

Development and Implementation of the Oregon Range Evaluation Project

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The objective of the Oregon Range Evaluation Project (EVAL) was to determine the most cost-effective way to increase herbage and browse for livestock and to determine the effects of range management strategies on water quantity and quality and consequences for the local economy. This project was developed as a result of a 1970 study, "The Nation's Range Resources—A Forest-Range Environmental Study" (Forest-Range Task Force 1972), which reviewed the forest and rangelands in the 48 adjacent United States to determine the production of animal unit months (AUM's) of grazing and 21 associated products and benefits. The assembled information was used to construct and model alternate sets of goals and to evaluate the minimum cost of each set under different political, social, environmental, and economic targets. The Chief of the USDA Forest Service, on the basis of this study, began the Accelerated Range Program in November 1973. This program included large-scale testing to confirm or adjust assumptions made in the Task Force Report. Data from evaluation areas were to be used to make appropriate adjustments in the Accelerated Range Program.

The Grant County (Oregon) Resource Council, the Grant County commissioners, and others interested in resources in Grant County have been concerned about resource development and improvement of the county's economic situation. Grant County's economy is based on natural resources, and county groups have worked diligently to develop and maintain them. The groups saw the Accelerated Range Program and the evaluation area concept as an opportunity to continue developing the natural resource base and to obtain additional information on social, environmental, and economic impacts of alternative management strategies. They also saw an opportunity to acquire skills necessary to develop comprehensive resource and land-use management plans. As a result, in 1974, the Grant County Resource Council proposed to the USDA Forest Service that Grant County be designated an "evaluation area" under the Forest and Rangeland Renewable Resources Planning Act. The Grant County Resource Council organized support from 31 groups throughout Oregon. Members of the resource council testified before the Senate and House Interior Sub-Committees in May 1975. In January 1976, Congress appropriated \$1.4 million to initiate a range evaluation project in Oregon.

The USDA Forest Service developed a plan outlining the framework of the evaluation study and formalizing project

objectives. Nine major objectives were established: (1) to identify known range management practices that influence herbage production; (2) to identify combinations of ecosystems, productivity rates, and condition classes that under different range management practices can be expected to result in differences in herbage response; (3) to apply range management practices on public and private lands; (4) to evaluate costs associated with implementing range management practices; (5) to evaluate herbage production responses associated with practice implementation; (6) to identify and evaluate responses of related resources after implementation; (7) to inform and involve local landowners, managers, officials, agency representatives, and interested citizens; and (8) to provide periodic feedback of results as they became available.

Description of the Area

The Oregon range evaluation area was located in east-central Oregon and included the northern half of Grant

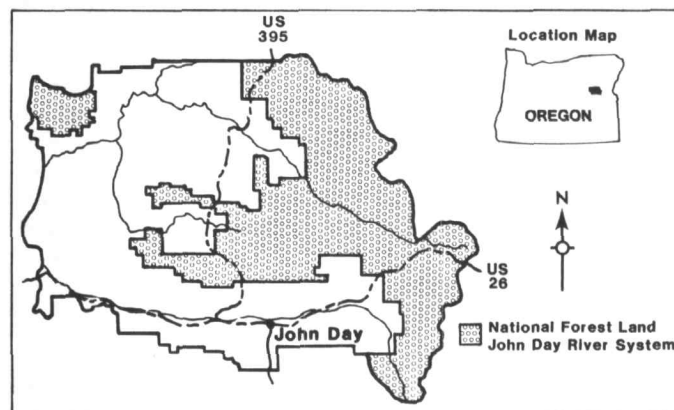


Fig. 1. Location and boundary of the Oregon Range Evaluation Project.

County plus a small portion of Umatilla and Wheeler Counties on the northwest and west boundaries (Fig. 1). About half of the 1.5-million-acre area is public lands, managed primarily by the Malheur National Forest. Terrain is generally hilly or mountainous and predominantly range and forest land. Elevations range from about 2,000 to 8,000 feet. The John Day River system drains the area. Irrigated valley land occurs along the main stem of the John Day River, the lower North Fork, and on portions of the Middle Fork. About 350 ranches are within the area and some 115 Bureau of Land Management grazing lease, and 60 Forest Service grazing permits have been issued.

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Fig. 2. Typical landscape on the Oregon Range Evaluation Project Area near Long Creek, Oregon—lower elevation grassland with scattered juniper and shrubs and higher elevation forest land.

