FOREST SERVICE HANDBOOK
OGDEN, UTAH

FSH 2209.21 - RANGELAND ECOSYSTEM ANALYSIS AND MANAGMENT HANDBOOK

Region 4 Amendment No. 2209.21-93-1

Effective May 18, 1993

POSTING NOTICE: Amendments to this title are numbered consecutively by title and calendar year. Post by document name. Remove entire handbook and replace with this amendment. Place this transmittal sheet at the front of the handbook and retain until the first transmittal of the next calendar year is received.

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Digest:

2209.21 - Please read the new posting notice carefully. These directions apply to this transmittal only.

Entire text is replaced. New text corresponds with text located in the R-4 Public Files.

The electronic document names are shown above for ease in accessing them yrom R-4 Public Files.

Hard copy exhibits are referenced in the text and issued hard copy only.

All subsequent amendments will be issued by document.

Updates guidelines and direction for the conduct of allotment management planning, including range analysis, the determination of suitability, ecological status, resource value ratings, ecological scorecards, the determination of trend, rangeland monitoring and evaluation, and data evaluation.

GRAY F. REYNOLDS
Regional Forester

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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

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01 - AUTHORITY. Rangeland analysis and allotment planning is conducted on a Nation-wide basis under the guidelines provided in the Forest Service Manual, Section 2210 and 2060, the 2209.14 Service-wide Range Analysis and Management Handbook, the 2090.11 Ecosystem Classification, Interpretation, and Application Handbook, and under the authority of the National Environmental Policy Act of 1969, the National Forest Management Act of 1976, and the Public Rangelands Improvement Act of 1978. These instructions and guides are written under the authority vested in the Regional Forester by FSM 2204.2, 2212.04, 2210.4, 2214.04, 2060.4, and 2062.4.

04 - RESPONSIBILITIES.

1. Forest Supervisors. Forest Supervisors may supplement instructions of this Handbook after the proposed supplement has had peer and scientific review, or if the material or methods are taken from cooperating Agency or Interagency Handbooks, and the material has been reviewed by the Regional Office Range Management Staff.

05 - DEFINITIONS.

Allotment Management Plan. A long term operating plan which is the implementing document for the decision made through the National Environmental Policy Act process that promotes progress toward desired future conditions.

Allowable Use. The degree of utilization considered desirable and attainable on various specific parts of an allotment considering the present nature and condition of the resource, management objectives, and level of management.

Animal Unit. Considered to be one mature dry cow of approximately 1000 pounds based upon an average daily forage consumption of 26 pounds dry matter per day. (Abbr. A.U.)

Animal Unit Month. (1) The amount of dry forage required by a 1000 pound dry cow for one month. Not synonymous with head month.

Apparent Trend. An estimate of trend drawn from the presence or absence of indicators noted or measured during a one-time observation. Conclusion drawn from such a method can be borne out or refuted only by making additional observations or measurements over time. Apparent trend is described in the same terms as measured trend except that when no trend is apparent it shall be described as "not apparent."

Benchmark. (1) A permanent reference point. (2) In range monitoring, it is used as a point where changes in vegetation through time are measured.

Browse. That part of shrubs, woody vines, and trees available for animal consumption from plants which are palatable to wildlife and/or domestic animals.

Canopy Cover. The percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of plants. Small openings within the canopy are included. The sum of canopy cover of several species may exceed 100 percent. (Syn. crown cover).

Carrying Capacity. The maximum number of animals that can be grazed on a land unit for a specific period of time without inducing damage to vegetation or related resources. It may vary from year-to-year on the same area due to fluctuating forage production. (Syn. grazing capacity.)

Class of Livestock. Age and/or sex group of a kind of livestock. (cf. class of animal.)

Community type. An aggregation of all plant communities distinguished by floristic and structural similarities in both overstory and undergrowth layers. A unit of vegetation within a classification.

Composition. The proportions of various plant species in relation to the total on a given area. It may be expressed in terms of cover, density, weight, etc.

Coordinated Resource Management (CRM). The process whereby various user groups are involved in discussion of alternative resource uses and collectively diagnose management problems, establish goals and objectives, and evaluate multiple use resource management.

Cover, Percent. The area covered by the combined aerial parts of plants and vegetative ground cover expressed as a percent of the total area.

Cover Type. The existing vegetation on an area.

Critical Area. A portion of rangeland which has a critical issue related to it, such as a threatened or endangered or sensitive species, a high use recreation area, or a key wildlife habitat. The area serves as a monitoring and evaluation site for the critical issue.

Cryptogam. A plant in any of the groups Thallophytes, Bryophytes, and Pteridophytes--mosses, lichens, and ferns.

Density. Numbers of individuals or stems per unit area. (Density does not equate to any kind of cover measurement.)

Desirable Plant Species. Species which contribute to the management objectives.

Desired Future Condition - Rangelands. The specific future condition of rangeland resources that meets management objectives as identified in the Forest Plan and Allotment Management Plan. Desired future condition of rangelands can be expressed in terms of ecological status of the vegetation; it could include species composition, diversity of habitats, or age classes of species; desired soil protection, including conditions

of soil cover, erosion, compaction, and loss of soil productivity; in riparian areas, it includes conditions of streambank and channel stability, stream habitat, streamside vegetation, stream sedimentation, and water quality.

Desired Plant Community. A plant community which produces the kind, proportion, and amount of vegetation necessary for meeting or exceeding the Forest Land Management Plan or Allotment Management Plan plan objectives established for an ecological type(s). The desired plant community must be consistent with the type's capability to produce the desired vegetation through management, land treatment, or a combination of the two. The desired plant community must conserve to the extent practicable the long-term potential of the site to produce vegetation, and produce in the short-term those combinations of desired goods and services.

Ecological Keys. Keys used to show the relationship among plant community types and their ecological status in an ecological type. A key groups the community types within an ecological type. Community types are correlated to a status or seral stage.

Ecological Site. A specific location on the land that is representative of an ecological type.

Ecological Status. The degree of similarity between the existing vegetation (all components and their characteristics and existing soil conditions compared to the potential natural community and the desired soil condition on a site. Syn with successional status.

Ecological Type. A category of land having a unique combination of potential natural community, soil, landscape features, climate, and differing from other ecological types in its ability to produce vegetation and respond to management. Lacking potential natural community vegetation, ecological types can be developed with a provisional potential natural community based upon the present plant community and abiotic environmental factors. Categories of ecological types include all sites that have this unique combination of components with the defined ranges of properties.

Ecological Unit. The mapping unit developed for an ecological type or types designed to meet management objectives. A riparian ecological unit is a mapping unit developed for riparian ecological type or types. This unit often includes a complex of small and intricately associated riparian communities. In some cases, the ecologcial unit may be described without describing the individual ecological types that make up the unit.

Endangered Species. Any species listed in the Federal Register, which is in danger of extinction throughout all or a significant portion of its range other than a species of the class insecta determined by the Secretary to constitute a pest whose protection under the provisions of the act would present an overwhelming and overriding risk to man.

Erosion Pavement. A concentration of gravel or coarser fragments (1/8 inch to 3/4 inch) that remains on the soil surface after finer particles have been removed by running water or wind.

Forage. All browse and herbaceous foods that are available to grazing animals. It may be grazed or harvested for feeding.

Frequency. A quantitative expression of the presence or absence of individuals of a species in a population.

Forb. Any herbaceous plant other than those in the Gramineae (or Poaceae), Cyperaceae, and Juncacea families.

Grass. A member of the family Gramineae (Poaceae).

Grasslike Plant. A plant of the Cyperaceae or Juncaceae families which vegetatively resembles a true grass of the Gramineae family.

Grazing System. A specialization of grazing management which defines systematically recurring periods of grazing and deferment for two or more pastures or management units. (cf. deferred grazing, intermittent grazing, deferred-rotation grazing, and short-duration grazing.)

Grazing Formula. The specific order of grazing or sequence within a grazing system.

Green Line. The first perennial vegetation from the water's edge. Riparian areas that are in high seral status with stable stream banks will exhibit a continuous line of vegetation at the bankfull discharge level. Rocky stream types may have a significant amount of rock causing breaks in the vegetation. This rock is considered part of the green line. Other breaks may occur in the first perennial band of vegetation (watercourses or bare ground). The amounts of these (perennial vegetation, rock, and bare ground) should be recorded.

Ground Cover. The percentage of material, other than bare ground, covering the land surface. It may include live vegetation, standing dead vegetation, litter, cobble, gravel, stones and bedrock. Ground cover plus bare ground would total 100 percent.

Half-Shrub. A perennial plant with a woody base whose annually produced stems die each year.

Head Month. A month's use and occupancy of range by one animal over 6 months of age with disregard for offspring and daily feed or forage requirements. (Abbr H.M.) Not synonymous with animal unit month.

Herb. Any flowering plant except those developing persistent woody stems above ground.

Herbage. Herbs taken collectively.

Indicator Species. (1) Species that indicate the presence of certain environmental conditions, seral stages, and/or previous treatment. (2) One or more plant or animal species selected to indicate a certain level of use.

Interdisciplinary Team. A group of individuals from different resource disciplines assembled to solve a problem or perform a task. The team is

assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. The members of the team proceed to solution with frequent interaction so that each discipline may provide insights to any stage of the problem and disciplines may combine to provide new solutions. This is different from a multidisciplinary team where each specialist is assigned a portion of the problem and their partial solutions are linked together at the end to provide the final solution.

Key Area. A relatively small portion of rangeland which because of its location, grazing or browsing value, and/or use, serves as a monitoring and evaluation site. (A key area guides the general management of the entire area of which it is a part, and will reflect the overall acceptability of current grazing management over the range.)

Key Species. (1) Forage species whose use serves as an indicator to the degree of use of associated species. (2) Those species which must, because of their importance, be considered in the management program.

Landform. Any physical, recognizable form or feature of the earth's surface having a characteristic shape and produced by natural causes.

Litter. The uppermost layer of organic debris on the soil surface, essentially the freshly fallen or slightly decomposed vegetal material.

Monitoring. The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives.

Objective. A clear and quantifiable statement of planned results to be achieved within a stated time period. Something aimed at or striven for within a predetermined time period. An objective must: be achievable, be measurable, have a stated time period for completion, be quantifiable, be clear, and its results must be described.

Overstory. The upper canopy or canopies of plants. Usually refers to tress, tall shrubs, and vines.

Palatability. The degree of attractiveness of a plant to animals as forage.

Pedestalled Plants. Plants which are growing on a hummock of soil as a result of water or wind erosion removing the soil from the interspaces between plants. In some situations, this may also occur from frost heaving.

Percent Use. The percentage of current year's forage production that is consumed or destroyed by grazing animals. May refer to a single species or to the vegetation as a whole.

Phenology. The study of periodic biological phenomenon, such as flowering, seeding, etc., especially as related to climate.

Photopoint. An identified point from which photographs are taken at periodic intervals. Syn., camera point.

Plant Community. An assemblage of populations of plants in a common spatial arrangement.

Plant Vigor. Plant health. (cf. plant vigor index.)

Potential Natural Community (PNC). The biotic community that would become established on an ecological type if all successional sequences were completed without interference by man under the present environmental conditions. Natural disturbances, such as drought, floods, wildfire, grazing by native fauna, insects, and disease, are inherent in its development. The PNC may include acclimatized or naturalized non-native species.

Proper Use Criteria. The limiting factor or factors which will be measured on a particular site. It could be percent utilization of forage, impact on other resources or uses, or any other measurable factor on a particular site.

Range Analysis. Systematic acquisition and evaluation of rangeland resources data needed for planning allotment management and overall land management.

Range Inspection. A field inspection of rangeland to determine if the Forest Plan Standards and Guides, the Allotment Management Plan Goals and Objectives, and the Grazing Permit requirements are being met and followed.

Range Site. Synonymous with ecological site when applied to rangeland.

Rangeland. All land-producing or capable-of-producing native forage for grazing and browsing animals, and lands that have been revegetated naturally or artificially to provide a forage cover that is managed like native vegetation. It includes all grasslands, shrublands, and those forest lands which will continually or periodically, naturally or through management, support an understory of herbaceous or shrubby vegetation that provides forage for grazing or browsing animals.

Rangeland Condition. The state of vegetation, soil cover, and soils in relation to a standard or ideal for a particular ecological type. (See satisfactory rangeland and unsatisfactory rangeland condition.)

Relict (Relic) Area. A remnant or fragment of a flora that remains from a former period when it was more widely distributed.

Research Natural Area. Part of a national network of reserved areas that include protected areas representative of the full array of North American ecosystems; biological communities, habitats, phenomena, and geological and hydrological formations and conditions.

Resource Value. The value of an ecosystem for a particular use or benefit on an ecological type. This value may be expressed as the value amount or as a relative rating, when compared to the maximum value for an ecological type.

Resource Value Rating (RVR). A rating of the value of vegetation present on an ecological type for particular use or benefit. RVR's may be

established for each plant community capable of being produced in an ecological type, including exotic or cultivated species.

Riparian Area. Geographically delineable areas with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems. Riparian areas may be associated with lakes, reservoirs, estuaries, potholes, springs, bogs, wet meadows, muskegs, and ephemeral, intermittent, or perennial streams.

Riparian Community Type. A repeating, classified, defined, and recognizable assemblage of riparian plant species.

Riparian Complex. A repeating, classified, defined, and recognizable assemblage of riparian community types.

Riparian Ecosystem. A transition between the aquatic ecosystem and the adjacent terrestrial ecosystem and is identified by soil characteristics and distinctive vegetation communities that require full or unbound water.

Rotation Grazing. A grazing scheme where animals are moved from one grazing unit in the same group of grazing units to another without regard to specific graze-rest periods or levels of plant defoliation.

Satisfactory Condition. When the desired future rangeland condition is being met or short term objectives are being achieved to move the rangeland toward the desired future condition.

Sensitive Species. Those plants and animals identified by the Regional Forester for which population viability is a concern, as evidenced by 1) a significant current or predicted downward trends in population numbers or density, or 2) a significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Seral Stage. The relatively transitory communities which develop under ecological succession. (synonymous with seral communities).

Shrub. A plant that has persistent, woody stems and a relatively low growth habit, and that generally produces several basal shoots instead of a single bole. It differs from a tree by its low stature and nonarborescent form.

Succession, Plant. The process of vegetational development whereby an area becomes successively occupied by different plant communities of higher ecological order.

Suitable Range. Rangeland that is accessible and used by grazing animals, that produces forage or has inherent forage producing capabilities, and that can be grazed on a sustained yield basis under reasonable management goals. (cf. unsuitable range.)

Species Composition. The proportions of various plant species in relation to the total on a given area. It may be expressed in terms of cover, density, weight, and so on.

Threatened Species. Any species listed in the Federal Register which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Trend. The direction of change in a plant community, ecological type, or an attribute as observed over time. The change in direction could be in ecological status; resource value rating; or a vegetative, ground cover, or soil feature over time. Most of the time trend should be described as "meeting", "moving toward", or "not meeting" a desired plant community. Trends in resource value ratings for several uses on the same site at a given time may be in different directions. There is also no necessary correlation between trends in resource value ratings or desired plant community and trend in ecological status.

Unsatisfactory Rangeland Condition. Unsatisfactory rangeland condition is when the desired future rangeland condition is not being met and short term objectives are not being achieved to move the rangeland toward the desired future condition. (cf. satisfactory range condition.)

Unsuitable Range. Rangeland which has no current value or which should not be used because of physical or biological restrictions, or lack of improvements that would allow use.

Vigor. The relative robustness of a plant in comparison to other individuals of the same species. It is reflected primarily by the size of a plant and its parts in relation to its age and the environment in which it is growing.

06 - GENERAL INSTRUCTIONS. Range analysis is a program concerned with the systematic collection and evaluation of rangeland resource data. It consists of identifying and mapping ecological types and the plant species within these types, suitability for grazing by livestock, and the ecological condition of the range. It also provides for the determination of the desired future condition of the rangeland. It provides for the periodic measurement of trend and the monitoring of condition. This information is used in planning and in making management decisions for range allotments.

The National Forest Management Act and the implementing regulations identify certain information needs concerning National Forest System rangeland. This information shall be collected through range analysis and allotment management planning. These needs are:

1. Identify suitability and potential capability of National Forest System lands for producing habitat and forage for grazing animals.

2. Determine and monitor rangeland condition and trend.

3. Determine the present and potential supply of forage for livestock, wild and free-roaming horses and burros, and the capacity of these lands to produce suitable food and cover for selected wildlife species.

4. Provide for the estimation of available forage supplies for grazing and browsing animals.

5. Identify rangelands in unsatisfactory condition as well as appropriate action for their restoration.

6. Consider alternative range management prescriptions (grazing systems and the facilities necessary to implement them).

7. Identify land treatment and vegetation manipulation practices.

8. Evaluate pest problems.

9. Evaluate possible conflict or beneficial interactions among livestock, wild free-roaming horses and burros and wild animal populations, and methods to regulate these.

10. Determine action to be taken for rehabilitation of rangelands in unsatisfactory condition.

11. Identify comparative cost efficiency of proposed treatments.

12. Evaluate and identify rangeland for quality improvement of soil, water, and air resources.

Rangeland inventory and analysis will meet these requirements if the information is needed for an analysis of the issues associated with the management of the rangelands being planned for.

A total job of range analysis and planning depends upon full cooperation among the persons doing the range analysis job: the District Ranger and District staff, ID team members, the grazing permittee, and rangeland management interest groups, such as wildlife and recreation people. The Ranger and/or the District Resource Assistant must participate to the extent that they become familiar with the techniques and results of the analysis. Rangers and/or their staffs must give administrative guidance and assume leadership in the development and application of environmental assessments and allotment management plans. They are also responsible for assuring permittee understanding and participation in the range analysis. Permittees can provide advice on range improvement needs, the habits of the livestock, and how they graze the allotment. Permittees shall be involved in rangeland analysis and planning.

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CHAPTER 10 - RANGELAND PLANNING

11 - PURPOSE OF RANGELAND PLANNING. The purpose of rangeland planning, through rangeland inventory, analysis, and the allotment management plan (AMP) is to:

1. Set forth in a clear, concise manner how the rangeland vegetation resources on the allotment shall be managed. Broader issues may also be decided concerning rangeland throughtout the planning process. The National Forest Management Act (NFMA) and the National Environmental Policy Act (NEPA) requirements could also bring issues such as road closures, trail heads, fisheries habitat values, and so forth, into the decisions of range vegetation management.

2. Maintain continuity of effort when personnel change.

3. Involve the permittee and interested publics in management of the range allotment.

4. Document a logical systematic program for investment in range improvements.

5. Assure a complete assembly of information in support of decision-making which documents compliance with National Forest Service policy, laws, and regulations, and Regional and Forest land management planning direction.

6. Provide a tie between the Forest Plan and on-the-ground application of standards and guidelines.

7. Provide monitoring criteria and schedules for evaluating management.

12 - STEPS OF THE RANGELAND INVENTORY, ANALYSIS AND PLANNING PROCESSES. The steps of the rangeland inventory, analysis and planning process are:

1. Land Management Plan Scoping Process. Review guidelines and direction in the Forest Plan identifying issues, concerns, opportunities, constraints, and inventory needs. Start biological assessment process by requesting species list from U.S. Fish and Wildlife Service/National Marine Fisheries Service if threatened, endangered, or sensitive species may be encountered.

2. Rangeland Inventory and Analysis. Obtain ID team, interested publics, and permittee assistance in securing the necessary inventory and monitoring information and establish criteria for determining allowable use levels.

3. Analysis of the current management situation. An evaluation of inventory information and a discussion of possible range management alternatives should be presented in a format for communicating and discussing the range management alternatives for the allotment. The timeframe discussed is the foreseeable future. This evaluation presents resource information and the depth of analysis needed to develop the AMP. Included are specialist reports of effects on different resources and biological assessments/evaluations.

4. NEPA analysis and decision. The NEPA process will identify, analyze, and select an alternative for the allotment management plan. Refer to the NEPA Regulations and section 31.

5. Allotment Management Plan. The elements of an AMP are explained in section 32 and FSM 2212.2. The AMP is done in cooperation and communication with the permittee(s) and the interested publics. Approval is by the authorized line officer. If the District Ranger is the authorized line officer, a copy of the approved AMP shall be supplied to the Supervisor's Office.

13 - COORDINATION, COOPERATION, AND CONSULTATION. NEPA, public involvement, interdisciplinary teams, permittee involvement, and Section 8 processes are available to facilitate and insure public participation and cooperation, coordination, consultation, and communications with permittees. While the Federal Land Policy Management Act is clear in its requirement that consultation is necessary during the development of the AMP, it remains the sole responsibility of the Forest Service line officer to determine grazing allotment decisions, including how much grazing will be allowed, on the National Forests. The interdisciplinary (ID) team, the permittee, and interested publics should assist in the rangeland inventory and analysis and in the preparation of environmental documents.

13.1 - Interdisciplinary Team (ID) Involvement. Securing the District/Forest ID team's assistance in all steps of the rangeland planning process will help reduce conflicts between the various disciplines when the prescribed management program is put into effect. The make-up of the ID team should be a reflection of the various issues and coordination aspects to be resolved. If the grazing of riparian areas or stream or lake fisheries are involved and these are key issues, an aquatic biologist and/or a hydrologist should be a member of the team. In some cases, the ID team members may accomplish (or help accomplish) some of the evaluation studies. Note: Current planning direction prohibits non-Forest Service participants as formal ID team members.

13.2 - Cooperation with Permittees. The grazing permittee is an integral part of any successful rangeland management program. The permittee has a great deal of information as to what is practical and workable concerning handling of livestock, practicality of grazing systems, and proper location and type of range improvements. The success or failure of the management program will largely be determined by the permittees' willingness to carry out the plan. Consequently, the use of National Forest System (NFS) rangeland in relation to the ranchers total operation is a fundamental necessity. Permittee cooperation is essential and is provided for in the Federal Land Policy and Management Act. Therefore,

permittees should be brought into all phases of the range allotment planning process. They should be particularly involved in formulating and selecting the preferred alternative and preparation of the management plan.

13.3 - Coordinated Resource Management. Coordinated Resource Management (CRM), sometimes called Coordinated Resource Management Planning (CRMP), is an excellent process to facilitate public participation in the development of an allotment management plan. Formal CRM efforts are particularly appropriate when dealing with opportunities or potential effects or conflicts across multiple ownerships and jurisdictions. CRM is most effective when initiated early in the planning process. CRM can be utilized to help identify and understand existing and desired conditions, to determine opportunities, and to identify possible management practices for consideration in the AMP. The CRM group could identify the specific proposed action and/or alternatives to that action for consideration in the NEPA process. A CRM group can interact throughout the NEPA process as a sounding board for the analysis and selection of actions for decision and implementation.

CRM Handbooks are published for the States of Wyoming, Utah, and Nevada. Handbooks and their associated planning forms can be obtained from the pertinent Supervisors Office or the Regional Office. Also refer to FSM 1580 for the Memorandum of Understanding (MOU) for coordinated resource management in Utah and Nevada.

If the CRM process undertaken through an Interagency Agreement or Memorandum of Understanding produces an allotment management plan that utilizes processes or methods that are described in other Regional, Agency, or scientifically recognized publications, those methods and processes are recognized as valid procedures.

13.4 - Section 8 Agreements. Section 8 of Public Law 95-514 the Public Rangelands Improvement Act of 1978 states "If the Secretary ..... develop(s) an allotment management plan for a given area, he shall do so in careful and considered consultation, cooperation and coordination with the ... permittees, landowers involved, ... and any State or States having lands within the area to be covered by such allotment management plan. Allotment management plans shall be tailored to the specific range condition of the area to be covered by such a plan, and shall be reviewed on a periodic basis to determine whether they have been effective in improving the range condition of the lands involved.... The Secretary concerned may revise or terminate such plans or develop new plans from time to time after such review and careful and considered consultation, cooperation and coordination with the parties involved."

The Intermountain Region has Memorandums of Understanding covering Section 8 consultation, cooperation and coordination with the States of Utah, Idaho, and Nevada. Wyoming has chosen not to enter into a Section 8 MOU but will use the CRM process instead. The intent of these MOUs is to involve the State Department of Agricultures in the AMP process if the process is likely to be controversial in nature. The State's role is to be a neutral facilitator in the allotment management planning process.

