use of information on the costs and revenues of forest production, 5) a test for sustainability of the outputs over time under the plan and a description of the flow of these outputs, 6) specification of the economic outputs that will be produced in the near-term under the plan in a form usable by tribal enterprises, 7) a set of alternatives that display the trade-offs implicit in emphasizing the different goals the tribe has for its forests, 8) integration of the forest plan with plans for the management of other resources, 9) linkage to operations plans that will guide plan implementation, and 10) a set of measures to gauge achievement of plan goals and a commitment to monitor their achievement and revise the plan as needed.

Findings

(1) Indian forest management plans have the potential for meeting many tribal goals and priorities but a narrow definition of sustained yield, inadequate analysis in some cases, and lack of funding and personnel make attainment of goals difficult.

(a) Forest management plans contain comprehensive objectives for management of commercial forests.

1) **Some goals come from federal regulations.** All forest management plans examined with one exception have a core set of base goals and objectives - those set out in the General Forest Regulations: 25CFR163.3. (See Fig-

Figure 9. Comparison of objectives for forest management in 25CFR163.3 (USDI, BIA, 1989b) (left column) with proposed objectives in new draft regulations (USI, BIA, 1992g) (right column). Bold indicates differences between the two sets of objectives.

Current Regulations	Draft New Regulations
The following objectives apply to the management of Indian forest land:	**Indian forest land management activities undertaken by the Secretary shall be designed to achieve the following objectives:**
1) The development, maintenance and enhancement of **commercial forest lands** in perpetually productive state by providing effective management and protection through the application of sound silvicultural and economic principles to the **reforestation, growth and harvest of timber and other forest products**. This includes making adequate provision for new forest growth as the timber is removed.	The development, maintenance and enhancement of **Indian forest land** in a perpetually productive state **in accordance with the principles of sustained yield and with the standards and objectives set forth in forest management plans** by providing effective management and protection through the application of sound silvicultural and economic principles to the harvesting of forest products, **forestation, timber stand improvement and other forestry practices**;
2) Regulation of the **forest resources** through the establishment and development of a **timber sales program that is supported by written tribal objectives, and a long-range multiple use plan (as included in a forest management plan) that requires sound forest management practices.**	The regulation of **Indian forest land** through the development and implementation, **with the full and active consultation and participation of appropriate Indian tribe, of forest management plans** which are supported by written tribal objectives;
3) The regulation of the **commercial forest** in a manner which will insure method and order in harvesting **the tree capital**, so as to make possible continuous production and a perpetual forest business.	The regulation of **Indian forest land** in a manner that will ensure the use of **good** method and order in harvesting so as to make possible, on a **sustainable yield basis**, continuous productivity and a perpetual forest business;
4) The development of Indian forests by Indian people to promote self-sustaining communities, so that Indians may receive **from their own property** not only the stumpage value, but also the benefit of whatever labor and profit it is capable of yielding.	The development of Indian forest land and associated **value-added industries** by Indian and Indian tribes to promote self-sustaining communities, so that Indians may receive from **their Indian forest land** not only stumpage value, but also the benefit of all the labor and profit that such Indian forest land is capable of yielding;
5) **The sale of Indian timber on the open market, when the volume available and/or utilized for harvest is in excess of that which is being developed by the local Indian forest enterprise(s).**	
6) The preservation of the forest in its natural state whenever the **authorized Indian representatives** determine that the recreational, cultural, aesthetic, or traditional values of the forest represent the highest and best use of the land to the Indians.	The retention of Indian forest land in its natural state when an Indian tribe determines that the recreational, cultural, aesthetic, or traditional values of the Indian forest land represents the highest and best use of the land;
7) The management and protection of forest resources to retain the beneficial effects of regulating water runoff and minimizing soil erosion.	The management and protection of forest resources to retain the beneficial effects to Indian forest land of regulating water run-off and minimizing soil erosion; and
8) **The management and protection of forest lands to** maintain and/or improve timber production, **soil productivity**, grazing, wildlife, fisheries, recreation, aesthetics, cultural, and other traditional values **of the forest to the extent that such action is in the best interest of the Indians."**	The maintenance and improvement of timber productivity, grazing, wildlife, fisheries, recreation, aesthetic, cultural and other traditional values."

ure 9, left column). This standard set of goals, provided by the federal government, address maintenance of forest productivity, forest regulation, economic contributions to tribal self-sufficiency, and the protection and management of the forest resource to benefit recreational, cultural, aesthetic, water quality, wildlife, and other resources. Goals 1,3,4,5, and 6 have been in the federal regulations since 1936 in a very similar form to what they are today. Interestingly, wording prohibiting clearcutting in contiguous areas were once in the regulations, but has since been removed.

These goals has evolved through time with the increasing involvement of the tribes themselves. Current regulations were approved in the mid 1980s. A new set of draft regulations have been proposed by the federal government after extensive consultation with the tribes (Figure 9, right column) which increase the emphasis on tribal leadership in the setting of objectives for the forest management plans and in developing the plans. They also shift the emphasis from commercial forest to all forest and make a stronger statement about the maintenance and improvement of the entire range of forest resources. **In total, the new draft regulations represent the visions and goals of tribal members recorded in our surveys (recall Section III) better than do the existing regulations.**

2) **Some goals are added by the tribes.** Most of the plans have identified specific tribal goals in addition to those in the regulations. Many of these tend to be more operational and have greater specificity in application. Generally, the goals and objectives beyond those from the regulations are developed by the forestry or natural resource staffs and reviewed by tribal governments. We have classified the goals that deal with the broader themes of forest management into a variety of categories (Table 24) .

(b) Tribal governments have generally endorsed the forest management plans with only a few exceptions. On most reservations sampled, the tribal governments have endorsed the current plan. Before endorsement, however, the tribes often add additional goals and limits, especially those relating to forest protection (Table 24).

(c) Federal guidance for forest planning is placing the tribes in an increasing strong leadership position in development of forest plans. The current regulations for forest planning call for tribal endorsement of forest plans. The new proposed regulations, prepared with tribal involvement, also call for active tribal participation and leadership in developing the plans (Figure 9).

(d) An overly restrictive definition of sustained yield management provided by the federal government can prevent attainment of tribal goals. Sustained yield is defined in the regulations as "the yield of forest products that a forest can produce continuously at a given intensity of management." Under the category of "sustained yield management", however, the regulations state that "Harvest schedules shall be directed toward achieving an approximate balance at the earliest practical time between maximum net growth and harvest." This definition of sustained yield management can prevent attainment of tribal visions and goals for four reasons: 1) it can cause acceptance of a particular future forest--one that maximizes tree growth--whether that forest fits their goals or not. 2) it can cause overly-rapid harvest of slow-growing, old-growth trees and stands, 3) it does not acknowledge the importance of a stable level of harvest and income in the near future, and 4) it does not relate sustained yield to the forests underlying processes and functions that help

Table 24. Auxiliary tribal goals and objectives in tribal Forest Management Plans (FMP).

Categories of Typical Goals	% of tribal goals in category
Protection/Preservation	25
Integration of NR Management	16
Sustainability/Productivity/ Diversity/Forest Health	20
Income/Employment/Economy	19
Sovereignty/Community	10
Development/Indian Education Public Services/Safety & Health	7
Efficiency in Forestry Operations	3
Source: a sample of 12 Forest Management plans.	100

determine forest sustainability. New proposed regulations would deal with the first difficulty, by changing the term "maximum growth" in the clause to "planned growth" but not the other three difficulties. The problems with this narrow interpretation of sustained yield management could become especially severe as tribes undertake the development of coordinated plans.

(e) **BIA's harvest-scheduling techniques in many places have not kept up with those of other agencies and technical support for the application of these techniques is inadequate.** In forestry, allowable cut levels are calculated with a variety of techniques. Often, the BIA plays a major role in advising tribes on harvest-scheduling techniques and in calculating harvest levels. On a few reservations, sophisticated techniques are being used. On many reservations, though, the bureau still advocates use of antiquated techniques (such as the Austrian formula) long ago discarded as inadequate for modern forest management, in part because they do not project sustainable harvest levels. Indeed, a number of tribes have recently agreed to substantially reduce their harvest levels because those previously proposed by the BIA could not be sustained. Use of antiquated formulas may have contributed to the overprediction. Regardless, these reductions have left tribal governments and tribal members feeling frustrated and betrayed.

In addition to problems with the techniques used for allowable cut planning, the level of technical support for harvest scheduling currently given by the BIA is inadequate. In comparison either with the support given harvest scheduling by the Forest Service, or the support given by the BIA to forest inventory, the technical support for harvest scheduling is embarrassingly small.

Recently, some tribes and BIA Area offices, often on their own initiative, have begun to experiment with the use of modern operations-research tools, such as simulations and linear programming, to estimate sustainable harvest levels. Such work should be encouraged.

(f) **The desired future forest often is not well explained.** Almost all forest management plans contain some description of what the desired future forest will be like. Often, though, the presentation is given in highly technical terms using Q ratios and diameter distributions. In addition, the justification of why this particular target forest was selected over some other is often not explained.

(g) **An overly technical presentation of plan results would largely preclude anyone but planners from understanding the results.** Few pictorial or graphical descriptions are provided in the forest plans that address the aggregate harvest/growth/inventory conditions over time or, as mentioned above, what the future forest will be. Without visual displays of forest condition and harvest over time, it will be nearly impossible for tribal governments and tribal members to fully grasp what a plan will provide.

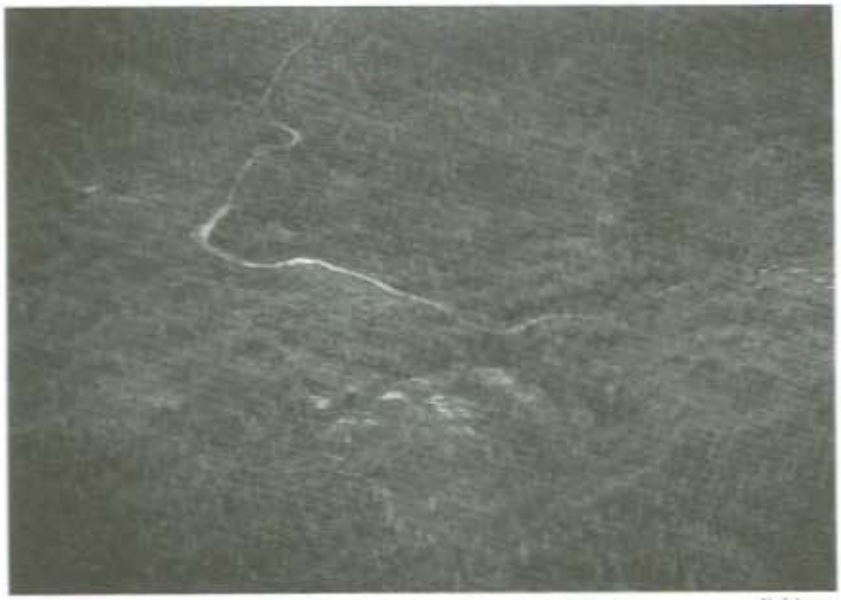
(h) **Alternatives developed in forest planning often are highly limited in the choices provided.** Some forest management plans describe only one alternative. Others describe land use choices but do not also describe choices for the future forest associated with a land use. A few allow choices for both land use and future forest structure.

(i) **A marginal analysis of the benefits and costs of changing the proposed plan often is not given in a systematic way.** For tribal governments to assess the value of proposed plans, they need to know why they are superior to alternative plans, i.e., the benefits and costs of moving to some alternative plan. As an example, the marginal benefits and costs of maintaining existing old-growth trees and stands is often not presented, yet there might be considerable interest in such an analysis.

(j) **Detailed information on future timber supplies often is not made available to managers of forest product enterprises.** The harvest schedule associated with the forest plan should include detailed information on likely species and sizes of logs that will be harvested in the next decade if the plan is implemented. The forest plans examined often did not summarize these statistics. Even where they are summarized, enterprise managers often seem unaware of them.

(k) **Operational planning to implement forest plans varies widely across the reservations.** In a few cases, operational planning by watershed is providing a sophisticated vehicle for implementing forest plans in a spatial context. More generally, though, operational planning is quite limited.

(l) **Consideration of all forest resources, as called for in forest plan goals, has been difficult to achieve.** Concentration on commercial timber production, including the overly restrictive definition of sustained yield mentioned above, lack of funding, and lack of natural resource professionals other than foresters have all contributed to the



Spruce budworm activity. Colville R. N. Johnson

problem. The proposed regulations might broaden the focus but, as discussed below in (3), a major change in federal priorities is needed for coordinated forest resource planning and management to become a reality.

(2) Forest inventories on Indian lands have provided much useful information but could be significantly improved.

(a) **The BIA's Continuous Forest Inventory (CFI) system for planning and policy analysis stands out compared with that of other agencies.** Over the years, the BIA has placed a major portion of its analytical resources into CFI to measure the size, characteristics, growth, and mortality of timber resources on reservations. The resulting information has played a central role in forest planning and policy analysis.

(b) **Some problems exist, however, in collecting and using CFI data,** including the lack of a central repository for CFI data or a system to make the data readily available, inconsistencies in CFI design among reservations, neglect of noncommercial aspects of forest resources, and slow turnaround in inventory analysis at BIA area and Central offices. Relatively few support staff have been formally educated in biometrics, computer programming, and database design and management.

The CFI data provides aggregate information about forests, but not specific information about individual stands. Most tribes have stand-level inventories that provide site-specific data to silviculturists who write prescriptions. Generally, these inventories are not complete enough to be used beyond their limited purpose. Where stand inventories are evolving, there is not enough communication among the various groups who need to use stand-based information. Furthermore, little effort goes into determining which basic data are needed for resources other than timber or how the data set could support coordinated planning.

(c) **The BIA's national Geographic Data Service Center has successfully brought a sophisticated Geographic Information System (GIS) to most reservations.** The BIA has been able to make a decision, select a system, establish a processing center, and provide training unlike some other federal agencies that have been unable to move ahead with GIS. However, the inability of the BIA to help the tribes obtain GIS equipment, a very large workload at the national Service Center, and the lack of advanced training programs have caused problems. Some tribes are committing to GIS systems without adequate staff and money.

3) **Recent BIA policy calling for development of "integrated resource management plans" for each Reservation, developed at the urging of the tribes, has not been successfully implemented.** These coordinated plans would provide overall direction for land use on Reservations, and would have forest management plans as one component. Completion of coordinated (integrated) land management plans have been difficult to accomplish on most reservations because of lack of clear examples of their purpose, content, and use; a relatively low priority for their development within the BIA, lack of planning assistance from the BIA; and the absence of adequate funding and resource management expertise.

(a) **Tribes are hampered in their abilities to coordinate management and planning because they lack support in many disciplines including engineering, fish, wildlife, range, soil, and water.** Some BIA forestry employees appear to believe that anything other than timber management is outside their trust responsibility. Functional connections among forestry, fish, wildlife, and range are often weak or absent. Natural resource professionals outside of forestry usually are tribal employees who often are less well trained, less well paid, and less well supported by budgets, and more

isolated from their profession, than their counterparts in public agencies and private industry. Consequently, they are less prepared to lead in coordinated management initiatives. They generally lack both the staff and baseline information to participate in a meaningful way. In addition, as discussed elsewhere, BIA forestry has little forest engineering and harvesting expertise, and must rely on the BIA Branch of Roads for road-design support; this has implications for soil and water protection. In many situations, wildlife biologists do not understand what foresters are trying to accomplish, and foresters do not understand what biologists are trying to accomplish. This lack of understanding defeats the purpose of resource coordination.

(b) **The link between forest and fishery management is weak.** Forest and fishery management are not administratively linked within BIA or in most tribes, despite the strong influence of forest activities on fish habitat. Moreover, because fish and forest products both generate income for the tribes, their actual and perceived conflicting needs make them even more important to coordinate.

To maintain their fishing treaty rights as well as sport-fishery income, Indians rely on hatcheries to sustain desired harvest levels or mitigate for losses to dams or non-Indian fish harvesters. Hatchery fish are not as connected to the land as native stocks, but are necessary for the tribes to fish their accustomed places and be assured of fish for subsistence, sale, or ceremony.

Funding for fisheries departments and commissions has been based largely on the potential for economic gain or realizing full treaty rights to fish harvest (usually 50% by treaty). Indeed, many fisheries departments focus their activities on off-reservation areas, harvest monitoring, hatcheries, and activities related to hydropower--areas to which funding is tied. As a result, tribal fisheries biologists and their limited staff often do not have the time or money needed to work on tribal forest-management concerns (such as ecological issues) and participate in coordinated resource planning.

(c) **Integrating cultural values into forest management has often been inadequate.** Cultural values and their associated tangible resources--medicine, craft, and food plants, sacred or special areas, and burial or archaeological sites--are related to the traditional ways tribal people interact with their landscape. Lack of knowledge and/or interest on the part of forestry staff, the sensitive and confidential nature of this material, and limited funding have all led to deficiencies.

Yet maintaining traditional ways is very important to many Indians for a variety of reasons. It provides a sense of cultural identity which contributes to individual and community health; it preserves a way of living that emphasizes sustainability; and it supports a local economy that not only represents material wealth to its participants but incorporates methods of sharing and trading goods that are part of the cultural heritage.

N. Johnson

Streamside discussion. Spokane R.

In caring for burial or archaeological sites, the BIA must achieve--and tribes desire at least--the level of protection afforded by the National Historical Preservation Act (NHPA), which requires archaeological surveys before any proposed operations. The need to conduct archaeological clearances has become a costly task to many tribes because no funding has been provided.

Spruce stand on an allotment. Alaska

K. Gabriel

NHPA's approach is limited both in terms of its specificity to ancient sites and its piecemeal approach (on a project-to-project basis). Therefore, tribes have had to develop other approaches for long-term, landscape-level planning; some have begun to inventory burial and other significant sites as well as culturally-important plants. Who has access to this sensitive information is an important issue. Tribes have responded by designating cultural committees, cultural staff, or trusted tribal natural-resource employees to interpret the information. Frequently, such groups or individuals have limited time and funds to devote to inventories because they are also involved with off-reservation concerns, timber sales, and non-forestry related business. Furthermore, within the tribe, not all important or sacred places may be known outside of family units. Some Southwest tribes have found it necessary to interview all potential users of proposed management areas individually.