Geology

The Oregon evaluation area lies within the Blue Mountain Physiographic Province of Oregon (Dickens 1955) and is on the border of 2 major geologic provinces—the Columbia Plateau to the north and the Basin and Range Province to the south. Geological formations in the area originate from sedimentary, metamorphic, or volcanic material. The most varied formations occur in the high mountains where old ocean sediments have been folded, faulted, and raised above surrounding lowlands.

Soils

Soils can be divided into three physiographic groups: (1) alluvial fans and flood plains; (2) medium-elevation uplands (2,000–5,000 feet); and (3) high-elevation uplands (5,000–8,000 feet) and open basins or mountain valleys. The alluvial fans and flood plains are generally arable lands used for crops, hay or improved pasture. The medium-elevation uplands, mainly soils of sedimentary and volcanic origin, support a shrub-grass vegetation. These uplands occupy the zone between the alluvial fans and flood plains and the high-elevation uplands and mountain valleys. The high-elevation uplands are forested areas on sedimentary or volcanic derived soils. National Forest lands occupy most of this area. The major mountain valley or open basin is Fox Valley. This subdivision supports grass-shrub and wet meadow vegetation (Fig. 2).

Climate

The Oregon Range Evaluation Area is in the Temperate

Zone and ranges from semiarid to cold and subhumid. About 10 inches of precipitation is received annually at low elevations, but this increases to about 40 inches in the higher mountain elevations. About 80% of the precipitation occurs between October 1 and May 31 (Fowler et al. 1979). Precipitation in the lower elevations comes principally as rain; in the high elevations, snow occurs between October and May. The growing season varies from 80 to 120 days, depending on elevation; however, at the high elevations no months are considered frost free. Temperature extremes vary from -50 to $+110^{\circ}$ F. Summers are hot and dry with the exception of low night temperatures in the high mountains. Winters are cold and moist.

Hydrology

The John Day River system drains the area. About 75% of the runoff comes from National Forest lands. The river system has three major drainages—the North Fork, the Middle Fork, and the main stem. The Middle Fork drains most of the project area. Peak streamflow, the result of snowmelt and occasional heavy rain, occurs within a 6-week period centered about mid-April. Minimum streamflow occurs between July and October. Yearly extremes are related to differences in winter snowpack. Extreme maximum water temperatures may occur during periods of low flow and may exceed the requirements for cold-water fish in small tributaries. In areas where livestock concentrations occur, fecal coliform bacteria standards may be exceeded for short periods.

Flora

Ten of the 34 ecosystems identified by Garrison et al.

(1977) occur within the project area: Douglas-fir, ponderosa pine, lodgepole pine, larch, fir-spruce, sagebrush, juniper, mountain grasslands, mountain meadows, and alpine. The forest ecosystems dominate the mountainous terrain, which is mostly National Forest System lands. The mountain grasslands, sagebrush, and juniper ecosystems dominate the hilly terrain, which is mostly private and BLM lands.

Fauna

A wide variety of animal life is found within the Evaluation Area. The major big game include mule deer and Rocky Mountain elk. The peregrine falcon is the only nationally recognized endangered species that may occur in the area. Species considered threatened by the Oregon Department of Fish and Wildlife include the bald eagle and upland sandpiper. The Middle Fork, North Fork, and main stem of the John Day River are spawning and rearing habitat for steelhead and chinook salmon. The streams, lakes, and reservoirs also serve as habitat for several species of trout. A wide variety of nongame birds, mammals, and fish also inhabit the area.

Economic Conditions

Grant County, Ore., has limited economic opportunities. The county has about 8,000 people spread over 4,533 square miles—one of the sparsely populated counties in Oregon. Major population centers and markets for agricultural and forest products are several hundred miles away, and transportation links are primarily paved, two-lane roads. Residents rely on income generated from the sale of products from basic resource industries—forestry, agriculture, and recreation—for their livelihood. The future holds little promise for diversification and industrialization. If the people of Grant County are to maintain their economic base, the conservation and development of renewable resources and improved management of the basic resources industries will be required. Sales of agricultural and forest industry products account for over 50% of the total income. Over 60% of the land in Grant County is controlled by Federal and State agencies, primarily the Forest Service and BLM. County economic conditions, therefore, strongly depend on public

land management decisions and policies.