All MOUs state that we are to notify the permittee when we begin work on the development or revision of their AMP, and provide opportunities for

their involvement. This should be documented in writing. In Utah and Idaho, we are responsible for advising the permittee of the State Department of Agriculture's availability, and if the permittee desires their involvement, we should notify the State of such and provide an opportunity for their participation. In Nevada, we notify, in writing, the permittee of the State's availability, and of the opportunity for the permittee to request such assistance through application to the Nevada Department of Agriculture. There is a State filing fee or charge to the permittee's in Nevada and Idaho. There is no State filing fee in Utah.

Refer to FSM 1580 for the Section 8 MOU's with Idaho, Nevada, and Utah. Also refer to the procedures for implementation of Section 8 in Idaho written by the Idaho Rangeland Committee.

14 - RELATIONSHIP OF FOREST PLANS TO ALLOTMENT MANAGEMENT PLANNING AND COMPLIANCE WITH NFMA AND OTHER ENVIRONMENTAL LAWS.

14.1 - Role of Forest Plans. Forest Plans establish a management approach for future decision-making. The Forest Plan and accompanying EIS establish a broad framework for management of a National Forest and set the stage for project review. In order to fulfill the statutory obligations arising from the National Environmental Policy Act (NEPA), and numerous other environmental laws and regulations, it is necessary to take a close site-specific look at projects and activities. The basic approach is to use Forest Plan management direction as a gateway to compliance with these environmental laws in making decisions at the project level.

Because Forest Plans are a guiding ordinance rather than a group of project decisions, a two stage decision process is used (Forest Plan and project level, in this case the Allotment Management Plan) so that the many other legal requirements are met prior to critical project decisions.

Forest Plans establish multiple use goals and objectives. Forest Plans put in place management area prescriptions, standards, and guidelines for future decision-making, and are adjustable through monitoring and evaluation, amendment, and revision. The level of analysis needed for a determination of the site specific management of the range resource in grazing allotments was not done at the forest plan level. Except as specifically stated in the Forest Plan Record of Decision, no project, contract, lease or other right to use National Forest System land results from Forest Plan approval. For NEPA and other environmental law purposes, approval of the Forest Plan is direction for future decision-making rather than irretrievable commitments of specific resource activities.

14.2 - Role of Allotment Management Plans.

14.21 - Federal Land Policy Management Act and Public Rangeland Improvement Act.

The Federal Land Policy Management Act, as amended by the Public Rangelands Improvement Act allows for Allotment Management Plans (AMP's) to be included in grazing permits at the discretion of the Secretary of Agriculture. (43 U.S.C.(1752(d))), as amended by 92 Stat. 1803 (1978)).

The Secretary has elected to exercise this discretion, and has delegated his authority to issue regulations in this area to the Chief of the Forest Service. (36 CFR (222.1 et. seq.)).

An Allotment Management Plan is defined in FLPMA and PRIA as a document prepared in consultation with permittees applying for livestock operations on the public lands prescribing (1) the manner in and extent to which livestock operations will be conducted in order to meet multiple use, sustained-yield, economic and other needs and objectives, (2) describing range improvements to be installed and maintained, and (3) containing such other provisions relating to livestock grazing and other objectives found by the Secretary to be consistent with the provisions of the FLPMA. (43 USC (1702(k)), and 36 CFR (222.1 (b)(2)), and (FSM 1023). A suggested statement of legal authority for Allotment Management Plans is shown in section 31 exhibits 01 and 02, Model Text of an Environmental Document and Allotment Management Plan.

14.22 - National Forest Management Act and National Environmental Policy Act. Forest Plans provide broad direction for site-specific resource planning. Allotment management planning attempts to implement this direction through site-specific analysis of the rangeland resource. Allotment management planning will include review of the Forest Plan direction, collection and evaluation of range information, alternative development, environmental and economic analysis, and development of an AMP. The decision to implement a specific AMP is an appealable decision.

The development of an allotment management plan or review of an existing AMP for compliance with the Forest Plan could result in changing management on an allotment; for example, a change in the grazing system, additional range improvements, an adjustment in the grazing season, level of use and/or numbers of livestock to meet Forest Plan direction. Changes in management on an allotment are made through the allotment management planning process, a process including environmental analysis in accordance with NEPA. Consistency of the AMP with the Forest Plan is determined by comparing direction in the AMP with Forest Plan direction stated in terms of forest-wide and management area standards and guidelines. The AMP and grazing permit must be consistent with the Forest Plan. A more complete discussion of grazing permit compliance with Forest Plan direction will follow in section 16.

14.23 - The Endangered Species Act. The Forest Service is a Federal Agency bound by Endangered Species Act of 1973, as amended in 1988 (50 CFR, Part 402) (ESA) requirements. ESA, Section 7, requires Federal Agencies ensure actions funded, carried out or permitted do not jeopardize the continued existence of Federally listed threatened, endangered or proposed species or destroy or adversely modify species' critical habitats.

The Forest Service must fulfill it's obligations under ESA through consultation with either the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS). The Forest Service is responsible for providing the FWS or NMFS all of the pertinent project and species data necessary for them to evaluate the proposed action so they can render a biological opinion (BO).

The consultation procedure for threatened or endangered species is as follows:

If FWS or NMFS advises the Forest Service that a threatened, endangered species may be present in the area of a proposed or on-going action, the Forest Service must conduct a biological assessment (BA) to determine whether the action is likely to affect the listed species.

The BA will determine if the action has (1) no effect or (2) may effect the listed species.

1. A no effect determination. If the determination is no effect, the FS may proceed without further consultation.

2. A may effect determination.

   a. If the determination is a may effect, but not likely to adversely affect the listed species, the Forest Service must enter informal consultation with FWS or NMFS and get written concurrence from them that they agree. FWS or NMFS does not have any specific timeframe to conclude the consultation process unless the action requires an EIS, which then requires a 30 day response from FWS or NMFS.

   b. If the determination is a may affect and likely to adversely affect the listed species, the Forest Service must enter into formal consultation with FWS or NMFS. FWS or NMFS has 135 days to respond with their BO of whether or not the action will jeopardize the continued existence of the species or destroy or adversely modify it's critical habitat. While formal consultation is underway the action is not allowed to proceed. The taking of threatened, and endangered species except under a FWS or NMFS permit is prohibited. When FSW or NMFS issues a BO, any terms and conditions issued as part of an incidental take authorization are mandatory.

FSM 2670 provides additional direction on requirements for compliance with ESA. Proposed species are also protected and their ESA requirements are slightly different from threatened and endangered species and FSM 2670 should be reviewed to ensure compliance of proposed species. Proposed species coordination with FWS or NMFS is called conferencing and a biological assessment and specific coordination with FWS or NMFS is required.

Biological assessments and evaluations must be either prepared or reviewed by journey level (GS-11) biologists and botanists.

Sensitive species are designated by the Regional Forester and the requirements for protection and management of sensitive species are found in FSM 2670. Sensitive species are not addressed in the ESA. Some key requirements of the FSM 2670 for sensitive species are:

1. A biological evaluation (BE) must be prepared to review proposed Forest Service actions (those activities funded, carried out or permitted) to determine their potential effect on sensitive species.

2. Forest Supervisors are required to ensure compliance with procedural and biological requirements for sensitive species and to develop quantifiable objectives for managing populations and/or habitat for sensitive species. A key responsibility is to develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions.

3. Avoid or minimize impacts to species whose viability has been identified as a concern and prohibit the collection or taking of sensitive plants except as authorized by Regional Policy (see R4 FSH 2609.25).

See exhibit 01 for schematic of the process.

14.23 - Exhibit 01

Integrating ESA and NEPA

EXHIBIT 01 IS A SEPARATE DOCUMENT.

FSH 2209.21 - RANGELAND ECOSYSTEM ANALYSIS AND MANAGEMENT HANDBOOK
R-4 AMENDMENT 2209.21-93-1
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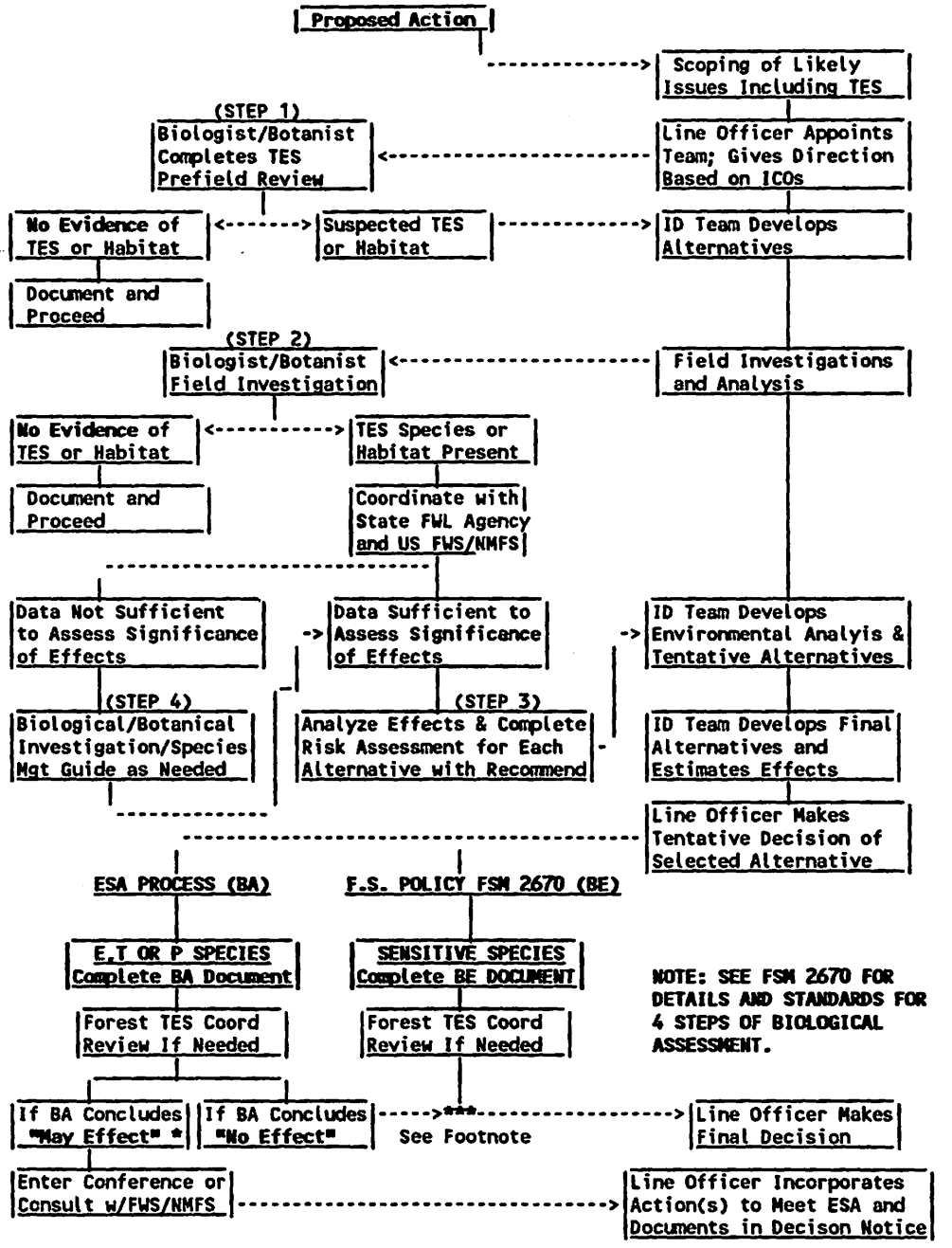
14.23 - Exhibit 01

INTEGRATING ESA and NEPA



* "May Effect" could mean either Beneficial Affect, Not Likely to Adversely Affect or Likely to Adversely Affect. Likely to Adversely Affect requires Formal Consultation

*** Line Officer should consider voluntary informal consultation with FWS/NMFS if "No Effect" could be a controversial determination.

15 - ALLOTMENT MANAGEMENT PLANNING PROCESS. The AMP prescribes the manner and extent to which livestock operations will be conducted in order to meet multiple use, sustained-yield, economic, and other needs and objectives. Accordingly, the AMP must integrate resource objectives, standards, guidelines, and management requirements for soil and water for watershed protection, wildlife and fisheries, recreation, timber, and other resources on lands within a range allotment. The AMP conforms with and consistently implements the management direction contained in the Forest Plan.

An AMP may be developed in the traditional approach of prescribing the manner and extent of livestock grazing in managing rangeland resources on a particular grazing allotment. Or, the Annual Operating Plan may describe how the Forest Plan Standards and Guides, as spelled out in Part Three of the Grazing Permit, will be accomplished. (See exhibit 01).

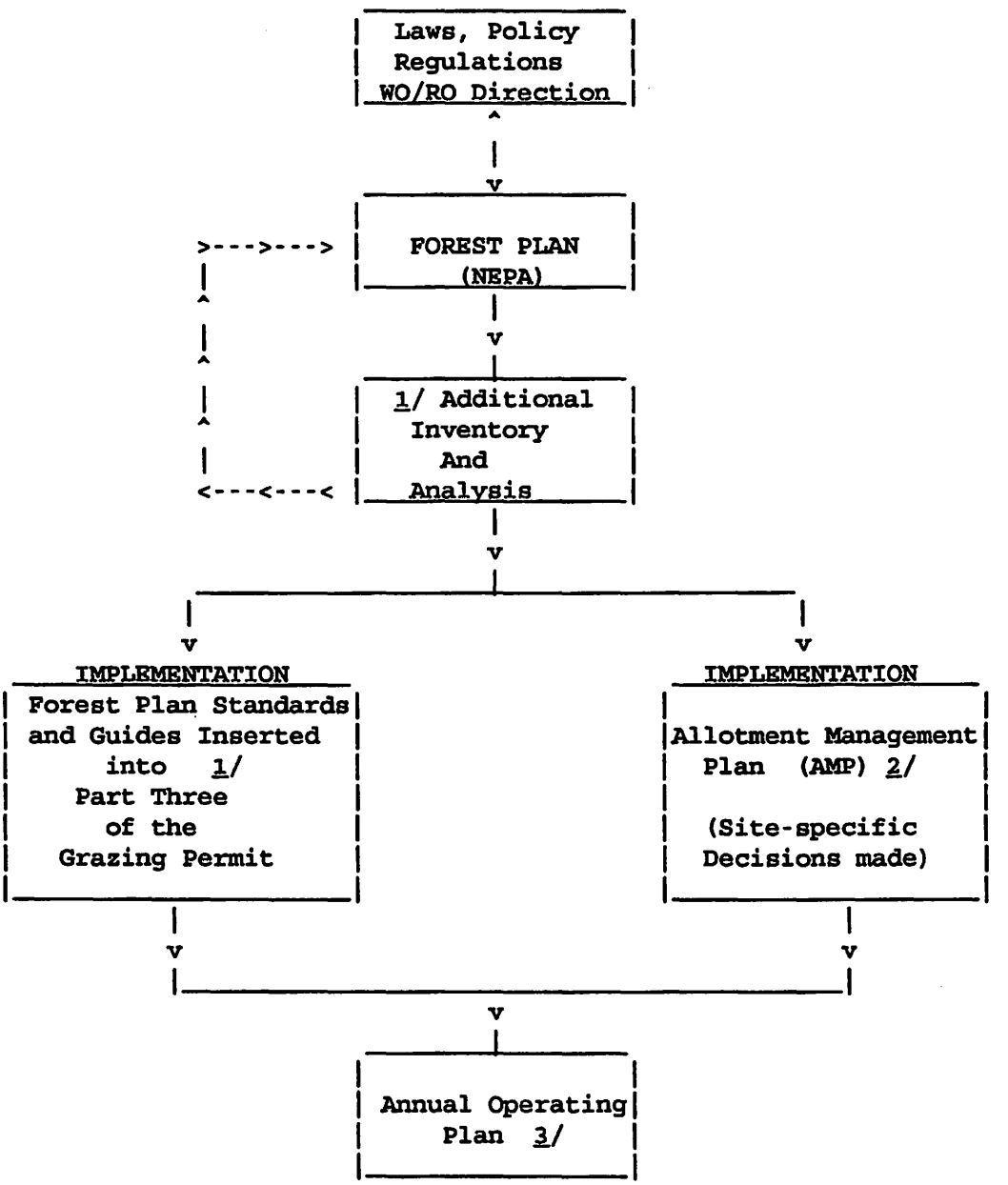
Both approaches should begin by comparing the desired future condition expected by the Forest Plan with the existing condition to determine if changes need to occur. If changes are needed, management opportunities are explored and a list of possible management practices are evaluated in time and space to determine if Forest Plan goals, standards, and guidelines can be met. A list of management practices, which could include actions pertaining to a range allotment, are developed to implement the Forest Plan.

Any proposed action resulting in the development or revision of an AMP or to the Forest Plan would be subject to NEPA compliance. Also, in either approach, an integrated resource inventory is strongly encouraged to gather all necessary resource information for the defined geographic area and avoid functional inventory and analysis.

It is important to recognize that with implementation of Forest Plans, the process of developing site-specific project proposals has changed. The process of developing an AMP now begins with the Forest Plan on the NFMA or land management side of the Forest Plan implementation triangle (see exhibit 02), prior to the NEPA or environmental analysis side of the triangle.

15 - Exhibit 01

ALLOTMENT MANAGEMENT PLAN DEVELOPMENT PROCESS



1/ NEPA documentation is usually not required; no site-specific decision made.

2/ Appropriate environmental analysis and documentation required by NEPA.

3/ Environmental analysis for minor adjustments usually may be categorically excluded from NEPA documentation except in extraordinary circumstances.

15 - Exhibit 02

The Whole Process...

FOREST PLAN IMPLEMENTATION

NFMA

Forest Plan Consistency

Possible Management Practices

Opportunities

Existing/Desired Condition

Location

Adjustment

NEPA

Proposed Action
Purpose and Need

Scoping
Issue identification
Alternatives

Effects
NFMA Findings
Significance
Decision

Notification

Evaluation

Monitoring

FEEDBACK

STEPS IN THE NFMA PROCESS

Forest Plan-- the process starts here.

1. Locate the area.
2. Determine the desired conditions/existing conditions.
3. Determine opportunities (What needs to be done).
4. Identify possible management practices (How to do it).
5. Are practices consistent with the Forest Plan.
6. List possible practices.

15.1 - National Forest Management Act (NFMA) Process. The following NFMA steps in the allotment management planning process should be completed prior to beginning the NEPA process:

1. Locating or Identifying the Area. This task is straight-forward for allotment management planning in that allotment boundaries are defined. Forest implementation schedules to bring grazing permits and allotments into compliance with forest plans have already identified priority and scheduling of allotments. Some Forests have given additional consideration to grouping allotments with similar topography, habitat types, and issues to streamline the inventory and analysis process.

2. Determining the Desired Conditions/Existing Conditions. This step should have also been partially completed with completion of forest implementation schedules to prioritize and schedule allotments for completion of AMP's. Identification that a particular allotment is not in compliance with the Forest Plan should be based on some comparison of existing conditions on the allotment with desired future conditions described in the Forest Plan.

While preliminary identification that an allotment is not in compliance with Forest Plan direction may have been made in the Range Action Plan schedule for the forest, sufficient information to assess existing soil and vegetation resources and their relationship to fish and wildlife habitat, livestock forage, and sensitivity to ground disturbing activities is likely not available at this stage. Adequate inventory information will be needed to define the existing status of affected resources as they relate to existing plant communities and the potential of the land to support desired plant communities (desired future condition). This information gathering process should be driven by the issues and concerns identified and only that level of data should be collected. This information will be used in later steps of the NFMA process, including determining what needs to be done, how to do it, consistency with the forest plan, and in the NEPA process to evaluate alternatives and conduct effects analysis.

It is critical that an interdisciplinary approach be utilized in developing the objectives of the inventory or identifying the information that is needed to make appropriate management interpretations. Inventory information is generally related to geographic areas or map units for purposes of analysis. In designing an inventory and mapping project, the intended users of the map must be consulted to determine the types of information that will be needed to make management interpretations. In vegetation mapping the existing vegetation of the landscape is described which in turn provides information for wildlife (for example, hiding cover, forage areas, thermal cover), timber (for example, merchantable volume), range (for example, forage values), and watershed (for example, ground cover) resource uses. An interdisciplinary approach to map unit design facilitates cost efficient inventory and mapping and interpretive information for a variety of resource considerations. An example of considerations and objectives that could be developed prior to any actual inventory can be found in exhibit 01.

Vegetation which will not protect the site potential should not be considered desirable. Some sites will experience deterioration in site productivity due to landscape evolution or other causes regardless of the management applied to them, that is, they do not have the potential to maintain themselves. A vegetation type which will adequately protect the site may not be attainable on some ecological types without management interventions which are not technically feasible, environmentally acceptable, or economically viable.

Description of the desired plant community should be based on attributes of vegetation which will provide the optimum mixture of resource value ratings to meet the objectives of land stewardship and the publics interested in it's management. Deciding on the desired plant community for a given situation involves several aspects. The first is the potential of the site. A range of possible, broad plant community types, including seeded stands, exotic species, and so forth, should be described for each ecological type. The description of such types should be kept fairly general and should preferably be based on actual examples of the type that have been observed in the field. Resource values for all contemplated uses or values can be estimated for each of the several vegetation types. Required management prescriptions can be described which are necessary to move present vegetation at any given location on an ecological type toward any of the possible alternative vegetation types. Knowing the possible vegetation types, the range of possible outputs obtainable from them, and the costs of achieving each forms the basis for deciding on the desired plant community for each given situation. Thus, the desired plant community must be (1) realistic considering site potential, and (2) described at a level of detail appropriate for the level planning and intensity or effectiveness of management to be applied.

15.1 - Exhibit 01

PROJECT OUTLINE FOR COORDINATED RESOURCE INVENTORY FOR RANGE AND MINERALS PROJECTS JIM BRIDGER RANGER DISTRICT HIGHTOP NATIONAL FOREST

INTRODUCTION

A coordinated resource inventory will be completed for the Jim Bridger Ranger District which will provide resource information needed to support management decisions for eleven allotment management plans and determining which lands are suitable for oil and gas leasing. The coordinated resource inventory will provide an assessment of existing soil and vegetation resource and its relationship to wildlife habitat, livestock forage and sensitivity to ground disturbing activities. The existing condition will be related to the desired future condition, based on land capability or potential. The inventory will provide information needed for completing cumulative effects analysis and evaluating management alternatives, as required by NEPA.

PRIMARY OBJECTIVES

Define the existing status of the affected resources as related to existing plant communities and the potential of the land to support the desired plant communities (desired future condition). Information will be used in the NEPA process for evaluating management alternatives and cumulative effects analysis for allotment management plans and oil and gas leasing, as they are related to identified issues.

1. Complete a coordinated resource inventory which will map and describe existing community types, and their resource values.

   a. WILDLIFE - Describe forage/cover values for upland birds (sagegrouse and sharptail) and mule deer. Describe existing forage/browse production for existing and potential community types, on key wildlife habitat.

   b. RANGE RESOURCE - Describe existing status of range resource as it relates to the desired plant community.

      Identify suitable and unsuitable range.

      Identify areas of conifer encroachment and increased shrub cover.

      Identify areas with overstocking and/or potential overstocking problems where further utilization studies may be needed to determine the appropriate stocking level.

15.1 - Exhibit 01--Continued

c. RIPARIAN AREAS - Describe existing status of riparian areas.

Describe existing plant communities as compared to the potential of a site to support a diversity of overstory and understory vegetation (compare disturbed sites to minimally disturbed or undisturbed sites) .

Describe characteristics of riparian areas important for maintaining fish habitat (bank stability, stream side cover).

d. MINERALS (OIL AND GAS LEASING EIS) - Identify:

Slopes greater than 40%

Riparian areas and wetlands

Wildlife habitat (elk, mule deer, and big horn sheep. Identify key summer, winter and transitory habitat and characterize by important plant communities or plant associations

Identify areas sensitive to disturbance (shallow soils, areas with high erosion or mass wasting potential.

e. THREATENED, ENDANGERED AND SENSITIVE SPECIES

Describe plant communities or plant associations important for providing habitat for peregrine falcon, bald eagle, raptors, (identify and describe important habitat, see attached wildlife/plant association matrix).

Request species list from U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service. Start biological assessment for threatened, endangered, and proposed and sensitive species for the proposed action (e.g. allotment management plan), or all alternatives as the line officer decides.

Complete sensitive plant inventories (correlate sensitive plant species with associated habitat types or ecological types).

f. BIO-DIVERSITY - Describe the occurrence of various plant communities on the landscape.

g. CULTURAL RESOURCES

Correlate landtype/vegetation map units to cultural site locations.