Forest management can be used to enhance rather than detract from cultural resource uses. Providing access, overseeing prescribed burns for the propagation of culturally important plants, active planting of craft materials, and preventing trespass from non-tribal special forest products gatherers are opportunities to integrate the living culture with forest management. These opportunities are rarely realized.

Dialogue between forest managers and those Indians following traditional ways often appears to be lacking. As outsiders, we feel that a rare opportunity is being lost to meld two types of natural resource knowledge and ways of doing. To combine the two is difficult. Resource managers to whom traditional knowledge might be disseminated must be trusted. Moreover, the meaning behind the knowledge may be obscure to those outside of Indian culture. Greater involvement of Indians in making management decisions should help blend the two.

The more we learn, the more we see that scientific and technological approaches taken in the past have not been adequate to protect the landscape. Drawing from an expanding scientific knowledge base, managers are now promoting new ways of caring for the land which echo traditional ways. Tribes should be able, if anyone can, to use the

knowledge that has always been theirs to manage their own lands. Creative approaches are needed to reconcile the "two ways." But, to be effective, they must come from within the tribal community, and natural resource managers must be open to and ready to facilitate the change.

(5) A number of issues require special planning and management.

(a) **Allotments. Allotments severely complicate forest management on Indian lands.** Allotments are small private holdings owned by individual Indians sometimes interspersed among tribal forests, often lying outside them. The legacy of federal land-distribution policies of the last century often have highly fractionated ownership created by heirship. In addition, owners of allotments (allottees) often have different management objectives than does the tribe.

Some 10 million acres of trust land (18% of the total of forested and non-forested trust lands) are owned by allottees (Table 25). Although trust responsibility extends to allotments, the nature of the multiple ownership on forested tracts often makes harvest scheduling and coordinated resource management extremely difficult. For example, an individual 80-acre allotment may be owned by as many as 400 people, many of whom may live off the reservation. The fact that 51% of owners must agree before forestry activities can proceed significantly slows operations. Timber-sale preparation may take 2 years or more; and probate is even more time consuming, holding up some forestry activities for over 4 years. Not surprisingly, all phases of forestry on allotments are backlogged.

Management costs on allotments are much higher than those on tribal forests because of the small size of allotments, their fractionated ownership, and the need to account individually for each owner's returns. For example, separate sale offerings must be made for each allotment, separate scaling records kept, and separate checks issued to each owner. Timber-sale preparation costs on allotments can be as much as twice those on tribal forests.

Often, both allottees and tribes are frustrated with each other because of the allotment system. Tribal managers often cannot get allottees to agree on actions for coordinated resource management, and allottees feel that their rights as individual landowners are being infringed upon. The BIA, as trust representative of the allottee, often finds itself in the middle. Many tribes have policies to purchase allotments if owners want to sell, but tribal funding is an obstacle. Some tribes are contracting (P.L. 93-638) to provide management services (timber sales, forest development) to allottees, an action which some allottees support but which others see as threatening their trust rights.

There is some question as to whether allottees receive service from the BIA comparable to that provided to tribes. Unfortunately, BIA data is inadequate to determine even how many allotments there are, let alone inventory their resources. Because of the complexity of dealing with scattered individual parcels, managing allotments would be expected to require proportionately more time than managing tribal lands. Yet, the BIA estimates that it spends proportionately less time managing allotments. (BIA, 1989). In addition, the BIA estimates that 4.2 million acres (24% of all Indian forestlands) are without adequate trespass protection, and a disproportionate share of this is on allotments. Likewise, of the 3.8 million acres estimated to be without adequate fire or pest protection, 34% is on allotments (BIA, 1989).

Allotment sale. Alaska K. Gabriel

Table 25. Characteristics of different forms of Indian land ownership on reservations (USDI BIA, 1989).

Characteristic	Tribal Trust[1]	Individual Trust[2]	Total Trust	Individual Restricted Fee[3]	Tribal Restricted Fee[4]	Tribal Simple[5]	Total
No. of separate allotment parcels (1000s)	7.4	61.7	69.2	26.6	.1	6.6	102
Avg. no. of owners /tract		34.4	5.7	2.2		28.2	
No. of restricted estates pending probate (1000)	3.9	6.9					
Total no. of acres (1000s)	45,643	10,600	56,243	1,744	0.8	1,807	59,794
No. of forested acres (timberland + woodland) (1000s)	14,488	865	15,353	868	0.6	820	17,041

[1] Tribal Trust: Lands held in trust by the U.S. government for a tribe (e.g., allotments, reservations)

[2] Individual Trust: Lands held in trust by the U.S. government for a specific individual(s) (e.g., allotments, public domain).

[3] Individual Restricted Fee: Lands owned by an individual Indian, not held in trust by the U.S. government, but protected from alienation and encumbrance.

[4] Tribal Restricted Fee: Land owned by a tribe, not held in trust by the U.S. government, but protected from alienation and encumbrance.

[5] Tribal Fee Simple: Tribal lands not held in trust by U.S. government and free from all restrictions (e.g., allotment).

Note: These figures are outdated; for example, there are now approximately 16 million acres of forested lands, not the 15.35 million reported here. The increases are due to tribal purchases, land acquisitions from other federal agencies, and refinements in estimating areas. Nevertheless, the tables still provide valuable information on land-ownership patterns.

(b) Alaska. The BIA has trust responsibilities in Alaska for trust lands of individual allottees and the Annette Islands, the only trust reservation in the state. Under P.L. 101-630 (Sec. 313), the BIA has technical assistance obligations to native corporations formed under the Alaska Native Claims Settlement Act (ANCSA) of 1971. Delivering forest management services to these varied clients provides a considerable challenge.

Southeast Alaska is more highly developed than interior Alaska. Both the Annette Islands reservation and native corporations have been actively harvesting in southeast Alaska, primarily for export. Harvesting in interior Alaska has been mainly limited to local use, although there have been a few recent sales for export. At least one major native corporation harvest contract involving the sale of 200 to 300 million board feet in interior Alaska is reportedly in development.

Native lands in Alaska are divided into three categories: allotted lands (individual trusts), reservations (tribal trusts), and native corporations (not trust lands).

Trust lands.--There are about 1.5 million acres of allotted lands consisting of about 10,000 allotments dispersed over approximately 15,000 parcels. On many of these parcels, ownership has not been fully established, and the amount of forestland is yet undetermined. The majority of allotment parcels have not been surveyed. Additionally, allotments are scattered across the state and exist as inholdings within larger, mostly non-Native ownerships (BLM, NPS, USF&WS, USFS, state, village and regional corporations). The Annette Islands Reservation has 51,000 acres of forestland.

BIA forestry trust services to allottees are provided by a BIA staff of seven divided between Juneau and Anchorage, and through compacts and 93-638 contracts by several regional corporations. The Portland Area provides forestry trust services to the Annette Islands reservation through a combination of BIA staff services and 93-638 contracts.

The base BIA forestry budget to provide trust services on the 15,000 allotment parcels in Alaska is 0.9 to 1.2 million dollars per year, or less than $1 per acre. About 1/2 of the budget is forest protection, 1/3 timber sales, and the rest divided among program support, forest development, and inventories. Compacts and 93-638 contracts are drawn from this base budget.

The base BIA forestry support for the Annette Islands reservation is about $56,000 per year, or about $1 per acre. In addition, the BIA provides technical services to the reservation at a level of about $50,000 to $70,000 per year. Total forestry support is therefore on the order of $2 per acre per year. The BIA recognizes that the level of support for the Annette Islands is low, and estimates that at least $300,000 per year is needed.

Native corporations.--The vast majority of native lands, 44 million acres, is held in native corporations. Perhaps 50% of those lands are forested. Of the 211 village corporations, 105 have 5,000 acres or more of timberland each. Of the 12 regional corporations, eight have significant timber resources. Village corporations have only surface rights on their lands; regional corporations have both surface and subsurface rights on their lands as well as subsurface rights on the lands belonging to village corporations.

Under ANCSA, land title is transferred to native corporations to settle land claims, but the special relationship between individual Indians or Alaskan natives and the U.S. government is not abrogated.

Two types of corporations were created: for-profit and non-profit. Normally, the for-profit corporations hold land title, and the non-profit corporations provide social services.

For-profit Native corporations are not eligible for forest management and forest development funds (unless as a subcontractor to a P.L. 93-638 Tribe). Non-profit corporations are eligible for contracting the full range of BIA service provision. Under a Self-Governance compact, a tribe or a non-profit corporation representing a consortium of tribes is eligible to not only provide services, but determine the exact nature of service provision (in compliance with 25 CFR).

Under certain conditions, native corporations can place their lands in the Federal Land Bank and have a federal agency, such as the BIA, Fish and Wildlife Service, National Park Service, BLM, or Forest Service, manage the lands.

Several regional and village corporations have developed their own forestry staffs. Some corporations contract with private consultants or with each other for forestry services.

Even though corporations are not eligible to receive the normal forest management services given trust lands, Title III of P.L. 101-630 (1990) provides that "The Secretary, in consultation with the village and regional corporations ... shall establish a program of technical assistance to promote the sustained yield management of their resources. Such technical assistance shall also be available to promote local processing and other value-added activities with such resources (see appendix I)."

Currently, the BIA has no appropriated funds for federal technical assistance to native corporations. A recent BIA survey of native corporations identified 100 million dollars' worth of forestry technical assistance and forest development needs. The Alaska BIA has proposed a 3 million dollar per year technical assistance program for native corporations to the Central office. The level of native investment in corporation forestlands is unknown.

Discussion of regeneration success. Flathead R. K. Gabriel

Young stand after shelterwood harvest. Flathead R. D. Cummings

Obstacles to management.--Although harvest potential from Alaska Native forestlands is significant, obstacles to forest management in Alaska include (1) difficult topographic and seasonal operating conditions; (2) poorly developed or nonexistent transportation systems; (3) long distances to processing facilities; (4) limited forest inventories, particularly in the interior; (5) few forest management plans; (6) an insufficient silvicultural research base; (7) very few professional forestry personnel; (8) low budgets, and (9) many uncertified allotments.

The BIA's forest-management service concerns include (1) the ability to maintain a critical level of staff and budgets to provide trust services to allottees as allocations increase for compacts and contracts to native corporations; (2) the ability of native corporations to maintain the quality of forestry services to allottees because native corporations are permitted to reallocate up to 30% of budgeted funds under compacts away from forestry services to allottees; (3) inadequate levels of staffing and funding for the Annette Islands reservation to provide for adequate timber-sale preparation, administration, and forest development; (4) lack of federal appropriations to provide technical assistance to forestland-owning native corporations; and (5) lack of forest resource knowledge, skills, and ability on the part of corporate directors and major shareholders.

In conclusion, forestlands of Alaskan natives are large, poorly inventoried, thinly staffed, and lacking forest management plans. Additional staff and budgets would undoubtedly contribute to improving forest management, but the brief time IFMAT could spend in Alaska prevents their definition here. Opportunities may exist for coordinating activities among various native owners. The major forestry players in Alaska will probably be the regional corporations and village corporations with major timber holdings. Development of regional forestry staffs and cooperative economic developments between village and regional corporations may ultimately benefit all native owners, including individual allottees.

(c) Other ownerships within Indian reservations. Forest planning and management are often greatly complicated by the mixed ownership within Indian reservations, especially with the new emphasis on ecosystem management. A variety of owners control forestland within reservations, including the U.S. government (Forest Service, BLM, Fish and Wildlife Service), states, counties, private forest industry, and nonindustrial private owners.

(d) Off-reservation lands. Management of off-reservation lands, where many tribes have treaty rights, adds greatly to the cost and staffing needs of tribal programs. Tribal employees in fisheries, wildlife, and cultural resources are depended upon to ensure that off-reservation lands are managed in a way that preserves tribal interests. Many times, demands from their off-reservation work are so great that tribal employees are unable to respond to them adequately or are left with little time to attend to reservation management.

Recommendations

(1) Ensure that coordinated resource management plans guide Indian forest management via clearly defined objectives, standards, operations plans, and monitoring procedures. Coordinated resource management plans should be the centerpiece of forest planning and the guiding documents for implementing ecosystem management. The U.S. government should support these plans with technical assistance featuring a mixture of foresters, planners, biometricians, wildlife biologists, ecologists, range conservationists, cultural

specialists, and others. Delivery of the forestry program, including preparation of coordinated plans, should become the responsibility of a single natural-resource manager with a single line of authority.

(2) Direct more staffing and funding toward bringing cultural resource planning initiatives and baseline data to where it can be effective in coordinated resource management. Increase educational efforts aimed at extending the sensitivity of forestry staffs to cultural concerns. Culturally oriented activities such as planting craft materials and burning to encourage the regeneration of plants of cultural significance should become part of the duties of the forestry department. Increased efforts should be made to involving traditionalists in forest management activities to help protect cultural resources and incorporate traditional knowledge into forest planning.

(3) Improve forest planning analysis.

(a) Change the definition of sustained yield management to one that focuses on the protection of underlying ecological processes and forest productivity. Reference to any particular rate of forest conversion in the definition, or specific objective for this conversion, should be dropped.

(b) Make forest plan results accessible to the lay reader. Graphs, figures, pictures and charts should clearly display the type of the forest that will be produced under the plan and the proposed harvest over time and associated growth and inventory.

(c) Develop alternatives for forest management that vary both the land use allocations and the forest structure that could be developed under a particular land use. Forest plans should include a marginal analysis of the benefits and costs from moving way from the proposed plan.

(d) Provide detailed information on the characteristics of the timber supplies that will be available if the plan is implemented. Forest plans should contain this information and enterprise managers should be aware of it.

(e) Modernize harvest scheduling techniques and include an up-to-date sustainability check. Inventory/planning support should be allocated to reservations to help in harvest scheduling. Some tribes and area offices have started using modern operations-research tools, like simulation and linear programming, for harvest scheduling; this work should be encouraged.

(f) Increase the emphasis on operational planning to implement forest plans and coordinated resource plans. Build on the creative analysis occurring on some reservations.

(4) Improve the BIA CFI system. Standards for maintaining or improving the integrity of CFI data should be developed, and the large reservations should be allowed to process their own data. Inventory support staffs at the national and area levels should be consolidated, and the number of biometricians, computer programmers, and database managers on those staffs increased. Common data structures and reporting systems should be created to develop one or several large cohesive systems, rather than dozens of small ones. The data collected should be broadened to include measures of ecosystem performance such as understory vegetation, snag characteristics, and dead and down wood.

(5) Address special planning and management issues

(a) Allotments

1) Recognize the greater demands on staff and funding to manage allotments.

Wildlife habitat patch. Red Lake R. N. Johnson

2) Consider financial mechanisms for tribes to return allotments to common ownership for allottees who wish to sell.

(b) Alaska

1) Compare the level of federal funding necessary to provide management services for comparable trust lands in other regions to that for Alaska, and evaluate why differences exist.

2) Assist owners of trust lands and native corporations in developing visions for their forests, and encourage them to work cooperatively toward their goals.

3) Safeguard trust rights of allottees through negotiation of trust standards between the Secretary of the Interior and regional or village corporations that want to provide forestry services to allottees.

4) Bolster regional expertise in forestry services by encouraging regional corporations with substantial timber holdings to develop natural resource staffs through professional education and technical training.

5) Develop and fund the technical assistance program to native corporations authorized under P.L. 101-630 sec. 313.

(c) Other ownerships within Indian reservations.

1) Return federal forestland within reservations to the tribes if they wish to claim it.

2) Encourage cooperative management of all forestlands within reservations.

(d) Off-reservation lands.

Recognize off-reservation planning and management tasks as part of coordinated resource planning to determine funding and staffing needs.

Pulpwood harvest. Red Lake R. N. Johnson

Evaluation of Establishing Standards

(G) An evaluation of the feasibility and desirability of establishing minimum standards against which the adequacy of the forestry programs of the BIA in fulfilling its trust responsibility to Indian tribes can be measured.

Findings

(1) The concept of trust responsibility in relation to Indian forest management has not been clearly defined in law or regulation, although draft trust standards exist for several forest resources and activities. Lack of definition of the trust responsibility contributes to poor communication between the trustee (the BIA) and the beneficiaries (the tribes) and can lead to inadequate forest management. This is especially evident as tribes move toward self-determination. Uncertainty on the part of both the trustee and beneficiaries could lead to suboptimal decision-making and tenuous accountability.

Both the tribes and BIA understand that trust responsibility is held by the U.S. government. Among other things, tribes cannot sell tribal trust lands, cannot usually put tribal lands at risk for collateral to obtain loans, and must manage tribal forestlands on a sustainable basis (25 CFR 163.3: the "proposed" General Forest Regulations for P.L. 101-630). Under 25 CFR, tribes must approve harvest levels and specific harvest decisions, but the Secretary of the Interior currently retains final responsibility to sign off on them.

In the complex forest-management setting, where actions taken today can have long-term effects on many resources, we believe the trustee must: (a) require that specific information (e. g., coordinated resource plans, cumulative effects analysis) be developed, and (b) assure that the beneficiary (tribe) clearly understands the possible consequences of forest management activities.

(2) Lack of an acknowledged trust responsibility for ensuring efficient operation of tribal enterprises contributes to their suboptimal performance and can impact the forest. Forest-products enterprises are often the actual determinants of forest-management decisions. Whereas forestland is held in trust, enterprises currently operate outside the trust. There is often a lack of communication between forest managers and managers of forest enterprises which hinders effective planning in both areas. Also, the BIA currently does not acknowledge that trust responsibility includes providing information on enterprise performance to tribes.

Recommendations

(1) Require that trust standards be agreed upon between the tribal governments and the Secretary of the Interior. These trust standards should be derived from the objectives embodied in each tribe's coordinated resource plan. Obviously not all tribal governments will be able to adopt coordinated plans in the short term. Therefore, interim procedures for agreeing upon trust standards will need to be established.

Consistent with other recommendations in this assessment, we believe that tribes will continue to move toward a greater degree of self-determination and will agree on trust responsibilities with the Secretary. In this context, we believe that establishing trust standards will clarify what is expected of both trustee and beneficiary. As a tribe becomes

Wild rice beds. Red Lake R. N. Johnson

better able to develop information, assess consequences, and take action, the Secretary's need to oversee will diminish, and the tribe will assume greater responsibility for its actions.