Role of Cooperating Organizations and Institutions

The lead agency for the Oregon Range Evaluation Project was the Forest Service including the National Forest System, State and Private Forestry (which provided funding for cooperating agencies and the private landowner sector), and Forest Service Research. Primary cooperating agencies and groups included the Soil Conservation Service and the Agricultural Stabilization and Conservation Service in the U.S. Department of Agriculture, the Bureau of Land Management in the U.S. Department of the Interior, Oregon Department of Forestry, Oregon Department of Fish and Wildlife, Oregon State University Extension Service, and private landowners. Memoranda of understanding were developed between the Forest Service and cooperating Federal and State agencies to outline the responsibilities of each agency and designate funds for the work. Other cooperating organizations and institutions were the Farmers Home Administration, Grant County Resource Council, National Park Service, Soil and Water Conservation Districts, United States Fish and Wildlife Service, Oregon State University, Washington State University, Southwestern Oregon State College, and Eastern Oregon State College.

The EVAL operation was directed by a nine-member Evaluation Team. The National Forest System provided the project coordinator. Each primary cooperating agency and group was represented by a team member with an equal voice. From the start, EVAL was a team effort with a clear understanding that success of the project would require the cooperation, consultation, and understanding of participants. Fiscal accountability for all funds was the main Forest Service responsibility. The National Forest System planned and implemented the Accelerated Range Program on the National Forest lands within the evaluation area. The areas had to be large enough to reflect management for realistic livestock distribution and forage utilization. Responsibilities included: (1) mapping vegetation and determining management strategies; (2) assisting in coordinated resource planning; (3) applying range practices to achieve prescribed management strategies; and (4) maintaining strategies and

RESOURCE INVENTORY FOR: Bar X Grazing Association																			
Pasture: number, name, strategy	Size	Forage production		Timber production		Opportunities, needs, problems	Amount	Alternatives	Amount	Cost unit	Total cost	Projected benefits	Projected impacts ¹						
		Present	Potential	Present	Potential								Range	Timber	Wild- life	Water- shed	Water quality	Soil	
	Acres	AUM's/yr		Bd.ft. acre	¹ yr ⁻¹					— Dollars —		AUM's/yr	Dollars/yr						
1	295	96	250	n/a	n/a	Improved distribution		Develop springs Planned grazing system	2	550	1100	10	100	++	○	++	+	+	+
North Unit														++	○	+	+	++	++
						Increase forage quality and quantity	200 acres	Improve and maintain irrigation ditches, fertilize, or both	?	?	50	500	++	○	++	+	+	+	+
C3 to D3									200 acres	35-70	7000 – 14000	200	2000	++	○	++	+	+	+
2	780	55	100	n/a	n/a	Improve distribution		Develop springs	2	550	1100	10		++	○	++	+	+	+
Tucker Unit								Constructs ponds	2	1400	2800	10		+ ++	○	++	+	+	+
B2 to C3								Remove fence	.25 m	1600	360	?		++	○	○	○	○	○
								Reconstruct fence	1.0 mi	2000	2000	?		+ ++	○	○	○	○	○
¹ Favorable impact ++, moderately favorable +, slightly favorable +, no effect 0, slightly unfavorable -, moderately unfavorable --, very unfavorable ---, and uncertain of impact?																			

¹Favorable impact ++, moderately favorable +, slightly favorable o, no effect 0, slightly unfavorable --, moderately unfavorable ---, very unfavorable ----, and uncertain of impact?.

Fig. 3. Form (simulated data) used by the Oregon Range Evaluation Project to prepare coordinated resource management plans.

practices for the duration of the project. The District Rangers retained responsibility for administering grazing permits and for other National Forest uses. State and private forestry worked through Federal and State agencies to implement the Evaluation Project on private forests and rangelands. They were responsible for securing the necessary cooperative agreements between agencies and private landowners and for facilitating the transfer of funds from Forest Service accounts to cooperative agencies and private landowners on an as-accomplished basis. The role of Forest Service Research was to assess social, economic, and environmental effects of implementing the range strategies. Research helped organize the application of range practices to isolate variables and control external forces so results could be clearly and easily interpreted. Research was also responsible for reporting the results derived from EVAL to appropriate users.