Identify plant communities supporting populations of plant species important for ethnic/religious uses.

15.1 - Exhibit 01--Continued

SECONDARY OBJECTIVES

1. Provide baseline information for monitoring progress toward Forest Plan goals for range resource, wildlife habitat and riparian areas.

2. Provide a data base for site specific project analysis, integrated resource analysis and Forest Plan revision.

3. Collect data, map vegetation/soils and store data in a consistent format which will enable incorporation into a GIS data base for use in coordinated resource analysis, planning and monitoring.

PROCEDURE

Mapping, characterizing and analyzing vegetation and soil characteristics will be based on methods outlined in FSH 2090.11 and the Range Analysis Handbook FSH 2209.21.

1. Vegetation will be mapped in two layers. One layer will identify potential vegetation. The second layer will characterize existing vegetation.

POTENTIAL VEGETATION LAYER

Polygons for the potential vegetation layer will be delineated according to vegetation types occurring on the Jim Bridger Ranger District.

Potential vegetation will be described based on types described in:

Sagebrush-Grass Habitat Types of Southern Idaho.

Riparian Community Type Classification of Eastern Idaho - Western Wyoming.

EXISTING VEGETATION LAYER

Describe existing vegetation by community type (where data with complete species list is collected) or by dominance type (where data is not collected). Example of dominance type: limber pine, overstory; bluebunch wheatgrass, understory).

On suitable range define important community types.

On unsuitable range characterize vegetation by dominance type, unless its determined that it is key wildlife habitat. If unsuitable range is important for wildlife than define important community types or plant associations.

15.1 - Exhibit 01--Continued

Riparian Vegetation--Utilize community types identified in the "Riparian Community Type Classification of Eastern Idaho - Western Wyoming", and supplement with site specific plots to verify similarity, describe existing vegetation and status and define resource values.

2. MAP UNIT DESCRIPTION/MAP LEGEND

Utilize photo interpretation, ecological classifications, compartment exams, past vegetation typing, landtype classifications and personal knowledge of the area to develop map unit descriptions of the area to be inventoried.

POTENTIAL VEGETATION LAYER

Develop map unit descriptions, describing potential vegetation types occurring on similar physical settings (landtype and soils) and with similar management interpretations.

Describe dominant and co-dominant taxonomic components (complexes and or habitat type associations)

Describe important resource values for each map unit.

EXISTING VEGETATION LAYER

Preliminary descriptions will be based on old range vegetation type maps and verified with current field data.

Describe dominant and co-dominant taxonomic units (community types or dominance types).

Describe important resource values for each map unit.

INTER-DISCIPLINARY MAP UNIT DESIGN--Utilize an interdisciplinary approach for developing map unit descriptions. Following is a listing of resource characteristics important for integrated resource analysis on the Jim Bridger Ranger District, which need to be considered when determining similar and dissimilar taxonomic components of a mapping unit.

Wildlife

Identify different cover types and plant associations important for key wildlife species.

Identify wetland and riparian plant communities.

Identify vegetation layers within plant communities from 0-6 1/2 feet to characterize hiding cover values within a mapping unit.

15.1 - Exhibit 01--Continued

Indentify suitable, occupied, and critical habitat for all species analyzed (including threatened, endangered or sensitive species).

Range

Identify plant communities with significant forage production.

Consider differences/similarity in palatability of forage/browse species for livestock and wildlife.

Consider differences/similarity in response of vegetation to management prescriptions (prescribed fire, grazing systems...similar successional pathways for specific management prescriptions).

Identify areas of conifer and shrub encroachment on grassland types.

Identify suitable and unsuitable range based on Forest or District guidelines.

Minerals

Identify slopes greater than 40%.

Identify wetland and riparian habitat types

Identify habitat types important to key wildlife species (elk, mule deer, black bear, moose).

Identify sites suitable or unsuitable for construction activities and sites with shallow soils and other characteristics which may hinder rehabilitation or re-establishment of native vegetation.

Riparian

Identify existing riparian plant communities.

Describe stream sedimentation

Describe fisheries values.

Describe stream system equilibrium.

Describe potential riparian vegetation.

Describe riparian dependent resource values.

15.1 - Exhibit 01--Continued

Bio-diversity

Describe plant communities and their location on the landscape, particularly those supporting populations of sensitive plant species and/or examples of unique plant communities or habitat types (including old growth).

3. PRE-FIELD WORK NEEDS:

Identify data already collected from previous analysis work.

Identify and map landtypes on aerial photos, through aerial photo interpretation.

Identify potential habitat types for forested, shrub and grass types by land type, using photo-interpretation.

Develop preliminary map unit descriptions.

Identify suitable and unsuitable range from past range analysis and aerial photo interpretation.

Determine number and potential locations for plot data within selected polygons. Final plot locations to be based on field observations.

4. FIELD PROCEDURES

Recon Survey--Verify photo-interpretations and select polygons representative of each map unit which will be sampled by the field crew.

Characterize existing and potential (minimally disturbed) community types, full species list and soil profile descriptions for each community type.

Characterize existing and potential map unit descriptions. Vegetation/soil composition forms will be filled out for selected polygons to characterize similar map units. Based on the sampling, the information collected will be extrapolated to other polygons which are not sampled.

5. OFFICE-DATA ANALYSIS

Transfer field data from aerial photos to 1:24,000 topographic maps.

Analyze data by plant community type, develop final map unit descriptions and resource values, based on field data and develop final resource maps by hand or through GIS.

15.1 - Exhibit 01--Continued

6. TIME FRAMES/COSTS/PERSONNEL NEEDS

Photo interpretation (landtype/soils delineations and vegetation component of the vegetation in a polygon).

WILDLIFE BIOLOGIST	5 DAYS
RANGE CON/ECOLOGIST	20 DAYS

Data collection/mapping (Marmarth area, 12,800 acres)

8 PERSON CREW (VEGETATION/SOILS EXPERTISE)	80 DAYS

Data input/Digitizing GIS

CREW MEMBER/RESOURCE CLERK	20 DAYS

Data analysis/final map unit descriptions, resource value ratings and report writing/interpretation for NEPA analysis and AMP preparations.

WILDLIFE BIOLOGIST		10 DAYS
RANGE CON/ECOLOGIST	3 people	50 DAYS

EQUIPMENT COSTS AND PER DIEM

PER DIEM	$2,080
EQUIPMENT	$1,000

3. Determining Opportunities (What needs to be done). As an example, once the existing plant communities and desired plant communities, based on site potential, have been described, then a comparison will identify differences that offer an opportunity to move from the existing plant community toward the desired plant community. There are other resource attributes to consider in addition to the existing and desired plant communities as well.

4. Identifying Possible Management Practices (How to do it). Identify management practices that will achieve the desired future condition.

5. Consistency with the Forest Plan. Determine possible management practices consistent with the Forest Plan that could be employed to move toward desired future condition or desired plant communities. Forest Plan goals, standards, guidelines, and other legal requirements provide the criteria for screening feasible management practices to determine consistency with the Forest Plan.

6. Listing Possible Practices. List possible management practices that are feasible and consistent with the Forest Plan to achieve desired future conditions. Also list preliminary issues or management concerns that may be associated with possible practices and the reasons for considering the practice.

7. Public Participation. Public participation should be a key element of the NFMA process as well as the NEPA process. Close consultation, cooperation, and coordination with grazing permittees is essential to help them understand the differences between existing and desired vegetation on their allotment and in identifying possible practices that will achieve desired future conditions for vegetation as well as the permittees livestock operation. Other interested parties should be involved as well to identify possible practices that will be responsive to potential concerns or issues they may express. Not only is public participation good business from the standpoint of identifying opportunities and possible practices to achieve desired conditions and reduce controversy later in the planning process, but it is a requirement of law.

Section 8 of the Public Rangeland Improvement Act requires the Secretary concerned to develop AMP's "in careful and considered consultation, cooperation, and coordination" with interested parties. FLPMA identifies "lessees, permittees, and landowners involved, . . . and any State or States having lands within the area to be covered by such allotment plan" as interested parties. Additionally, under 36 CFR (222.7(d), the Chief has identified other "agencies, institutions, organizations, and individuals who have interest in improvement of range management" as interested parties with who the Forest Service will cooperate. Furthermore, in FLPMA's declaration of policy, Congress specifically requires the Secretary of Agriculture to consider the views of the general public, and to allow for adequate third party participation when exercising his discretionary authority. (43 USC (1701(a)(5))).

16 - NATIONAL FOREST MANAGEMENT ACT AND NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE WITH REISSUANCE OF GRAZING PERMITS. The Chief's April 17 and July 27, 1990, letters direct that grazing permits shall be consistent with Forest Plan direction prior to reissuance. This direction applies to all situations involving issuance of grazing permits, including expiration, waiver of existing permits, and issuance of new permits. The Chief directed that this would be accomplished by (1) modifying the AMP to include the standards and guidelines, or (2) where no AMP exists, or adequate time and resources are not available to revise existing AMP's, then the grazing permit will be modified to include the appropriate Forest Plan direction (See 15 - Exhibit 01). Compliance with NEPA is also a requirement whenever a permit is issued or reissued.

For purposes of NEPA documentation in the latter situation, the proposed action will be to reissue the grazing permit with the appropriate Forest Plan direction included in the permit. Scoping should occur to identify issues. If issues are identified the documentation should disclose the effects of the proposed action and the alternative of not reissuing the grazing permit. If no issues are identified with reissuance of the grazing permit, then documentation in a decision memo would be appropriate.

Appropriate direction from Forest Plans to be included in the grazing permit may be found in the Forest-wide and management area direction including the goals, objectives, standards, and guidelines. Forest Plan contain varying degrees of quantifiable direction. If quantifiable standards and guidelines exist, they should be included in the grazing permit. It is extremely important that the permittee have a thorough understanding of the intended purpose of direction included in the grazing permit. Typical examples of quantifiable standards and guidelines found in Forest Plans that may be appropriate would include the following areas:

1. Forage
   - Utilization standards
     - Upland sites
     - Riparian areas
     - Key wildlife areas
       - Big game winter range
       - Calving areas

2. TES plants or animals

3. Noxious weeds

4. Other resource direction
   - Fisheries
   - Watershed
   - Timber
   - Recreation
   - Wilderness

Forest Plan direction that is expressed in terms of goals and desired conditions that are more qualitative in nature can be referenced in the grazing permit. To accomplish this reference the appropriate Forest-wide direction or the specific management area direction (that is; MA X,Y, and Z) that are applicable to the allotment and the grazing permit. Ensure that the permittee understands the direction and the management actions they need to take in order to comply with this direction.

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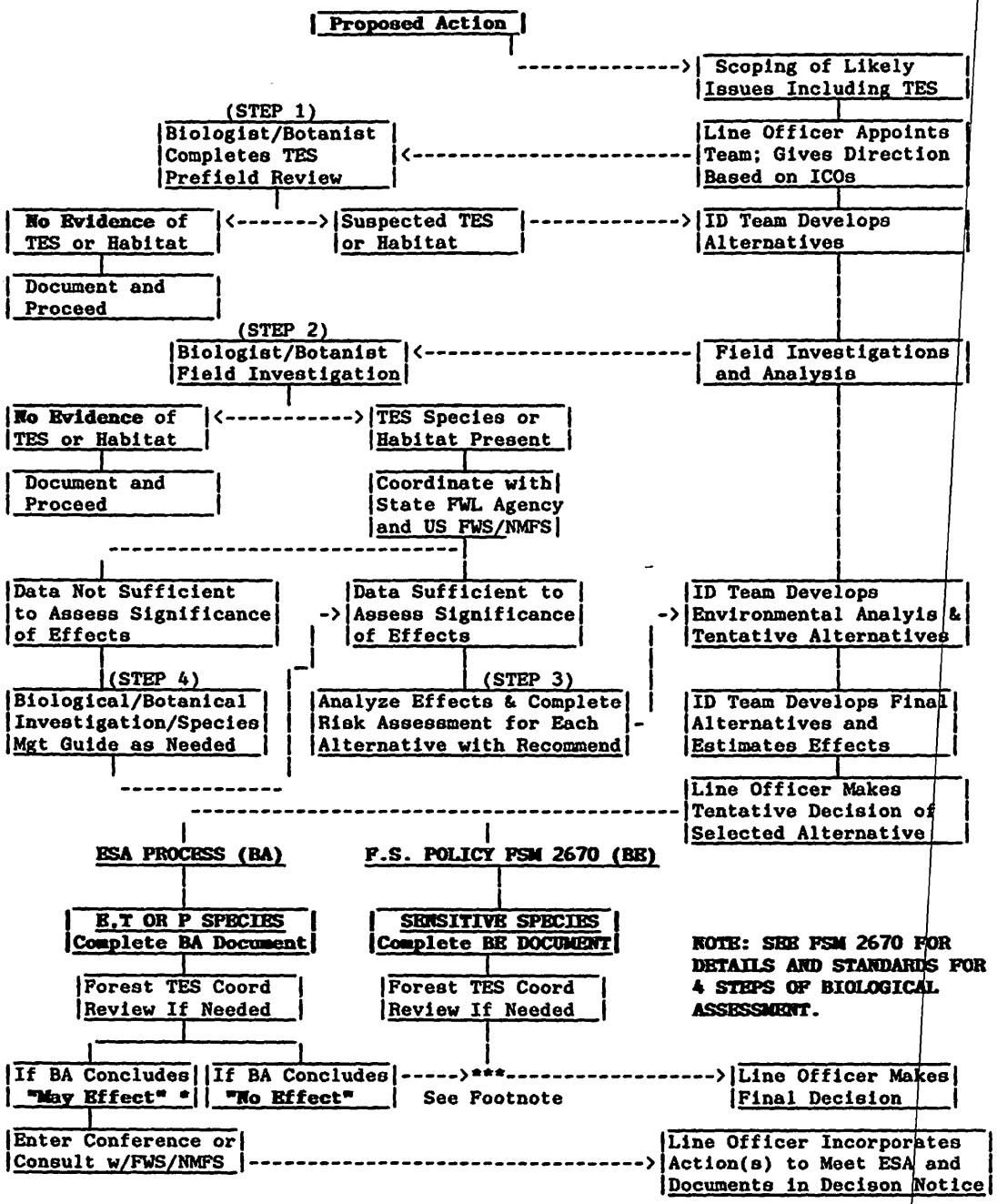
INTEGRATING ESA and NEPA



NOTE: SEE FSM 2670 FOR DETAILS AND STANDARDS FOR 4 STEPS OF BIOLOGICAL ASSESSMENT.

* "May Effect" could mean either Beneficial Affect, Not Likely to Adversely Affect or Likely to Adversely Affect. Likely to Adversely Affect requires Formal Consultation

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29.3 Verifying Carrying Capacity
29.31 Cattle Range
29.31a Calculations
29.32 Sheep Range
29.4 Further Consideration of Grazing Capacity
29.5 Potential Additional Capacity

FSH 2209.21 - RANGELAND ECOSYSTEM ANALYSIS AND MANAGEMENT HANDBOOK
R-4 AMENDMENT 2209.21-93-1
EFFECTIVE 5/18/93

CHAPTER 20 - RANGELAND INVENTORY AND ANALYSIS

21 - PRIORITIES AND INTENSITY.

21.1 - Priorities for Analysis. Rangeland inventory and analysis is the systematic collection and evaluation of rangeland resource data. The Forest Supervisor shall establish priorities for analysis considering the following factors:

1. Allotments with anadromous fisheries or Threatened, Endangered or Sensitive plant or animal habitat that are impacted by livestock grazing.

2. Allotments with riparian areas in unsatisfactory ecological status.

3. Allotments with big game - livestock conflicts.

4. Allotments that include Wilderness Areas that have areas in not in desired future condition.

5. Allotments not in the above criteria without NEPA documentation or a current AMPs.

6. Other allotments not meeting Forest Plan direction (standards and guidelines).

7. Allotments meeting Forest Plan direction.

21.2 - Intensity of Analysis. The minimum requirements for accomplishment of the inventory phase of the rangeland inventory and analysis process can be found in FSM 2212.11. Also refer to FSM 2060 and FSH 2090.11, Ecological Classification and Inventory Handbook.

Inventory and analysis must be accomplished on rangelands in the National Forest System (NFS), whether they are grazed by livestock or not. The intensity will vary depending on the need for information and whether the area is within a grazing allotment. The intensity also depends on the resource condition and issues found by the interdisciplinary review and scoping effort for the area. Follow Forest Plan direction and the Forest Range Action Plan. Ask the question, "What information is needed to answer the issues and concerns, manage the allotment, and prepare or revise/update the management plan?" and have the answer determine the informations needs requirement.

21.21 - Base Level Analysis. The following base level shall be accomplished on each land area that is inventoried. If possible, this should be accomplished through an integrated inventory effort.

1. Develop a base map of each allotment. Mapping should be done on aerial photos or by satellite remote sensing and the data transferred to a base topographic, orthophoto map, or to a GIS system. Include on each map or on GIS layers:

a. Allotment or land area boundary.

b. Vegetative ecological types, mapped by ecological status. (This may be done through complexes.)

c. Rangeland suitability, mapped by livestock or wildlife class.

d. Existing range improvements and locations.

e. Location of threatened, endangered, and sensitive plant and animal species habitat.

f. Riparian areas not included in meadows and wetland types.

2. From the base, determine and summarize the following:

a. Acres of suitable range by livestock class.

b. Acres of each current vegetative ecological type and acres by ecological status.

c. Trend direction as related to the desired future condition (could be described in terms of ecological status or plant community or soil attributes) by acres.

d. Acres of satisfactory and unsatisfactory rangeland.

e. Summary of all range improvements.

f. Acres of TES habitat.

21.22 - Higher Intensity Analysis, Updating, and Re-analysis. Higher intensity analysis above base level, re-analysis, and allotment updating should be done on a priority basis or as there is a need for information to meet Forest Plan standards, for management, and/or for development the allotment resources.

The following elements can be added to the basic inventory requirements and are helpful in determining the impacts of and opportunities for management and use of the land area and its resources. The degree of information added to and analyzed with the basic information will depend upon the amount of cooperation, conflicts, and problems that exist over the analysis area.

1. Monitoring Studies.

a. Rangeland trend studies.

b. Use Studies.

Proper use determinations.

Utilization mapping.

c. Allotment management grazing system adequacy.

d. Big game herd unit information needs.

2. Desired future condition descriptive elements.

3. Range Inspections.

4. Inventory of planned range improvements.

5. Other range administration impacts. When livestock or management system adjustments are foreseen on allotments which:

a. Have a downward trend over a significant portion of the grazed area, and/or,

b. Are not moving toward the desired future condition at a satisfactory rate or do not meet Forest Plan Standard and Guidelines, and/or,

c. Are overstocked, then,

d. Actual use, inspection and utilization data, and proper use determinations should be collected for a minimum of 3 years under season-long grazing systems or a minimum of one full rotation under deferred or rest-rotation systems to explain the needed adjustment(s).

22 - ANALYSIS PROCEDURES OUTLINE.

1. Determine intensity of analysis and makeup of interdisciplinary team (sec. 13.1 and 21.2).

2. Prepare aerial photographs or orthophotos for field mapping or satellite imagery and GIS for computer mapping (sec. 23 and 24).

3. Assemble.

a. Forest suitability criteria (sec. 26).

b. Publications and guides to classify plant communities, to rate resource values, and to describe desired future conditions (sec. 24.32 and 27).

c. Publications and inventory data of the soils of the area (sec. 24.33).

d. Field equipment and forms (sec. 27.2 and 44.12b & c).

4. In field.

a. Delineate ecological types and the present plant community (sec. 24.3 and 27).

b. For each ecological type:

(1) Map suitability (sec. 26).

(2) Determine ecological status (sec. 24.3).

(3) Determine desired future condition (sec. 15.1 and 27.4).

(4) Determine trend (sec. 44.1).

(5) Label type (sec. 24.7).

5. Submit aerial photographs to Regional Office for map preparation and acreage compilation (sec. 25.1), or prepare maps on Forest GIS system.

6. Complete summary report (sec. 25.3).

23 - OFFICE WORK. Members of the interdisciplinary and integrated rangeland inventory and analysis team shall become familiar with the allotment by:

1. Reviewing allotment folders and files concerning the allotment. These records provide insight into the history of grazing use and various problems and opportunities on the allotment. Discuss the allotment with the permittee(s) and other interested parties in order to determine past and present use, patterns of livestock use and movement, problem areas, potential range improvements, and so forth.

2. Becoming knowledgeable about the presence of endangered or threatened or sensitive plant species and their habitats within the allotment. The Forest wildlife biologist, botanist, or Regional botanist can assist, as well as The Nature Conservancy who have offices in each Intermountain State.

3. Locating and analyzing Potential Natural Communities (PNC's) on specific ecological types. These areas are used to prepare ecological scorecards. They provide the means to determine type potential and can be found on most ranges. A search in the unsuitable portions of the allotment will often prove productive. However, when comparing unsuitable areas with other portions of the allotment, care must be taken to assure that they are the same ecological type. Relict areas, Research Natural Areas, and old exclosures or pastures may furnish valuable information. Frequency, density, cover, or dominance data should be collected from representative potential natural communities. In addition, information on soils should be made a part of the record. Summarize information collected on Form R4-2200-41 (1/93), Potential Natural Community Scorecard (sec. 27.2, ex. 01).

4. Observing the use pattern of livestock and wildlife. Use intensity studies are helpful aids.

5. Identifying key and critical areas for wildlife species.

6. Determining if soil inventories have been accomplished on the allotment. If available, use them to the fullest possible extent. If soil data are not available, or if the soil inventory cannot be scheduled to coincide with rangeland analysis, the project leader must collect or arrange for the collection of soils information with the help and advice of a soil scientist. In addition, soil parent material should be observed along with general observations on watershed damage, gully systems, and sheet erosion.

7. Observing and recording all water locations on base maps. Water availability and location are major factors influencing livestock and wildlife distribution. It also has a bearing on classifying range suitability and influences range management planning. In areas where water is in short supply or is poorly distributed, there may be a greater potential for conflict between the various uses.

8. Becoming familiar with the allotment boundaries and accurately locating the boundary on the base map. These lines should be checked on the ground to make certain that they conform with the approved written boundary description or map.

9. Being knowledgeable of basic plant ecology. This is essential to determine resource values and potentials, ecological status of the range, and the establishment of the desired future condition goals. At a minimum, one team member must be familiar with the vegetation of the area and be able to identify the plant species. Type potential can best be determined from prepared ecological scorecards and through examination of protected areas which have not been grazed by livestock.

10. Sources of information:

a. Regional Guide.

b. Forest Land and Resource Management Plan.

c. Old range inventory maps and records.

d. Old allotment management plans.

e. Timber inventory, range site (SCS) data, soil inventory, and soil-vegetation maps.

f. Range inspections, range readiness guides, utilization reports, allotment inspection reports.

g. Knowledge of permittees, State wildlife agency personnel, volunteers, Forest users, and interested public groups.

h. Old aerial photos.

i. Wildlife use, census, and habitat analysis and trend records.

j. Land adjustment and status records.

k. County records for land ownership.

24 - FIELD MAPPING. See section 24.1 for mapping with GIS and/or remote sensing.

1. Field type delineations shall be done on aerial or ortho photographs. Type delineations must include:

a. Ecological types. Ecological types and groups of ecological types for uplands shall be mapped in the field or by satellite scene. For riparian areas, community complexes shall be mapped following the standards in the Integrated Riparian Evaluation Guide. Where pretyping was done in the office, the types shall be checked and corrected, as necessary, in the field. Community types or complexes shall be used for riparian analysis.

b. Rangeland suitability. The acreage of land on an allotment suitable for grazing use can be a factor in determining grazing capacity. Rangeland suitability is mapped concurrently with the ecological type and seral stage classification. Suitability should be based on Forest or District suitability criteria set by an interdisciplinary team.

c. Ecological status and trend. Ecological status and trend of the range is based on information obtained from ecological scorecards. The seral stage classification shall be made in accordance with the instructions for rating ecological status.

2. Exercise care when delineating information to insure completeness, accuracy and legibility, because the information will appear on the range analysis map exactly as it is written.

3. Symbols showing range improvements not already plotted shall be entered on the field photos in black ink. Notes and descriptions of the improvements may be placed on the backside of the photos.

4. Proposed improvements, areas with revegetation potential, and areas with noxious weeds may be delineated on the photos using red ink or shown on an overlay attached to the photos.

5. Overlays become a part of the allotment analysis data and must be retained in the permanent files. If an overlay is used, list the photo number and date on the overlay and mark at least two reference points for orientation purposes. All four fiducial marks should be used for registration of overlays.