The beneficiaries cannot, however, replace the U.S. government as trustee or trust overseer (e.g., an independent oversight commission; recall Figure 1), particularly in forestry, with its long production cycles and complex mix of resources.

Because the interests of Indian owners differ from tribe to tribe, we believe that the most appropriate setting for establishing trust standards is the individual tribe, with participation of the Secretary and trust oversight mechanism (e. g., independent commission) as each tribe chooses its level of self-determination.

Further, we believe that certain principles can assist the Secretary and tribe in developing standards:

(a) a tribal vision for forests and their management should be articulated where one does not now exist;

(b) trust standards should be linked and relative to this tribal vision;

(c) each tribal government should, in cooperation with the Secretary, develop the standards with local involvement;

(d) the agreed-upon standards should have measurable yardsticks for achieving trust responsibility, with measurement techniques determined before standards are approved;

(e) to the degree possible, standards should measure achievement of desired conditions and outcomes (performance) rather than inputs, techniques, or technologies; and

(f) standards should encourage and reward compliance and promote efficient use of resources.

These principles need to be applied flexibly in a tribal setting. They would, however, provide relatively easy guidelines to monitor and considerably clarify trust oversight.

(2) Expand the trust responsibility to include technical assistance to tribal enterprises and reporting to tribes on enterprise performance. Forest management and enterprises need to be linked more effectively. In general, forest-products enterprises need to be modernized and better connected to tribal goals for economic development if tribal forest resources are to be managed in a truly coordinated way. Trust standards for utilization of raw material (logs) should be linked to forest-products enterprises. It makes little ecological or economic sense to improve forest productivity, only to have the increased yield poorly utilized at the mills. Communication between forest managers and forest-products enterprises needs to be strengthened. For example, forest-management representatives could be included on an enterprise's board of directors; conversely, forest-enterprise personnel could be included on a coordinated resource planning team.

(3) Invest in education to improve the ability of tribal members to develop and apply trust standards for natural resource management. This initiative should (1) create more incentives for tribal members to enter natural resource, forest enterprise, and business professions, and (2) incorporate greater use of forest resource and management concepts in kindergarten-grade 12 education.

Recommendation for Reform and Increased Funding

(H) A recommendation of any reforms and increased funding levels necessary to bring Indian forestland management programs to a state-of-the-art condition.

Specific findings and recommendations have been given by task (A through G). Here, we repeat our most important findings and recommendations in order of importance.

Findings

The main findings are:

(1) the gap between the visions that Indians express for their forests and how these forests have been managed,

(2) the gap in funding between Indian forests and comparable federal and private lands.

(3) the lack of coordinated resource planning and management.

(4) the need for a better method of setting and overseeing trust standards for Indian forestry.

Recommendations

Our major recommendations are:

(1) Reconfigure the relationship between the federal government and the tribes (see detailed recommendations under Sections E and G).

(2) Implement coordinated planning and management (see detailed recommendations under Sections B, C, D, F).

(3) Provide adequate funding and staffing (see detailed recommendations under Section A, B, C and Table 1).

We believe that considerable management flexibility still exists on Indian forestlands, where many innovative approaches are already being tried. Further, we believe that others have much to learn from Indian forestry and the holistic Indian view of forests and people. But it is urgent that more attention and resources be directed soon to Indian forests by Congress because only a decade or two of flexibility is left. If not, options will be irretrievably lost and, with them, a major opportunity to bring Indian forests up to management standards of federal lands such as the National Forests and to provide examples of integrated forest management.

Future Work

Our study was completed in a short time relative to the size and complexity of Indian forests and the nature of the legislatively mandated tasks. We were specifically exempted from in-depth consideration of the ANCSA-created native corporations in Alaska. Moreover, the scarcity of information about woodlands, the larger portion of Indian forestlands, severely restricted our ability to comment on them. These millions of acres should, in our view, be a focus of future assessments. Nevertheless, we think we have reached useful overall conclusions to the questions asked about Indian forestry.

Shelterwood harvest. Nez Perce R. J. Franklin

APPENDIX I.
National Indian Forest Resources Management Act

TITLE III - INDIAN FOREST AND WOODLANDS

SEC. 301. Short Title

This title may be cited as the "National Indian Forest Resources Management Act."

SEC. 302. FINDINGS

The Congress finds and declares that--

(1) the forest lands of Indians are among their most valuable resources and Indian forest lands--

(A) encompass more than 15,990,000 acres, including more that 5,700,000 acres of commercial forest land and 8,700,000 acres of woodland,

(B) are a perpetually renewable and manageable resource,

(C) provide economic benefits, including income, employment, and subsistence, and

(D) provide natural benefits, including ecological, cultural, and esthetic values;

(2) the United States has a trust responsibility toward Indian forest lands;

(3) existing Federal laws do not sufficiently assure the adequate and necessary trust management of Indian forest lands;

(4) the Federal Investment in, and the management of, Indian forest land is significantly below the level of investment in, and management of, National Forest Service forest land, Bureau of Land Management forest land, or private forest land;

(5) tribal governments make substantial contributions to the overall management of Indian forest land; and

(6) there is a serious threat to Indian forest lands arising from trespass and unauthorized harvesting of Indian forest land resources.

SEC. 303. PURPOSES.

The purposes of this title are to--

(1) allow the Secretary of the Interior to take part in the management of Indian forest lands, with the participation of the lands' beneficial owners, in a manner consistent with the Secretary's trust responsibility and with the objectives of the beneficial owners;

(2) clarify the authority of the Secretary to make deductions from the proceeds of sale of Indian forest products, assure the use of such deductions on the reservation from which they are derived solely for use in forest land management activities, and assure that no other deductions shall be collected;

(3) increase the number of professional Indian foresters and related staff in forestry programs on Indian forest land; and

(4) provide for the authorization of necessary appropriations to carry out this title for the protection, conservation, utilization, management, and enhancement of Indian forest lands.

SEC. 304 DEFINITIONS.

(1) "Alaska Native" means Native as defined in section 3(b) of the Alaska Native Claims Settlement Act of December 18, 1971 (43 U.S.C. 1604);

(2) "forest" means an ecosystem of at least one acre in size, including timberland and woodland, which--

(A) is characterized by a more or less dense and extensive tree cover,

(B) contains, or once contained, at least ten percent tree crown cover, and

(C) is not developed or planned for exclusive non-forest use;

(3) "Indian forest land" means Indian lands, including commercial and non-commercial timberland and woodland, that are considered chiefly valuable for the production of forest products or to maintain watershed or other land values enhanced by a forest cover, regardless whether a formal inspection and land classification action has been taken;

(4) "forest land management activities" means all activities performed in the management of Indian forest lands, including--

(A) all aspects of program administration and executive direction such as--

(i) development and maintenance of policy and operational procedures, program oversight, and evaluation,

(ii) securing of legal assistance and handling of legal matters,

(iii) budget, finance, and personnel management, and

(iv) development and maintenance of necessary data bases and program reports;

(B) all aspects of the development, preparation and revision of forest inventory and management plans, including aerial photography, mapping, field management inventories and re-inventories, inventory analysis, growth studies, allowable annual cut calculations, environmental assessment, and forest history, consistent with and reflective of tribal integrated resource management plans;

(C) forest land development, including forestation, thinning, tree improvement activities, and the use of silvicultural treatments to restore or increase growth and yield to the full productive capacity of the forest environment;

(D) protection against losses from wildfire, including acquisition and maintenance of fire fighting equipment and fire detection systems, construction of firebreaks, hazard reduction, prescribed burning, and the development of cooperative wildfire management agreements;

(E) protection against insects and disease, including--

(i) all aspects of detection and evaluation,

(ii) preparation of project proposals containing project description, environmental assessments and statements, and cost-benefit analyses necessary to secure funding,

(iii) field suppression operations, and

(iv) reporting;

(F) assessment of damage caused by forest trespass, infestation or fire, including field examination and survey, damage appraisal, investigation assistance, and report, demand letter, and testimony preparation;

(G) all aspects of the preparation, administration, and supervision of timber sale contracts, paid and free use permits, and other Indian forest product harvest sale documents including--

(i) cruising, product marking, silvicultural prescription, appraisal and harvest supervision,

(ii) forest product marketing assistance, including evaluation of marketing and development opportunities related to Indian forest products and consultation and advice to tribes, tribal and Indian enterprises on maximization of return on forest products,

(iii) archeological, historical, environmental and other land management reviews, clearances, and analyses,

(iv) advertising, executing, and supervising contracts,

(v) marking and scaling of timber, and

(vi) collecting, recording and distributing receipts from sales;

(H) provision of financial assistance for the education of Indians enrolled in accredited programs of postsecondary and postgraduate forestry and forestry-related fields of study, including the provision of scholarships, internships, relocation assistance, and other forms of assistance to cover educational expenses;

(I) participation in the development and implementation of tribal integrated resource management plans, including activities to coordinate current and future multiple uses of Indian forest lands;

(J) improvement and maintenance of extended season primary and secondary Indian forest land road systems; and

(K) research activities to improve the basis for determining appropriate management measures to apply to Indian forest lands;

(5) "forest management plan" means the principal document, approved by the Secretary, reflecting and consistent with a tribal integrated resource management plan, which provides for the regulation of the detailed, multiple-use operation of Indian forest land by methods assuring that such lands remain in a continuously productive state while meeting the objectives of the tribe and which shall include--

(A) standards setting forth the funding and staffing requirements necessary to carry out each management plan, with a report of current forestry funding and staffing levels, and

(B) standards providing quantitative criteria to evaluate performance against the objectives set forth in the plan;

(6) "forest product" means--

(A) timber,

(B) a timber product, including lumber, lath, crating, ties, bolts, logs, pulpwood, fuelwood, posts, poles and split products,

(C) bark,

(D) Christmas trees, stays, branches, firewood, berries, mosses, pinon nuts, roots, acorns, syrups, wild rice, and herbs,

(E) other marketable material, and

(F) gravel which is extracted from, and utilized on, Indian forest lands;

(7) 'forest resources" means all the benefits derived from Indian forest lands, including forest products, soil productivity, water, fisheries, wildlife, recreation, and aesthetic or other traditional values of Indian forest lands;

(8) "forest trespass" means the act of illegally removing forest products from, or illegally damaging forest products on, forest lands;

(9) "Indian" means a member of an Indian tribe;

(10) "Indian land" means land title to which is held by--

(A) the United States in trust for an Indian, an individual of Indian or Alaska Native ancestry who is not a member of a federally-recognized Indian tribe, or an Indian tribe, or

(B) an Indian, an individual of Indian of Alaska Native ancestry who is no a member of a federally recognized tribe, or an Indian tribe subject to a restriction by the United States against alienation;

(11) "Indian tribe" or "tribe" means any Indian tribe, band, nation, Pueblo or other organized group or community which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians and shall mean, where appropriate, the recognized tribal government of such tribe's reservation;

(12) "reservation" includes Indian reservations established pursuant to treaties, Acts of Congress or Executive orders, public domain Indian allotments, and former Indian reservations in Oklahoma;

(13) "Secretary" means the Secretary of the Interior;

(14) "sustained yield" means the yield of forest products that a forest can produce continuously at a given intensity of management; and

(15) "tribal integrated resource management plan" means a document, approved by an Indian tribe and the Secretary, which provides coordination for the comprehensive management of such tribe's natural resources.

SEC. 305. MANAGEMENT OF INDIAN FOREST LAND.

(a) Management Activities.--The Secretary shall undertake forest land management activities on Indian forest land, either directly or through contracts, cooperative agreements, or grants under the Indian Self-Determination Act (25 U.S.C. 450 et seq.).

(b) Management objectives.--Indian forest land management activities undertaken by the Secretary shall be designed to achieve the following objectives--

(1) the development, maintenance, and enhancement of Indian forest land in a perpetually productive state in accordance with the principles of sustained yield and with the standards and objectives set forth in forest management plans by providing effective management and protection through the application of sound silvicultural and economic principles to--

(A) the harvesting of forest products,

(B) forestation,

(C) timber stand improvement, and

(D) other forestry practices;

(2) the regulation of Indian forest lands through the development and implementation, with the full and active consultation and participation of the appropriate Indian tribe, of forest management plans which are supported by written tribal objectives and forest marketing programs;

(3) the regulation of Indian forest lands in a manner that will ensure the use of good method and order in harvesting so as to make possible, on a sustained yield basis, continuous productivity and a perpetual forest business;

(4) the development of Indian forest lands and associated value-added industries by Indians and Indian tribes to promote self-sustaining communities, so that Indian may receive from their Indian forest land not only stumpage value, but also the benefit of all the labor and profit that such Indian forest land is capable of yielding;

(5) the retention of Indian forest land in its natural state when an Indian tribe determines that the recreational, cultural, aesthetic, or traditional values of the Indian forest land represents the highest and best use of the land;

(6) the management and protection of forest resources to retain the beneficial effects to Indian forest lands of regulating water run-off and minimizing soil erosion; and

(7) the maintenance and improvement of timber productivity, grazing, wildlife, fisheries, recreation, aesthetic, cultural and other traditional values.

SEC. 306 FOREST MANAGEMENT DEDUCTION.

(a) Withholding of Deduction.--pursuant to the authority of section 1 of the Act of February 14, 1920 (41 Stat. 415; 25 U.S.C. 413), the Secretary shall withhold a reasonable deduction from the gross proceeds of sales of forest products harvested from Indian forest land under a timber sale contract, permit, or other harvest sale document, which has been approved by the Secretary, to cover in whole or part the cost of managing and protecting such Indian forest land.

(b) Amount of Deduction.--Deductions made pursuant to subsection (a) shall not exceed the lesser amount of--

(1) 10 percent of gross proceeds, or

(2) the percentage of gross proceeds collected on the date of enactment of this title as forest management deductions by the Secretary on such sales of Indian forest products, unless the appropriate Indian tribe consents to an increase in the deductions.

(c) Use of Deduction.--The full amount of any deduction collected by the Secretary shall be expended according to an approved expenditure plan, approved by the Secretary and the appropriate Indian tribe, for the performance of forest land management activities on the reservation from which such deductions are collected and shall be made available to the tribe, upon its request, by contract or agreement for the performance of such activities.

(d) Limitations.--(1) Forest management deductions withheld pursuant to this section shall not be available to--

(A) cover the costs that are paid from funds appropriated specifically for fire suppression or pest control, or

(B) otherwise offset Federal appropriations for meeting the Federal Trust responsibility for management of Indian forest lands.

(2) No other forest management deductions derived from Indian forest lands shall be collected to be covered into the general funds of the United States Treasury.

SEC. 307. FOREST TRESPASS.

(a) Civil Penalties; Regulation.--Not later than 18 months from the date of enactment of the title, the Secretary shall issue regulations that--

(1) establish civil penalties for the commission of forest trespass which provide for--

(A) collection of the value of the products illegally removed plus a penalty of double their value,

(B) collection of the costs associated with damage to the Indian forest land caused by the act of trespass, and

(C) collection of the costs associated with enforcement of the regulations, including field examination and survey, damage appraisal, investigation assistance and reports, witness expenses, demand letters, court costs, and attorney fees;

(2) designate responsibility with the Department of the Interior for the detection and investigation of forest trespass; and

(3) set forth responsibilities and procedures for the assessment and collection of civil penalties.

(b) Treatment of Proceeds.--The proceeds of civil penalties collected under this section shall be treated as proceeds from the sale of forest produces from the Indian forest lands upon which such trespass occurred.

(c) Concurrent Jurisdiction.--Indian tribes which adopt the regulations promulgated by the Secretary pursuant to subsection (a) shall have concurrent tribal jurisdiction to enforce the provisions of this section and the regulation promulgated thereunder. The Bureau of Indian Affairs and other agencies of the Federal government shall, at the request of the tribe, defer to tribal prosecutions of forest trespass cases. Tribal court judgments regarding forest trespass shall be entitled to full faith and credit in Federal and State courts to the same extent as a Federal court judgment obtained under this section.

SEC. 308. DIRECT PAYMENT OF FOREST PRODUCTS RECEIPTS.

(a) Regulations.--Notwithstanding any other law, the Secretary shall, within 1 year from the date of enactment of this title, promulgate regulations providing for the payment of the receipts from the sale of Indian forest products as provided in this section.

(b) Payment Into a Bank Depository.--upon the request of an Indian tribe, the Secretary shall provide that the purchaser of the forest products of such tribe, which are harvested under a timber sale contract, permit or other harvest sale document which has been approved by the Secretary, shall make prompt direct payments of the gross proceeds of sales of such forest products, less any amounts segregated as forest management deductions pursuant to section 306, into a bank depository account designated by such Indian tribe.

SEC. 309. SECRETARIAL RECOGNITION OF TRIBAL LAWS.

Subject to the Secretary's responsibilities as reflected in sections 302 (2) and 303 (1) and unless otherwise prohibited by Federal statutory law, the Secretary shall comply with tribal laws pertaining to Indian forest lands, including laws regulating the environment or historic or cultural preservation, and shall cooperate with the enforcement of such laws on Indian forest lands. Such cooperation shall include--

(1) assistance in the enforcement of such laws;

(2) provision of notice of such laws to persons or entities undertaking activities on Indian forest lands; and

(3) upon the request of an Indian tribe, the appearance in tribal forums.

SEC.310. INDIAN FOREST LAND ASSISTANCE ACCOUNT.

(a) Establishment.--at the request of an Indian tribe, the Secretary may establish a special Indian forest land assistance account within the tribe's trust fund account to fund the Indian forest land management activities of such tribe.

(b) Deposits and Expenditures.-- (1) The Secretary may deposit into the Indian forest land assistance account established pursuant to subsection (9a) any funds received by the Secretary or in the Secretary's possession from--

(A) non-Federal sources, if such funds are related to activities on or for the Indian forest lands of such tribe's reservation,

(B) donations and contributions,

(C) unobligated forestry appropriations for the benefit of such Indian tribe, and

(D) user fees or other funds transferred under Federal interagency agreements if otherwise authorized by Federal law and, if such funds are related to activities on or for the Indian forest lands of such tribe's reservation.

Funds deposited in such account shall be for the purpose of conducting forest land management activities on the Indian forest lands of such tribe.