The Soil Conservation Service provided technical assistance and resource inventories, excluding timber, for private landowners, and developed this information for the coordinated resource management plans. This information was used to prepare long-term agreements with cooperating private landowners. They also provided the technical expertise, standards, and guidelines to install range practices on private lands and reviewed and certified their completion. The Agricultural Stabilization and Conservation Service assisted in carrying out the terms of the long-term agreements and documenting payments due participating private landowners. After technical certification by the responsible agency, the ASCS forwarded certifications for payments to the Forest Service. The County Agriculture Conservation Program Committee reviewed each request for payment to ensure that it was in line with the cost of the work accomplished. They also assisted the EVAL team to determine rates for landowners who chose to use their own labor or machinery to

install range practices. The Bureau of Land Management participated in developing coordinated resource management plans, but no range practices were implemented on the Bureau lands because of prior National litigation (U.S. District Court for the District of Columbia 1975).

The Oregon Department of Forestry provided technical assistance to participating private landowners for forest management and practices. State Forestry was responsible for approving prescribed burns, issuing burning permits, and providing technical assistance for prescribed burns on private lands. State foresters inventoried and developed the coordinated resource management plans for forest resources on private lands. They provided the technical expertise, standards, and guidelines for installing land management practices they were responsible for on private lands, and reviewed and certified their completion.

Oregon State University Extension Service, the primary organization for information and education, prepared brochures, pamphlets, and slide programs to make landowners aware of the goals, opportunities, and requirements for participating in EVAL. The Extension Service was both technical consultant and participant in developing management plans. They provided technical expertise, standards, and guidelines for installing range practices they were responsible for on private lands and reviewed and certified completion. The Extension Service handled communications between cooperators and the EVAL team and scheduled the use of such equipment as rangeland drills, plows, and seeders.

The Oregon Department of Fish and Wildlife provided technical assistance on fisheries and wildlife habitat needs for the coordinated resource management plans. Wildlife biologists also provided expertise to private landowners interested in enhancing wildlife habitat on their lands.

A rancher who was not a cooperator in the EVAL program

LTA: 021				RANCH: BAR X Grazing Association			Form Printed: 13-Jan-82 Review Date: 10-Jan-81			
Pasture name: Timber Pasture				512 acres	Current Strategy = B		Planned Strategy = D			
Eval. prac. no.	Map code	Practice	Description (unit)	Amount approved	Federal cost share	Federal cost planned	Year to accom- plish	Amount completed	Actual Federal share	Month/ year paid
					Percent	Dollars			Dollars	
18.1	t1	Timber thinning	Precommercial thinning (acre)	36	75	972	1978	36	629	12/78
18.3	t1	Timber thinning	Pile thinning slash (acre)	36	75	1188	1978	36	1718	12/78
10.6	s3	Seed thinning	No seedbed preparation – dribblers (acre)	36	75	371	1978	38	365	12/78
18.4	t1	Timber thinning	Burn slash piles (\$7/acre)	36	75	189	1982			
10.9	t1	Seeding	Seed burn spots (\$3/acre)	36	75	81	1982			
19.2	dd1	Debris disposal	Mechanical pile old logging slash (acre)	20	75	330	1978	20	175	01/79
14.1	sw5	Small water development	Spring w/trough	1	75	375	1981			
14.2	sw6	Small water development	Dozer pond	1	75	563	1977	1	272	11/81
20.2	pg5	Planned grazing	Rest (acre)	38	100	38	1979	38	38	01/80
20.1	pg6	Planned grazing	Deferment (acre)	38	100	19	1980	19	19	02/81
16.9	f2	Fence	Reconstruction (mile)	1	75	1200	1979	0.9	1387	12/80
Pasture total: 5326										

Fig. 4. Form (simulated data) used to prepare long-term agreements for the Oregon Range Evaluation Project.

was selected to represent the private landowner. He provided the team with a rancher's viewpoint, emphasizing practicality in developing coordinated resource management plans and long-term agreements and applying range management practices. The private landowner representative added stability and coordination between ranchers and team members. He helped resolve differences and enhanced communication between participating ranchers and team members. This representative also provided EVAL with credibility, which some landowners perceived as low in government agencies.