6. Use a solid black line on the photo to delineate range suitability and ecological types.

7. Use a black line to denote ecological status and apparent trend on the photos. Generally, the minimum area delineated is 20 acres. Exceptions are meadows, some riparian areas, other high forage-producing lands, seeded units, PNC's and/or critical watershed areas. These may be mapped to a minimum size of five acres.

8. Show ecological type analysis transect locations using the proper symbol for each ecological type where an ecological scorecard write-up is made. The transect symbol itself should be shown in red, but the write-up number should be listed in black so it will appear on the finished map.

9. Some lands are so broken with islands of rock, dense stringers of timber or other physical features that the job of delineating small intermingled suitable areas or ecological types is difficult and impractical. In such cases, it is permissible to map the entire area in one category and estimate the percentage in each classification. This technique should be used only when the intermixed classifications are contrasting or significantly different and only when minimum areas of 20 acres cannot be mapped.

10. The kind of livestock using an area must be considered in determining range suitability. Suitability criteria for the allotment to be analyzed shall be prepared before starting the field inventory. They will be modified as needed during the inventory process. See section 25 for further information.

11. The Regional Office Engineering Staff can prepare a range analysis map from the field data shown on the aerial photos. Priority of map preparation is based on a first-come, first-served basis unless special priorities are assigned by Range Management. Forests submitting special priority requests must submit justification for any such requests to Range Management.

12. There are Regional training sessions offered in aerial photo interpretation, GIS, and remote sensing if training is needed in these areas.

24.1 - Mapping With Remote Sensing Using Satellite Imagery and GIS. [Reserved]

24.2 - Mapping Rangeland Suitability. All rangelands being analyzed within grazing allotments (or areas not presently grazed but where grazing by livestock and/or wildlife is planned in the future) should be mapped as suitable or unsuitable for grazing. See further suitability discussion in section 26.

Suitable rangeland must be classified as open or closed on the basis of existing management systems and improvement facilities. The following symbol shall be used:

S Suitable Rangeland - Rangeland is that part of the rangeland that livestock or wildlife will naturally graze. Suitable rangeland may be in a depleted condition because of past overuse, in which case, it may provide little current forage.

Unsuitable rangeland is any area that cannot be grazed by a kind of livestock because of unstable soils, inaccessibility, lack of range improvements, steep topography, barrenness, inherent low potential for forage production, or administrative closures.

The following symbols must be used in delineating unsuitable range:

U Unsuitable Rangeland.

B Barren areas. Includes areas such as rock slides, boulder fields and recent lava flows which do not have the capability to produce livestock forage. Areas which are devoid of vegetation as a result of poor condition should not be included in this category.

Areas of water surface need not be classified for suitability, since their nature is already shown by standard symbol on the base map.

24.3 - Identifying Ecological Types. Reference the Ecosystem Classification, Interpretation, and Application Handbook, FSH 2090.11, chapters 1 and 3, and section 27 in this Handbook for further discussions on identifying and naming ecological types.

Differences in the kind, proportion, and production of plants are in large measure the result of differences in soil, topography, climate, and other environmental factors. Variations in soil texture, depth, and topographic position usually result in pronounced differences in plant communities. Environmental conditions associated with a specific ecological type can be used to identify the type in the absence of the potential natural vegetation.

Distinguishing between ecological types along ecotones is difficult. Type differentiation may not be readily apparent until the cumulative environmental impact on vegetation is examined over a broad area. Ecological type differences may be reflected in production or in the kinds and proportion of the plant species making up the core of the plant community, or both. Of necessity, boundaries between ecological types along a gradient of closely related soils and a gradually changing climate may be somewhat arbitrary and, therefore, may be mapped as a composite.

The criteria used to differentiate one ecological type from another are:

1. Significant differences in the kind and proportion of species groups in the plant community.

2. Significant differences in soil properties, slope, and topographic position reflecting different use potentials and hazards that are not reflected in the community.

Any differences in criteria, either singly or in combination, great enough to indicate a different use potential or to require different management are bases for establishing an ecological type.

24.31 - Naming Ecological Types. Ecological types are named using a two-part, abiotic and biotic name. The abiotic portion is based on readily recognized permanent physical features such as landform or soil family. The biotic name shall consist of two (sometimes three) scientific names of characteristic, diagnostic, or prominent species. Where one layer of vegetation exists, one or two names shall be chosen, for example, Agropyron smithii/Stipa viridula. Where more than one

vegetation layer exists, names shall come from both (or three) layers. For example, Pinus ponderosa/Purshia tridentata/Festuca idahoensis. An example of a complete ecological type name might be Pinus ponderosa/Purshia tridentata/Festuca idahoensis--Typic Cryoboraolls, fine-loamy mixed ecological site, or a Artemisia tridentata/Purshia tridentata/Festuca idahoensis--Typic Cryoboraolls, fine-loamy, mixed.

Ecological types are correlated on the basis of species frequency, composition, cover, or production of the potential natural communities (PNC's), and soils or landform. Sometimes it is necessary to extrapolate frequency, composition, cover and plant production data from one soil to describe the plant community on a similar soil for which no data are available. The delineation of two distinct soil or landform taxonomic units does not automatically require recognition of two ecological types. Likewise, some soil or landform taxonomic units occur over broad environmental gradients and thus may support more than one distinctive PNC because of changes in an environmental component such as average annual precipitation or temperature. Where this occurs the soil or landform taxonomic unit should be phrased to reflect the different potential plant community.

Each Forest may devise a numerical coding scheme for their ecological type names for use on photos, maps, and GIS systems.

It is permissible to use community type names for ecological type names if ecological classifications, type keys, or names are not available. A key or notes should be kept with the analysis to describe these communities.

24.32 - Available Classifications and References. Much of the rangeland ecosystems in the Intermountain Region lack ecological classifications. Exhibit 01 depicts the existing classifications, and exhibit 02 lists the available reference material for these classifications.

24.32 - Exhibit 01

Existing Classifications for Zones in the Intermountain Region

Zone 1	Humboldt, Toiyabe
Zone 2	Dixie, Fishlake, Manti-LaSal
Zone 3	Uinta, Ashley, Wasatch-Cache
Zone 4	Bridger-Teton, Targhee, Caribou
Zone 5	Boise, Challis, Payette, Salmon, Sawtooth

- \- No classifications available
- p Classifications partially completed or completed for only minor portions of the zone.
- c Classifications completed
- na Ecosystems do not occur or are minor components of this zone.

Ecosystem	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Coniferous Forest	-	p	c	p	0
Aspen	p	c	c	c	p
Pinyon Juniper	c	-	-	-	-
Sagebrush	p	-	-	p	p
Mountain Brush	-	-	-	-	-
Oak-Maple	na	-	-	-	-
Riparian	c	c	c	c	p
Mountain Forblands	-	p	-	p	-
Grasslands	-	-	-	-	-

24.32 - Exhibit 02

Ecological Classifications References

Range Management
Ecological Classification References
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24.32 - Exhibit 02--Continued

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24.33 - Soil Taxa for Ecological Types. For each ecological type where soils are used instead of landform for the abiotic descriptor, determine soil subgroups and family using existing soil inventories done either by the Soil Conservation Service or Forest Service or both. If unavailable, collect the data to classify the soil using the SCS procedure described in their Soil Taxonomy Handbook or Forest Service procedure described in FSM 2250 and FSH 2509.18. Work closely with Forest or Regional soil scientists to determine the best way to obtain soils data.

24.34 - Mapping Ecological Types. Within a specific area of land, ecological types shall be delineated on maps either as single types, a major type including small areas of other types, or as a complex of two or more types that are so interspersed that separate delineation would not be practical or meaningful.

The name of ecological types are shown on the map within each delineation. If a delineation represents a single type or a major type that has minor inclusions of other types (making up as much as 15% of the delineation), the name of the major type is used. If a delineation represents more than one type (for example, a complex) the name of each major type and the approximate proportion of each is indicated. For example, Agropyron spicatum/Festuca idahoensis--Loamy upland, 65 percent; Agropyron spicatum/Poa secunda--Shallow loam, 35 percent.

Need for mapping detail varies in accordance with relative productivity of a type, size of management unit, intensity of use patterns and information requirements. Land that has relatively high productivity is usually mapped in greater detail than that of low productivity. Land that is suitable for many alternative uses also may be mapped in more detail.

Intensity and details in mapping ecological types, therefore, are determined locally on the basis of the kinds of land and the needs for planning. Major consideration is given to management needs for various uses of the land, including but not limited to timber harvest, livestock grazing, habitat for wildlife, and watershed protection. To insure compatibility of mapping units, soil scientists and vegetation specialists should work closely together to define mapping units that insure soils and vegetation information is coordinated.

24.4 - Ecological Status. The ecological status for each type can be interpolated from the potential natural community type by visual reconnaissance or from ecological type scorecards, ecological type keys of plant community types, or extrapolated from similar landscapes. When extrapolation is not possible due to lack of data and similar types, a measurement may need to be done. The ecological status, when measured, shall be determined using the coefficient of community similarity (2w/a+b), where (a) is the sum of values for measured parameters of present vegetation, (b) is the sum of values for measured parameters in the PCN, and (w) is the sum of the values for the measured parameters that are common to both (see instructions on back of the Ecological Scorecard, section 27.3). Ecological status can be determined by using the percentage similiar to a potential natural community type using nested frequency, ground cover, canopy cover, shrub density, or the riparian measurements of green line and cross sections.

The Ecological Status and Class Symbols that shall be used for uplands are:

Ecological Status %	Ecological Status Class Symbol (Seral Stage)	
85-100	PNC	Potential Natural Plant Community
60-84	LS	Late Seral
40-59	MS	Mid Seral
0-39	ES	Early Seral

(See section 27 for further discussion.)

24.5 - Mapping Trend. Apparent trend in soil stability and vegetation shall be judged for each area on which desired future condition has been determined. The following symbols must be used to denote apparent trend:

Toward ^ | Away From | v | Not Apparent - ->

Judge apparent trend using the trend guides contained in Apparent Trend Rating form R4-2200-25, exhibit 01.

24.5 - EXHIBIT 01 IS A SEPARATE DOCUMENT.

Apparent trend should not be confused with long-term trend. Apparent trend is a judgement based on soil and vegetative indicators observed while conducting the analysis.

Long-term trend is determined from repeated measurements on permanent benchmarks which are much more reliable that a one-time measurement and/or observation. The change in direction of repeated measurements of attributes which express the desired future condition over time is long-term trend. A description of what the trend attributes measured are should be expressed. Trend in desired future condition should be described as "meeting", "moving toward", or "not meeting".

(See section 44.1 for further discussion.)

24.5 - Exhibit 01

24.5 - EXHIBIT 01 IS A SEPARATE DOCUMENT.

24.5 - Exhibit 01

USDA Forest Service

R4-2200-25 (1/93)

APPARENT TREND RATING
(Reference FSH 2209.21)

FOREST Wyoming NF DISTRICT Jim Bridger ALLOTMENT Temple Peak
Study Name/Number Brushy Basin T4 By John Sample Date 8/19/93

VEGETATION

Toward or Stable		Away From	
1. Favorable frequency grouping and age classes of higher seral stage plants.	X	1. A disproportionate amount of early seral stage plants. Seedlings having difficulty in becoming established.	___
2. Forage plants not being pulled up or trampled out by grazing.	___	2. Forage species being pulled up and trampled out by grazing.	___
3. Vigor of key species high as indicated by leaf length, seed stock production, and normal color.	X	3. Low vigor of key species as indicated by reduced size of plant, reduced leaf length, lack of seed stalks, and off-color (sickly yellow).	___
4. Browse species showing little or no hedging.	___	4. Browse species showing signs of repeated heavy hedging.	X

SOIL

Toward or Stable		Away From	
1. Ground cover dispersion--uniform.	___	1. Ground cover dispersion-- variable to highly variable.	___
2. No detectable soil movement	___	2. Soil movement detectable.	X
3. Soil cover continuous and intact.	___	3. Soil cover broken and soil exposed.	X
4. No exposure of plant roots.	___	4. Plant roots exposed. (Except where caused by frost heaving)	___
5. Stones and rock fragments, where present, normal, and in place --no movement of rock fragments.	___	5. Stones and rock fragments, where present, concentrating on surface as erosion pavement. Fragments loose and often moving downslope.	___
6. Lichen lines on stones and rock fragments extend to soil level.	___	6. Lichen lines on stones considerably above soil surface--no lichens on rock fragments.	X
7. No active gullies.	X	7. Active gullies--indicated by recent cutting and sloughing.	___
8. No recent soil deposits either alluvial or aeolian.	___	8. Recent soil deposits--alluvial or aeolian.	X
9. No wind-scoured depressions.	___	9. Wind-scoured depressions. to frost heaving.	___

24.6 - Mapping Other Features. Other features noted during the range analysis mapping process should be carefully identified and/or pinpricked on photos or the GIS base map. These features include the following:

1. Location of studies, transects, and camera points.

2. Cultural and archeological features.

3. Structural Range Improvements--such as water troughs and fences.

4. Water Sources--such as streams, springs, seeps, and ponds.

The appropriate feature symbol should be accurately placed on the front of the map or photo (see Standard Symbols in section 24.71). They should be pinpricked and a description of the feature placed on the back of the aerial photo.

24.7 - Field Mapping Symbols.

1. Range Suitability.

S - Suitable range
U - Unsuitable range
B - Barren areas

2. Ecological Type Classification. The following format shall be followed in labeling ecological types, status, trend, and suitability:

Range Suitability, Ecological Status, Ecological Type, Trend
Example: SLSMArtrt/Feid/Typic Cryorthents

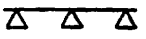
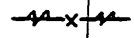
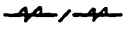
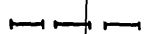
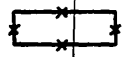
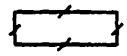
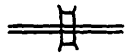
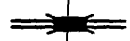
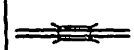
This shows suitable range in a late seral stage of a Artemisia tridentata tridentata, Festuca idahoensis with a typic cryorthents soils ecological type, that is meeting desired future condition standards.

24.71 - Standard mapping symbols. The following symbols are standard for delineation on aerial photos:

Basic Typing Units	Color	Symbol
Allotment Boundary	Green	_____
Ecological Site Boundary	Black	_____
Ecological Site Classification	Black	SLSArtrt/Feid
Perennial Streams	Blue	_____
Intermittent Streams	Blue	____... ____....
Springs	Blue	0- - ->
Benchmarks	Red	( ) BM
		Pinprick
Permanent Trend Transect	Red	|_____| | C24 |

Note: Information shown on photos in red should not be transferred to the map. For existing range improvements and permanent study locations, use the "Standard Map Symbols for Range Administration" shown in exhibit 01. These must be shown in black on the photos.

24.71 - Exhibit 01

	EXISTING	PLANNED		EXISTING	PLANNED
Stream Bank Protection			Pump		
Dam and Reservoir			Fence		
Stock Pond, Tank or Charco			Small Reservoir		
Spring Development			Electric Fence		
Spring and Trough			Pipe Line or Sprinkler Main		
Trough			Study Exclosure (>1 acre)		
Well	WELL 	WELL 	Study Exclosure (< 1 acre)		
Irrigation Ditch			Cattle Guard		
Windmill			Stock Bridge		
Windmill and Trough			Corral		
Water Tank	WATER TANK	WATER TANK			

NOTES: When existing fences are combined with other symbols, they may be shown as follows:

 = Fence along both sides of good motor road, etc.

 = Fence along one side of ditch, etc.

When planned fences are combined with other symbols, they may be shown as follows:

 = Planned fence along both sides of good motor road, etc.

 = Planned fence along one side of ditch, etc.

When fences or ditches, etc., are to be removed, they may be shown as follows:

24.71 - Exhibit 01--Continued

Trail	
Alienated Land	
Forest Service Guard Station	
House, Cabin, or Other Building	
Helispot	Ⓢ
Recreation Site	
Rimrock	
Bluffs, Ridge, and Buttes	
Section Corner, Recovered	
Spring	
Permanent Stream	
Intermittent Stream	
Stock Driveway (brown)	
Benchmark - Location and Number	②
Permanent Trend Transect	T
Permanent Camera Point	CP
Dirt Road	
Primitive Road	
Four-Wheel Drive Road	4WD

FSH 2209.21 - RANGELAND ECOSYSTEM ANALYSIS AND MANAGEMENT HANDBOOK
R-4 AMENDMENT 2209.21-93-1
EFFECTIVE 5/18/93

CHAPTER 20 - RANGELAND INVENTORY AND ANALYSIS

25 - WORK COMPLETION.

25.1 - Completion of the Range Analysis Map. After delineation mapping has been accomplished, complete the following procedures:

1. Symbols should be complete and type-lines matched with the type-lines on adjacent mapping units. Check the allotment boundary against the official boundary description on the grazing permit and make certain they coincide. Photos should be inked as they are to be kept as permanent working records.

2. Where private land is involved, the known section corners, land monuments, mining claim monuments, and private property corners should be pinpricked on photos. Accurate photo-identified locations are of great help to Engineering in delineating the private lands, and as many as possible should be provided. Section corner location forms should be completed for all corners found.

Features that can be plainly identified on aerial photos such as roads, trails, springs, water developments, pipelines, wells, campgrounds, and powerlines should also be delineated.

3. Except where using a Forest GIS system or a Forest or Regional remote sensing system, transfer of the information from the aerial photos to the allotment map can be handled by the Regional Office as follows:

a. Requestor shall prepare and send a cover letter (Reply to: 7140) along with the following material to the Geometronics Group of Engineering in the Regional Office.

(1) Sufficient photos for complete stereo coverage of the allotment. Make sure the ends of all the flight lines have stereo coverage. If there is need for maps to be produced by a certain date, this should be stated in the cover letter along with a justification statement of why a special priority should be assigned.

(2) A map on which the allotment boundary is delineated.

b. If the aerial photos are needed between the date of submission to Engineering and the date the photogrammetric work can be started, the following alternate procedure will be followed:

(1) Include the following statement in the cover letter: "Photos are needed on the Forest. Please return."

(2) The Engineering Staff group shall enter the allotment name on its priority list, return the photos to the Forest, and shall advise the Forest of the estimated date the aerial photos will be needed for data transferring.

The photogrammetric section, Engineering Staff group, has the responsibility for transfer of the range analysis data from the photos to a stable base map, in conformity with Class C map standards.

4. After data transfer has been completed, the range analysis information is hand lettered on the base map.

5. A mylar copy of the base containing the hand lettered range analysis information and two black and white (B/W) prints are returned to the Forest.

6. A correction copy will generally not be made on standard range allotment maps. However, correction copies and final drafting services are available on special request. On complex projects, a correction copy can be obtained using the following procedure:

a. Make corrections, additions and deletions on one of the B/W prints in colored pencil or ink using red for addition and blue for deletions. This applies to all types of corrections, including ecological data and drainage symbols.

b. Make the corresponding corrections to ecological symbols and type lines on the aerial photos.

c. If the locations and symbols for permanent and intermittent streams on the B/W print do not correctly represent these natural water features, delineate corrections on the photo in blue.

d. Geographic names can be added or changed on the range analysis map by following the required procedures outlines in FSM 7147.

e. Return the complete set of aerial photos, including corrections and the B/W print to the Regional Office, Engineering Staff group. If the locations of type lines and features are not required, return only the corrected map.

f. After final review, the cronaflex positive with half-tone base and hand-inked type lines, and two B/W after prints will be obtained and returned to the Forest.

7. The allotment map will then be removed from the priority list and the remaining project materials returned to the Forest.

8. The District shall file all range analysis maps, aerial or ortho photos, satellite scenes, forms and data in folders marked "Permanent Record - Do Not Destroy" and they must be kept permanently in the 2210 Ranger District allotment folder. A cronaflex composite should be retained.

25.2 - Acreage Compilations. Acres can be easily computed by a Forest or District GIS system. If these systems are not in use, the following applies. After the range allotment analysis information is transferred and inked, Engineering shall compute the acreage of each range ecological type, seral stage, and land ownership by section, township and range. These computations are adjusted to match Government Land Office legal acreages for each section.

To complete final computations and avoid delays, it may be necessary to add type lines (that is, close polygons). These additions made by Engineering are marked in green on one copy of the map returned to the Forest.

Unless otherwise requested by the Forest, landownership in any given section of land shall be by two classes of land--NFS land and other land. All private land in any given section of land shall be lumped together unless otherwise requested by the Forest. For instance, if two different landowners own tracts of land within the same section of land, the land owned by both individuals shall be lumped together as other land. If the Forest needs to know the acreage by ecological type of each of the individual landowners' tracts of land, the tracts have to be designated on the aerial photographs when they are submitted. The Forest can designate the individual tracts of land on the photo as well as list their needs on the 7140 letter under "Special Instructions." If further clarification is needed, Engineering and Forest personnel should work it out via the telephone.

The computerized printout of the acreages by ecological type will not show the trend arrows. The printout will show an "M" for meeting, and a "N" for not meeting, and a "T" for moving toward. Thus an SLSArtrt/Feid/Typic Cryorthents type will be shown as SLSMArtrt/Feid/Typic Cryorthents on the computer printout if the type is meeting the desired future condition description.

The printout contains some acres outside the allotment since entire sections are digitized. Sections with acres outside the allotment boundaries must have the "outside" acres subtracted from the total acreage of the section in order to get the correct total acreage of the allotment.

The final computer listing provided by Engineering shows map acreage by type by section, the range acreages adjusted to the Government Land Office (GLO) plat (legal) acreages by type and section and the percentage adjustment between map and GLO.

25.3 - Range Analysis Summary Report.

Prepare a summary report of the range analysis inventory that covers the following:

1. Title Page. Show name of report, unit allotment is located on, author, and date of preparation. For example: Range Analysis Summary for Temple Peak S&G Allotment, Jim Bridger Ranger District, Wyoming National Forest, John Sample, Februray 29, 1993.

2. Range Analysis Inventory. Briefly describe the inventory process followed, referencing vegetative and soil classification and guides. For example: An inventory of the Temple Peak Sheep and Goat (S&G) Allotment was completed in 1993 following the procedure in Range Analysis Handbook, FSH 2209.21. Classification and guides to the vegetation and soil follow (list publications and guides).

3. Environment and Climate. Briefly describe the physiography, geology, major soils, elevational ranges and the climate characteristics of the area the allotment is in.

4. Ecological Status and Trend. Display the following:

a. Summary of Range Allotment Status, Form R4-2200-43, exhibit 01.

b. Summary of Ecological Status and Trend, Form R4-2200-44, exhibit 02.

5. Suitability Criteria. Insert the suitability criteria used in the inventory.

6. Range Analysis Map. Insert the map. In addition, note the location of the aerial photographs, GIS maps, or satellite imagery used in the inventory.

25.3 - Exhibit 01

USDA Forest Service

R4-2200-43 (1/93)

SUMMARY OF RANGE ALLOTMENT STATUS
(Reference FSH 2209.21)

Forest Wyoming NF District Jim Bridger Allotment Temple Peak S&G

Livestock Class Sheep Other Grazers Big Horn Sheep

Year of Inventory 1992 Data Compiled by John Sample Date 1/8/92

ACRES NFS 2,000 Others 0 Total Acres 2,000

NATIONAL FOREST SYSTEM LANDS ACRES:

1. Suitability and Trend

	Suitable	Unsuitable	Total
Meeting desired condition	500	500	1,000
Moving toward desired condition	950		950
Not meeting desired condition		50	50

2. Acres by Ecological Status

PNC 800 LS 350 MS 800 ES 0 VES 50

3. Other information

25.3 - Exhibit 02

USDA Forest Service R4-2200-44 (1/93)

SUMMARY OF ECOLOGICAL STATUS AND TREND
(Reference FSH 2209.21)

Forest Wyoming NF District Jim Bridger Allotment Temple Peak

Complied by: John Samples Date 3/92

Community Name		Ecological Status (acres)				Trend for DFC acres		
Group by PNC & Seral	Symbol	PNC	LS	MS	ES	Meet	M.Toward	Not M.

26 - SUITABILITY.

26.1 - Rangeland Suitability. Written suitability criteria must be prepared by the interdisciplinary team in advance and approved by the appropriate line officer. Upon completion of field inventory, the approved suitability criteria should be retained with the analysis data as a permanent record. Suitability criteria shall be consistent with the Forest Plan criteria.

26.11 - Classification of Rangeland Suitability.