(2) Funds in the Indian forest land assistance account and any interest or other income earned thereon shall remain available until expended and shall not be available to otherwise offset Federal appropriations for meeting the Federal responsibility for management of Indian forest lands.

(c) Audits.-- At the request of an Indian tribe or upon the Secretary's own volition, the Secretary may conduct audits of the Indian forest land assistance account and shall publish the results of such audit.

SEC. 311. TRIBAL FORESTRY PROGRAMS.

(a) Establishment.--The Secretary shall establish within the Bureau of Indian Affairs a program to provide financial support to forestry programs established by an Indian tribe.

(b) Support Allocation Formula; Criteria.--(1) The Secretary, with the participation of Indian tribes with Indian forest lands, shall establish, and promulgate by regulations, a formula--

(A) for the determination of Indian tribes eligible for such support,

(B) for the provision of levels of assistance for the forestry programs of such tribes, and

(C) the allocation of base support funds to such tribes under the program established pursuant to subsection (a).

(2) The formula established pursuant to this subsection shall provide funding necessary to support--

(A) one professional forester, including fringe benefits and support costs, for each eligible tribe, and

(B) one additional professional or forest technician, including fringe benefits and support costs, for each level of assistance for which and eligible Indian tribe qualifies.

(3) In any fiscal year that appropriations are not sufficient to fully fund tribal forestry programs at each level of assistance under the formula required to be established in this section, available funds for each level of assistance shall be evenly divided among the tribes qualifying for that level of assistance.

SEC. 312. ASSESSMENT OF INDIAN FOREST LAND AND MANAGEMENT PROGRAMS.

(a) Initial Assessment.--(1) Within 1 year after the date of enactment of this title, the Secretary, in consultation with affected Indian tribes, shall enter into a contract with a non-Federal entity knowledgeable in forest management practices on Federal and private lands to conduct an independent assessment of Indian forest lands and Indian forest land management practices.

(2) Such assessment shall be national in scope and shall include--

(A) an in-depth analysis of management practices on, and the level of funding for, specific Indian forest land compared with similar Federal and private forest lands,

(B) a survey of the condition of Indian forest lands, including health and productivity levels,

(C) an evaluation of the staffing patterns of forestry organizations of the Bureau of Indian Affairs and of Indian tribes,

(D) an evaluation of procedures employed in timber sales administration, including preparation, field supervision, and accountability for proceeds,

(E) an analysis of the potential for reducing or eliminating relevant administrative procedures, rules and policies of the Bureau of Indian Affairs consistent with the Federal trust responsibility,

(F) a comprehensive review of the adequacy of Indian forest land management plans, including their compatibility with applicable tribal integrated resource management plans and their ability to meet tribal needs and priorities,

(G) an evaluation of the feasibility and desirability of establishing minimum standards against which the adequacy of the forestry programs of the Bureau of Indian Affairs in fulfilling its trust responsibility to Indian tribes can be measured, and

(H) a recommendation of any reforms and increased funding levels necessary to bring Indian forest land management programs to a state-of-the-art condition.

(3) Such assessment shall include specific examples and comparisons from each of the regions of the United States where Indian forest lands are located.

(4) The initial assessment required by this subsection shall be completed no later than 36 months following the date of enactment of this title. Upon completion, the assessment shall be submitted to the Committee on Interior and Insular Affairs of the United States House of Representatives and the Select Committee on Indian Affairs of the United States Senate and shall be made available to Indian tribes.

(b) Periodic Assessments.--On each 10-year anniversary of the date of enactment of this title, the Secretary shall provide for an independent assessment of Indian forest lands and Indian forest land management practices under the criteria established in subsection (a) which shall include analyses measured against findings in previous assessments.

(c) Status Report to Congress.--The Secretary shall submit, within 1 year of the first full fiscal year after the date of enactment of this title and within 6 months of the end of each succeeding fiscal year, a report to committee on Interior and Insular affairs of the United States House on Interior and Insular Affairs of the of the United States House of Representatives, the Select Committee on Indian Affairs of the United States Senate, and to the affected Indian tribes a report on the status of Indian forest lands with respect to standards, goals and objectives set forth in approved forest management plans for each Indian tribe with Indian forest lands. The report shall identify the amount of Indian forest land in need of forestation or other silvicultural treatment and the quantity of timber available for sale, offered for sale, and sold for each Indian tribe.

(d) Assistance from Secretary of Agriculture.--The Secretary of Agriculture, through the Forest Service, is authorized to provide, upon the request of the Secretary of the Interior, on a nonreimbursable basis, technical assistance in the conduct of such research and evaluation activities as may be necessary for the completion of any reports of assessments required by this title.

SEC. 313. ALASKA NATIVE TECHNICAL ASSISTANCE PROGRAM.

(a) Establishment.--The Secretary, in consultation with the village and regional corporations established pursuant to the Alaska Native Claims Settlement Act f(43 U.S.C. 1601 et seq.) shall establish a program of technical assistance for such corporations to promote the sustained yield management of their forest resources. Such technical assistance shall also be available to promote local processing and other value-added activities with such forest resources.

(b) Indian Self-Determination Act.--The technical assistance to be provided by the Secretary pursuant to subsection (a) shall be made available through contracts, grants or agreements entered into in accordance with, and made available to entities eligible for, such contracts, grants, or agreements under the Indian Self-Determination Act (25 U.S.C. 450 et seq).

SEC. 314. ESTABLISHMENT OF INDIAN AND ALASKA NATIVE FORESTRY EDUCATION ASSISTANCE.

(a) Forester Intern Program.--(1) Notwithstanding the provisions of title 5 of the United States Code governing appointments in the competitive service, the Secretary shall establish and maintain in the Bureau of Indian Affairs at least 20 forester intern positions for Indian and Alaska Native Students.

(2) For purposes of this subsection, the term "forester intern" means an Indian or Alaska Native who--

(A) is acquiring necessary academic qualifications to become a forester or a professional trained in forestry-related fields and

(B) is appointed to one of the positions established under paragraph (1).

(3) The Secretary shall pay all costs for tuition, books, fees and living expenses incurred by a forester intern while attending an approved post-secondary or graduate school in a full-time forestry-related curriculum.

(4) A forester intern shall be required to enter into an obligated service agreement to serve as a professional forester or other forestry-related professional with the Bureau of Indian Affairs, an Indian tribe, or a tribal forest-related enterprise for 2 years for each of education for which the Secretary pays the intern's educational costs under paragraph (3) of this subsection.

(5) A forester intern shall be required to report for service with the Bureau of Indian Affairs during any break in attendance at school of more than 3 weeks duration. Time spent in such service shall be counted toward satisfaction of the intern's obligated service agreement.

(b) Cooperative Education Program.--(1) The Secretary shall maintain, through the Bureau of Indian Affairs, a cooperative education program for the purpose of recruiting promising Indian and Alaska Native students who are enrolled in secondary schools, tribally controlled community colleges, and other post-secondary or graduate schools for employment as a professional forester or other forestry-related professional with the Bureau of Indian affairs, an Indian tribe, or a tribal forest-related enterprise.

(2) The cooperative educational program that is to be maintained under paragraph (1) shall be modeled on and shall have essentially the same features of the program operated on the date of enactment of this title pursuant to chapter 308 of the Federal Personnel Manual of the Office of Personnel Management.

(3) Under the cooperative agreement program that is to be maintained under paragraph (1), the Secretary shall pay all costs for tuition, books, and fees of an Indian or Alaska native student who--

(A) is enrolled in a course of study at an education institution with which the Secretary has entered into a cooperative agreement, and

(B) is interested in a career with the Bureau of Indian Affairs, an Indian tribe or a tribal enterprise in the management of Indian forest land.

(4) Financial need shall not be a requirement to receive assistance under the cooperative agreement program that is to be maintained under this subsection.

(5) A recipient of assistance under the cooperative education program that is to be maintained under this subsection shall be required to enter into an obligated service agreement to serve as a professional forester or other forestry-related professional with the Bureau of Indian Affairs, an Indian tribe, or a tribal forest-related enterprise for one year for each year for which the Secretary pays the recipient's educational costs pursuant to paragraph (3).

(c) Scholarship Program.--(1) The Secretary is authorized to grant forestry scholarships to Indians and Alaska Natives enrolled in accredited programs for post-secondary and graduate forestry and forestry-related programs of study as full-time students.

(2) A recipient of a scholarship under paragraph (1) shall be required to enter into an obligated service agreement with the Secretary in which the recipient agrees to accept employment for one year for each year the recipient received a scholarship, following completion of the recipient's forestry or forestry-related course of study, with

(A) The Bureau of Indian Affairs;

(B) a forestry program conducted under a contract, grant, or cooperative agreement entered into under the Indian Self-Determination Act (25 U.S.C. 450, 450 et seq.);

(C) an Indian enterprise engaged in a forestry or forestry-related business; or

(D) an Indian tribe's forestry-related program.

(3) The Secretary shall not deny scholarship assistance under this subsection solely on the basis of an applicant's scholastic achievement if the applicant has been admitted to and remains in good standing in an accredited postsecondary or graduate institution.

(d) Forestry Education Outreach.--The Secretary shall conduct, through the Bureau of Indian Affairs, and in consultation with other appropriate local, state, and Federal agencies, and in consultation and coordination with Indian tribes, a forestry education outreach program for Indian and Alaska Native youth to explain and stimulate interest in all aspects of Indian forest land management and careers in forestry.

(e) Adequacy of Programs.--The Secretary shall administer the programs described in this section until a sufficient number of Indians and Alaska natives are trained to ensure that there is an adequate number of qualified, professional Indian foresters to manage the Bureau of Indian Affairs forestry programs and forestry programs maintained by or for Indian tribes.

SEC. 315 POSTGRADUATION RECRUITMENT, EDUCATION AND TRAINING PROGRAMS.

(a) Postgraduation Recruitment.--The Secretary will establish and maintain a program to attract Indian and Alaska Native professional foresters and forestry technicians who have already graduated from their course of postsecondary or graduate education for employment in either the Bureau of Indian Affairs forestry programs or, subject to the approval of the tribe, in tribal forestry programs. According to such regulations as the Secretary may prescribe, such program shall provide for the employment of Indian and Alaska native professional foresters or forestry technicians in exchange for the Secretary's assumption of the employee's outstanding student loans. The period of employment shall be determined by the amount of the loan that is assumed.

(b) Postgraduate Intergovernmental Internships.--For the purposes of training, skill development and orientation of Indian, Alaska native, and Federal forestry personnel, and the enhancement of tribal and Bureau of Indian Affairs forestry programs, the Secretary shall establish and actively conduct a program for the cooperative internship of Federal, Indian, and Alaska Native forestry personnel. Such program shall--

(1) for agencies within the Department of the Interior--

(A) provide for the internship of Bureau of Indian Affairs, Alaska Native, and Indian forestry employees in the forestry-related programs of other agencies of the Department of the Interior, and

(B) provide for the internship of forestry personnel from other Department of the Interior agencies within the Bureau of Indian Affairs and, with the consent of the tribe, within tribal forestry programs;

(2) for agencies not within the Department of the Interior, provide, pursuant to an interagency agreement, internships within the Bureau of Indian Affairs and, with the consent of the tribe, within a tribal forestry program of other forestry personnel of such agencies who are above their sixth year of Federal Service;

(3) provide for the continuation of salary and benefits for participating Federal employees by their originating agency; and

(4) provide for salaries and benefits of participating Indian and Alaska Native forestry employees by the host agency; and

(5) provide for a bonus pay incentive at the conclusion of the internship for any participant.

(c) Continuing Education and Training.--The Secretary shall maintain a program within the Division of Forestry of the Bureau of Indian Affairs for the ongoing education and training of Bureau of Indian Affairs, Alaska native, and Indian forestry personnel. Such program shall provide for--

(1) orientation training for the Bureau of Indian Affairs forestry personnel in tribal-Federal relations and responsibilities;

(2) continuing technical forestry education for Bureau of Indian Affairs Alaska Native, and tribal forestry personnel; and

(3) developmental training of Indian and Alaska Native personnel in forest land based enterprises and marketing.

SEC. 316. COOPERATIVE AGREEMENT BETWEEN THE DEPARTMENT OF THE INTERIOR AND INDIAN TRIBES.

(a) Cooperative Agreements.--(1) To facilitate the administration of the programs of the programs and activities of the Department of the Interior, the Secretary is authorized to negotiate and enter into cooperative agreements with Indian tribes to--

(A) engage in cooperative manpower and job training and development programs,

(B) to develop and publish cooperative environmental education and natural resource planning materials, and

(C) to perform land and facility improvements, including forestry and other natural resources protection, fire protection, reforestation, timber stand improvement, debris removal, and other activities related to land and natural resource management.

The Secretary may enter into such agreements when the Secretary determines the public interest will be benefitted.

(2) In such cooperative agreements, the Secretary is authorized to advance or reimburse funds to contractors from any appropriated funds available for similar kinds of work or by furnishing or sharing materials, supplies, facilities or equipment without regard to the provisions of section 3324, title 31, United States Code, relating to the advance of public moneys.

(b) Supervision.--In any agreement authorized by this section, Indian tribes and their employees may perform cooperative work under the supervision of the Department of the Interior in emergencies or otherwise as mutually agreed to, but shall not be deemed to be Federal employees other than for purposes of section 2671 through 2680 of title 28, United States Code, and section 8101 through 8193 of title 5, United States Code.

(c) Savings Clause.--Nothing is this title shall be construed to limit the authority of the Secretary to enter into cooperative agreements otherwise authorized by law.

SEC. 317. OBLIGATED SERVICE; BREACH OF CONTRACT.

(a) Obligated Service.--Where an individual enters into an agreement for Obligated Service in return for financial assistance under any provision of this title, the Secretary shall adopt such regulations as are necessary to provide for the offer of employment to the recipient of such assistance as required by such provision. Where an offer of employment is not reasonably made, the regulations shall provide that such service shall no longer be required.

(b) Breach of Contract; Repayment.--Where an individual fails to accept a reasonable offer of employment in fulfillment of such Obligated Service or unreasonably terminates or fails to perform the duties of such employment, the Secretary shall require a repayment of the financial assistance provided, prorated for the amount of time of obligated service performed, together with interest on such amount which would be payable if at the time the amounts were paid they were loans bearing interest at the maximum legal prevailing rate, as determined by the Treasurer of the United States.

SEC. 318. AUTHORIZATIONS.

There are authorized to be appropriated such sums as may be necessary to carry out the purposes of this title.

SEC. 319. REGULATIONS.

Except as otherwise provided by this title, the Secretary is directed to promulgate final regulations for the implementation of the title within eighteen months from the date of its enactment. All regulations promulgated pursuant to this title shall be developed by the Secretary with the participation of the affected Indian tribes.

SEC. 320. SEVERABILITY.

If any provision of this title, or the application of any provision of this title to any person or circumstance, is held invalid, the application of such provision or circumstance and the remainder of this title shall not be affected thereby.

SEC. 321. TRUST RESPONSIBILITY.

Nothing in this title shall be construed to diminish or expand the trust responsibility of the United States toward Indian forest lands, or any legal obligation or remedy resulting therefrom.

APPENDIX II.
IFMAT Trip Log

1. First IFMAT meeting

The first meeting of IFMAT was held in Portland, Oregon on April 17, 1992. The purpose of the meeting was to define the mission of IFMAT, develop project design, and establish intermediate goals. Presentations were given by BIA and Tribal incumbents to orient the panel to Indian forestry and the legislative requirements of the independent forestry assessment. The meeting was attended by ITC planning committee members, the IFMAT panel, and BIA representatives from the Central and Portland Area office.

2. June 1992

-The second IFMAT meeting was held in Portland, Oregon on June 11th and 12th. The meeting focused on finalization of the national assessment work plan and the tribal questionnaire. The first afternoon was a joint meeting with the ITC executive board.

-Other accomplishments were the completion of the draft work plan for IFMAT; review and revision of the Tribal questionnaire; joint meeting of the ITC executive board and IFMAT; development of the initial reservation site visitation schedule ; initial development of the Warm Springs site visit plan; contact with Warm Springs Tribal leaders concerning IFMAT visit; initial contact with White Mt. Apache and Makah tribes concerning visits; forest products trip developed for SW tribes site visitation; and development of focus group review of tribal questionnaire.

-Ms. Joyce Berry of Colorado State University was selected to the IFMAT national team as a survey research expert and writer.

3. July 1992

-Preparation for site visits to the Warm Springs, Navajo, White Mountain Apache, and Tulalip reservations was undertaken during the month of July. All members of IFMAT submitted questions to be answered by IFMAT during site visits. In addition, meetings with BIA and tribal natural resource managers were held at the Warm Springs reservation to prepare for IFMAT's visit.

-Dr. Jerry Franklin and Dr. Norm Johnson visited the Warm Springs reservation on July 27th through 28th. The balance of the team visited the Warm Springs reservation including Dr. Johnson during August 3rd to August 5th.

-Ed Williston and Cal Mukumoto visited the Navajo Nation on July 21st and 22nd. The trip allowed IFMAT to review the Navajo mill and to establish some plans for the main IFMAT visit in September, 1992. Correspondence with the Tulalip reservation set up a one day visit on August 6,1992. The White Mountain Apache Tribe was contacted and a pre-IFMAT meeting has been tentatively set for early August. Ed Williston also visited the Mescalero Tribe on July 23rd and toured their mill.

-The questionnaire was revised twice during the month of July with two versions being produced. The two versions were tested on a 15 member focus group consisting of BIA and tribal resource managers and tribal members on July 31st. The results of the focus group indicated that a shorter version of the questionnaire be developed. The focus group also suggested attending other tribal conferences to obtain tribal member input.

Finally, focus groups were established at the individual tribal level as a method of deriving tribal input into the management assessment.

-Ed Williston, IFMAT member, met with the BIA marketing specialists from the Portland Area, Minneapolis Area, and the Phoenix Area offices, and the Phoenix Area forester on Monday, July 20th. The meeting covered current issues in BIA forest products marketing, manufacturing and merchandising.

4. August 1992

-The Warm Springs Reservation and the Tulalip Reservation was visited by IFMAT during the first week of August.