The Evaluation Project

EVAL was conceived as a 10-year project with funding through the three branches of the Forest Service. By 1982, several changes in personnel had occurred and funding had decreased significantly. As a result, objectives were reviewed and the values being monitored were decreased from 18 to 6 (Table 1); 1 year less was allowed for data collection, and the

management plans and long-term agreements, assigning management strategies, and establishing range management practices on public and private land. Initially, all management strategies were to be implemented within the first 5 years, 1976-80; however, because of funding interruptions, financial constraints on landowners, and scheduling problems, the time extended through 1983. Once new strategies were implemented, maintenance kept them at acceptable standards throughout the project. This was essential to obtain the quality of data needed for monitoring, which included collecting baseline data and evaluating the effects of grazing management strategies on environmental, economic, and social resources. Reporting included data management, data summaries and analyses, and dissemination of results to managers of public and private lands, resource planners, private landowners, educators, and other interested persons.

Coordinated Resource Management Plan

Before any range management practice was implemented, a coordinated resource management plan was developed for each cooperator. The coordinated resource management plan was designed to provide an environmental assessment of potential range management practices. The Soil Conservation Service was responsible for preparing the grazing management portion of the coordinated management plan for private and non-Federal public lands; the Oregon Department of Forestry was responsible for preparing forest management plans on private lands. On Federal lands, mainly National Forest grazing allotments, the responsible Federal agency developed the grazing management plan.

The EVAL team and planning personnel met with the rancher, reviewed ranch property, and discussed the rancher's management objectives and potential practices. The available grazing and timber resources were inventoried by the agency planners and a coordinated resource management plan was developed for all lands in the ranch operation. The initial planning process did not adequately address the total ranch and public land resources or the environmental concerns. A more complete planning process was developed that provided alternatives to increase forage resources and address environmental concerns. Plans were developed by vegetative type within each pasture. Forestry alternatives were developed for each timber stand only on private lands. Management alternatives for private lands were selected to meet the objectives of the landowner. Range management alternatives for public lands were coordinated with other resource management objectives. Each alternative was subjectively rated on its potential impact to other resources.

The completed coordinated resource management plan had a brief description of the ranch operation including problems and objectives. The crop, grazing, and timber management opportunities were described in detail along with costs and benefits. Resource problems and potential solutions were also described. Each pasture had a detailed vegetation description by area, present and potential productivity, recommended management alternatives, and estimated costs and projected benefits (Fig. 3). Two maps were included to illustrate the vegetative resources and the present and potential range management practices. All parties had to approve the plan with final approval by the project coordina-

Table 1. Resources monitored on the Oregon Range Evaluation Project before and after March 1982.

Values	Before March 1982 ¹	After March 1982 ²
Quantitative:		
Forage production	*	*
Wood production	*	
Water flow	*	*
Storm runoff	*	*
Sediment	*	
Water quality	*	* ³
Soil stability		
Qualitative:		
Birds	*	
Small mammals	*	
Other vertebrates	*	
Big game		
Fish	*	
Riparian habitat	*	
Dispersed recreation	*	
Scenic beauty	*	
Cultural heritage	*	
Economic:		
Employment	*	
Animal value		* ⁴
Practice cost accounting	*	*

¹Asterisk indicates at least base data were collected or contracted prior to September 30, 1981. In some cases the quantitative values were adequately assessed.

²Asterisks indicate resource values monitored after March 1982.

³Sediment is considered part of water quality.

⁴Employment and animal value were combined in the economic assessment output.

project was extended by 1 year to provide additional time for data summarizing, analyzing, and preparing publications and a final report.

EVAL was divided into four major elements: implementing, maintaining, monitoring, and reporting. These elements were used to separate project activities including funding responsibility and work planning.

Implementation included selecting private landowners to cooperate with EVAL, developing of coordinated resource

tor. Each management plan was subject to annual review by the EVAL team and the private landowner.

Management Strategies

Present and planned management strategies were determined before the CRMP could be implemented. Six management strategies were defined.

Strategy A—Environmental management without livestock. Livestock were excluded by fencing. The environment was protected from such disasters as wildfires and pest epidemics, and resource damage was corrected to maintain land stewardship. No costs were charged to range under this strategy.

Strategy B—Environmental management with livestock. This strategy allowed livestock grazing within the apparent capacity of the range environment. Any resource damage from overuse was corrected, but investments for additional management practices were limited to the amount needed to maintain the resource base, such as soil, water, and wildlife. The goal of this strategy was to maintain livestock in a pasture without any attempt to properly distribute them throughout the pasture.