1. Suitable Rangeland. Suitable rangeland is defined as land that is accessible to grazing, produces forage or has inherent forage-producing capabilities, and can be grazed on a sustained yield basis under reasonable management practices. Areas that produce forage and become accessible as a result of timber management practices, fire, or other events may be classified as suitable range. Such areas frequently are called transitory range even though forage may be produced 10 or more years before natural or man-caused changes terminate it. Many prescribed burns, especially in tall brush or timber types, will be transitory.

Rangeland suitability is determined independently of the effects of past use. Areas denuded of vegetation by overgrazing shall be classified as suitable rangeland if they meet other suitability standards. Suitable rangelands devoid of vegetation are problem areas and action should be initiated to reestablish the vegetal cover.

Suitable rangeland that is not available for grazing because of land management decisions should be classified as unsuitable range. Such areas are closed to grazing and the reason for closure indicated. Closed areas should be reviewed periodically and reopened to grazing and classified as suitable if the reason for closure no longer exists.

Suitable rangeland should be classified and mapped based on: (1) patterns of use under the existing management and range improvements, and (2) expected changes in patterns of use resulting from specified changes in management and improvements. Such classification often pinpoints opportunities for improved utilization in an allotment.

2. Unsuitable Rangeland. This classification includes any area that should not be grazed because of unstable soils, steep topography, lack of management improvements, or inherent low potential for production. Some of the primary considerations are:

a. Physical characteristics of the terrain. These physical characteristics include such features as steepness and length of slope and natural barriers.

b. Soil and vegetation characteristics. Some situations where rangeland might be classed as unsuitable (as determined by the Forest suitability criteria) because of soil and vegetation limitations are:

(1) Loose granitic soil on steep slopes.

(2) Highly erosive soils from shale and mudstone.

(3) Areas of insufficient vegetal cover to protect the soil from erosion where restoration would not be possible or practical under continued grazing use. However, soil protection (erosion potential) by itself should not be a criteria for determination that the range is unsuitable for grazing. Rangeland may be in a depleted condition due to past abuse. It may provide little forage currently, but should be classified as suitable if it meets all the other criteria.

c. Areas that could be grazed but will not be grazed because of a lack of appropriate range improvements, such as water developments, fences, or vegetation manipulation.

26.12 - Standards and Guides for Suitability Classification. Each Forest interdisciplenary team shall develop their own specific rangeland suitability criteria. The following elements should be considered in developing suitability criteria:

1. Site Productivity. Productivity of an ecological type should be evaluated in pounds of herbage and browse produced annually per acre. The minimum acceptable productivity is the level below which it would not be feasible or practicable to graze livestock. Lands which are not capable of producing at least 200 pounds dry weight of forage per acre are classified as unsuitable and require no further consideration.

2. Soil Stability. Soil stability is the inherent ability of soils to resist erosion. It depends on several factors, principally climate, erodibility, topography, and cover. These factors are used to evaluate the erosion potential or erosion hazard. The following factors affecting soil stability may be considered in developing suitability guides:

a. Erodibility. Erodibility is the inherent tendency of the soil to erode without consideration of climate, topography, or cover. It is based on:

(1) The strength and size of the surface soil aggregates.

(2) Profile characteristics, such as texture, depth to restrictive layers, and coarse rock fragments on the surface and in the profile which affect infiltration, percolation, and storage of water.

b. Topography. Slope gradient, length, roughness, shape, and aspect affect erosion hazard. Long slopes build up greater heads of water than short ones. Steep slopes are more subject to erosion by overland flow than are gentle slopes, because the erosion capability of overland flow increases as the rate of flow increases.

c. Inherent Soil Surface Cover. Inherent cover consists of vegetation, litter, and rock fragments. The amount, kind, and dispersion of cover determines its efficiency in protecting the soil from accelerated erosion.

3. Physical Barriers. Physical barriers include steep slopes, cliffs, brush, trees, down timber, rock, and other obstructions that restrict free movement of grazing animals. Rangeland classified as unsuitable because of barriers should be reclassified if the obstructions are removed.

4. Management. The kind of animal grazed and the management system applied to them may affect suitability. A change from band herding of sheep to herderless fenced pasture sheep management may result in safe use of areas previously identified as unsuitable because of risks of soil damage. Intensified management may result in the need to redefine suitability criteria.

5. Interrelationships. Consider how the factors of soil stability, erosion, accessibility, slope, and distance to water interrelate to determine suitability. For instance, one mile to water on flat ground could be suitable rangeland for livestock, but one mile to water on a 40 percent slope might be unsuitable rangeland.

27 - ECOLOGICAL SCORECARDS. Also refer to the ecological type discussions in section 24.2.

27.1 - Standard Methodology. The Regional standard methodology for scorecard measurements shall be to use nested frequency, shrub canopy (line intercept), total canopy cover (Daubenmire plots), ocular reconnaissance, shrub age and form, or ground cover as determined by the frequency frame points. Although the degree of similarity of present vegetation to PNC or DFC will vary somewhat depending on the attribute chosen for characterization, in most cases the differences will not be significant enough to alter interpretation.

All methodologies for these measurement methods are found in chapter 40 except for the Daubenmire total canopy cover method. The total canopy cover measurement method shall be used only for inventory purposes and shall not be used as a monitoring technique. References to use when applying the Duabenmire total canopy cover method are: 1. Daubenmire, R. 1959, A Canopy Coverage Method of Vegetational Analysis, Northwest Science, Vol 33, No 1., pp. 43-64.; 2. USDI BLM, May 1985, Rangeland, Monitoring Trend Studies, Technical Reference 4404-4, pp. 18-23.; 3. Region 2 Ecosystem Classification, Interpretation, and Application Handbook FSH 2090.22; or 4. Region 1 Ecosystem Inventory and Analysis Guide (ECODATA).

27.2 - Potential Natural Community Scorecards.

A Potential Natural Community (PNC) Scorecard, R4-2200-41, (ex. 01) is a description of a potential natural community capable of occurring on an ecological type. The ideal is to have the community based on measurements of at least three reference sites of the type, not on inferences from other types. A minimum of three reference sites also helps sample the spatial variation of a type. Existing benchmark sites, exclosures, Research Natural Areas, Botanical Areas, and reference sites of other Agencies should be used when available.

A PNC is the biotic community that would be established if all successional sequences of its ecosystem were completed without additional human-caused disturbance under present environmental conditions. Grazing by native fauna, natural disturbances, such as drought, floods, wildfire, insects, and disease, are inherent in the development of PNCs which may include naturalized, non-native plant species.

Methods used to measure ecological type attributes must be repeatable and verifiable. All factors must be included in the guide that will be needed later for ecological status. It is recommended that the method(s) for monitoring an ecological type (to see if it is at its desired future condition as described by the Forest Plan and/or the Allotment Management Plan) be the same method(s) used to describe the type in the scorecard. By doing this, monitoring studies can be directly scored from the ecological type scorecard as to ecological status and resource values. For example, if a sagebrush-grass type will likely be monitored with a nested-frequency study, the ecological guide should be developed with the nested-frequency method.

When a Forest develops an ecological type scorecard, it should be submitted to the Regional Office for networking to other Forests which have similar ecological types.

27.2 - Exhibit 01

USDA Forest Service

R4-2200-41 (1/93)

POTENTIAL NATURAL COMMUNITY SCORECARD
(Reference FSH 2209.21)
Artrvp / Feid / Argic Cryoborolls
ECOLOGICAL TYPE

Type of Measurement - Nested Frequency

	SPECIES	AMOUNT IN PNC	NOTES
	Agsp	259	
	Feid	187	
G	Kocr	46	
R	Brca	72	
A	Stle	39	
S	Mebu	23	
S	Cage	10	
E	Stoc	-	
S			
	Heun	7	
	Erum	8	
	Erhe	146	
	Geri	35	
	Liru	4	
	Hafl	1	
	Lule	1	
	Giag	41	
F	ASTE	4	
O	Hial	27	
R	Canu	2	
B	Cach	3	
S	Trdu	1	
	Arho	2	
	Acmi	-	
	Basa	-	
	Phhe	-	
	Crac	-	
	Lodi	-	
S	Artrvp	48	
H	Chiv	126	
R	Putr	9	
U	Rice	12	
B	Syor	7	
S	Chna	4	
TOTAL		(w)1124	

27.2 - Exhibit 01--Continued

Potential Natural Vegetation Scorecard

Plant species found on the ecological type are listed and the measured amount in the potential natural community (PNC) are recorded in the "Amount in PNC" column. All measured amounts of the PNC recorded are totaled at the bottom of the column (w). The quantitative measurement PNC method represented by the scorecard must be indicated because the same method must be used in rating ecological status or desired future condition as is used in measuring the PNC. The commonly used vegetative measurements are nested frequency, canopy cover, total cover, and density. Ground cover is also acceptable to score against.

Ecological Description of Artrvp / Feid / Argic Cryoborolls Type

Forest	Sawtooth	Total Forage, #/acre dw(est.)	1000 est
District	Fairfield	% Shrub Canopy Cover	21
Allotment	Gooding C&H	% Vegetation (Basal Area)	8
Examiner	Little, Hamm	% Litter	44
Date	7/25/85	% Rock	2
Soil Family	Argic Cryoborolls	% Pavement	13
% Slope	35	% Crypotgam (Moss, Lichens)	0
Aspect	South	% Bare Soil	33
Elevation	6600		

Dot tally summary of ground cover measured from the nested frequency frame:

Vegetation 7 Litter 35 Rock 2 Pavement 10 Moss 0 Soil 26
Total 80

Remarks: Parent material is granitic from the Idaho Batholith.

Canopy cover is for Artrvp. It was determined by 500 feet of Line intercept.

27.3 - Ecological Scorecards. Ecological scorecards based on local knowledge and quantifiable vegetation and soil features are desirable. The scorecard should list easily identifiable features that correlate to ecological status or successional stages in an ecological type, or the desired future condition description. Ecological Scorecards, R4-2200-42, (ex. 01) shall be used if local knowledge (for example, extrapolation, ocualr estimations, summarized site analysis data) or seral keys do not exist to classify ecological types into successional stages of the PNC. Ideally, a well described ecological type will show all communities within the sere to be expected following different kinds of disturbance.

If a quantifiable method is needed to determine a vegetative seral state, this scorecard shall be used. A seral rating is based on the floristic or ground cover similarity of the current vegetation to the PNC. The similarity will be expressed on a scale of 0 to 100 with adjective ratings assigned as early, mid, late, and PNC status. The vegetation inventory of an allotment will indicate both the current vegetation and where known the PNC vegetative association and the seral status of the ecological type.

Using the PNC scorecard information, the ecological status can be determined on the ecological scorecard. The ecological status is derived by the coefficient of similarity between the current plant community and the PNC and a status class determined.

27.3 - Exhibit 01

USDA Forest Service

R4-2200-42 (1/93)

ECOLOGICAL SCORECARD
(Summary for Form R4-2200-22)
(Reference FSH 2209.21)

Forest Sawtooth District Fairfield Allotment Camas C&H Date 7/23/85
Study Name and/or Number Owens #1 Examiner J.Shelly
Ecological (PNC) Type Artrvp/Feid/Argic Cryoborolls
Existing Community Artrvp/Feid Method of Measurement Nested Frequency

	SPECIES	ECOLOGICAL STATUS Present	PNC	Similar	NOTES
	Agsp	121	259	121	
	Feid	110	187	110	
	Stle	79	39	39	
G	Kocr	126	46	46	
R	Poco	152	-	-	
A	Mebu	3	23	3	
S	Brca	38	72	38	
S	Caro	35	-	-	
E	Stco	2	-	-	
S	Hafl/Geri	5/24	1/35	1/24	
	Basa	81	-	-	
	Acmi/Frmo	58/48	-/-	-/-	
	Sein/Arlu	50/41	-/-	-/-	
	LUPI	5	1	1	
	Canu/ERIO	1/3	2/154	1/3	
	CAST/Meob	1/4	1/-	1/-	
F	Rugy	12	-	-	
O	Arho	14	2	2	
R	Hyca	41	-	-	
B	Liru/MICRO	3/2	4/-	3/-	
S	Crac	19	-	-	
	PENS/Heun	8/24	-/7	-/7	
	APOC	37	-	-	
	Hial	7	27	7	
	Bere	3	-	-	
S	ROSA	4	-	-	
H	RISE	1	12	1	
R	Chna	3	4	3	
U	Amal	3	-	-	
B	Chvil	8	126	8	
S	Syor	38	7	7	
	Putr	32	9	9	
	Artrvp	36	48	36	
		a	b	w	
TOTAL		1282	1124	471	
Ecological Status %				39%	
Ecological Class				Early Seral	

% Ground Cover	26%	68%	38% equals a low erosion control resource value.

27.3 - Exhibit 01--Continued

ECOLOGICAL SCORECARD PROCEDURES

GENERAL

1. Identify the ecological type being rated. Complete information at top of page. Type of measurement used must be the same as used in the Potential Natural Community Scorecard.

2. List species in the present plant community and record species quantity under Present Ecological Status column.

Ecological Status

3. For each species in the present plant community, record in the PNC column the amount of the species that occurs in the PNC. These data are obtained from the specific PNC Scorecard for the ecological type. At the bottom of the column record the total quantity of the PNC as shown in the PNC Scorecard as item(b).

4. Determine how much of the present plant community is like the PNC. The "Similar" column is the lower value of the PNC or present column. Total the "Similar" as item (w).

5. Calculate the similarity between the present plant community and the PNC by the formula: $2w / a + b$, where a is the present community total and b is the PNC total. Enter this figure in the Present column as the Ecological Status %.

6. Enter the Ecological Status Class symbol using the following:

Ecological Status %	Ecological Status Class Symbol
86-100 PNC	Potential Natural Plant Community
60-85	LS Late Seral
40-59	MS Mid Seral
0-39	ES Early Seral

27.4 - Desired Future Condition (DFC) Ratings. Multiple-use management decisions should answer how to deal with coordination between resource uses of rangelands. Basic guidance comes from the Forest Plan emphasis, objectives, and standards and guides. Use of the rangeland resource, within that guidance, can be partially founded on ecological status data and where the resource is in relationship to the DFC.

The DFC can be based on what values a plant community has for various resources and uses. Exhibit 02 is an incomplete Regional plant species list with resource values listed for cattle, sheep, horses, mule deer, elk, and erosion control potential. This list may be modified to fit a particular Forest. This list may be used to help determine the value of specific plants found in a plant community for specific resource values. Use this list, along with potential natural community scorecards, to help derive the composition of a desired plant community for the desired future condition description.

Additional resource values can be built as the local need determines. Additional resource value ratings that could be built are: edibility, nitrogen-fixing potential, biomass production; short- and long-term revegetation potential, energy value, scenic beauty, nesting cover, and food value for upland game, big game, nongame, and waterfowl.

When determining the watershed protection resource value for a particular ecological type, also consider rating current ground cover conditions against the ground cover in a PNC ecological type.

To determine the current plant community status in relation to the desired plant community (a desired future condition as stated in Allotment Management Plans or Forest Land and Resource Plans), Form R4-2200-45 in exhibit 01 can be used. DFC status is derived by the coefficient of similarity and a similarity class determined.

Information from the Range Inventory Standardization Committee Report (1983) suggests that a value of 75 percent similar or greater may be used to differentiate between meeting and not meeting management objectives.

27.4 - Exhibit 01

USDA Forest Service

R4-2200-45 (1/93)

DESIRED FUTURE CONDITION SCORECARD
(Reference FSH 2209.21)

Forest Sawtooth District Fairfield Allotment Camas C&H Date 7/23/85
Study Name and/or Number Owens #1 Examiner J.Shelly
Ecological (PNC) Type Artrvp/Feid/Argic Cryoborolls
Present Community Artrvp/Feid Method of Measurement Nested Frequency

	SPECIES	PLANT COMMUNITIES Present	PLANT COMMUNITIES Desired Community	PLANT COMMUNITY SIMILARITY
	Aqsp	75	150	75
	Feid	280	349	280
	Stle	276	184	184
G	Kocr	250	286	250
R	Sihy	4	15	4
A				
S				
S				
E				
S				
F	Erum	270	211	211
O	Crac	115	217	115
R	Luar	36	124	36
B	Arnu	20	9	9
S				
S				
H	Artrvp	217	155	115
R	Chvi	112	91	91
U				
B				
S				
		a	b	w
	TOTAL	1655	1651	1370

DFC Similarity % 83%

27.4 - Exhibit 01--Continued

USDA Forest Service R4-2200-45 (1/93)

DESIRED FUTURE CONDITION SCORECARD PROCEDURES

1. Identify the ecological type being rated. Complete information at top of page. Type of measurement must be the same as used to describe the desired plant community.

2. List species in the present plant community and record species quantity under Present Plant Community column.

3. In the present plant community column record the amount of each species found in the present plant community being rated.

4. In the desired plant community composition column, record how the desired plant community should appear to meet Allotment Management Plan or Forest Plan goals and objectives.

5. Determine how much of the present plant community is like the desired plant community. The Plant Community Similarity column is the lower value of the desired plant community or the present plant community column.

6. Total all three columns.

7. Calculate the similarity between the present plant community and the desired plant community by the formula: $2w / a + b$, where w is the total of the similarity column, a the the total of the present community column, and b is the total of the desired community column.

8. Enter this figure in the desired future condition similarity row as a percent.

9. Information fron the Range Inventory Standardization Committee Report (1983) suggests that a value of 75 percent similar or greater may be used to differentiate between meeting and not meeting management objectives.

27.4 - EXHIBIT 02 IS A SEPARATE DOCUMENT.

FSH 2209.21 - RANGELAND ECOSYSTEM ANALYSIS AND MANAGEMENT HANDBOOK
R-4 AMENDMENT 2209.21-93-1
EFFECTIVE 5/18/93

27.4 - Exhibit 02

REGION 4 RANGE MANAGEMENT RESOURCE VALUE RATINGS GUIDE

Column Descriptions

Genus and Species - followed with a P, the plant is poisonous.
Y Forage preference - yearly
S Forage preference - spring
S Forage preference - summer
F Forage preference - fall
W Forage preference - winter

Column heading identifies type of animal rated.

E Erosion Control potential (watershed protection)

Abbreviations Used

H = High
M = Medium
L = Low

Definition of Codes

Preference of plant by cattle, sheep, horses, mule deer, and elk - The relish and degree of use shown by selected ungulates for a plant or plant part.

a. HIGH - highly relished and consumed to a high degree.
b. MODERATE - moderately relished and consumed to a moderate degree.
c. LOW - not relished and normally consumed to only a small degree or not at all.

Watershed - Erosion Control Potential - A plant exhibits growth habit, plant structure, biomass and/or a root system that has the potential to reduce soil erosion.

a. HIGH - A plant that has aggressive growth habits, persistent plant structure, high potential biomass, and/or a good soil-binding root-rhizome-runner system in established stands.

b. MODERATE - A plant that has moderately aggressive growth, moderately persistent plant structure, moderate potential biomass, and/or a moderate soil-binding root-rhizome-runner system in established stands.

c. LOW - A plant that has poor growth, persistence, biomass and/or a soil-binding root system that makes it generally inadequate for erosion control.

27.4 - Exhibit 02--Continued

GRASS AND GRASSLIKE	Resource Value Ratings						
Genus and Species	YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
Agropyron cristatum	MHMMM	MHMMM	HHHHH	MHLLM	MHMMM	M	Fairway wheatgrass
Agropyron dasystachyum	HHMMH	MHMMM	HHHHH	MHLLM	HHHMM	M	Montana wheatgrass
Agropyron elongatum	MMLLM	MMLLM	HHMMM	MMLLM	MHLLM	H	Tall wheatgrass
Agropyron hispidus	HHHMM	MHMMM	HHHHM	MHMLM	HHHMM	H	Intermediate wheatgrass
Agropyron lanceolatus	MHMMM	MMLLM	HHMMM	MHLLM	MHMMM	H	Thickspike wheatgrass
Agropyron repens	MMLLM	LMLLL	MHMMM	MMMLM	HHHMM	H	Quackgrass
Agropyron scribneri	LMLLL	LMLLL	HHHHL	LMLLL	MMMLL	M	Scribner wheatgrass
Agropyron smithii	MHMMM	MMLLM	MHMMM	MHLLM	MHMMM	H	western wheatgrass
Agropyron spicatus	HHMMM	MMLLM	MHMMM	MMLLM	HHMMM	M	Hairy bluebunch
Agropyron trachycaulus	MHMMM	MMMMM	HHHMH	MMMMM	HHHMH	M	Slender wheatgrass
Agropyron hispidus	MHMMM	MMMMM	MHMMM	MMLLM	HHHMM	H	Pubescent wheatgrass
Agrostis stolonifera	MMMLL	LMLLL	MHMMM	LMLLL	MHMML	M	Redtop bentgrass
Agrostis exarata	MMMLL	LMLLL	MHMMM	LMLLL	MHMML	M	Spike bentgrass
Agrostis idahoensis	MHMLL	LMLLL	MHMMM	LMLLL	LMLLL	M	Idaho redtop
Agrostis scabra	MHMLL	LMLLL	MMMLL	LMLLL	MMMLL	M	Rough bentgrass
Agrostis stolonifera	MHMLL	LMLLL	MMHLL	MMHLL	MMMLL	H	Carpet bentgrass
Agrostis variabilis	MHMLL	LMLLL	MMHLL	MMHLL	MMMLL	M	
Alopecurus pratensis	MMMMM	MMMLM	MMMML	MMLLM	MMMMM	M	Meadow foxtail
Andropogon barbinodis	MLMLM	LLLLM	MMMMM	LLLLM	LLLLL	H	Cane beardgrass
Andropogon hallii	MMMMM	MMMMM	MMMML	MLMML	MLMML	H	Sand bluestem
Aristida fendleriana	LMLLL	LMLLL	MLLLL	LLLLL	LLLLL	M	Fendler three-awn
Aristida longiseta	LMLLL	LMLLL	MMMLL	LLLLL	LLLLL	M	Red three-awn
Aristida oligantha	LMLL-	LMLL-	LMLL-	LMLL-	LLLL-	L	Prairie three-awn
Aristida purpurea	MMMLL	LMLLL	MMMLL	LMLLL	LLLLL	L	Purple three-awn
Arrhenatherum elatius	MMMMM	MMLLM	MHMMM	MMLLM	H	M	Tall oatgrass
Avena fatua	MHM-M	MHL-M	MHM-M	LML-L	LML-L	L	Wildoat
Avena sativa	MHM-L	MHL-L	MHM-L	LML-L	LML-L	L	Common oat
Beckmannia syzigachne	MMLLL	LMLLL	LMLLL	LMLLL	LLLLL	M	American sloughgrass
Bouteloua aristidoides	LLMLL	LLLLL	LLMLL	LLMLL	LLLLL	M	Needle grama
Bouteloua barbata	LLM--	LLM--	LLM--	LLL--	LLL--	L	Sixweeks grama
Bouteloua curtipendula	MHMMM	MMMLM	MMMMM	LMLLL	LMLLL	M	Sideoats grama
Bouteloua eriopoda	MHMMM	MMMLM	MMMMM	LMLLL	MMMLL	M	Black grama
Bouteloua gracilis	MHMMM	MMMLM	MMMMM	LMLLL	MMMLL	M	Blue grama
Bouteloua hirsuta	MHMLL	MMMLM	MMMMM	LMLLL	LMLLL	M	Hairygrama
Bouteloua simplex	LMMLL	LLLLL	LLMLL	LLLLL	LLLLL	L	Mat grama
Bromus anomalus	MHMMM	MHMMM	HHHMM	MHMMM	MHMMM	M	
Bromus brizaeformis	HHL--	MML--	HHL--	MML--	MHM--	L	Rattlesnake grass
Bromus carinatus	HHHMM	MHMMM	MHMMM	MMMLL	HHHMM	M	Mountain brome
Bromus carinatus	HHHMM	MHMMM	MHMMM	MMMLL	HHHMM	M	Big mountain brome
Bromus ciliatus	HHHMM	MHMMM	HHHMM	MHMMM	MHMMM	M	Fringed brome
Bromus diandrus	LML--	LLL--	LML--	LML--	MML--	L	Ripgut brome
Bromus japonicus	HHM--	HHM--	HHM--	MMM--	MMM--	L	Hairy brome
Bromus inermis	HHHMM	MHMMM	HHHMM	MMMLM	HHHMM	H	Smooth brome
Bromus mollis	HHM--	HHM--	HHM--	MMM--	MHM--	L	Soft chess
Bromus rubens	MML--	MML--	MML--	MML--	LLL--	L	Foxtail brome
Bromus tectorum	MHLLH	MHLLH	MHLLM	MHLLH	MHLLH	L	Cheatgrass
Buchloe dactyloides	HHHMM	HHHMM	HHHMM	LLMLL	HHHMM	H	Buffalo grass
Calamagrostis canadensis	HHHMM	MMHLL	MHMMM	MMMML	MMHHM	H	Bluejoint reedgrass
Calamagrostis stricta	HHHMM	MMMML	HHHHH	MMMLM	M	H	Northern reedgrass
Calamagrostis montanensis	MMHMM	MMMMM	MMMMM	LMLLL	MHMML	M	Plains reedgrass
Calamagrostis purpurascens	LMLLL	LMLLL	MMMMM	MMMML	MMMML	M	Purple pinegrass
Calamagrostis rubescens	MMHHM	LMMLL	MHMMM	MMLLM	MLMML	H	Pinegrass
Calamovilfa longifolia	HHMLH	MHLLM	HHMLH	LMMLL	MMLLM	H	Prairie sandreed
Carex albonigra	H	H	H	H		M	Black & white sedge
Carex aquatilis	HHHHM	MMMMM	MHMMM	MMMMM	MHHMM	H	Water sedge
Carex atherodes	H	M	H			M	
Carex atrata	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	M	
Carex aurea	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	M	Golden sedge
Carex douglasii	MHMLL	LLMLL	MHMLL	MMMLL	MMMLL	M	Douglas sedge
Carex ebenea	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	M	Ebony sedge
Carex egglestonii	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	M	Eggleston sedge
Carex elynoides	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	H	Blackroon sedge
Carex epapillosa	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	M	Smoothfruit sedge
Carex filifolia	MMMLL	MMMLL	MMMMM	LMLLL	MMMLM	H	Treadhead sedge
Carex geyeri	HHHMM	LMMLL	HHHMM	MHMMM	HHHMM	M	Elk sedge
Carex heliophila	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	L	Sun sedge