-IFMAT conducted its third meeting on August 4th and 7th. During the August 4th meeting at the Warm Springs reservation IFMAT reviewed its progress at the Warm springs Reservation. During the August 7th meeting at the University of Washington in Seattle, Washington; IFMAT reviewed lessons learned from the Warm Springs and Tulalip Reservation visits, set up strategies for subgroups and subsequent visits, discussed subcontracting national comparisons to a third party, and revised IFMAT's schedule.

-Sue Grainger selected to national team by Dr. Norm Johnson. Sue will assist the team in research and previsits.

5. September 1992

-Navajo trip postponed due to schedule conflict with Tribal celebration.

-IFMAT visited the White Mountain Apache Reservation in Whiteriver, Arizona. The visit began on September 7, 1992 and ended on September 11, 1992.

-Two IFMAT meetings were held during the White Mountain Apache visit discussing such issues as report outlines, budget adjustments, core question revisions and other organizational issues.

-The Phoenix Area Office was visited by Dr. John Sessions and Mr. Jim Spitz on September 11, 1992.

-Dr. Jerry Franklin visited the Navajo Nation on September 11th.

-Pre-visit work began for the Menominee and Lac Du Flambeau tribes of Wisconsin. Permission was obtained and Jim Spitz and Ms. Sue Grainger visited the two tribes during the week of September 28th.

-Intermediate contract deliverables for IFMAT were discussed with Bill Downes, Contract Officer's Representative of the BIA. The deliverables are as follows:

1. Report Outline, due by October 31, 1992

2. Core Questions, due by October 31, 1992

3. Questionnaire, due by October 31, 1992

4. Request for Proposal on Regional Comparison report, due by November 30, 1992

5. Monthly progress report, due at the end of the month.

6. October 1992

-John Gordon and Jerry Franklin visited the Colville Reservation on October 15 and 16th. Overview of Colville's forest situation was obtained, top managers were interviewed.

-IFMAT visited the Menominee Reservation during October 18th through October 21st.

-IFMAT visited the Lac Du Flambeau reservation during October 22nd to October 23rd.

-John Gordon and Joyce Berry visited the Minneapolis Area Office on October 21. They also interviewed BIA forestry staff and the Assistant Area Director for Trust.

-Cal Mukumoto and Jim Spitz visited the Olympic Peninsula Agency and the Quinault Indian Reservation on October 28th and 29th for preparation of the Makah, Quinault IFMAT visit in December, 1993.

-Other IFMAT activities included preparation for the Mississippi Choctaw and the Alabama Coushatta visit in January, 1993. The first two weeks of October included final preparation for the Menominee/Lac Du Flambeau visit.

-Financial arrangements were made for a direct transfer of funds from the BIA to the US Forest Service for Dr. Sedell's travel.

7. November 1992

-John Gordon, Joyce Berry and Cal Mukumoto visited the BIA central office on November 12, 1992. Interviews were conducted with Jim Howe, Acting Chief Forester; Marshall Cutsworth, former chief forester and Senior Analyst, Trust; and Pat Hayes, Deputy to the Assistant Secretary - Indian Affairs. IFMAT was also introduced to Peter Markey, Contract Officer; Lynn Stall, Central Office BIA forestry; and Hank Kipp, BIA Natural Resource Specialist.

-John Gordon, Joyce Berry and Cal Mukumoto interviewed Mark Phillips, Edwards Associates, on November 11, 1992 in Washington D.C.

-Writing team (John Gordon, Joyce Berry and Cal Mukumoto) met to set up schedule for establishing the final report of IFMAT on November 11, 1992.

-Ed Williston and Cal Mukumoto visited Colville Tribal Enterprise Corporation (CTEC) on November 17, 1992. Ed and Cal also toured mill facilities in Omak, Washington.

-The Mississippi Choctaw tribe and Alabama-Coushatta Tribe were visited by Sue Grainger and Jim Spitz during week of November 30, 1992.

-Sue Grainger attended a conference at White Earth, Minnesota on November 4 and 5 to gather information on traditional uses of forests.

-Jerry Franklin visited the Navajo Nation in November 8-10, 1992.

-Plans and arrangements for the Makah/Quinault and Portland Area Office visits were finalized.

-Questionnaires were mailed to all timbered tribes.

-John Sessions toured Warm Springs Forest Products Industries on November 3, 1992.

8. December 1992

-IFMAT panel visited the Makah and Quinault Indian Reservations during the week of December 6th.

-John Gordon and Joyce Berry interviewed personnel at the BIA Olympic Peninsula Agency and Portland Area Office on December 8, 1992.

9. January 1993

-The month of January started with a meeting of the writing team for IFMAT. The team review a draft of current IFMAT postulates and conclusions. A draft IFMAT final report was finished and distributed to IFMAT members.

-Karen Gabriel was selected as the Fish and Wildlife specialist by Jim Sedell.

-During the week of January 18th, IFMAT visited the Mississippi Band of the Choctaw Reservation. The trip was attended by Sue Grainger, Karen Gabriel, Joyce Berry, Cal Mukumoto and David Patton.

Request for Proposals for the IFMAT comparison report was released to potential contractors. Due date for proposals was February 15th.

-An IFMAT meeting for March 13-17th in New Haven, CT. was set. The meeting purpose was to review individual reports and update the draft of the final report.

-Questionnaires were distributed throughout the BIA.

10. February 1993

-Proposals for the comparison report of national and regional inputs and outputs of Indian Forestry management were received from Dr. Lloyd Irland, Irland Group and Mr. Sam Radcliff, George Banzhaf & Company on February 17, 1993.

-Jim Spitz and Sue Grainger visited the Hoopa Reservation during February 7th, and 8th to set up the IFMAT visit for late March.

-On February 9th, Cal Mukumoto interviewed Gloria Brown, President of the Quinault Allottee Association, and others in Oakville, Washington.

-An interview with Don Smouse of the Portland Area Office was held on February 24th. Those attending meeting were Sue Grainger, Jim Spitz, Cal Mukumoto, and Dr. Norm Johnson.

-Cal Mukumoto attended the ITC Board meeting from February 24th to February 26th.

11. March 1993

- An IFMAT meeting held for March 15th through 17th. Due to a major snow storm (weathermen named it "the storm of the century") only Dr. Gordon, Dr. Sedell, Dr. Sessions and Ms. Berry were able to meet. This group provided a review of the draft study report and reviewed the format for working paper reports to individual tribes. A new meeting is planned for April 4th and 5th in Portland, Oregon.

-The Irland Group was selected by IFMAT to do the comparison report. Banzhaff Company was selected to complete case comparison studies by region.

-During the last week of March, the Hoopa Valley Reservation was visited by IFMAT. Dr. John Sessions also made a presentation to the ITC Symposium on March 30th.

12. April 1993

- A full IFMAT meeting was held on April 4,1993 in Portland, Oregon. Project achievements were reviewed and future plans were set. A revised budget was developed and submitted to the BIA.

-IFMAT visited the Quinault Reservation with the Quinault Allottee association on April 12, 1993.

-Jim Spitz made an informative presentation about IFMAT to the Portland Area Foresters meeting on April 19, 1993.

-John Gordon and Joyce Berry visited the Eastern Band of the Cherokee during the 27th-29th.

-Sue Grainger interviewed Stephen Beckham of Lewis and Clark College concerning history of western Washington tribes on April 26,1993.

13. May 1993

-A joint IFMAT/ITC oversight committee meeting was held on May 5th in Seattle Washington. Dr. John Gordon, Joyce Berry and Cal Mukumoto attended the meeting with Gary Morishima and Dexter Gill. IFMAT activities were reviewed. Potential review policy of the final report was discussed.

-Cal Mukumoto attended the ITC Board meeting in Poulson, MT during May 12-14th. A policy for reviewing the final IFMAT report was finalized.

-Jim Spitz and Sue Grainger visited the Colville Reservation to set up the IFMAT visit in June during the week of May 9th. They also visited the Yakima reservation during the week of May 16th.

-Dr. John Gordon and Joyce Berry visited Washington, D.C. during May 10-12. They interviewed the office of Trust Management, Department of Interior and updated congressional staff on IFMAT progress.

-Plans were finalized for trips to California, Navajo and Yakima.

14. June 1993

IFMAT started the month by visiting the Southwest. Sue Grainger visited the Southern California Agency during the week of June 1st. Sue toured reservation lands near the Agency office with BIA forester Tom Chosa.

During the week of June 4th, IFMAT visited the Zuni, Alamo and Navajo Nations. Individuals participating on this trip were Sue Grainger, Karen Gabriel, Joyce Berry, David Patton, Jerry Franklin, Jim Sedell, John Sessions, and Cal Mukumoto.

Starting on June 20th, IFMAT visited the Yakima, Spokane and Colville reservations. Individuals participating on this trip were John Gordon, Joyce Berry, Ed Williston, David Patton, Norman Johnson, John Sessions, Jerry Franklin, Karen Gabriel, Debbie Cummings, Jim Spitz and Cal Mukumoto, Sue Grainger.

During the week of June 27th, John Sessions, Karen Gabriel, David Patton and Debbie Cummings visited the Flathead Reservation. Jerry Franklin returned to the Yakima Reservation on June 29th and 30th.

Arrangements were made for visiting Alaska lands in early July. On June 22nd a full IFMAT meeting was held in Spokane, Washington. Plans were drawn to complete the IFMAT final report by November 1993.

Dr. Dennis Lynch of Colorado State University submitted a report on US government Indian policy.

15. July 1993

IFMAT activities for the month of July were as follows:

July 6th -9th; John Sessions, Ed Williston, and Karen Gabriel visited tribes in Alaska. Interviews were held with BIA officials from Juneau and Anchorage; Klukwan Forest Products; Central Council Tlinget and Haida Indians; Tanana Chiefs Conference; Gana-a' Yoo Limited; Copper River Native Association; Doyon and Ahtna Regional Corporations; and the US Fish & Wildlife Service.

July 12-13; John Sessions visited the Nez Perce Indian Reservation.

July 19th-23rd; John Gordon, Joyce Berry and Cal Mukumoto met in New Haven, Connecticut to update IFMAT's final report draft. Sue Grainger, Karen Gabriel and Lloyd Irland visited the Penobscot Indian Reservation in Maine.

July 29th; Cal Mukumoto visited the Swinomish Reservation in La Conner, Washington.

John Johnson, a silviculturist, and Stan Gregory, a fisheries biologist, visited the Cherokee Reservation during the month of July.

16. August 1993

An IFMAT meeting was held at Oregon State University on August 4th and 5th. The purpose of the meeting was to review current work and to draft an IFMAT report.

The White Earth, Leech Lake and Red Lake Reservations were visited by IFMAT during August 18th to 19th.

Work continued on the comparison reports which are expected to be concluded by early September, 1993.

17. September 1993

A meeting with the ITC Liaison Committee was held on September 8th in Portland, Oregon. Dr. K. Norm Johnson with Cal Mukumoto and Jim Spitz represented IFMAT. A draft IFMAT report and future plans for IFMAT were discussed.

IFMAT and resource staff met at Yale University in New Haven, CT. from 9/22-25/93. The meeting purpose was to reach consensus on IFMAT findings and recommendations.

18. November 1993

Jerry Franklin and Jim Sedell visit Nez Perce Reservation.

19. December 1993

Presentation by IFMAT to ITC Executive Board.

APPENDIX III.
IFMAT Questions

Sept 27, 1992

Introduction

The IFMAT questions are divided into five groups with various subgroups.

Group	Subgroups
Cultural and Ecological	Cultural Forest Ecology Wildlife and Range Fisheries
Forest Management	Forest Management Practices Forest Inventory Forest Management Planning Engineering
Wood Processing and Manufacturing	
Economic Development	Wood and Wood Products Nonwood Products Employment Investment Capital
Organization	

Group: Cultural and Ecological

Subgroup: Cultural

1. How has the tribe traditionally utilized the forest and woodland ecosystems for subsidence, for non-commodity products or services and for various social (including religious) activities?

2. What are critical values associated with these ecosystems beyond the commonly recognized economic resource utilization? What are features of the forest/woodland stands and of the landscapes patterns that are essential to provision of tribal values?

3. How have the areas and types of traditional uses and values been inventoried? How are management guidelines for protecting traditional uses and values established to ensure that management meets tribal objectives? How does the forest management plan address protection and sustainability of these uses and values?

4. Does an inventory exist of ancient towns, camps, and other sites that reflect tribal history? How are these resources protected during forest operations?

5. How is cultural resource knowledge made available to resource managers? What is the monitoring process to evaluate performance?

Subgroup: Forest Ecology

1. What type of ecosystem classification is used? How are composition, structure, types, distribution and environmental relationships of the major forest and woodland ecosystems included?

2. What is known about the landscape pattern and disturbance history of the forest and woodland landscapes in both pre- and post-settlement times? How is this historic disturbance pattern utilized in designing the forest management plan?

3. What monitoring programs exist or are planned with regards to various ecological aspects of the reservation forests and woodlands including: productivity, especially over long term; biological diversity, especially animal and plant species of special significance to the tribe; structural diversity of stands; and landscape pattern?

4. What "paleo" information exists with regards to climate, vegetation, and land use for the reservation? That is, what information exists that provides a very long-term context for environmental conditions and ecological change in the region?

a. Is there a paleoclimatic reconstruction for the reservation or question surrounding acres?

b. Is there information on long-term vegetational changes?

c. What kind of long-term information exists on tribal occupancy and utilization of the region and its effects?

Subgroup: Wildlife and Range

1. How is habitat maintained for native wildlife species? How are threatened, endangered and sensitive species managed?

2. How are big game and other wildlife of special interest to the tribe managed to meet tribal objectives?

3. What are the programs for nongame species (watchable wildlife)?

4. What is the policy for snags, stumps, down material including rotting logs, old forest conditions, travel corridors, and critical habitat areas?

5. Does a wildlife biologist review resource plans, such as timber, range, watershed, recreation, etc., to determine their effects on different animal species?

6. What is the livestock management plan for the reservation? What is the grazing system and is the number of livestock permitted to graze on the reservation based on carrying capacity?

Subgroup: Fisheries and Watershed

1. What are the conditions of riparian zones, lakes and streamcourses? What is the condition of fish species and stocks existing on the reservation?

2. What philosophy and goals does the tribe have for its fisheries resource? How are watersheds and riparian areas managed to met these goals? How are potential cumulative effects from forest management activities considered?

3. What are the tribal goals for their water resources? How are watersheds and riparian areas managed to meet tribal objectives in terms of water quality or flow? Are potential cumulative effects from forest management activities considered?

4. How is the performance of the fisheries resource, water quality, and water flow monitored?

Group: Forest Management

Subgroup: Forest Management Practices

1. What do tribal members think about current management practices? What are their primary concerns? Who do they think should be responsible for decisions concerning forest management?

2. What landscape and stand-level plans (silvicultural prescriptions) exist and how do these meet tribal goals? How are these plans linked the overall forest management plan?

3. How do regeneration practices and young stand tending practices contribute to meeting the objectives of the forest management plan? How are they monitored?

4. How do intermediate harvests (precommercial and commercial) or partial cuts meet forest structure and production levels outlined in the management plan?

5 How are current forest practices contributing to the overall productivity and structure of forestlands?

6. How is forest health being maintained? What are the preventive operations undertaken to control pests and fire? What is the role of fire in maintaining this health?

7. How prepared is the forestry staff to deal with major incidences of wildfire?

8. What are the costs of the following areas by activity timber management planning, site preparation, planting, animal control, vegetation management, precommercial thinning, fertilization, sale layout, logging and transport, sale administration, road construction, road maintenance, fire management, pest management, fish and wildlife? How do these costs compare to those on similar ownerships?

Subgroup: Forest Inventory

1. What is the current state of the forest including timber inventory by species, size, and condition; growth; mortality; and dead and down material? What statistical processes and measures are used in inventory design and inventory summarization?

2. How is the inventory utilized in forest management? How is it used in setting of timber harvest levels, location and type of timber harvest, and likely species, sizes, and values of timber that will be harvested?

3. What spatial inventory exists on the condition and productivity of the forest (including timber stands, streams, wildlife habitat, recreation and visual areas)? What spatial information exists on recent operations (timber harvest,roads, and other)? Is this information represented through a Geographic Information System? How is spatial information made available to forest managers and utilized in forest management?

Subgroup: Forest Management Planning

1. Have desired future conditions for stands, landscapes, and the forest been developed? How do these desired conditions reflect tribal objectives for the protection and use of Reservation forests?

2. How does the forest management plan address sustainability of commercial timber resources?

   a. How do the planners utilize current forest condition, desired future condition, and current and future growth in projecting the potential harvest level through time? Do the projections reflect the leaving of some wood on site to maintain longterm productivity?

b. How are revenues and costs of timber production, and potential employment of tribal members, considered in selecting the timber harvest level and the associated silvicultural methods and timber harvest techniques

c. How does the projected harvest level incorporate yield and harvest restrictions from accommodating tribal objectives for other resources?

d. Given all these considerations, what evidence has been mustered to show that the planned harvest is sustainable?

3. How has the tribe been involved in development of the forest management plan? What alternative harvest schedules have been presented to the tribe, during development of the plan? Have alternatives been developed that vary the land allocation for timber production, the desired future forest, and the species and sizes of timber that could be grown and harvested? Have the revenue, cost, and employment implications of these different alternatives been estimated and presented?

4. How are the full spectrum of forest resources of interest to the tribe, such as fish, wildlife, water, scenic beauty, and traditional uses, integrated into the forest management plan?

a. Have standards and guidelines been specified that will protect these resources during plan implementation?

b. What estimates have been made of the forest management plan's implication for these resources? To what degree, do these estimates recognize the potential cumulative effect of timber harvest on the resources?

c. Has an interdisciplinary team, reflecting the resources of interest to the tribe, been involved in construction of the plan including the prediction of plan effects on different resources and then development of standards and guidelines?

5. How has the feasibility of the projected harvest level been ascertained? Will the likely timber volumes that will be produced from the stands selected for harvest add up to the projected level? Will it be possible to place the scheduled level of timber sales across the landscape?

6. How have operations plans for different parts of the forest been linked to the overall forest management plan? How do these operations plans reflect spatial objectives and restrictions? How does the planning for individual sales reflect the forest management and operations plans? Are these plans developed by an interdisciplinary team?