Strategy C—Extensive management of environment and livestock. Management practices were primarily fences and water developments to obtain uniform livestock distribution and plant use and to maintain plant vigor. The management objective was to obtain full use of the AUM's available for grazing. No attempt was made to increase forage production through cultural practices, such as fertilization and seeding.

Strategy D—Intensive management of environment and livestock. All available range management practices were used to increase production of livestock forage consistent with multiple-use constraints and maintain the environment. The objective was to manage the forage base to best use joint resources and to obtain full use of the AUM's available for grazing. Cultural practices, such as juniper and brush control, seeding, and fertilization, were used to increase the forage base.

Strategy E—Environmental management with maximum livestock production. Stewardship of soil and water was required, and timber on private lands had to be maintained through the Oregon State Forestry Practices Act. Multiple-use was not an objective. The objectives were to increase commodity production such as livestock, timber, and fee hunting, and to maintain basic soil and water resources. This strategy was not applied on public lands.

Strategy X—Exploitative management. The attainment of this strategy was not a management goal. It was included to inventory exploitative grazing that depletes the soil or vegetation and violates the principles of sustained yield.

Each management strategy was viewed as a management objective, except strategy X (exploitative grazing). Strategies A through D required that any damaged resource base be corrected and that the resource base be maintained through responsible land stewardship. Strategies B through D had multiple-use objectives. Strategy E did not have multiple-use objectives but required stewardship of the land and water resource base; it was applied only to private lands.

Range Management Practices

EVAL recognized 24 range management practices that could be used to attain the appropriate management strategy (Table 2). The EVAL team developed policies and speci-

Table 2. Range management practices used on the Oregon Range Evaluation Project Area.

Range management practice	Cost-share		Agency
	Percent	Dollars per acre	
Fertilization	50		SCS
Irrigation	75		SCS
Drainage	50		SCS
Brush control:			
Mechanical		75	SCS
Chemical	75		SCS
Biological	75		NFS
Fire	75		NFS
Debris disposal	75		NFS ¹
Weed control (non-woody)	75		OSUES
Mechanical soil treatments	75		SCS
Seeding	75		SCS
Prescribed burning	75		NFS ¹
Rodent control	75		OSUES
Insect and disease control	75		NFS
Small water developments	75		SCS
Large water developments	75		SCS
Fences	75		SCS
Precommercial timber thinning	75		NFS ¹
Planned grazing systems:			
Deferment		0.50	SCS
Rest		1.00	SCS
Livestock access trails	75		SCS

¹Field work done by Oregon Department of Forestry.

SCS = Soil Conservation Service; NFS = National Forest System; OSUES = Oregon State University Extension Service.

fications for each practice, assigned technical responsibility to a specific agency for private and non-Federal lands; and determined the Federal cost-share—generally 75%. Requirements for State or Federal permits were met, and archaeological surveys were done on both Federal and private lands where practices would result in ground disturbance.

Long-Term Agreements

Long-term agreements were the contracts between the Forest Service and private landowner for the range improvement practices. This contract was the action plan for the coordinated resource management plan, which the landowners were required to have before they could enter into an agreement. The long-term agreements followed the same format used by the Agricultural Stabilization and Conservation Service to implement the Forestry Incentives and Agriculture Conservation Programs. For each pasture, an agreement specified practices to implement; extent approved, such as number of acres, miles, or units; Federal cost-share in percent and dollars; and year to perform. In addition, space was provided for adding the extent completed, actual Federal cost-share, and month paid (Fig. 4). The total cost-share for an individual landowner was limited to \$50,000; for cooperative grazing associations the limit was \$80,000. These limits were subject to review and individual adjustment by the EVAL team. Landowners could choose to install practices with their own equipment, labor, or both, and be eligible for Federal cost-sharing when the job was satisfactorily completed; or they could contract part or all of the job.

The long-term agreements allowed access for research personnel to establish plots and collect data on private lands. They also obligated the private landowner to provide cost data on installing the range practices and to provide records of actual use for each pasture included in the agreement. The landowner was obligated to maintain the agreed-upon practices for the duration of the Project. If a ranch was sold, the new owner could stay with the EVAL project and sign the existing management plan and long-term agreement after mutual agreement to any modifications. If the new landowner elected not to continue, the seller was liable for reimbursing the Federal Government for all cost-shared dollars received under the agreement.