27.4 - Exhibit 02--Continued

GRASS AND GRASSLIKE	Resource Value Ratings						
Genus and Species	YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
Carex lanuginosa	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	H	Wooly sedge
Carex microptera	HHHHM	MHMMM	HHHHM	MMMML	MHMMM	M	Smallwing sedge
Carex nebraskensis	HHHHM	MMMMM	HHHHM	MMMMM	MHHMM	H	Nebraska sedge
Carex nigricans	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	H	Black alpine sedge
Carex obtusata	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	M	Obtuse sedge
Carex paysonis	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	M	Tolmie sedge
Carex praegracilis	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	H	Silver sedge
Carex raynoldsii	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	H	Raynolds sedge
Carex rossii	MMLLL	LMMLL	LMLLL	LMLLL	MMMLL	H	Ross sedge
Carex rostrata	LLMML	LMLLL	LMLLL	LMLLL	MMMLL	H	Beaked sedge
Carex rupestris	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	M	Rock sedge
Carex stenophylla	MHHMM	MMMML	MMMMM	MMMMM	MHHMM	M	Needleleaf sedge
Catabrosa aquatica	HHHMM	MMMMM	HHHMM	MMMMM	MMMMM	M	Brookgrass
Cenchrus longispinus	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	sandbur
Dactylis glomerata	HHHHM	HHHHM	HHHHM	HHHHM	HHHHM	M	Orchardgrass
Danthonia californica	MHMMM	MMMMM	MMMMM	MMMMM	HHHMM	M	California danthonia
Danthonia intermedia	HHHHL	MMMML	HHHHL	HHHHL	HHHHL	M	Timber danthonia
Danthonia parryi	MMMML	MMMML	MMMML	MMMML	HHHML	M	Parry danthonia
Danthonia unispicata	MMMML	MMMML	HHHML	MMMML	MMMML	M	Onespike danthonia
Deschampsia caespitosa	HHHHM	MHMMM	HHHMM	MMMML	MHHMM	H	Tufted hairgrass
Distichlis spicata	MMMML	LLLLL	MMMML	LLLLL	LLLLL	H	Inland saltgrass
Echinochloa crus-galli	MMMLL	MMMML	MMMML	MMMLL	MMMLL	L	Barnyard grass
Eleocharis acicularis	MMMML	MMMML	MMMLL	MMLLL	MMMLL	H	Needle spikerush
Eleocharis palustris	MMMML	MMMML	MMMLL	LMLLL	MMMLL	H	Spikerush
Elymus canadensis	MMMMM	MMMLL	MHMMM	LMLLL	MMMLL	M	Canada wildrye
Elymus caput-medusa	LML--	LLL--	LLL--	LLL--	LLL--	L	Medusahead rye
Elymus cinerus	HHMMH	MMLLL	HHLLM	MHMMM	HHHMM	H	Great Basin wildrye
Elymus condensatus	MMLLM	LMLLL	HHMMH	LMLLL	MMMLM	H	Giant wild rye
Elymus glaucus	MHMLM	MMMLL	HHMLM	MMMLM	HHMMH	H	Blue wildrye
Elymus junceus	HHMMH	HHMMH	HHMMH	HHMMH	HHMMH	M	Russian wildrye
Elymus salinus	LMLLL	LLLLL	MMMLL	LLLLL	LLLLL	H	Salina wildrye
Elymus simplex	MMMLL	LLLLL	MMMLL	LLLLL	MMMLM	M	
Elymus triticoides	MMMLM	LLLLL	MMMLM	LMLLL	MMMLM	M	Creeping wildrye
Eragrostis cilianensis	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Stinkgrass
Eragrostis trichodes	HHHHM	MMMML	HHHHM	MMMMM	LLMLL	M	Sand lovegrass
Festuca arizonica	MHMMM	LMMLL	HHHHM	MMMLL	MMMLL	M	Arizona fescue
Festuca arundinacea	HHHMM	MMMMM	HHHMH	MMMLM	MHMMM	H	Reed fescue
Festuca idahoensis	HHHHH	MHHMM	HHHHH	MHMMM	HHHMH	M	Idaho fescue
Festuca octoflora	LML--	MMM--	LML--	MMM--	LML--	L	Sixweeks fescue
Festuca ovina	HHHHM	HHHHM	HHHHM	MHMMM	HHHMM	M	Sheep fescue
Festuca rubra	HHHMM	MHMLM	HHHMM	MMMMM	HHHMM	H	Red fescue
Festuca scrabrella	HHHMH	MHHMM	HHHHM	MMMLM	HHHMM	M	Rough fescue
Fesctuca thurberi	HHHMM	MMMLL	HHHMM	MMMLL	HHHMM	H	Thurber fescue
Festuca viridula	HHHHM	HHHMM	HHHHM	MHMMM	HHHMM	H	Greenleaf fescue
Glyceria grandis	HMHHM	MLMML	HMHHM	HMHHM	HHHHM	H	American mannagrass
Glyceria striata	HHHHM	MLMML	HMHHM	LLLLL	HHHHM	H	Fowl mannagrass
Helictotrichon hookeri	H	M	H			M	Alpine oat
Heteropogon contortus	MHHLL	LMLLL	LMLLL	LMLLL	LLLLL	M	Tanglehead
Hilaria belangeri	HHHHH	MMMMM	HHHHH	MMMMM	MMMMM	M	Curly mesquite
Hilaria jamesii	HHHHM	MHMM	HHHHM	MMHMM	MMHMM	H	Galleta
Hilaria rigida	HHHML	MHMLL	HHHML	MHMLL	LMLLL	M	Big galleta
Hordeum brachyantherum	MMLLL	LMLLL	MHLLL	MHLLL	MMMLL	M	Meadow barley
Hordeum jubatum	MHLML	LMLLL	MHLML	MHLML	MHLML	L	Foxtail barley
Juncus balticus	MHMMM	LMLLL	MHLLL	LMLLL	LMLLL	H	Baltic rush
Juncus longistylis	MHMMM	LMLLL	MHLLL	LMLLL	LMLLL	H	Longstyle rush
Juncus parryi	MHMMM	LMLLL	MHLLL	LMLLL	LMLLL	H	Parry rush
Kobresia bellardii	MMMML	MMMML	LLLLL	LMLLL	LMMLL	H	Kobresia
Kobresia sibirica	MMMML	MMMML	MMMML	LLLLL	MMMML	M	Kobresia
Koeleria cristata	MHHMM	MHHMM	MHHMM	MHHMM	MHHMM	M	Prairie junegrass
Leersia oryzoides	MMMML	MMLLL	MMMML	MMLLL	MMLLL	L	Rice cutgrass
Lolium perenne	HHHMM	HHHMM	HHHMM	MMMLL	HHHMM	M	Perennial ryegrass
Melica bulbosa	HHHHM	MHMMM	HHHHH	MHMMM	MHHMM	M	Oniongrass
Melica spectabilis	HHHHM	MHMMM	HHHHH	MHMMM	HHHMM	M	Showy oniongrass
Muhlenbergia asperifolia	M	M	M	M	M	L	Alkali muhly
Muhlenbergia cuspidata	MMMLM	MMMLM	MMMLM	MMMLM	MMMLM	M	Sandhills muhly
Muhlenbergia montana	MHMMM	MMMMM	MHMMM	MMMMM	HHHMM	M	Mountain muhly

27.4 - Exhibit 02--Continued

GRASS AND GRASSLIKE	Resource Value Ratings						
Genus and Species	YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
Muhlenbergia porteri	HHHMH	MMMMM	HHHMH	MLMML	MLMML	M	Bush muhly
Muhlenbergia pungens	M	M	M		L	L	Sandhill muhly
Muhlembergia racemosa	HHHMM	MMMLL	HHHMM	MMMLL	MMMLL	M	Green muhly
Muhlenbergia richardsonis	MMMLL	LMLLL	MMMML	MMMLL	MMMLL	M	Mat muhly
Muhlenbergia torreyi	MMMML	MLMML	MMMML	MMMLL	MMMLL	M	Ring muhly
Munroa squarrosa	LMLLL	LMMLL	LMLLL	LMLLL	LMLLL	L	False buffalograss
Oryzopsis hymenoides	HHHMH	HHHMH	HHHMH	MHMMH	MHMMH	H	Indian ricegrass
Oryzopsis micrantha	HHHMH	MHMMH	HHHMH	MHMMH	MHMMH	M	Littleseed ricegrass
Panicum capillare	MMMLL	LMLLL	MMMLL	LMLLL	LMLLL	L	Common witchgrass
Panicum virgatum	MMMLL	LMLLL	MMMLL	LMLLL	LMLLL	M	Switchgrass
Phalaris arundinacea	MHMLL	MMMLL	MMMLL	MMMLL	MMMLL	H	Reed canarygrass
Phleum alpinum	HHHHL	MHHML	HHHHM	MMMHM	MMMHM	M	Alpine timothy
Phleum pratense	HHHHM	MMHHM	MMLLM	MMHHM	MMMHM	M	Timothy
Phragmites australis	LMMLL	LLLLL	LMLLM	LLLLL	LLLLL	H	Common reed
Poa alpina	HHHHL	HHHHL	HHHHL	HHHHL	HHHHL	M	Alpine bluegrass
Poa arida	MMMMM	MMMLL	MHMMM	MMMLL	MMMLL	M	Plains bluegrass
Poa bulbosa	MHMLM	MHMLM	MHMLM	MHMLM	MHMLM	L	Bulbosa bluegrass
Poa canbyi	HHHMM	MHMMM	HHHMM	HHHMM	HHHMM	M	Canby bluegrass
Poa compressa	HHHHM	HHHHM	HHHHM	HHHHM	HHHHM	M	Canada bluegrass
Poa fendleriana	HHHHM	HHHMM	HHHHM	MHMMM	HHHMM	M	Mutton bluegrass
Poa glauca	H	M	H	M	H	M	Wood bluegrass
Poa nervosa	HHMMM	MMMMM	HHHMM	MMMLL	HHHMM	M	Wheeler bluegrass
Poa nevadensis	HHHMH	MMMMM	HHHHM	MMMMM	HHHMM	M	Nevada bluegrass
Poa palustris	HHHMM	MMMMM	HHHHM	MMMMM	HHHMM	H	Fowl bluegrass
Poa pratensis	HHHHH	HHHMM	HHHHM	HHHMH	HHHMH	H	Kentucky bluegrass
Poa reflexa	HHHMM	MHHML	HHHMM	MHMMM	HHHMM	M	Nodding bluegrass
Poa secunda (sandbergii)	MHLMM	MHLMM	MHLMM	MHLMM	MHLMM	M	Sandburg bluegrass
Redfieldia flexuosa	MMMLL	LMLLL	MMMLL	LMLLL	LLLLL	H	Blowoutgrass
Schizachyrium scoparium	HHHML	HHHML	HHHML	HHHML	HHHML	M	Little bluestem
Scirpus acutus	MLMML	LLMML	LMMLL	LLLLL	LLLLL	M	Tule bulrush
Scirpus americanus	MLMML	LLMML	LMMLL	LLLLL	LLLLL	M	American bulrush
Scirpus maritimus	MLMML	LLMML	LMMLL	LLLLL	LLLLL	M	Bulrush
Scirpus validus	MLMML	LLMML	LMMLL	LLLLL	LLLLL	M	Softstem bulrush
Secale cereale	HHHML	MMMLL	HHHML	LMLLL	MMMLL	L	Winter rye
Setaria glauca	MMMLL	LMLLL	MMMML	LMLLL	LMLLL	L	Yellow bristlegrass
Setaria italica	MMMLL	LMLLL	MMMML	LMLLL	LMLLL	M	Bristlegrass
Setaria viridis	MMMLL	LMLLL	MMMML	LMLLL	LMLLL	L	Green bristlegrass
Sitanion hystrix	MHLLM	MHLLL	MHLLM	MHLLM	HHHMH	M	Bottlebrush squirreltail
Sorghastrum nutans	HHHMM	HHHMM	HHHMM	LMLLL	LMLLL	M	Yellow Indiangrass
Sorghum bicolor	H	H	H	M		H	Sorghum sudangrass
Sparganium eurycarpum	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Giant burreed
Spartina gracilis	LMLLL	LLLLL	LMLLL	LLLLL	LLLLL	H	Alkali cordgrass
Spartina pectinata	MMMLL	LMLLL	MMMLL	LMLLL	LMLLL	H	Prairie cordgrass
Sporobolus airoides	MHMMM	MMMLL	HHHMM	LMLLL	MMMLL	H	Alkali sacaton
Sporobolus contractus	MHMML	LMMLL	MHMML	MHMML	MMMLL	H	Spike dropseed
Sporobolus cryptandrus	MMMLL	MMMLL	MMMLL	MMMLL	MMMLL	M	Sand dropseed
Sporobolus heterolepis	HHHHM	HHHHM	HHHHM	HHHHM	MMMML	M	Dropseed
Stipa columbiana	HHHHM	MHMMM	HHHHM	MHMMM	HHHHM	M	Subalpine needlegrass
Stipa comata	HHMLH	MHLLM	HHMLH	MHLLM	MHLLM	M	Needle and thread
Stipa lettermanii	MMMLL	MMMLL	MMMML	MMMLL	MMMLL	M	Letterman needlegrass
Stipa occidentalis	HHHML	MMMML	HHHML	MMMML	HHHML	M	Western needlegrass
Stipa pinetorum	M	M	M	H	H	M	Pinewoods needlegrass
Stipa richardsonii	MMMLL	MMMLL	MHMLL	MMMLL	MHMML	M	Richardson needlegrass
Stipa scribneri	MMMLL	MMMLL	MHMLL	MMMLL	MHMML	M	Scribner needlegrass
Stipa thurberiana	MMMLM	MMMLM	HHHLM	MMMLM	MMMLM	M	Thurber needlegrass
Stipa viridula	HHHHM	MHMMM	HHHHM	MHMMM	HHHMH	M	Green needlegrass
Trisetum spicatum	HHHHM	MHMMM	HHHHM	MHMMM	HHHHM	L	Spike trisetum

27.4 - Exhibit 02--Continued

FORBS

Genus and Species	YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
	Resource Value Ratings						
Abronia fragrans	MMMLL	MMMLL	LLLLL	LLLLL	LLLLL	L	Snowball sandverbena
Achillea millefolium lanulosa	LMLLL	MMMML	LLLLL	MMMML	MMMLL	M	Western yarrow
Aconitum columbianum - P	LLLLL	MMMLL	LLLLL	MMMLL	LLLLL	M	Columbia monkshood
Actaea rubra	LLLLL	LMLLL	LLLLL	LMLLL	LMLLL	M	Red baneberry
Agastache urticifolia	MMMML	HHHHL	MMMML	LLMML	LLLML	M	nettleleaf horsemint
Agoseris glauca	HHHM-	HHHM-	MMML-	HHHM-	HHHM-	L	Pale agroseris
Alisma plantago-aquatica	L	L	L	L	L	L	Waterplantain
Allium acuminatum	MHL--	MHL--	MHL--	MHL--	MHL--	L	Tapertip onion
Allium brevistylum	MHL--	MHL--	MHL--	MHL--	MHL--	L	Shortstyle onion
Allium ceruum	MHL--	MHL--	MHL--	MHL--	MHL--	L	Nodding onion
Allium nevadense	MHL--	MHL--	MHL--	MHL--	MHL--	L	Nevada onion
Allium textile	MHL--	HHM--	LML--	MHL--	MHL--	L	Textile onion
Amaranthus blitoides	LLLL-	MMML-	LLLL-	MMML-	LMLL-	M	Amaranth or pigweed
Amaranthus retroflexus	MMML-	HHMM-	MMMM-	HHHM-	MMMM-	L	Redroot amaranth
Anaphalis margarttacea	LLLLL	LLLLL	LMLLL	LLLLL	LLLLL	M	Common pear-everlasting
Anemone patens mulifida	MMMLL	MMMLL	LLLLL	MMMLL	LLLLL	L	Spreading pasque-flower
Antennaria alpina	LLLLL	MMMLL	LLLLL	MMMLL	LLLLL	M	Alpine pussytoes
Antennaria dimorpha	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Low pussytoes
Antennaria microphylla	LLLLL	MMMLL	LLLLL	MMMLL	LLLLL	H	Rose pussytoes
Antennaria parvifolia	LLLLL	MMMLL	LLLLL	MMMLL	LLLLL	H	Littleleaf pussytoes
Aquilegia species	LLLLL	LMMLL	LLLLL	LMMLL	LMMLL	M	Columbine
Apocynum cannabinum - P	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Hemp dogbane
Arabis drummondii	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	L	Drummond rockcress
Arenaria congesta	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	L	Ballhead sandwort
Arenaria fendleri	LLLLL	MMMLL	LLLLL	LMMLL	LLLLL	L	Fendler sandwort
Arenaria hookeri	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	L	Hooker sandwort
Arenaria obtusiloba	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	L	Twinflower sandwort
Artemisia ludoviciana	LLLLL	HHHML	LLLLL	MMMLL	MMMLL	M	White sage
Asclepias labriformis -P	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Milkweed
Acclepias speciosa - P	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Showy milkweed
Asclepias subverticiliata	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Horsetail milkweed - P
Aster chilensis adscendens	MMMML	MHMML	LMLLL	MMMML	MMMML	H	Pacific aster
Aster engelmannii	MMMML	HHMML	MMMLL	HHHML	HHHML	H	Engelmann aster
Aster ericoides pansus	MMMLL	MHMLL	LMMLL	MMMLL	MMMLL	M	Heath aster
Aster foliaceus canbyi	MMMML	MLMML	LLMLL	MLMML	MLMML	H	Alpine leafybract aster
Astragalus adsurgens robustior	MHML-	MHML-	LMLL-	MMML-	MMLL-	M	Milkvetch
Astragalus beckwithii	LMLL-	MMMM-	LLLL-	MMMM-	LMLL-	L	Beckwith milkvetch
Astragalus bisulatus - P	LLLL-	LMLL-	LLLL-	LMLL-	LLLL-	L	Twogrooved locoweed
Astragalus cibarius	LLLL-	MMML-	LLLL-	MMML-	MMML-	L	Silkly milkvetch
Astragalus cicer	LMLL-	MMMM-	LMLL-	HHHM-	MMMM-	H	Chickpea milkvetch
Astragalus convallarius-P	LLLL-	LMML-	LLLL-	MMML-	MMML-	L	Timber poisonvetch
Astragalus crassicarpus	MML--	HHM--	MML--	LLL--	LLL--	M	Groundplum milkvetch
Astragalus drummondii	LLL--	MML--	LLL--	LLL--	LLL--	M	Drummond milkvetch
Astragalus flexuosus	MML--	MML--	MML--	MML--	LLL--	L	Flexile milkvetch
Astragalus miser - P	LLL--	LML--	LLL--	MMM--	LLL--	L	Weedy milkvetch
Astragalus missouriensis	LLL--	MML--	LLL--	LLL--	LLL--	L	Missouri milkvetch
Astragalus mollissimus-P	LLL--	LML--	LLL--	MMM--	LLL--	L	Wooly milkvetch
Astragalus nelsonianus- P	LLL--	LML--	LLL--	MMM--	LLL--	M	Narrowleaf poisonvetch
Astragalus purshii	LLLL-	LMLL-	LLLL-	MMML-	LLLL-	L	Pursh locoweed
Astragalus spatulatus	LLLL-	LMLL-	LLLL-	LLLL-	LLLL-	L	Tufted milkvetch
Balsamorhiza hookeri	MMMML	MHMML	MMMML	HHHHM	MLLMH	M	Hooker balsamroot
Balsamorhiza incana	MMMLL	MMHMM	HHHHM	HHHHM	MLLMH	L	Hoary balsamroot
Balsamorhiza macrophylla	MMMLL	MMMML	LMLLL	MHMML	MLLMH	M	Cutleaf balsamroot
Balsamorhiza sagittata	MHMML	HHHMM	MHMLH	HHHHM	HHHHM	M	Arrowleaf balsamroot
Bassia hyssopifolia	MMMLL	MHMMM	MMMLL	MMMMM	MMMLL	M	Fivehook bassia
Brassica nigra	MMMLL	HHHML	LMLLL	MMMMM	MMMLL	M	Black mustard
Calochortus nuttallii	HHHM-	HHHM-	MHMM-	HHHM-	MHMM-	L	Segolily, mariposa lily
Caltha leptosepala	MMMLL	MMMLL	LLLLL	HMHML	MMHML	M	Elkslip marshmarigold
Camassia quamash	LMML-	MHHM-	LLLL-	MHMM-	MMLL-	L	Common camass
Campanula rotundifolia	MMMLL	MHHHM	LMLLL	MMMML	LMMLL	L	Bluebell
Capsella bursa-pastoris	LLLLL	MMMMM	LLLLL	MMMMM	LMLLL	L	Shephards-purse
Cardaria draba	LLLLL	MMMLL	LLLLL	LMMLL	LMLLL	M	Pepperweed whitetop
Carduus nutans	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Musk bristlethistle
Castilleja angustifolia	LMLLL	MMML	LLLLL	MMMML	LMLLL	M	Northwestern painted-cup
Castilleja chromosa	LMLLL	MMMML	LLLLL	MMMML	LMLLL	M	Desert Indian paintbrush
Castilleja flava	MMMML	MMMML	LLLLL	MMMML	LMLLL	M	Yellow Indian Paintbrush