7. How will compliance with the overall forest management plan be monitored in terms of the achieving the standards, guidelines, and outputs in the plan?

8. How are woodland resources managed? Does a plan for their management exist?

Subgroup: Engineering

1. Does a transportation plan exist? How are future forest activities considered in the development of the plan? How are road standards and locations selected? How does the plan consider capital investments over time?

2. How are soil and water protected during logging, road construction and road operations? What are the specifications and how are they monitored?

3. How is the residual stand protected during logging? What are the specifications and how are they monitored?

4. What are the utilization standards? How is wood utilization monitored during harvesting operations?

Group: Wood Processing and Manufacturing

1. What is the log or wood supply for the mill? What is the annual inventory by species, size, and quality?

2. What equipment does the mill have? How does it match up to state-of-the-art in the industry?

3. How is wood utilization and productivity measured? What is it currently?

4. How does utilization and productivity compare to other mills?

5. What is the annual revenue and volume output for the mill by species and grade? How does this compare to other owners?

Group: Economic Development

Subgroup: Wood and Wood Products

1. How are stumpage and wood products sold? What has been the revenue from stumpage and wood products during the last five years? Are these receipts on a $/unit basis comparable to those on similar ownerships?

2. What has been the revenue from new economic development during the last five years? What is projected for the next five years?

3. Does an economic development plan exist? If so, how do forest opportunities contribute to the plan?

4. Are there species or sizes of timber currently not being utilized? How do the resource managers ensure that they achieve the highest value from the different species and sizes?

5. Do log export, log merchandising, wood processing and/or value added opportunities exist? How are they being pursued?

6. Do opportunities exist to increase use of wood byproducts including sawdust, bark, chips?

Subgroup: Nonwood Products

1. What other woodland products with commercial value could be utilized? For example: firewood, mushrooms, seeds, foliage, shrubs, ferns, nuts, berries, tree bark, burls, ginseng and others.

2. What recreational opportunities (camping, fishing, hunting) exist and can they be developed further?

Subgroup: Employment

1. What additional opportunities for Indian employment exist? How are they being developed and evaluated?

Subgroup: Investment Capital

1. How much federal funding (appropriated) funds has been available recently for different forest management activities? Does the funding allocation adversely affect the scope and type of activities that can be undertaken?

2. Is economic development based on forest resources hindered by lack of capital? What would be the tribe's highest priority project if more funds became available?

Group: Organization

1. Describe your organizational structure including chart,names of key individuals, and number of persons by area.

2. Names, job titles, main duties, education, and years of experience of supervisors, professionals, and technicians (with some level of specialized training) in the following areas:

   a. engineering (planning, location, road construction, maintenance,)

   b.timber management (planning, inventory, sale layout, sale administration, regeneration and silviculture)

   c. wildlife (game and nongame)

   d. fisheries (game and nongame)

   e. fire management

   f. ecology

      1. forest communities

      2. ecosystem structure and function

      3. biological diversity

      4. longterm productivity

      5. landscape analysis

   g. pest management

   h. cultural resources

   i. range conservation

   j. data management (GIS, inventories)

   k. forest management planning

3. What are the numbers or percentages of Indians employed?

4. How do salary scales compare to other organizations?

APPENDIX IV.
Tribal Questionnaire

Questionnaire for Assessment of Indian Forest Land Management

The Intertribal Timber Council (ITC) is sponsoring a study of Indian forest land management under the provisions of the Indian Forest Resource Management Act of 1990. The purpose of this study is to help develop policies which will improve forest management and better meet the needs of individual tribes and associations. Findings and recommendations will be submitted to the U.S. Congress, Bureau of Indian Affairs, Indian tribes, and interested individuals by November 1993.

Seven nationally recognized experts in forest resource management have agreed to serve on the Indian Forest Management Assessment Team (IFMAT). IFMAT seeks to develop a "snapshot" of the current condition of Indian forests and forest resource management, and to describe future options for Indian forests. This is the first time an independent, objective evaluation has been conducted of Indian forest management programs.

This questionnaire has been developed to provide information for IFMAT's use and to ensure that programs met the objectives and goals of individual tribes. ***The ITC believes that the information obtained through this questionnaire will be of vital importance to the future of Indian forest lands and strongly urges you to take the time to personally complete the form. Your participation, perspectives, and opinions will be invaluable.***

The identities of all respondents will be maintained in the strictest confidence, so please be direct and frank when answering the questions. If you need more room to answer questions, please use the space provided in question X or attach additional sheets to the questionnaire.

Thank you for your help. ***It will make a difference.*** Please mail your completed questionnaire as soon as possible. Completed questionnaires and questions should be directed to:

Ms. Joyce Berry,Assistant Professor
Colorado State University
Department of Forest Sciences
Fort Collins, Colorado / 80523

ABOUT THE INTERTRIBAL TIMBER COUNCIL

The Intertribal Timber Council was founded in 1976 for the purpose of improving the management of Indian forest resources through working cooperation among Indian tribes, the Bureau of Indian Affairs, academia, government, and industry. The Council's general membership includes 65 Indian tribes and Alaska Native organizations located from Maine to Alaska to New Mexico. An eleven-member Executive Board provides direction. The ITC is headquartered at 4370 N.E. Halsey Street, Portland, OR 97213, (503) 282-4296.

QUESTIONNAIRE

Please provide the following information to help with interpretation and follow-up.

Name (optional):_____

Occupation or title:_____

Reservation or Alaskan Native Association/Tribe:_____

_____

Address (optional):_____

_____

_____

Are you a tribal member of the above named reservation or Alaskan Native Association/Tribe?

Yes____ No____

Are you willing to discuss your responses with IFMAT?

Yes____ No____

Please indicate your gender, age and years of schooling.

Gender : Male____ Female____

Age : 18-25____ 26-35____ 36-45____ 46-55____ 56-65____ 66+____

Schooling: K-6 ___ 7-9____ 10-12 ____ High school degree____ College # years____

I. In general, how concerned are you about what happens on your tribal forests? Please circle 5 (very concerned) to 1 (not concerned).

Very Concerned				Not Concerned
5	4	3	2	1

II. What do you want from your tribal/association forests? Rate these from 5 (high value) to 1 (low value). Circle appropriate number.

	High Value				Low Value	Don't Know
1. Recreation	5	4	3	2	1	0
2. Income	5	4	3	2	1	0
3. Subsistence (living off the land)	5	4	3	2	1	0
4. Protection of forest resources	5	4	3	2	1	0
5. Spiritual values	5	4	3	2	1	0
6. Cultural values	5	4	3	2	1	0
7. Beauty/Scenery	5	4	3	2	1	0
8. Other_____	5	4	3	2	1	0

III. Which of the three (3) above do you value most?

1. (Most Valued)_____

2._____

3._____

IV. How well do you think your forests are being managed now? Rate the management of the forest resources or activities below from 5 (excellent management) to 1 (poor management).

	Excellent				Poor	Don't Know
1. Wildlife	5	4	3	2	1	0
2. Fisheries	5	4	3	2	1	0
3. Grazing for livestock	5	4	3	2	1	0
4. Timber or firewood for tribal use	5	4	3	2	1	0
5. Timber for sale or enterprise	5	4	3	2	1	0
	Excellent				Poor	Don't Know
6. Recreation	5	4	3	2	1	0
7. Water quantity and quality	5	4	3	2	1	0
8. Cultural site protection	5	4	3	2	1	0
9. Forest resource protection	5	4	3	2	1	0
10. Non-timber forest products(ie. mushrooms)	5	4	3	2	1	0
11. Obtaining a fair price for timber	5	4	3	2	1	0
12. Employment of tribal members	5	4	3	2	1	0
13. Creation of new enterprises	5	4	3	2	1	0
14. Food gathering	5	4	3	2	1	0
15. Spiritual values	5	4	3	2	1	0
16. Visual Quality	5	4	3	2	1	0
17. Protection from pollution/waste	5	4	3	2	1	0
18. Poaching	5	4	3	2	1	0
19. Trespassing	5	4	3	2	1	0
20. Overall management	5	4	3	2	1	0

V. Of the forest resources or activities listed in question IV above, which three (3) are the most important to you.

1. (Most Important)_____
2. _____
3. _____

VI. What organization has primary management responsibility for your forests? Check one below.

1. B.I.A. ____
2. Tribe ____
3. Equally shared tribe and BIA ____
4. Other (list) _____
5. Don't know ____

VII. What organization do you think, should have primary management responsibility for your forests?

1. B.I.A. ____
2. Tribe ____
3. Equally shared tribe and BIA ____
4. Other (list) _____
5. Don't know ____

VIII. What resources/activities do you think are being managed best on your forest (list up to three):

1._____

2._____

3._____

IX. List the three aspects of forest management most in need of improvement on your forests, and suggest what should be done about them.

1._____

Suggestions:_____

_____

2._____

Suggestions:_____

_____

3._____

Suggestions:_____

_____

X. Do you have any additional comments or suggestions about your forests?

_____

_____

_____

_____

_____

_____

Thank you for your comments, if you have additional comments please feel free to attach additional pages to this questionnaire. Please return questionnaire to :

Ms. Joyce Berry, Assistant Professor
Colorado State University
Department of Forest Sciences
Fort Collins, Colorado / 80523

APPENDIX V.
BIA Questionnaire

Questionnaire for Assessment of Indian Forest Land Management

The Intertribal Timber Council (ITC) is sponsoring a study of Indian forest land management under the provisions of the Indian Forest Resource Management Act of 1990. The purpose of this study is to help develop policies which will improve forest management and better meet the needs of individual tribes and associations. Findings and recommendations will be submitted to the U.S. Congress, Bureau of Indian Affairs, Indian tribes, and interested individuals by November 1993.

Seven nationally recognized experts in forest resource management have agreed to serve on the Indian Forest Management Assessment Team (IFMAT). IFMAT seeks to develop a "snapshot" of the current condition of Indian forests and forest resource management, and to describe future options for Indian forests. This is the first time an independent, objective evaluation has been conducted of Indian forest management programs.

This questionnaire has been developed to provide information for IFMAT's use and to ensure that programs met the objectives and goals of individual tribes. ***The ITC believes that the information obtained through this questionnaire will be of vital importance to the future of Indian forest lands and strongly urges you to take the time to personally complete the form. Your participation, perspectives, and opinions will be invaluable.***

The identities of all respondents will be maintained in the strictest confidence, so please be direct and frank when answering the questions. If you need more room to answer questions, please use the space provided in question VIII or attach additional sheets to the questionnaire.

Thank you for your help. ***It will make a difference.*** Please mail your completed questionnaire as soon as possible. Completed questionnaires and questions should be directed to:

Ms. Joyce Berry, Assistant Professor
Colorado State University
Department of Forest Sciences
Fort Collins, Colorado / 80523

ABOUT THE INTERTRIBAL TIMBER COUNCIL

The Intertribal Timber Council was founded in 1976 for the purpose of improving the management of Indian forest resources through working cooperation among Indian tribes, the Bureau of Indian Affairs, academia, government, and industry. The Council's general membership includes 65 Indian tribes and Alaska Native organizations located from Maine to Alaska to New Mexico. An eleven-member Executive Board provides direction. The ITC is headquartered at 4370 N.E. Halsey Street, Portland, OR 97213, (503) 282-4296.

B.I.A. QUESTIONNAIRE

Please provide the following information to help with interpretation and follow-up.

Name (optional):_____

Occupation or title:_____Years with B.I.A. _____

B.I.A. location:_____

Reservation or Alaskan Native Association/Tribe (if applicable):_____

_____

Address (optional):_____

_____

_____

Are you a member of a Tribe or Alaskan Native Association?

Yes____ No____ Tribe/ Association_____

Are you willing to discuss your responses with IFMAT?

Yes____ No____

Please indicate your gender, age and years of schooling.

Gender : Male____ Female____

Age : 18-25____ 26-35____ 36-45____ 46-55____ 56-65____ 66+____

Schooling: K-6 ___ 7-9____ 10-12 ____ High school degree____ College # years____

Make your answers based on the tribal/association forest you know best. Name of Tribe/Association _____

I. What do your clients want from their tribal/association forests? Rate these from 5 (high value) to 1 (low value). Circle appropriate number.

	High Value				Low Value	Don't Know
1. Recreation	5	4	3	2	1	0
2. Income	5	4	3	2	1	0
3. Subsistence (living off the land)	5	4	3	2	1	0
4. Protection of forest resources	5	4	3	2	1	0
5. Spiritual values	5	4	3	2	1	0
6. Cultural values	5	4	3	2	1	0
7. Beauty/Scenery	5	4	3	2	1	0
8. Other_____	5	4	3	2	1	0

II. Which of the three (3) above do they value most?

1. (Most Valued)_____
2. _____
3. _____

III. How well do you think these forests are being managed now? Rate the management of the forest resources or activities below from 5 (excellent management) to 1 (poor management).

	Excellent				Poor	Don't Know
1. Wildlife	5	4	3	2	1	0
2. Fisheries	5	4	3	2	1	0
3. Grazing for livestock	5	4	3	2	1	0
4. Timber or firewood for tribal use	5	4	3	2	1	0
5. Timber for sale or enterprise	5	4	3	2	1	0
6. Recreation	5	4	3	2	1	0
	Excellent				Poor	Don't Know
7. Water quantity and quality	5	4	3	2	1	0
8. Cultural site protection	5	4	3	2	1	0
9. Forest resource protection	5	4	3	2	1	0
10. Non-timber forest products(ie. mushrooms)	5	4	3	2	1	0
11. Obtaining a fair price for timber	5	4	3	2	1	0
12. Employment of tribal members	5	4	3	2	1	0
13. Creation of new enterprises	5	4	3	2	1	0
14. Food gathering	5	4	3	2	1	0
15. Spiritual values	5	4	3	2	1	0
16. Visual Quality	5	4	3	2	1	0
17. Protection from pollution/waste	5	4	3	2	1	0
18. Poaching	5	4	3	2	1	0
19. Trespassing	5	4	3	2	1	0
20. Overall management	5	4	3	2	1	0

IV. Of the forest resources or activities listed in question III above, which three (3) are the most important to your clients?

1. (Most Important)_____
2. _____
3. _____

V. What organization do you think, should have primary management responsibility for these forests?

1. B.I.A. ____
2. Tribe ____
3. Equally shared tribe and BIA ____
4. Other (list) _____
5. Don't know ____

VI. What resources/activities do you think are being managed best on these forest (list up to three):

1._____

2._____

3._____

VII. List the three aspects of forest management most in need of improvement on these forests, and suggest what should be done about them.

1._____

Suggestions:_____

_____

2._____

Suggestions:_____

_____

3._____

Suggestions:_____

_____

VIII. Do you have any additional comments or suggestions about these forests?

_____

_____

_____

_____

_____

_____

Thank you for your comments, if you have additional comments please feel free to attach additional pages to this questionnaire. Please return questionnaire to :

Ms. Joyce Berry, Assistant Professor
Colorado State University
Department of Forest Sciences
Fort Collins, Colorado / 80523

APPENDIX VI.
Reservations by Category

RESERVATION

Category-1 - Major Forested Reservation: comprised of more than 10,000 acres of commercial timberland in trust, or determined to have more than 1.0 MMBM [million board measure] harvest of timber products annually.

Category-2 - Minor Forested Reservation: comprised of less than 10,000 acres of commercial timberland in trust, and less than 1.0 MMBM harvest of timber products annually, or whose forest resource is determined by the Area Office to be of significant commercial timber value.

Category-3 - Significant Woodland Reservation: comprised of an identifiable forest area of any size which is lacking a timberland component, and whose forest resource is determined by the Area Office to be of significant commercial woodland value.

Category-4 - Minimally Forested Reservation: comprised of an identifiable forest area of any size determined by the Area Office to be of minor commercial value at this time.

Category-5 - Reservation or Indian property with forest land that the Bureau is charged with some degree of legal responsibility, but the land is not [Federal] trust status.

Category 1

Area	Shortname
Albuquerque	Southern Ute
Albuquerque	Jicarilla
Albuquerque	Mescalero Apache
Billings	Blackfeet
Billings	Northern Cheyenne
Billings	Crow
Eastern	Penobscot
Eastern	Passamaquoddy (all)
Eastern	Eastern Band of Cherokee
Eastern	Mississippi Choctaw
Minneapolis	Menominee
Minneapolis	Red Lake
Minneapolis	Leech Lake
Minneapolis	White Earth
Minneapolis	Grand Portage
Minneapolis	Bois Forte
Minneapolis	Lac Courte Oreilles
Minneapolis	Lac du Flambeau
Minneapolis	Bad River
Minneapolis	Stockbridge/Munsee
Navajo	Navajo
Phoenix	White Mountain Apache

Phoenix	San Carlos
Phoenix	Uintah & Ouray
Phoenix	Hualapai
Portland	Siletz
Portland	Grande Ronde
Portland	Colville
Portland	Nez Perce
Portland	Coeur D` Alene
Portland	Quinault
Portland	Umatilla
Portland	Warm Springs
Portland	Tulalip
Portland	Yakima
Portland	Spokane
Portland	Flathead
Portland	Annette Island
Portland	Makah
Sacramento	Tule River
Sacramento	Hoopa Valley

Category 2

Area	**Shortname**
Aberdeen	Pine Ridge
Aberdeen	Rosebud
Aberdeen	Turtle Mountain
Aberdeen	Winnebago (NE)
Aberdeen	Omaha
Albuquerque	Zia
Albuquerque	Jemez
Albuquerque	Isleta
Albuquerque	Acoma
Albuquerque	Laguna
Albuquerque	Santa Clara
Albuquerque	Taos
Albuquerque	Tesuque
Albuquerque	San Ildefonso
Albuquerque	Picuris
Albuquerque	Zuni
Albuquerque	Ramah-Navajo
Anadarko	Alabama/Coushatta
Billings	Fort Belknap
Billings	Wind River
Billings	Rocky Boy's
Eastern	Brighton
Eastern	Seminole (all)
Juneau	Ahtna
Juneau	Southeast
Juneau	Chugach
Juneau	Cook Inlet
Juneau	Doyon
Juneau	Koniag
Minneapolis	Sac and Fox (IA)
Minneapolis	Mille Lacs
Minneapolis	Fond du Lac
Minneapolis	Potawatomi (WI)
Minneapolis	Red Cliff
Minneapolis	Mole Lake

Minneapolis	Bay Mills
Minneapolis	Hannahville
Minneapolis	L'Anse (all)
Minneapolis	L'Anse (Ontonagon)
Muskogee	Chickasaw
Muskogee	Cherokee
Muskogee	Choctaw
Portland	Fort Hall
Portland	Chehalis
Portland	Quileute
Portland	Skokomish
Portland	Squaxin Island
Portland	Nisqually
Portland	Port Gamble
Portland	Port Madison
Portland	Swinomish
Portland	Muckleshoot
Portland	Lummi
Portland	Kalispel
Sacramento	Round Valley
Sacramento	Fort Bidwell
Sacramento	Yurok

Category 3

Area	**Short Name**
Aberdeen	Cheyenne River
Aberdeen	Fort Berthold
Aberdeen	Devils Lake
Aberdeen	Sisseton
Aberdeen	Standing Rock
Aberdeen	Crow Creek
Albuquerque	Santo Domingo
Albuquerque	Nambe
Albuquerque	Ute Mountain
Anadarko	Potawatomi (KS)
Anadarko	Cheyenne/Arapaho
Anadarko	Kiowa/Comanch/Apach
Anadarko	Wichita/Caddo/Delaw
Anadarko	Otoe
Anadarko	Ponca
Anadarko	Pawnee
Anadarko	Sac and Fox (OK)
Anadarko	Absentee Shawnee
Anadarko	Mexican Kickpoo
Billings	Fort Peck
Phoenix	Duck Valley
Phoenix	Goshute
Phoenix	Hopi
Phoenix	Havasupai
Sacramento	Central Cal. P.D.
Sacramento	X.L. Ranch
Sacramento	Northern Cal.P.D.
Sacramento	Southern Cal.P.D.