Monitoring

The Forest Service, Pacific Northwest Research Station, was assigned monitoring responsibilities for the Oregon Range Evaluation Project. The initial monitoring assignment broadly consisted of assessing environmental effects, economic returns, and social benefits (Table 1). Analysis of range practices needed to achieve a prescribed management strategy emphasized economic input to accomplish production goals with the least cost. Ongoing practices were carefully monitored throughout EVAL to determine which practices were environmentally or socially unacceptable or uneconomical. The production of herbage as a result of timber harvesting activities, which have a much greater impact on a site than do range management activities, was not within the scope of EVAL. Sites subjected to timber harvesting within 5 years preceding EVAL were, therefore, avoided when monitoring locations were selected.

Monitored Outputs

The 6 outputs remaining from the original 18 were divided into 3 primary groups: (1) AUM's, herbage and browse production, herbage and browse utilization and stocking; (2) water yield, storm runoff, and water quality, which included sediment; and (3) economic assessment, which included employment, animal value, and cost accounting.

To accomplish the economic assessment and evaluate the investments in precommercial thinning, the value of wood yield had to be included. Some of the discontinued outputs were completed under the terms of cooperative agreements made before 1982; these included birds (Skirvin 1981), dispersed recreation, scenic beauty (Sanderson et al. 1986), and cultural heritage (Patterson 1982). Reports on the remaining 6 outputs and their related components were analyzed and are being published in various scientific outlets.

Summary

In terms of cooperation, development of management plans, implementation of range practices, and technology transfer, the Oregon Range Evaluation Project was success-

ful. One of the most notable aspects of EVAL was the excellent interagency cooperation and the cooperation provided by the private landowners. During the course of the project, 22 coordinated resource management plans and 21 long-term agreements were developed and implemented. More than 1,000 range practices were established on 58,000 acres of private land and on 283,000 acres of public land. EVAL stimulated sufficient interest in range management improvements that more ranchers are now requesting technical assistance than prior to EVAL, especially for thinning the tree overstory. In some cases range practices are being initiated without the benefit of matching funds. Also as a result of EVAL, the Oregon Department of Forestry has instituted 20-foot minimum spacing of trees following precommercial thinning as the standard requirement for this practice.

More than 100 theses, reports, and publications have been produced as a consequence of EVAL, and the final analyses are being prepared for publication. These results will provide private landowners, land managers, and environmental groups with economic and environmental information useful in range management. Owners of private land who manage comparable vegetative types will be able to analyze their investments with greater knowledge about costs and returns. Land managers will better understand the environmental interactions of range management activities, and thereby avoid potential conflicts and better understand costs and returns of various management strategies.

Literature Cited

- Dickens, S.N. 1955.** Oregon geography. 2nd ed. Edwards Bros., Eugene, Ore., and Oregon State University Bookstore, Corvallis.
- Forest-Range Task Force. 1972.** The nation's range resources—a forest-range environmental study. USDA Forest Serv. For. Resour. Rep. 19.
- Fowler, W.B., J.D. Helvey, and C. Johnson. 1979.** Baseline climatic and hydrologic relationships for the High Ridge Evaluation Area. USDA Forest Serv. Gen. Tech. Rep. PNW-91.
- Garrison, G.A., A.J. Bjugstad, D.A. Duncan, M.E. Lewis, and D.R. Smith. 1977.** Vegetation and environmental features of forest and range ecosystems. USDA Agric. Handb. 475.
- Patterson, G.J. 1982.** Threatened eastern Oregon lifestyles: ranchers, Indians, and loggers in Grant and Harney Counties, Bibliophilos. 1(2):71-81.
- Sanderson, H.R., R.A. Meganck, and K.C. Gibbs. 1986.** Range management and scenic beauty as perceived by dispersed recreationists. J. Range Manage. 39(5):464-469.
- Skirvin, A.A. 1981.** Effect of time and time of season on the number of observations and density estimates of breeding birds. p. 271-274. In: Studies in Avian Biology No. 6: Estimating Numbers of Terrestrial Birds. Ralph, C.J., and J.M. Scott (editors). Cooper Ornithological Society. Allan Press, Inc., Lawrence, Kans.
- U.S. District Court for the District of Columbia. 1975.** Natural Resource Defense Council, Inc. et al. vs. Rogers C.B. Horton et al. Case 1983-73.