27.4 - Exhibit 02--Continued

FORBS

Genus and Species	Resource Value Ratings YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
Castilleja integra	MMMML	MMMML	MMMML	MMMML	LMLLL	M	Wholeleaf painted-cup
Castilleja linariaefolia	MMMML	MMMML	LLLLL	MMMML	MMMML	M	Wyoming painted-cup
Castilleja miniata	LMLLL	LLLLL	LLLLL	MMMML	MMMML	M	Scarlet painted-cup
Castilleja occidentalis	MMMML	HHHHL	LLLLL	HHHHL	MMMML	M	Western painted-cup
Castilleja sulphurea	LLLLL	MMMML	LLLLL	MMMML	MMMML	M	Sulphur painted-cup
Centaurea maculosa	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Centaurea
Centaurea repens	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Russian centaurea
Cerastium arvense	LLLLL	MMMML	LLLLL	LMMLL	LMMLL	L	Starry cerastium
Ceratophyllum demersum	L	L	L	L		L	Hornwort
Chaenactis douglasii	LLLLL	LMLLL	LLLLL	LMLLL	LLLLL	L	Douglas chaenactis
Chenopodium album	MMM--	HHM--	MMM--	HHMM-	MMM--	L	Lambsquarter goosefoot
Chenopodium leptophyllum	LML--	MMM--	MMM--	HHM--	MMM--	L	Slimleaf goosefoot
Chenopodium rubrum	LML--	MMM--	mmm--	hhm--	mmm--	L	Goosefoot
Chorispora tenella	LMLL-	MMML-	MMLL-	MMML-	MMML-	L	Blue mustard
Cicuta douglasii - P	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Douglas waterhemlock
Cirsium arvense	LLLLL	LMLLL	LLLMM	LLLLL	LLLLL	H	Canada thistle
Cirsium coloraense	LLLLL	LMLLL	LLLMM	LLLLL	LLLLL	M	Thistle
Cirsium foliosum	LLLLL	LMLLL	LLLMM	LLLLL	LLLLL	L	Elk thistle
Cirsium undulatum	LLLLL	LMLLL	LLLMM	LLLLL	LLLLL	L	Wavyleaf thistle
Cirsium vulgare	LLLLL	LMLLL	MLMMM	LLLLL	LLLLL	L	Bull thistle
Clematis columbiana	LMLLL	HHMML	MMMLL	MMMML	LMLLL	L	Virginsbower
Clematis hirsutissima	LMLLL	MMMML	LLLLL	MMMML	LMLLL	M	Scott clematis
Clematis ligusticifolia	LMLLL	MMMML	LLLLL	MMMML	LMLLL	M	Western virginsbower
Cleome lutea	LLL--	MMM--	LLL--	MMM--	LML--	L	Yellow spiderflower
Cleome serrulata	LLL--	MMM--	LLL--	MMM--	LML--	L	Bee spiderflower
Comandra umbellata	LLLLL	MMMLL	LLLLL	MMMLL	LMMLL	M	Toadflax
Conium maculatum - P	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Poison-hemlock
Convolvulus arvensis	MHMLL	HHHHM	MMMMM	HHHHM	HHHMM	M	European glorybind
Conyza canadensis	LLLLL	LMMLL	LLLLL	LMMLL	LMLLL	L	Canada horseweed
Corydalis aurea	LMLL-	MMML-	LLLL-	LMLL-	LMLL-	L	Budbeak
Corydalis caeseana	LMLL-	MMML-	LLLL-	LMLL-	LMLL-	L	Fitweed
Coryphantha missouriensis	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Nipple coryphantha
Coryphantha vivipara	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Cushion coryphantha
Crepis acuminata	MHMLL	HHHMM	LMMLL	HHHMM	HHHMM	L	Tapertip hawksbeard
Crepis intermedia	MHMLL	HHHMM	LMMLL	HHHMM	HHHMM	L	Gray hawksbeard
Crepis modocensis	MHMLL	HHHMM	LMMLL	HHHMM	HHHMM	L	Modoc hawksbeard
Crepis occidentalis	MHMLL	MHMLL	MHMLL	MHMLL	MHMLL	M	Western hawksbeard
Crepis runcinata	MHMLL	MHMLL	MHMLL	MHMLL	MHMLL	L	Dandelion hawksbeard
Croton texensis	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Texas croton
Cryptantha celosiodes	LLL--	MMM--	MML--	MMM--	MMM--	L	Cryptantha
Cryptantha humilis	LLL--	MMM--	MML--	MMM--	MMM--	L	Cryptantha
Cryptantha sericea	LLL--	MMM--	MML--	MMM--	MMM--	L	Cryptantha
Cymopterus acaulis	LLL--	LML--	LLL--	LML--	LML--	L	Stemless spring parsley
Cymopterus purpurascens	LLL--	LML--	LLL--	LML--	LML--	L	Parsley
Cynoglossum officinale	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Common houndstongue
Dalea enneandra	M	M	M			M	Dalea, prairie clover
Dalea purpurea	H	H	H			M	Dalea
Dalea villosa	M	M	M			M	Dalea
Delphinium barbeyi - P	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	L	Barbey larkspur
Delphinium bicolor - P	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Little larkspur
Delphinium geyeri - P	LLLLL	MMMLL	LLLLL	LLLLL	LLLLL	L	Geyer larkspur
Delphinium nuttallianum-P	LLLLL	MMMLL	LLLLL	LLLLL	LLLLL	L	Nuttall larkspur
Delphinium occidentale-P	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Duncecap larkspur
Descurainia pinnata	LML--	MMM--	LLL--	LML--	LML--	L	Pinnate tansymustard
Dipsacus sylvestris	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Venus-cup teasel
Dodecatheon pulchellum	MMML-	HHHM-	MLLL-	MHMM-	MMMM-	L	Darkthroat shootingstar
Dyssodia papposa	LLL--	LLL--	LLL--	LLL--	LLL--	L	Dogweed
Epilobium angustifolium	LMLLL	MMMLL	LLLLL	HHHML	HHHML	M	Fireweed
Equisetum arvense	LLLLL	LLLLL	LLLLL	LLLLL	LMMLL	H	Field horsetail
Equisetum hyemale	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	H	Western scouring-rush
Equisetum laevigatum	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	H	Smooth horsetail
Erigeron argentatus	MMMLL	HHHMM	LLLLL	HHHMM	MMMLL	L	Fleabane
Erigeron engelmannii	MMMML	HHHMM	LLLLL	HHHMM	MMMLL	M	Engelmann fleabane
Erigeron pumilus	MMMML	HHHMM	LLLLL	HHHMM	MMMLL	L	Low fleabane
Erigeron simplex	MMMML	HHHMM	LLLLL	HHHMM	MMMLL	L	Oneflower fleabane
Erigeron speciosus macranthus	MMMML	HHHMM	LLLLL	HHHMM	MMMLL	M	Oregon fleabane

27.4 - Exhibit 02--Continued

FORBS

Genus and Species	YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
	Resource Value Ratings						
Eriogonum alatum	LLLLL	LMMLL	LLLLL	MMMLL	LMLLL	M	Wing eriogonum
Eriogonum cernuum	LLLLL	LMMLL	LLLLL	MMMLL	LMLLL	L	Nodding eriogonum
Eriogonum contortum	LLLLL	LMMLL	LLLLL	MMMLL	LMLLL	L	Rush eriogonum
Eriogonum flavum	LLLLL	LMMLL	LLLLL	HHHML	MMHML	L	Eriogonum
Eriogonum inflatum	LLL--	MML--	LLL--	LLL--	LML--	L	Desert trumpet eriogonum
Eriogonum racemosum	LLLLL	LMLLL	LLLLL	MMMLL	MMMLL	L	Redroot eriogonum
Eritrichium aretioides	L	L	L	L		L	Forget-me-not
Erodium cicutarium	MHM--	HHH--	MHM--	HHH--	HHH--	L	filaria
Erysimum asperum	MMML-	MHMM-	LLLL-	MHMM-	MMMM-	L	Plains erysimum
Erythronium grandiforum	LLL--	MHM--	LLL--	MHM--	MHM--	L	Lambstongue fawnlily
Euphorbia esula	LLLLL	LMLLL	LLLLL	LMLLL	LMLLL	H	Leafy spurge
Fragaria vesca bracteata	LLLLL	MMMMM	LLLLL	MMMMM	MMMMM	M	European strawberry
Fragaria virginiana	LLLLL	MMMMM	LLLLL	MMMMM	MMMMM	M	Virginia strawberry
Frasera montana	LLMLL	MMMML	LLLLL	MMMMM	MMMMM	M	Small frasera
Frasera speciosa	LLMLL	MMMML	LLLLL	MMMMM	MMMMM	M	Showy frasera
Fritillaria atropurpurea	LML--	MHM--	LLL--	MHM--	MMM--	L	Purplespot fritillary
Fritillaria pudica	LML--	MHM--	LLL--	MHM--	MMM--	L	Yellow fritillary
Gaillardia aristata	LLLLL	MMMML	LLLLL	MMMML	LMMLL	M	Common perennial gaillardia
Galium boreale	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Northern bedstraw
Gaura coccinea	LLLLL	LMLLL	LLLLL	LMLLL	LMLLL	L	Scarlet gaura
Gentiana affinis	LLL--	MML--	LLL--	MML--	MML--	L	Rocky Mountain pleated gentiana
Geranium fremontii	LLLLL	MMMLL	LLLLL	HHHML	MMMML	M	Fremont geranium
Geranium viscosissimum	LLLLL	MMMLL	LLLLL	MHMLL	MMMML	M	Geranium
Geum rossiiterbinatum	LLLLL	MMMLL	LLLLL	MMMLL	MMLLL	L	Avens
Geum triflorum	LLLLL	LMLLL	LLLLL	MMMLL	MMLLL	L	Avens
Gilia aggregata	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	L	
Gilia congesta	LLLLL	LMMLL	LLLLL	LMMLL	LMMLL	L	
Gilia pumila	LLLLL	MMMLL	LLLLL	MMMLL	LMMLL	L	
Gilia spicata	LLLLL	MMMLL	LLLLL	MMMLL	LMMLL	L	
Glycyrrhiza lepidota	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	American licorice
Grindelia squarrosa	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Curley gumweed
Halogeton glomeratus - P	LLL--	MMM--	LLL--	LLL--	LLL--	L	Halogeton
Hedysarum boreale	HHHHH	HHHHH	HHHHH	HHHHH	HHHHH	H	Northern sweetvetch
Helenium autumnale	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Common sneezeweed
Helianthella quinquenervis	MMMLL	HHHML	MMMLL	MMMLL	MMMLL	M	Fivenerve helianthella
Helianthella uniflora	LMLLL	HHHMM	LMLLL	MMMHM	MMMLL	M	Oneflower helianthella
Helianthus annuus	LLLLL	MMMML	LLLLL	MMMML	MMMML	L	Common sunflower
Helianthus maximilianii	LLLLL	MMMLL	LLLLL	MMMML	MMMML	M	Maximilian sunflower
Helianthus petiolaris	LMMLL	MMMLL	LMMLL	MMMML	MMMML	L	Prairie sunflower
Helianthus rigidus	LMMLL	MMMLL	LMMLL	MMMML	MMMML	M	Sunflower
Heracleum spondylium	HHHHM	HHHHM	HHHHM	HHHHM	HHHHM	M	Cowparsnip
Heterotheca villosa	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Hairy goldaster
Hieracium cynoglossoides	MMHHL	HHHHL	MMMML	HHHML	MHHML	L	Houndstongue hawksweed
Hieracium cynoglossoides	MMHHL	HHHHL	LLMML	HHHML	MHHML	L	Woolyweed
Hydrophyllum capitatum	MMM--	HHH--	MMM--	HHH--	HHH--	L	Ballhead waterleaf
Hymenopappus filifolius	LLLLL	MMMLL	LLLLL	MMMLL	LMLLL	L	Hymenopappus
Hymenoxys acaulis	LLLLL	MMMML	LLLLL	MMMML	LMMLL	M	Stemless hymenoxys
Hymenoxys grandiflora	LLLLL	MMMLL	LLLLL	MMMML	LMMLL	M	Graylocks hymenoxys
Hypericum perforatum P	LLLLL	LMLLL	LLLLL	LLLLL	LLLLL	M	Klamath weed
Iris missouriensis	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	H	Rocky Mountain iris
Isatis tinctoria	LMLL-	LMML-	LLLL-	LMML-	LMML-	L	Dyers woad
Iva axillaris	LLLLL	LMLLL	LLLLL	LMLLL	LLLLL	H	Poverty sumpweed
Iva xanthifolia	LLLLL	LMLLL	LLLLL	LMLLL	LLLLL	H	Rag sumpweed
Kuhnia eupatoriodes	LLLLL	MMMLL	LLLLL	MMMLL	LLLLL	M	False boneset
Lactuca serriola	MMHML	HHHHM	MHHML	HHHML	HHHML	L	Prickly lettuce
Lactuca tatarica puchella	MMHML	HHHML	HHHML	HHHML	MHHML	L	Chicory lettuce
Lappula redowskii	LLLL-	LMLL-	LLLL-	LMLL-	LLLL-	L	Annual stickseed
Lappula squarrosa	LLLL-	LMLL-	LLLL-	LMLL-	LLLL-	L	European stickseed
Lathyrus leucanthus	HMHHM	HMHHM	MMMMM	HMHHM	HMHHM	M	Aspen peavine
Lathyrus ochroleucus	HMHHM	HMHHM	MMMMM	HMHHM	HMHHM	M	Peavine
Lemna minor	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Common duckweed
Lemna trisulca	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Star duckweed
Lepidium densiflorum	LLLL-	LMLL-	LLLL-	LMLL-	LMLL-	L	Prairie pepperweed
Lepidium perfoliatum	LLLL-	LMLL-	LLLL-	LMLL-	LMLL-	L	Clasping pepperweed
Leucelene ericoides	L	M	L	L	L	L	Heath aster

27.4 - Exhibit 02--Continued

FORBS	Resource Value Ratings						
Genus and Species	YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
Leucocrinum montanum	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Common starlily
Lewisia rediva	LLLLL	MMLLL	LLLLL	LMLLL	LLLLL	L	Bitterroot lewisia
Liatris punctata	LLLLL	MMMMM	LLLLL	MMMMM	MMMMM	M	Dotted gayfeather
Ligusticum porteri	MMMML	MHHML	MMMML	HHHHL	HHHHL	M	Porter ligusticum
Linaria dalmatica	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	H	Dalmatian toadflax
Linaria vulgaris	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	H	Butter-and-eggs toadflax
Linum lewisii	MMMLL	MHMLL	MHMML	MHMML	MHMML	M	Lewis flax
Linum rigidum	LLL--	LML--	LLL--	MML--	MMM--	L	Stiffstem flax
Lithospermum ruderale	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Wayside gromwell
Lomatium dissectum	MML--	MML--	MHL--	MML--	MML--	M	Carrotleaf leptotaenia
Lomatium foeniculaceum	MML--	MML--	LLL--	MML--	MML--	M	Lomatium
Lomatium grayi	MML--	MML--	LLL--	MML--	MML--	M	Gray lomatium
Lomatium triternatum	MML--	MML--	LLL--	MML--	MML--	M	Narrowleaf lomatium
Lotus corniculatus	HHHMH	HHHMH	MMMLM	HHHMH	HHHMH	M	Birdsfoot deervetch
Lupinus argenteus - P	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Silvery lupine
Lupinus caudatus - P	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Tailcup lupine
Lupinus leucophyllus - P	MMMLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Velvet lupine
Lupinus pusillus	MMMLL	MMMLL	MMMLL	MMMLL	MMMLL	L	Rusty lupine
Lupinus sericeus - P	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Silky lupine
Lupinus alpestris	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Mountain lupine
Lygodesmia juncea	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Rush skeletonplant
Machaeranthera bigelovii	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Bigelow aster
Machaeranthera canescens	LLLLL	MMMLL	LLLLL	MMMML	LLLLL	M	Hoary aster
Machaeranthera glabriuscula	LLLLL	LMMLL	LLLLL	LLLLL	LLLLL	L	Alkali aster
Machaeranthera grindeloides	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	M	Aster
Machaeranthera tanacetifolia	LLLLL	LMMLL	LLLLL	LLLLL	LLLLL	L	Tansyleaf aster
Madia glomerata	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Cluster tarweed
Malcolmia africana	LLLLL	LMMLL	LLLLL	LLLLL	LLLLL	L	African mustard
Medicago lupulina	HHHHH	HHHHH	MMMMM	HHHMM	MMMMM	H	Black medick
Medicago sativa	HHHHH	HHHHH	HHHHH	HHHHH	HHHHH	H	Alflafa
Melilotus alba	HHHHL	HHHHL	HHHHL	HHHHL	HHHHL	M	White sweetclover
Melilotus officinalis	HHHML	HHHML	HHHML	HHHML	HHHML	M	Yellow sweetclover
Mentzelia albicaulis	LLL--	MMM--	LLL--	MMM--	MMM--	L	Whitestem mentzelia
Mentzelia decapetala	LLL--	MMM--	LLL--	MMM--	MMM--	L	Tenpedal mentzelia
Mertensia ciliata	LLMLL	HHHHL	MMMML	HHHHM	HHHHL	M	Mountain bluebells
Mertensia lanceolata	MMMML	MMMML	MMMML	HHHHM	MMMML	M	Lanceleaf bluebells
Mertensia oblongifolia	MMMML	HHHHM	MMMML	HHHHM	HHHHM	M	Oblongleaf bluebells
Monarda fistulosa	M	H	M	M	M	M	Wildbergamot beebalm
Musineon divaricatum	LLL--	MMM--	LLL--	MMM--	LML--	L	Leafy musineon
Myosotis sylvatica	LLLLL	MMMLL	LLLLL	MMMLL	M	L	Alpine forget-me-not
Myriophyllum ecalgescens	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Parrotfeather
Oenothera caespitosa	LLL--	MMM--	LLL--	MMM--	LLL--	L	Tufted evening primrose
Oenothera coronopifolia	MMM--	MMM--	MMM--	MMM--	LLL--	L	Evening primrose
Onobrychis viciifolia	HHHMM	HHHMM	HHHMM	HHHMM	HHHMM	M	Common sainfoin
Osmorhiza occidentalis	MHMML	HHHML	MMMLL	HHHML	HHHML	M	Sweetanise
Oxyria digyna	LLLLL	MMMLL	LLLLL	MMMLL	LLLLL	M	Alpine mountain sorrel
Oxytenia acerosa	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Prickly oxytenia
Oxytropis lambertii - P	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Lambert crazyweed
Oxytropis sericea - P	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Silky crazyweed
Pedicularis bracteosa	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Bracted pedicularis
Pedicularis groenlandica	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Elephanthead lousewort
Penstemon albidus	MMMLL	MMMML	LLLLL	MMMLL	LMMLL	L	Penstemon
Penstemon caespitosus	LMLLL	MMMML	LLLLL	LMLLL	LMLLL	L	Mat penstemon
Penstemon cyananthus	LMLLL	MMMML	LLLLL	LMLLL	LMLLL	L	Wasatch penstemon
Penstemon eatonii	MMMLL	MMMML	LLLLL	HHHML	LMLLL	M	Eaton penstemon
Pemstemon eriantherus	MMMLL	MMMML	LMLLL	MMMLL	LMLLL	L	Fuzzytongue penstemon
Penstemon fremontii	LMLLL	MMMML	LLLLL	MMMLL	LMLLL	L	Fremont penstemon
Penstemon laricifolius	MMMLL	MMMML	LMLLL	MMMLL	LMLLL	L	Penstemon
Penstemon nitidus	LMLLL	MMMML	LLLLL	MMMLL	LMLLL	L	Waxleaf penstemon
Penstemon palmeri	MMMLL	MMMML	LLLLL	MMMLL	LMLLL	M	Palmer penstemon
Penstemon strictus	LMLLL	MMMML	LLLLL	MMMLL	LMLLL	M	Rocky Mountain penstemon
Penstemon whippleanus	LMLLL	MMMML	LLLLL	MMMLL	LMLLL	M	Whipple penstemon
Petrophytum caespitosum	LMLLL	LMMLL	LLLLL	LMMLL	LMLLL	L	Tufted rockmat
Phacelia hastata	LLLLL	MHMLL	LLLLL	MHMLL	MMMLL	L	Alpine phacelia
Phacelia sericea	LLLLL	MHMLL	LLLLL	MHMLL	MMMLL	M	Silky phacelia
Phlox condensata	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Phlox

27.4 - Exhibit 02--Continued

FORBS	Resource Value Ratings						
Genus and Species	YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
Phlox hoodii	LLLLL	LMLLL	LLLLL	LMLLL	LLLLL	M	Hoods phlox
Phlox longifolia	LMLLL	LMLLL	LLLLL	LMLLL	LMLLL	L	Longleaf phlox
Phlox multiflora	LLLLL	LMLLL	LLLLL	LMLLL	LLLLL	M	Flowery phlox
Phlox muscoides	LLLLL	LMLLL	LLLLL	LMLLL	LLLLL	L	Phlox
Plantago patagonia	LMLL-	HHHM-	LMLL-	MMMM-	MMMM-	L	Wooly Indianwheat
Polemonium foliossimum	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Leafy poleminium
Polygonum amphibium	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	L	Bigroot ladysthumb
Polygonum aviculare	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	L	Prostrate knotweed
Polygonum bistortoides	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	M	American bistort
Polygonum douglasii	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	L	Douglas knotweed
Polygonum lapathifolium	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	L	Curlytop ladysthumb
Polygonum persicaria	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	L	Spotted ladysthumb
Polygonum ramosissimum	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	L	Bush knotweed
Potamogeton crispus	LLLLL	LLMLL	LLLLL	LLMLL	LLLLL	L	Curly pondweed
Potamogeton filiformis	LLLLL	LLMLL	LLLLL	LLMLL	LLLLL	L	Pondweed
Potamogeton foliosus	LLLLL	LLMLL	LLLLL	LLMLL	LLLLL	L	Leafy pondweed
Potemogeton nodosus	LLLLL	LLMLL	LLLLL	LLMLL	LLLLL	L	Longleaf pondweed
Potemogeton pectinatus	LLLLL	LLMLL	LLLLL	LLMLL	LLLLL	L	Fennell-leaf pondweed
Potemogeton pusillus	LLLLL	LLMLL	LLLLL	LLMLL	LLLLL	L	Baby pondweed
Potemogeton richardsonii	LLLLL	LLMLL	LLLLL	LLMLL	LLLLL	L	Richardson pondweed
Potentilla anserina	MLMML	MLMML	LLMLL	MLMML	MLMML	M	Silverleaf cinquefoil
Potentilla fruticosa	MLLMM	MLMMM	LLMLL	MLMMM	MLMMM	M	Cinquefoil
Potentilla glandulosa intermedia	LLLML	MLMML	LLLML	MLMML	MLMML	L	Cinquefoil
Potentilla gracilis	LLLML	MLMML	LLLML	MLMML	MLMML	L	Northwest cinquefoil
Psoralea tenuiflorum	LLLLL	LMMLL	LLLLL	LMMLL	LLLLL	L	Slimflower scurf-peer
Ranunculus aquatilis	LLL--	LLL--	LLL--	LLL--	LLL--	L	Hairleaf water buttercup
Ranunculus cymbalaria	LLL--	MMM--	LLL--	MMM--	MMM--	L	Rocky Mountain buttercup
Ranunculus eschscholtzii	LLL--	LLL--	LLL--	MMM--	MMM--	L	Eschscholtz buttercup
Ranunculus glaberrimus	MML--	MML--	LLL--	MMM--	MMM--	L	Sagebrush buttercup
Ratibida columnifera	LMLLL	MMMLL	LLLLL	MMMLL	LMMLL	M	Upright prairie coneflower
Rudbeckia laciniata	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Cutleaf coneflower
Rudbeckia occidentalis	LLLLL	MMMLL	LLLLL	LLLLL	LLLLL	M	Western coneflower
Rumex acetosella	LLLLL	MMMML	LLLLL	MMMML	MMMML	M	Sheep sorrel
Rumex crispus	LMLLL	MMMML	LLLLL	MMMLL	MMMLL	M	Curly dock
Rumex venosus	LMLLL	MMMML	LLLLL	LMMLL	LMMLL	L	Veiny dock
Ruppia maritima	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Widgeongrass
Sagittaria cuneata	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Duckpotato arrowhead
Salicornia europaea	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Glasswort
Salicornia utahensis	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Utah glasswort, samphire
Salsola iberica	LMLLL	MHMLM	LLLLL	MMLLM	MMLLM	L	Russian thistle
Sedum lanceolatum	LMLLL	LMLLL	LMLLL	LMLLL	LMLLL	M	Lancedleaved sedum
Selaginella densa densa	LLLLL	LLLLL	LLLLL	LMLLL	LMLLL	M	Spikemoss selaginella
Senecio amplectens	LMLLL	LMLLL	LLLLL	LMLLL	LMLLL	M	Showy alpine groundsel
Senecio canus	LLL--	MMM--	LLL--	HHM--	MML--	L	Wooly groundsel
Senecio crassulus	LLL--	MMM--	LLL--	HHM--	HHM--	L	Thickleaf groundsel
Senecio integerrimus - P	LML--	HHM--	LLL--	HHM--	HHM--	L	Lambstongue groundsel
Senecio multilobatus	LLL--	MMM--	LLL--	MMM--	MML--	L	Lobeleaf groundsel
Senecio plattensis	MMM--	MMM--	MMM--	MMM--	MMM--	L	Groundsel
Senecio riddellii	LLL--	MMM--	LLL--	MMM--	MMM--	M	Groundsel
Senecio serra	LMLLL	HHMLL	LMMLL	MHMLL	MHMLL	M	Groundsel
Senecio triangularis	LLL--	MMM--	LLL--	HHM--	HHM--	M	Arrowleaf groundsel
Sibbaldia procumbens	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	
Silene acaulis	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Moss silene
Sisymbrium altissimum	LL---	MM---	LL---	MM---	MM---	L	Tumblemustard
Sisyrinchium angustifolium	LMLLL	MMMML	LMLLL	MMMLL	MMMLL	L	Blue-eyed-grass
Smilacina racemosa	LLLLL	LMMLL	LLLLL	MHMML	MMMLL	M	Fat Solomon-plume
Smilacina stellata	LLLLL	MMMLL	LLLLL	MHMML	MMMLL	M	Starry Solomon-plume
Solanum rostratum	LLLLL	MMMLL	LLLLL	LLLLL	LLLLL	L	Buffalobur nightshade
Solidago canadensis	LLLLL	LMLLL	LLLLL	MLMMM	LLLLL	H	Canada goldenrod
Solidago gigantea	MMMLL	MMMLL	MMMLL	LMLLL	LMLLL	M	Giant goldenrod
Solidago missouriensis	LMLLL	LMLLL	LMLLL	LMLLL	LMLLL	H	Missouri goldenrod
Solidago mollis	LMLLL	LMLLL	LMLLL	LMLLL	LMLLL	M	Velvety goldenrod
Solidago occidentalis	LMLLL	LMLLL	LMLLL	LMLLL	LMLLL	L	Western goldenrod
Solidago rigida	LMLLL	LMLLL	LMLLL	LMLLL	LMLLL	M	Stiff goldenrod
Sonchus arvensis	LLLL-	LMLL-	LLLL-	MMLL-	LMLL-	L	Field sowthistle