Category 4

Area	Short Name
Aberdeen	Santee
Aberdeen	Lower Brule
Albuquerque	San Felipe
Albuquerque	Cochiti
Albuquerque	Santa Ana
Albuquerque	Sandia
Albuquerque	Pojoaque
Albuquerque	San Juan
Anadarko	Nemaha
Anadarko	Absentee Wyandotte
Anadarko	Shawnee
Anadarko	Iowa (NE/KS)
Anadarko	Miami
Anadarko	Kickapoo
Anadarko	Sac and Fox (NE/KS)
Anadarko	Fort Sill
Anadarko	Tonkawa
Anadarko	Kaw
Anadarko	Citizen Potawatomi
Anadarko	Iowa (OK)
Eastern	Narragansett
Eastern	Coushatta
Eastern	Maliseet
Eastern	Pequot
Eastern	Miccosukee
Eastern	Poarch Creek
Eastern	Wampanoag
Eastern	Tunica-Biloxi
Eastern	Immakolee
Juneau	Bering Straits
Juneau	Bristol Bay
Juneau	Calista
Juneau	Nana
Juneau	Artic Slope
Minneapolis	Lower Sioux
Minneapolis	Minnesota P.D.
Minneapolis	St. Croix
Minneapolis	Wisconsin P.D.
Minneapolis	Winnebago (MN)
Minneapolis	Winnebago (WI)
Minneapolis	Oneida
Minneapolis	Isabella
Minneapolis	Michigan P.D.
Muskogee	All Miami Agency
Phoenix	Salt River
Phoenix	Skull Valley
Phoenix	South Fork
Phoenix	Kaibab
Phoenix	Shivwits
Phoenix	St George, Utah
Phoenix	Indian Peaks
Phoenix	Kanosh
Portland	Colville P.D.
Portland	Kootenai
Portland	Oly. Pen. P.D.

Portland	Shoalwater
Portland	Lower Elwha
Portland	Hoh
Portland	The Dalles P.D.
Portland	Sauk-Suiattle
Portland	Upper Skagit
Portland	Puget Sound P.D.
Portland	Spokane P.D.
Sacramento	Fort Independence
Sacramento	Grindstone Creek
Sacramento	Hopland
Sacramento	Jackson
Sacramento	Dry Creek
Sacramento	Coyote Valley
Sacramento	Sulphur Bank
Sacramento	Manchester
Sacramento	Cortina
Sacramento	Enterprise
Sacramento	Shingle Springs
Sacramento	Lookout
Sacramento	Middleton
Sacramento	Sherwood Valley
Sacramento	Tuolumne
Sacramento	Upper Lake
Sacramento	Cold Springs
Sacramento	Bishop
Sacramento	Berry Creek
Sacramento	Laytonville
Sacramento	Lone Pine
Sacramento	Stewarts Point
Sacramento	Cedarville
Sacramento	Agua Caliente
Sacramento	Morongo
Sacramento	Cahuilla
Sacramento	Cuyapaipe
Sacramento	Los Coyotes
Sacramento	Augustine
Sacramento	Capitan Grande
Sacramento	Pala
Sacramento	Pauma/Yuima
Sacramento	Santa Rosa
Sacramento	Santa Ysabel
Sacramento	Soboba
Sacramento	Manzanita

Category 5

Area	**Short Name**
Eastern	Poarch Creek (N.T.)
Eastern	Penobscot (N.T.)
Eastern	Passamaquoddy (N.T.)
Eastern	Pequot (N.T.)
Eastern	Narragansett (N.T.)
Eastern	Oil Springs
Eastern	St. Regis
Eastern	Tonawanda
Eastern	Tuscarora
Eastern	Cattaraugus

Eastern	Seneca (all)
Eastern	Onondaga
Portland	Nez Perce (N.T.)
Portland	Quinault (N.T.)
Portland	Lummi (N.T.)

Source: BOFRP, 1993.

GLOSSARY

ADAPTIVE MANAGEMENT - The process of implementing policy decisions as scientifically driven management experiments that test predictions and assumptions in management plans, and using the resulting information to improve the plans.

AESTHETICS - A characteristic of a landscape or thing pertaining to its beauty.

ALASKA NATIVE CLAIMS SETTLEMENT ACT (ANCSA) - Legislation enacted Dec.18, 1971 which seeks to compensate Alaska Natives for the extinguishment of the title to their land claims.

ALLOTMENTS - Parcels of land held in trust for specific Indian individuals. Originating out of the General Allotment Act of 1887, communally held tribal lands were divided into separate parcels and a parcel was given to each tribal member.

ALLOTTEES - The owners of the allotments.

APPRAISAL - An estimate of the economic value of a stand of timber at a particular point in time.

ARCHAEOLOGICAL SITE - A geographic locale that contains the material remains of prehistoric and/or historic human activity.

AUSTRIAN FORMULA - A means of calculating annual allowable cut based on a formula that considers the current growing stock level, the desired future growing stock level, the number of years over which the forest will be converted from the current level to the future level, and forest growth.

BARK BEETLES - Insects of the family Scolytidae, some of which attack live trees and live and mine between the bark and wood of the main stem of the tree. Their infestation may lead to the death of the tree.

BASAL AREA - The area of the cross section of a tree stem including the bark, near its base, generally at breast height, or 4.5 feet above the ground.

BIA BRANCH OF ROADS - Department of the BIA concerned with the maintenance of BIA system roads.

BIA SYSTEM ROADS - Multi-purpose public roads on reservation that do not fall under the auspices of counties or states.

BIG GAME - Large mammals that are hunted by humans. Big game include elk, black-tailed deer and black bear.

BIOLOGICAL DIVERSITY (BIODIVERSITY) - The variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions.

BIOLOGICAL LEGACIES - Large trees, down logs, snags and other components of the forest stand left after harvesting for the purpose of maintaining site productivity and providing structure and ecological function in subsequent stands.

BOARD FOOT (BF) - Lumber or timber measurement term. The amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide.

BUREAU OF INDIAN AFFAIRS(BIA) - A division within the U.S. Department of the Interior charged with providing federal services to Indians.

BUREAU OF LAND MANAGEMENT(BLM) - A land management agency within the U.S. Department of the Interior.

CANOPY - A layer of foliage in a forest stand. This most often refers to the uppermost layer of foliage, but it can be used to describe lower layers in a multi-storied stand.

CATEGORIES OF RESERVATIONS - See RESERVATIONS

CAVITY NESTER - Wildlife species, most frequently birds, that require cavities (holes) in trees for nesting and reproduction.

CLEARCUT - A harvest in which all or almost all of the trees are removed in one cutting.

CLEARCUT HARVEST - A timber harvest method in which all trees are removed in a single entry from a designated area, with the exception of wildlife trees or snags.

COMMERCIAL TIMBERLAND - Land classified as forest that contains at least 5% crown cover of commercial timber species which is currently or prospectively capable of bearing merchantable forest products at a high enough value to provide a net benefit to the user.

COMMERCIAL THINNING - The removal of generally merchantable trees from an even-aged stand, usually to encourage growth of the remaining trees. (See even-aged management)

COMMERCIAL WOODLAND - Land classified as forest that contains less than 5% crown cover of commercial timber species which is currently or prospectively capable of bearing merchantable forest products at a high enough value to provide a net benefit to the user.

COMPACTING - A mechanism (authorized under P.L. 100-472) by which a tribe can take over management of any or all federal Indian programs with their associated budgets and exercise discretionary power over how the budgets are distributed among the "compacted" programs. (See Self-Governance Demonstration Project)

CONIFER - A tree belonging to the order Gymnospermae, comprising a wide range of trees that are mostly evergreens. Conifers bear cones (hence, coniferous) and needle-shaped or scalelike leaves.

CONTRACTING (AUTHORIZED BY 93-638) - Under public law 93-638, tribes may contract the operations of all or part of federal Indian programs and assume the budget associated with those specific programs.

CONTINUOUS FOREST INVENTORY (CFI) - A system of permanent plots that provide a sampling of both area and tree attributes (such as growth, mortality and stand class performance as well as individual tree performance). The system's purpose is to render a planning inventory for large ownership tracts.

COORDINATED RESOURCE PLANNING/MANAGEMENT - An integrative, holistic approach to the management of natural resources--forest, water, wildlife, fisheries, culture, range--that recognizes a multiplicity of uses and values.

COOPERATIVE AGREEMENTS - A legal mechanism, (authorized by P.L. 95-313, "Cooperative Forestry Assistance Act"), by which tribes may enter into service contracts with federal agencies for various forestry activities.

COOPERATIVE MANAGEMENT - The collaboration of a number of land-owners in the management of a natural resource that is common to all (e.g. private owners of lands that share a common view may coordinate their land management practices to protect the land's scenic quality).

CORD - a measure of cut and stacked wood, generally pulpwood. (usually 128 cubic feet; 4'by 4'by 8').

COVER - Vegetation used by wildlife for protection from human predators, or weather conditions. May also refer to the protection of the soil and the shading provided to herbs and forbs by vegetation.

CROWN COVER - The degree to which the crowns of trees are nearing general contact with one another. Generally measured as the percentage of the ground surface that would be covered by a downward vertical projection of foliage in the crowns of trees.

CULTURAL RESOURCES - Those tangible items which relate to the traditional way that Indian peoples interact with their landscape, includes medicine, craft and food plants, sacred or special areas, and burial/archeological sites.

CUMULATIVE EFFECTS - Those effects on the environment that result from the incremental effect of the action when added to the past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

DEFOLIATORS- Insects that feed on foliage and act to remove some or all of the foliage from a tree, shrub or herb.

DIVERSITY - The variety, distribution, and abundance of different plant and animal communities and species within an area. (See biological diversity)

DOWN LOG - Portion of a tree that has fallen or been cut and left in the woods.

DWARF MISTLETOE - A parasitic flowering plant, capable of survival only on living conifers. Heavy infections cause reduction in height and diameter growth and in wood quality and sometimes result in the death of the tree.

ECOLOGICAL CLASSIFICATION - A system which categorizes ecosystems usually by plant community.

ECOLOGICAL HEALTH - The state of an ecosystem as measured though the adequacy of processes and functions to maintain the diversity of biotic communities commensurate with those initially found there.

ECOLOGICALLY SIGNIFICANT - Species, stands, and forests considered important to maintaining the structure, function, and processes of particular ecosystems.

ECOSYSTEM - A unit comprising interacting organisms considered together with their environment. (e.g. marsh, watershed and lake ecosystems)

ECOSYSTEM DIVERSITY - The variety of species and ecological processes that occur in different physical settings.

ECOSYSTEM MANAGEMENT - A strategy or plan to manage ecosystems to provide for all associated organisms and processes.

ENDANGERED SPECIES - Any species of plant or animal defined through the process of the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range.

ENDANGERED SPECIES ACT - Legislation passed in 1973 that seeks to protect any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range.

EVEN-AGED FOREST - A forest stand comprised of trees with less than a 20-year difference in age.

EVEN-AGED MANAGEMENT (EVEN-AGED SILVICULTURE) - Manipulation of a forest stand to achieve a condition in which trees have less than a 20-year age difference. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for harvesting. Clearcut, shelterwood, or seedtree cutting methods produce even-aged stands.

FAUNA - The animal life of a region or geological period.

FEATURED SPECIES - A species that is important to a tribe, either for subsistence or sport hunting, cultural and religious values.

FLORA - The plant life of a region or geological period.

FOCUS GROUP - A group of people assembled to provide advice and opinion about tribal forestry and forest management.

FORAGE - Vegetative material that is eaten by a specific animal.

FOREST - An ecosystem with more or less dense and extensive tree cover which contains at least 10% tree crown cover of any size, or formerly having had such tree cover, and currently not developed nor planned for exclusive nonforest use . Roadside, streamside, and shelterbelt strips must have tree crown width of at least 120 feet . Timberland and woodland are components of forest land.

FOREST DEVELOPMENT - Those activities to do with the regeneration of forest vegetation and control of stand composition and growth, (e.g. planting or seeding, thinning, brush control, fertilization, pruning).

FOREST DEVELOPMENT BACKLOG - The number of acres of forested lands that require additional stocking or thinning to reach management standards.

FOREST ENTERPRISE - Wood processing facilities.

FOREST INVENTORY - A detailed list of various characteristics of all the forested stands of a particular ownership. Characteristics frequently included include the number, species and growth rates of commercial trees.

FORESTLAND - Land that is now, or is capable of becoming, at least 10 percent stocked with forest trees and that has not been developed for nontimber use.

FOREST SERVICE - A division of the U.S. Department of Agriculture charged with management of the National Forests and other duties.

FRAGMENTED LAND OWNERSHIP - A discontinuity of ownership over a discrete unit of land, (e.g. within the boundary of an Indian reservation).

GEOGRAPHIC INFORMATION SYSTEM (GIS) - A computer system capable of storing and manipulating spatial (mapped) data.

GENETIC DIVERSITY - The genetic variety within populations of a species.

GRAZING CAPACITY - The number of livestock or wildlife that a given area can support without causing site degradation.

GROUP SELECTION - Removal of groups of trees ranging in size from a fraction of an acre up to about 2 acres.

GROWTH AND YIELD - Having to do with the estimate of current, or prediction of future tree sizes, densities and volumes.

HABITAT - The environment of an specific place in which an animal can survive and reproduce.

HABITAT DIVERSITY - The number of different types of habitat within a given area.

HABITAT FEATURE - A characteristic of a habitat.

HABITAT TYPE - A unit of landscape which shares similar vegetative characteristics.

HARVEST LEVEL - The amount of timber volume that is removed from a forest over a discrete time period, generally a year.

HARVEST SCHEDULING - The act of determining the harvesting level under assumptions about the land available for timber production, land productivity, management intensity, and fluctuation in harvest level permitted from period to period.

HATCHERIES - A place for hatching fish eggs, usually with the intention of stocking some water body with young fish.

INFRASTRUCTURE - The transportation system including roads, trails, and bridges.

INTEGRATED RESOURCE MANAGEMENT PLANS - A plan that integrates the goals, objectives and operations of all the natural resource management programs (e.g. forestry, fish, wildlife, range, water and cultural resources). One example of coordinated management plans.

INTERDISCIPLINARY TEAM - A group of individuals with varying areas of specialty assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze the problem and proposed action.

LANDSCAPE - A heterogenous land area with interacting ecosystems that are repeated in similar form throughout.

LARGE WOODY DEBRIS - Pieces of wood larger than 10 feet long and 6 inches in diameter.

LUMP-SUM SALES - A timber sale in which the purchaser buys rights to all the timber in a given stand at a single flat rate regardless of volume and species.

MANAGED FOREST - Any forest that is treated with silvicultural practices and/or harvested. Often applied to land that is harvested on a scheduled basis and contributes to an allowable sale quantity.

MARKET VALUE - The economic value of an item on an open market.

MARKING (TIMBER-SALES) - The process of marking the trees within a timber sale area which are either to left or taken in a partial harvest cut.

MERCHANTABLE TREES, STANDS, OR TIMBER - Trees or stands that people will buy for the wood they contain.

MITIGATE - Modification of actions to (1) avoid impacts by not taking a certain action or parts of an action; (2) minimize impacts by limiting the degree or magnitude of the action and its implementation; (3) rectify impacts by repairing, rehabilitating, or restoring the affected environment; (4) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or (5) compensate for impacts by replacing or providing substitute resource or environments.

MIXED CONIFER FOREST - A forest community that is dominated by two or more coniferous species.

MONITORING - The process of collecting information to evaluate if objective and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

MULTI-AGED MANAGEMENT - A forest stand that has more than one distinct age class arising from specific disturbance and regeneration events at various times. These stands normally will have multilayered structure.

NATIVE FISH - A fish that is indigenous to a specific place.

NATIONAL BIOLOGICAL SURVEY - A proposed division of the U.S. Department of the Interior.

NATIONAL ENVIRONMENTAL PROTECTION ACT (NEPA) - An act passed in 1969 to declare a National policy that encourages productive and enjoyable harmony between humankind and the environment, promotes efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, enriches the understanding of the ecological systems and natural resources important to the Nation, and establishes a Council on Environmental Quality. It also made federal law the process by which federal development activities must be analyzed to assess their potential effects on the environment.

NATIONAL HISTORIC PRESERVATION ACT (NHPA) - An act passed in 1966 that seeks to protect historic properties; Sec. 106 of that act requires every federal agency "take into account" how each of its undertakings could affect historic properties.

NON-COMMERCIAL TIMBERLAND -Land classified as forest that contains at least 5% crown cover of commercial timber species which is not currently or prospectively capable of bearing merchantable forest products at a high enough value to provide a net benefit to the user.

NON-COMMERCIAL WOODLAND - Land classified as forest that contains less than 5% crown cover of commercial timber species which is not currently or prospectively capable of bearing merchantable forest products at a high enough value to provide a net benefit to the user.

NON-TIMBER VALUES - Values regarding the forest environment other than timber for income such as aesthetic or cultural values.

NOXIOUS PLANT - A plant specified by law as being especially undesirable, troublesome, and difficult to control.

NUTRIENT CYCLING - Circulation or exchange of elements such as nitrogen and carbon between nonliving and living portions of the environment. Includes all mineral and nutrient cycles involving mammals and vegetation.

OPTIMAL STOCKING - A stocking level within a plantation or stand of trees that best achieves the objectives for the area.

PARTIAL CUTTING - Removal of selected trees from a forest stand.

POLE - Commercial species 5.0 inches DBH to 8.9 inches DBH.

POPULATION - A collection of individual organisms of the same species that potentially interbreed and share a common gene pool. Population density refers to the number of individuals of a species per unit area, population persistence to the capacity of the population to maintain sufficient density to persist, well distributed, over time.

PRE-COMMERCIAL THINNING - The practice of removing some of the trees less than merchantable size from a stand in order to stimulate growth on the remaining trees.

PRESCRIBED FIRE/BURNING - A fire burning under specified conditions that will accomplish certain planned objectives. The fire may result from planned or unplanned ignitions.

PULPWOOD - Logs of a size or species that make them more suitable for pulping for paper manufacturing than for making solid wood products.

REFORESTATION - The natural or artificial restocking of an area with forest trees; most commonly used in reference to artificial stocking.

REGENERATION - The actual seedling and saplings existing in a stand; or the act of establishing young trees naturally or artificially.

RESERVATION

Category-1 - Major Forested Reservation: comprised of more than 10,000 acres of commercial timberland in trust, or determined to have more than 1.0 MMBF [million board feet] harvest of timber products annually.

Category-2 - Minor Forested Reservation: comprised of less than 10,000 acres of commercial timberland in trust, and less than 1.0 MMBF harvest of timber products annually, and whose forest resource is determined by the Area Office to be of significant commercial timber value.

Category-3 - Significant Woodland Reservation: comprised of an identifiable forest area of any size which is lacking a timberland component, and whose forest resource is determined by the Area Office to be of significant commercial woodland value.

Category-4 - Minimally Forested Reservation: comprised of an identifiable forest area of any size determined by the Area Office to be of minor commercial value at this time.

Category-5 - Reservation or Indian property with forest land that the Bureau is charged with some degree of legal responsibility, but the land is not [Federal] trust status."

RESIDUAL STAND - The trees that remain standing after some event such as selection cutting or thinning.

RESTORATION - Improving the current conditions of an ecosystem to restore its original functioning and provide for its long-term productivity.

RIPARIAN AREA - A geographic area containing an aquatic ecosystem and adjacent upland areas that directly affect it.

RIPARIAN ZONE - Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs, and wet meadows.

ROOT ROT - A tree disease that attacks the roots of trees frequently causing individual tree death. Infected trees and stumps may infect others nearby and can create pockets within a stand with no live trees.

ROTATION - The planned number of years between regeneration of a forest stand and its final harvest (regeneration cut or harvest). A forest's age at final harvest is referred to as rotation age.

ROTATION AGE - The age of a stand when harvested at the end of a rotation.

SALVAGE - The removal of dead or diseased trees from forest stands.

SECOND-GROWTH - Relatively young forest that have developed following a disturbance (e.g. cutting, serious fire, or insect attract) of the previous old-growth forest.

SELECTION CUTTING/HARVEST - A method of uneven-aged management involving the harvesting of single trees from stands (single-tree selection) or in groups (group selection) without harvesting the entire stand at any one time.

SAWLOGS - Logs that are suitable for construction grade or better grades of lumber.

SAWTIMBER - A stand of timber that exhibits size, form and species characteristics that make them suitable for lumber manufacture.

SCALING - The measurement of a log to estimate the sawtimber volume within it.

SELF-DETERMINATION - The ability of a people to pursue their own goals.

SELF-GOVERNANCE DEMONSTRATION PROJECT - A provision under Title III of P.L. 100-472, an amendment to Indian Self-Determination Act, which allows Indian tribes to enter into an annual funding agreement with the Secretary of the Interior. These agreements allow the Indian tribes to plan, consolidate, and administer programs, services, and functions administered federally and redesign programs, functions and services. It allows tribes the flexibility to develop programs and establish funding priorities to meet their specific needs (see Compacting).

SILVICULTURE - The science and practice of controlling the establishment, composition, and growth of the vegetation of forest stands. It includes the control or production of stand structure such as snags and down logs, in addition to live vegetation.

SILVICULTURAL PRESCRIPTION - A professional plan for controlling the establishment, composition, constitution, and growth of a forest stand.

SITE CLASS - A measure of an area's relative capacity for producing timber or other vegetation.

SITE INDEX - A measure of forest productivity expressed as the height of the tallest trees in a stand at an index age.

SITE PREPARATION - Any action taken in conjunction with a reforestation effort (natural or artificial) to create an environment favorable for survival of suitable trees during the first growing season. This environment can be created by altering ground cover, soil or microsite conditions, using biological, mechanical, or manual clearing, prescribed burns, herbicides, or a combination of methods.

SITE PRODUCTIVITY - The ability of a geographic area to produce biomass, as determined by conditions (e.g., soil type and depth, rainfall, temperature) in that area.

SKID TRAIL - A path created by dragging logs to a landing (gathering point).

SNAGS - Any standing dead, partially dead, or defective (cull) tree at least 10 inches in diameter at breast height and at least 6 feet tall. A hard snag is composed primarily of sound wood, generally merchantable. A soft snag is composed primarily of wood in advanced stages of decay and deterioration, generally not merchantable.

SNAG CHARACTERISTICS - Attributes of a snag that define its ecological function (e.g. degree and type of rottenness, number and type of branches).

SOIL COMPACTION - An increase in bulk density (weight per unit volume) and a decrease in soil porosity resulting from applied loads, vibration, or pressure.

SPECIES - (1) A group of individuals that have their major characteristics in common and are potentially interfertile. (2) The Endangered Species Act defines species as including any species or subspecies of plant or animal. Distinct populations of vertebrates also are considered to be species under the act.

SPECIES DIVERSITY - The number, different kinds, and relative abundance of species in an area.

SPRUCE BUDWORM - A defoliator that feeds principally in buds and on the foliage of the current year. Sustained heavy attack causes nearly complete defoliation in 4-5 years. Epidemics cause decreased growth, tree deformity, top killing, and ultimate death of trees over extensive areas of forest. It occurs primarily on Douglas-fir and true firs.

STAND (tree stand) - An aggregation of trees occupying a specific area and sufficiently uniform in composition, age, arrangement, and condition so that it is distinguishable from the forest in adjoining areas.

STAND CONDITION - A description of the physical properties of a stand such as crown closure or diameters.

STAND-LEVEL INVENTORY - an inventory that collects data on the characteristics of trees within discrete stands. This provides finer scale information than such systems as the CFI which collect information from widely spaced plots.

STAND STRUCTURE - The various horizontal and vertical physical elements of a stand of trees.

STOCKING - A measure of the proportion of the area actually occupied by trees; i.e., the percentage of area stocked.

STRUCTURAL COMPLEXITY - The degree of variation of horizontal and vertical elements within a forest.

STRUCTURAL RETENTION - Harvest practices that leave physical elements (e.g., green trees, snags, down logs) of old-growth forests on site after harvest.

STRUCTURE - The various horizontal and vertical physical elements of the forest.

STUMPAGE - The value of standing timber after deduction of logging and processing costs.

SUBSISTENCE - Means of supporting life.

SUITABLE FOREST ACRES - Acres available for regularly scheduled timber harvest.

SUPPRESSION - The action of extinguishing or confining a fire.

SUSTAINABLE HARVEST - A harvest volume that can be maintained through time without decline.

SUSTAINED YIELD - The yield that a forest can produce continuously at a given intensity of management.

THRIFTY STAND - A stand of trees that exhibits health, vigor and optimal or near-optimal growth.

THINNING - The practice of removing some of the trees from a stand so that remaining trees will grow faster and with increased vigor.

TIMBER HARVEST SCHEDULE - The quantity of timber planned for sale and harvest, by time period, an area of forest.

TIMBERLAND - Land qualifying as forest and containing at least 5 percent crown cover of commercial timber species.

TIMBER MANAGEMENT PLAN - An activity plan that specifically addresses procedures related to the offering and sale of timber volume consistent with the approved allowable cut.

TIMBER PRODUCTION - The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use other than for fuelwood.

TIMBER SALE ADMINISTRATION - The administration of the timber sale contract including review of contractor operation plans, on-site inspection of harvest operations for conformance to contractual specifications, and post-operation audit for contract compliance.

TIMBER SALE PREPARATION - Those activities relating to preparing a stand of timber for logging, includes cruising and appraising the timber; designating the sale area boundaries; marking trees; defining skid trail locations; preparing the sales contract and putting the sale out to bid.

TIMBER STAND - see Stand.

TIMBER STAND IMPROVEMENT - Measures such as thinning, pruning, release cutting, prescribed fire, girdling, weeding, or poisoning of unwanted trees aimed at improving growing conditions for the remaining trees.

TRANSPORTATION SYSTEM - Network of roads used to manage a land area.

TRUST - Pertains to the relationship of the U.S. federal government to Indian tribes and denotes a degree of responsibility on the part of the U.S. government.

TRUST OVERSIGHT COMMITTEE - Proposed by this report, the oversight committee is a group that would review tribal coordinated resource management plans and offers periodic assessments on whether tribes are meeting the standards set down in the plans. Part of the redesigned federal government-tribal relationship. (Recall Analysis of BIA Administrative Procedures).

UNDERSTOCKED - The condition when a plantation of trees fails to meet the minimum requirements for number of well-spaced trees per acre of the desired species.

UNDERSTORY - The trees and other woody species growing under the canopies of larger adjacent trees and other woody growth.

UNEVEN-AGED MANAGEMENT - A combination of actions that simultaneously maintains continuous forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

UTILIZATION - In reference to timber harvest, the removal of wood biomass (logs) from the forest to the mill. Specifically, it refers to that portion of the tree that is removed as a log.

UTILIZATION STANDARDS - Rules defined by forestry department, enterprise or mill that indicate the portion of tree that must be removed during harvest (e.g. "to a 6" top" indicates that the portion of a tree stem below which the trunk tapers to 6" will be bucked off and removed and the remainder left in the woods; a similar standard would be applied to stump height).

VISION - The desired future condition of a forest and forest resources.

VERTICAL DIVERSITY - The diversity in a stand that results from the complexity of the above-ground structure of the vegetation. The more tiers of vegetation or the more diverse the species composition (or both), the higher the degree of vertical diversity.

WATERSHED - The drainage area of a lake or stream.

WATERSHED RESTORATION - Improving current conditions of watersheds to restore degraded fish habitat and provide long-term protection to aquatic and riparian resources.

WHITEWOODS - In this report it refers to the group of western conifers that include western hemlock, the true firs and the spruces.

WILDLIFE TREE - A live or dead tree retained for food or cover of one or several species.

WINDTHROW - A tree or trees uprooted or felled by the wind.

WOODLAND - Land qualifying as forest and containing less than 5% crown cover of commercial timber species.

YOUNG STANDS - Forest stands not yet mature generally, less than 50-80 years old; typically 20-40 years old.

LITERATURE CITED

Arthur Anderson and Co. 1989. *Forest Management Cost Study.* Hartford, Connecticut: Arthur Anderson and Co.

Dibble, John R. and Beverly A. Schwab. 1993. *Uneven-aged Forests on Indian Lands: 1992 Annual Project Report U.S. Global Change Research Program.* Washington D.C.: USDI BIA - Div. of Forestry, Branch of Forest Resource Planning.

Indian Resource Development Fund. Undated. *Sources of Financial Aid Available to American Indian Students.*

The Irland Group. 1993 *Regional Comparative Assessment of Tribal Timber Management Programs in the Early 1990's.* Augusta, Maine.

Oregon Dept. of Forestry. 1991. *State of Oregon Forestry Accomplishment and Cost Report, FY 1990.* Salem, OR: Oregon State Department of Forestry.

Sessions, J. et al. *Timber for Oregon's Tomorrow---the 1989 Update.* 1990. Corvallis, OR: O.S.U. Forest Research Lab.

Sloan, Gail. 1991. Education Opportunities Under the Act in *Proceedings of the 16th Annual National Indian Timber Symposium.* Albuquerque, New Mexico.

Society of American Foresters. 1993. *Forestry Education Enrollment and Degrees Granted Survey.* Bethesda, MD.: Society of American Foresters, Department of Science Education.

USDA Forest Service. 1992. *Report of the Forest Service, Fiscal Year 1991.* Washington, DC: USDA - FS.

USDI BIA - Office of Trust and Economic Development, Div. of Forestry. 1988. *Native American Woodland Resources: A National Overview.* Washington, DC: USDI BIA - Div. of Forestry.

USDI BIA - Office of Trust and Economic Development, Div. of Forestry. 1989a. *Allotted Indian Forest Lands Study, Data Overview.* Portland, OR: USDI BIA - Div. of Forestry, Branch of Forest Resource Planning.

USDI BIA - Office of Trust and Economic Development, Div. of Forestry. 1989b. 25 CFR 163. *General Forest Regulations.* Washington DC.

USDI BIA - Office of Trust and Economic Development, Div. of Forestry. 1990. *30 BIAM Supp. 10; Integrated Resource Management Planning.* Washington, D.C.

USDI BIA - Office of Trust and Economic Development, Div. of Forestry. 1991a. *53 BIAM Supp. 2; Forest Management Planning.* Washington, D.C.

USDI BIA - Office of Trust and Economic Development, Div. of Forestry. 1991b. Memorandum from Deputy Commissioner of Indian Affairs to BIA Central Office regarding *Education and Administration, Bureau of Indian Affairs Recruitment Campaign.*

USDI BIA - Office of Trust and Economic Development, Div. of Forestry. 1992a. *Annual Economic Benefits Derived from Indian Forest Resources: 1991 Update.* Portland, Oregon: BIA, Div. of Forestry - Branch of Forest Resource Planning.

USDI BIA - Office of Trust and Economic Development, Div. of Forestry. 1992b. *Indian Forest Management--- Foundation for the Future 1990-1991.* Washington, DC: USDI BIA - Div. of Forestry.

USDI BIA - Office of Trust and Economic Development, Div. of Forestry. 1992c. *Forestry Program Funding and Position Analysis* . Washington, DC: USDI BIA - Div. of Forestry.

USDI BIA - Recruitment and Retention Working Group. 1992d. *Part 9 - Final Period Report of The BIA Recruitment and Retention Working Group* . Washington, DC: USDI BIA - Recruitment and Retention Working Group.

USDI BIA - Office of Trust and Economic Development, Div. of Forestry, Branch of Forest Resource Planning. 1992e. *Status of Forest Management Inventories and Planning.* Portland, OR: USDI BIA - Div. of Forestry, BOFRP.

USDI BIA - Office of Trust and Economic Development, Div. of Forestry. 1992f. *Catalog of Forest Acres 1992.* Washington, DC: USDI BIA - Div. of Forestry.

USDA BIA - Office of Trust and Economic Development, Div. of Forestry. 1992g. *25 CFR 163; Proposed General Forest Regulations.* Washington, DC.

USDI BIA - Office of Trust and Economic Development, Div. of Forestry, Branch of Forest Resource Planning. 1993. *Unfunded Forest Development Need Spreadsheet.*, Portland, OR.

U.S. Laws, Statutes, etc.; Public Law 89-665. [S. 3035], *National Historic Preservation Act.* Act of October 15, 1966. In its: United States statutes at large, 1966. 16 U.S.C. sec. 470, et seq. (1966). Washington, DC: U.S. Government Printing Office: 915. Vol. 80.

U.S. Laws, Statutes, etc.; Public Law 92-203. [H.R. 10367], *Alaska Native Claims Settlement Act of December 18, 1971.* In its: United States statutes at large, 1971. 48 U.S.C. , et seq. (1971). Washington, DC: U.S. Government Printing Office: 688. Vol. 85.

U.S. Laws, Statutes, etc.; Public Law 93-638. [S.1017], *Indian Self-Determination and Education Assistance Act of 1975.* Act of January 4, 1975. In its: United States statutes at large, 1975. 25 U.S.C. sec. 450, et seq. (1975). Washington, DC: U.S. Government Printing Office: 2203. Vol 83.

U.S. Laws, Statutes, etc.; Public Law 93-205. [S.1983], *Endangered Species Act of 1973.* Act of December 28, 1973. In its: United States statues at large, 1973. 16 U.S.C. sec. 668, et seq. (1976). Washington, DC: U.S. Government Printing Office: 884. Vol. 87.

U.S. Laws, Statutes, etc.; Public Law 95-313. [H.R.11777], *Cooperative Forestry Assistance Act of 1978.* Act of July, 1978. In its: United States statutes at large, 1978. 16 U.S.C. sec. 2101 et seq. (1978). Washington, DC: U.S. Government Printing Office: 365. Vol. 92.

U.S. Laws, Statutes, etc.; Public Law 100-472.[H.R. 1223], *Indian Self-Determination and Education Assistance Act Amendments of 1988.* Act of October 5, 1988. In its: United States statutes at large, 1988. 25 U.S.C. sec. 450 et seq. (1988). Washington, DC: U.S. Government Printing Office: 2285. Vol. 102.

U.S. Laws, Statutes, etc.; Public Law 101-630. [H.R. 3703],*National Indian Forest Resources Management Act--Title III--Indian Forest and Woodlands Act of Nov. 28, 1990.* In its: United States statutes at large, 1990. 25 U.S.C. sec. 3101 et seq. (1990). Washington, DC: U.S. Government Printing Office: 4532. Vol. 104.

INDEX

C

D

E

F

G

H

I

J

L

M

N

O

P

Q

R