27.4 - Exhibit 02--Continued

FORBS	Resource Value Ratings						
Genus and Species	YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
Sphaeralcea ambigua	LLLLL	LMMLL	LLLLL	MMMML	MMMML	M	Desert globemallow
Sphaeralcea coccinea	MMMML	MMMML	LMLLL	MMMML	MMMML	M	Scarlet globemallow
Sphaeralcea grossulariaefolia	MMMML	MHMML	LMLLL	MHMML	MMMML	M	Gooseberryleaf globemallow
Sphaeralcea munroana	MMMML	MHMML	LMLLL	MHMML	MMMML	M	Munro globemallow
Stanleya pinnata	LMLLL	MMMLL	LLLLL	LMLLL	LLLLL	L	Desert princesplume
Stellaria jamesiana	MMMLL	HHHML	MMMMM	MHMML	MMMML	M	Tuber starwort
Stellaria media	MM---	HH---	MM---	HH---		L	Chickweed
Suaeda calceoliformis	LLLLL	MMMLL	LLLLL	LMLLL	LLLLL	L	Seepweed
Suaeda torreyana	LLLLL	MMMLL	LLLLL	LMLLL	LLLLL	L	Seepweed
Taraxacum officinale	HHHHH	HHHHH	HHHHH	HHHHH	HHHHH	L	Common dandelion
Thalictrum fendleri	LLLLL	MMMLL	LLLLL	MMMLL	HHHLL	L	Fendler meadowrue
Thalictrum occidentale	LLLLL	MMMLL	LLLLL	MMMLL	HHHLL	L	Western meadowrue
Thalictrum venulosum	LLLLL	MMMLL	LLLLL	MMMLL	MMMLL	M	Veiny meadowrue
Thermopsis montana	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Mountain thermopsis
Thlaspi arvense	LLL--	MML--	LLL--	MML--	LLL--	L	Field penneycress
Thlaspi montanum	LLL--	MML--	LLL--	MML--	LLL--	M	Blue penneycress
Tradescantia occidentalis	L	L	L			L	Prairie spiderwort
Tragopogon dubius major	MMMLL	MHMLL	MMMLL	MHMMM	MHMMM	L	Yellow salsify
Tragopogon porrifolius	MMMLL	MHMLL	MMMLL	MHMLL	MHMMM	L	Vegetable-oyster salsify
Tragopogon pratensis	MMMLL	MHMLL	MMMLL	MHMLL	MHMMM	L	Meadow salsify
Tribulus terrestris	LLL--	LLL--	LLL--	LLL--	LLL--	L	Puncture vine
Trifolium dasphyllum	HHHHH	HHHHH	HHHHH	HHHHH	HHHHH	M	Whiproot clover
Trifolium fragiferum	MMMMM	HHHHH	MMMMM	LLLLL	LLLLL	M	Strawberry clover
Trifolium gymnocarpon	HHHHH	HHHHH	HHHHH	HHHHH	HHHHH	L	Hollyleaf clover
Trifolium hybridum	HHHHH	HHHHH	MMMMM	HHHHH	HHHHH	M	Alsike clover
Trifolium longipes	HHHHH	HHHHH	HHHHH	MMMMM	MMMMM	M	Longstalk clover
Trifolium nanum	MMMMM	HHHHH	MMMMM	HHHHH	HHHHH	M	Dwarf clover
Trifolium parryi	HHHHH	HHHHH	HHHHH	MMMMM	MMMMM	M	Parry clover
Trifolium pratense	HHHHH	HHHHH	MMMMM	MMMMM	MMMMM	M	Red clover
Trifolium repens	HHHHH	HHHHH	HHHHH	HHHHH	HHHHH	M	White clover
Triglochin maritimum - P	LLLMM	MMMMM	LLLLL	H	L	H	Seaside arrowgrass
Triglochin palustre	M	M	L	L	L	H	Marsh arrowgrass
Typha domingenis	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	H	Cattail
Typha latifolia	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	H	Common cattail
Urtica dioica	LLLLL	MMMLL	LLLLL	LMLLL	LLLLL	M	Big stinging nettle
Utricularia minor	L	L	L	L	L	L	Lesser bladderwort
Utricularia vulgaris	L	L	L	L	L	L	Common bladderwort
Valeriana edulis	MMMML	HHHHL	LLLLL	HHHHL	HHHHL	M	Edible valerian
Veratrum californicum	LLMML	LMMLL	LLLLL	LLMLL	MMMML	H	California false-hellebore
Verbascum thapsus	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Flannel mullein
Vicia americana	HHHH-	HHHH-	HHHH-	HHHH-	HHHH-	M	American vetch
Vicia villosa	MMMM-	MMMM-	LLLL-	HHHH-	HHHH-	M	Hairy vetch
Viola adunca	MMMM-	HHH--	LLL--	HHH--	MMM--	L	Hook violet
Viola nuttallii	MMM--	MMM--	MMM--	HHH--	HHH--	L	Nuttall violet
Wolffia punctata	L	L	L	L	L	L	Watermeal
Wyethia amplexicaulis	LLLLL	LMLLL	LLLLL	MHMLL	MHMLL	M	Mulesear wyethia
Wyethia helianthoides	LLLLL	LMLLL	LLLLL	MMMLL	MMMLL	M	Whitehead wyethia
Wyethia scabra	LMLLL	LMLLL	LMLLL	MMMLL	MMMLL	L	Badlands wyethia
Xanthium strumarium	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Cocklebur
Xerophyllum tenax	LLLLL	LLMLL	LLLLL	LLMLL	LLMLL	M	Beargrass
Zannichellia palustris	L	L	L	L		L	Common poolmat
Zigadenus elegans - P	LMLLL	LMMLL	LMLLL	LMMLL	LMMLL	L	Mountain deathcamas
Zigadenus paniculatus-P	LMLLL	LMMLL	LMLLL	LMMLL	LMMLL	L	Foothill deathcamas
Zigadenus venenosus - P	LLLLL	LMLLL	LLLLL	LMLLL	LMLLL	L	Meadow deathcamas

27.4 - Exhibit 02--Continued

SHRUBS & TREES	Resource Value Ratings						
Genus and Species	YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
Acer glabrum	MMMMM	MMMMM	MMMMM	MMMMM	MMMMM	M	Rocky Mountain Maple
Acacia greggii	LLLLL	LMLLL	LLLLL	LMLLL	LLLLL	M	Catclaw acacia
Allenrolfea occidentalis	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Iodine bush
Alnus incana	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Thinleaf alder
Ambrosia artemisiifolia	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Bur-sage
Ambrosia psilostachya	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Bur-sage
Amelanchier alnifolia	MLMMM	HMHHH	LLLLL	HHMHH	HHMHH	M	Saskatoon serviceberry
Amelanchier utahensis	MLMMM	HMHHH	LLLLL	HHMHH	HHMHH	M	Utah serviceberry
Amorpha canescens	M	M	M	M	M	M	Leadplant amorpha
Amorpha fruticosa	M	M	M	M	M	M	Indigobush amorpha
Arctostaphylos patula	LLLLM	LLLLM	LLLLM	LLLLM	LLLLM	H	Greenleaf manzanita
Arctostaphylos uva-ursi	LLLLL	LLLLL	LLLLL	LLLLM	LLLLM	M	Bearberry
Artemisia arbuscula	LLLLL	MMLMM	LLLLL	HHHMH	MMLLM	M	Low sagebrush
Artemisia biglovii	LLLML	MMMLM	LLLLL	MMMMM	LLLMM	M	Biglow sagebrush
Artemisia cana cana	LLLLL	H	M	M	M	M	Silver sagebrush
Artemisia cana viscidula	LLLLL	M	LLLLL	M	M	M	Mountain silver sagebrush
Artemisia cana bolanderi	M	H	M			M	Bolander silver sagebrush
Artemisia dracunculus	M	H	LLLLL	H	M	H	
Atemisia filifolia	LLLLM	LLLLM	LLLLL	LLLLM	LLLLM	M	Sand sagebrush
Artemisia frigida	LLLMM	HHMHH	MMMLM	HHHMH	HHMMH	M	Fringed sagebrush
Artemisia nova	LLLLL	MLLMM	LLLLL	LLLMM	LLLLL	M	Black sagebrush
Artemisia pedatifida	M	H	H	L	L	L	Birdfoot sagebrush
Artemisia pygmaea	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	L	Pygmy sagebrush
Artemisia scorpulorum	LLLLL	MLMMM	LLLLL	MLMMM	LLMMM	M	
Artemisia spinescens	MMMMM	HHMMH	MMMMM	HHMMH	HHMMH	L	Bud sagebrush
Artemisia tridentata tridentata	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Basin big sagebrush
Artemisia tridentata vaseyana	LLLMM	MLLMM	LLLLL	MLLMM	MLLMM	M	Mountain big sagebrush
Artemisia tridentata wyomingensis	LLLLL	LLLLM	LLLLL	LLLLM	LLLLM	M	Wyoming big sagebrush
Artemisia tripartita rupicola	LLLLL	LLLMM	LLLLL	LLLMM	LLLMM	M	Wyoming threetip sagebrush
Artemisia tripartita tripartita	LLLLL	LLLMM	LLLLL	LLLLM	LLLLM	M	Tall threetip sagebrush
Atriplex argentea	MLLMM	MMMMM	LLLLM	LLLMM	LLLMM	L	Saltbush
Atriplex bonnevillensis	MLMMM	MMMMM	LLLLM	LLMML	LLLMM	M	Saltbush
Atriplex canescens	MMMMH	HHHHH	MMMMH	HHHHH	MMMMH	M	Fourwing saltbush
Atriplex confertifolia	MMMMM	HHMHH	LLLLM	LLMML	LLLLM	M	Shadscale
Atriplex corrugata	MHMML	MHMMM	LMMLL	LMMLL	LLLLL	M	Mat saltbush
Atriplex cuneata	MHMML	MHMMM	LMMLL	LMMLL	LLLLL	M	Castle valley clover
Atriplex falcata	MHMML	MHMMM	LMMLL	LMMLL	LLLLL	M	
Atriplex gardneri	LLLLL	MMMMM	LLLLL	MMMMM	LLLLL	M	Gardner saltbush
Atriplex garrettii	LLLLL	MMMMM	LLLLL	MMMMM	LLLLL	L	Garrett daltbush
Atriplex gardneri	MMMLL	MHMMM	MMMMM	MMMMM	LLLLL	M	Saltbush
Atriplex obovata	LMLLL	MMMMM	LLLLL	LMLLL	LLLLL	M	Saltbush
Berberis fendleri	LLLLL	LLLLL	LLLLL	LLLMM	LLLMM	M	Barberry
Ceanothus fendleri	LLLLM	LLLLM	LLLLM	MMMMM	MMMMM	M	Fendler ceanothus
Ceanothus martinii	LLLLM	LLLLM	LLLLM	LLLLM	LLLLM	M	Martin ceanothus
Ceanothus sanguineus	LLLLM	LLLLM	LLLLM	LLLLM	LLLLM	M	Redstem ceanothus
Ceanothus velutinus	LLLLM	LLLLM	LLLLM	LLLLM	LLLLM	M	Snowbush ceanothus
Celtis occidentalis	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Common hackberry
Ceratoides lanata	MMMHH	HHHHH	MMMHH	HHHHH	MMMHH	H	Common winterfat
Cercocarpus intricatus	MLLMM	MLLMM	LLLLM	HMMHH	MMMHH	M	Littleleaf mountain mahogany
Cercocarpus ledifolius	MMMMM	MMMMM	LLLLM	HHHHH	HHHHH	M	Curlleaf mountain mahogany
Cercocarpus montanus	MMMMM	HMHHM	MMMMM	HMHHM	HMHHM	M	True mountain mahogany
Chamaebratiaria millefolium	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Desert sweet
Chrysothamnus depressus	LLLMM	MMMMM	LLLMM	MMMMM	MLMMM	M	
Chrysothamnus greenei	LLLLL	MMMMM	LLLLL	MMMMM	MMMMM	M	Greens rabbitbrush
Chrysothamnus nauseosus albicaulis	MLLMM	MMLMM	LLLLL	HMHHH	MMMMM	M	White rubber rabbitbrush
Chrysothamnus nauseosus consimilis	LLLLL	LLLLL	LLLL	LLLLM	LLLLM	M	Rubber rabbitbrush
Chrysothamnus nauseosus graveolens	MLLMM	MLLMM	LLLLL	HMHHH	MMMMM	M	Green rubber rabbitbrush
Chrysothamnus nauseosus hololeucus	MLLMM	MMLMM	LLLLL	HMHHH	MMMMM	M	Rubber rabbitbrush
Crrysothamnus nauseosus nauseosus	LLLLL	LLLLM	LLLLL	LLLLM	LLLLM	M	Rubber rabbitbrush

27.4 - Exhibit 02--Continued

SHRUBS & TREES	Resource Value Ratings						
Genus and Species	YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
Chrysothamnus nauseosus salicifolius	LLLML	MLLMM	LLLLL	HMMHH	HMMHH	M	Rubber rabbitbrush
Chrysothamnus parryi parryi	LLLLL	MMLLM	LLLLL	MMLLM	MMLMM	M	Parry rabbitbrush
Chrysothamnus vaseyi	LLLLL	MMLLM	LLLLL	MMLMM	MMLMM	M	Vasey rabbitbrush
Chrysothamnus viscidiflorus elegans	LLLLL	MLLMM	LLLLL	MLLMM	LLLMM	M	Low rabbitbrush
Chrysothamnus viscidiflorus lanceolatus	LLLML	MLLMM	LLLLL	MLLMM	MLLMM	M	Mountain low rabbitbrush
Chrysothamnus viscidiflorus pumilus	LLLML	MLLMM	MLLMM	MLMMM	MLMMM	M	Low rabbitbrush
Chrysothamnus viscidiflorus stenophyllus	LLLLL	LLLLM	LLLLL	LLLMM	LLLMM	M	Narrowleaf low rabbitbrush
Chrysothamnus viscidiflorus viscidiflorus	LLLML	LLLML	LLLML	LLLMM	LLLMM	M	Stickyleaf low rabbitbrush
Coleogyne ramosissima	MLLMM	MLLMM	LLLLM	MLLMM	LLLLL	M	Blackbrush
Cowania mexicana	MMLMH	HMMHH	LLLLM	HHMHH	HHMHH	M	Stansbury cliffrose
Crataegus douglasii	LLLMM	LLLMM	LLLMM	MML	M	M	Douglas hawthorn
Ephedra nevadensis	MLMMH	MLLMH	MLLMM	MLLMH	LLLLM	M	Nevada ephedra
Ephedra torreyana	MLLMM	MLLMM	MLLMM	MLLMM	LLLLM	M	Torrey ephedra
Ephedra viridis	MLLMM	MLLMM	MLLMM	MLLMM	MLLMM	M	Green ephedra
Eriogonum microthecum laxiflorum	LLLLL	MMMMM	LLLLL	MLMMM	LLLLM	M	Eriogonum
Eriogonum ovalifolium	LLLLL	MMLLM	LLLLL	MMLLM	LLLLM	M	Cushion eriogonum
Eriogonum umbellatum	LLLLL	MMLLM	LLLLL	MMLLM	LLLLM	M	Sulfur eriogonum
Eurotia lanata	HMMHH	HMMHH	HMMHH	HMMHH	HMMHH	M	Winterfat
Fallugia paradoxa	LLLLM	MLLMH	LLLLL	MLLMH	LLLLM	M	Apache-plume
Grayia brandegei	MMLMH	HHLMH	LLLMM	MMLMH	LLLMM	M	Spineless hopsage
Grayia spinosa	MMLMH	HHLMH	LLLMM	MMLMH	LLLMM	M	Spiny hopsage
Guttierrezia sarothrae	LLLLL	LLLLL	LLLLL	LLLLL	LMLML	M	Broom snakeweed
Haplopappus acaulis	LLLLL	MLLMM	LLLLL	MLLMM	MLLMM	M	Goldenweed
Holodiscus discolor	LLLML	LLLMM	LLLLL	MLLMM	MLLMM	M	Rockspirea (creambush)
Holodiscus dumosus	LLLLL	MMLLM	LLLLL	MLLMM	MLLMM	M	Bush ocean-spray
Juniperus communis	LLLLL	LLLLL	LLLLL	LLLLM	LLLLM	H	Mountain commom juniper
Juniperus horizontalis	LLLLL	LLLLL	LLLLL	LLLLM	LLLLM	M	Creeping juniper
Juniperus monosperma	LLLLL	LLLLM	LLLLL	LLLMM	LLLLM	M	One-seed juniper
Juniperus osteosperma	LLLLL	LLLLM	LLLLL	LLLMM	LLLLM	M	Utah juniper
Juniperus scopulorum	LLLLL	LLLLM	LLLLL	LLLMM	LLLLM	L	Rocky Mountain juniper
Kochia americana	MMMMM	HHHHH	LMLLL	MMMMM	LLLMM	M	Green molly summer cypress or red sage
Kochia scoparia	HHHHH	HHHHH	MMMMM	HHHHH	MMMHM	L	Summer cypress
Larrea tridentata	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Spreading creosotebush
Leptodactylon pungens	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Prickly phlox
Lonicera involucrata	LLLML	MMLLM	LLLLL	MMLLM	MMLLM	M	Bearberry honeysuckle
Lonicera utahensis	LLLML	MMLLM	LLLLL	MMLLM	MMLLM	M	Utah honeysuckle
Mahonia fremontii	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Fremont barberry
Mahonia repens	LLLLL	LMMLL	LLLLL	MMMMM	MMMMM	H	Creeping barberry
Mammilaria missouriensis	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Nipple cactus
Opuntia echinocarpa	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Strawtop pricklypear
Opuntia fragilis	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Brittle pricklypear
Opuntia polyacantha	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Plains pricklypear
Pachistima myrsinites	LLLLL	LLMLL	LLLLL	MLMLM	MLMLM	M	Myrtle pachistima
Peraphyllum ramosissimum	LLLMM	MMLMM	LLLLL	HMMHH	MLMMM	M	Squaw-apple
Philadelphus microphyllus occidentalis	LLLML	LLLML	LLLLL	MLLMM	MLLMM	M	Mockorange
Physocarpus malvaceus	LLLML	LLMML	LLLLL	MLLML	LLLML	M	Mallow ninebark
Physocarpus monogynus	LLLML	LLMML	LLLLL	MLLML	LLLML	M	Mountain ninebark
Prosopis glandulosa (juliflora)	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Mesquite
Prunus emarginata	LLLML	MMLMM	LLLML	MHMMM	MHMMM	M	Bittercherry
Prunus virginiana - P	LLLMM	MMLMM	LLML	MHMMM	MHMMM	M	Common chokecherry
Purshia glandulosa	MLLMM	MLLHH	LLLLL	MLLMM	MLLMM	H	Desert bitterbrush
Purshia tridentata	HMHHH	HMHHH	LLLMM	HMHHH	HMHHH	m	Antelope bitterbrush
Quercus gambelii	MMLMM	MLMMM	LLLLL	HMMHH	HMMHH	m	Gambel oak
Quercus macrocarpa	LLLLL	MLMMM	LLLLL	HMMHH	HMMHH	M	Bur oak
Quercus turbinella	LLLLL	LLLLL	LLLLL	MMMMM	LLLLL	H	Shrub live oak
Rhamnus cathartica	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Common buckthorn
Rhus glabra	LLLLL	LLLML	LLLLL	MLLMH	MLLMH	M	Rocky Mountain sumac

27.4 - Exhibit 02--Continued

SHRUBS & TREES	Resource Value Ratings						
Genus and Species	YSSFW Cattl	YSSFW Sheep	YSSFW Horse	YSSFW MDeer	YSSFW Elk	E W	Common Name
Rhus trilobata trilobata	LLLLL	LLLMM	LLLLL	LLLMM	LLLMM	M	Skunk bush sumac
Ribes aureum	HHHMH	HMHMH	LLLLL	HMHMH	HMHMH	H	Golden currant
Ribes cereum	LLLMM	MLLMM	LLLLL	HLMHH	MLMMH	M	Wax currant
Ribes hudsonianum	LLLMM	MLLMM	LLLLL	MLMMM	LLLLM	M	Currant
Ribes inerme	LLLLL	MLLMM	LLLLL	MLMMM	MLMMH	M	Whitestem gooseberry
Ribes montigenum	LLLLL	MLMML	LLLLL	MMMHH	MMMHH	M	Gooseberry currant
Ribes setosum	LLLLL	LLLMM	LLLLL	MMMHH	MMMHH	M	Missouri gooseberry
Ribes viscosissimum	LLLLL	LLMML	LLLLL	MMMHH	MMMHH	M	Sticky currant
Robinia neomexicana	MMMML	HHHHL	MMMML	MMMHH	MMMHH	M	New Mexico locust
Robinia pseudoacacia	MMMML	MMMML	MMMML	MMMML	MMMML	M	Black locust
Rosa arkansana	LLLML	MMMML	LLLLL	HHHHM	MMMML	M	Rose
Rosa woodsii	LLLMM	MLMMM	LLLMM	HMHHH	HMHHH	H	Woods rose
Rubus deliciosus	LLLLL	LLLML	LLLLL	MMMML	LLLML	M	Raspberry
Rubus idaeus sachalinensis	MLLML	MLMML	LLLML	MLMML	MLMML	H	American red raspberry
Rubus parviflorus	LLLML	MLMML	LLLML	MLMML	MLMML	H	Thimbleberry
Salix amygdaloides	MLLHH	MMMMM	LLLLM	MMMMM	MLLMM	M	Peachleaf willow
Salix arctica	MLLHH	MMMMM	LLLLM	HMMHH	HMMHH	M	Arctic willow
Salix bebbiana	MLLHH	MMMMM	MLLMM	MMMMM	HMMHH	H	Smooth bebb willow
Salix boothii	MLLHH	MMMMM	LLLLM	MMMMM	MMMMM	M	Booth willow
Salix brachycarpa	LLLMM	MMMMM	LLLLL	MMMHM	HMMHH	M	Short-fruit willow
Salix commutata	LLLMM	MMMMM	LLLLL	MMMHM	HMMHH	M	Undergreen willow
Salix drummondiana	MLMHH	MMMMM	LLLLM	MMMMM	MMMMM	M	Drummond willow
Salix eastwoodiae	MLLHH	MMMMM	LLLLM	MMMMM	MMMMM	M	Eastwood willow
Salix exigua exigua	MLMHH	MMMMM	MLLMM	HMMHH	HMMHH	M	Coyote sandbar willow
Salix exigua melanopsis	MLLHM	MMMMM	LLLLM	MMMMM	MMMMM	M	Dusky willow
Salix geyeriana	MLLHH	MMMMM	LLLLM	MMMMM	MMMMM	M	Geyer willow
Salix lasiandra	MLLHH	MMMMM	LLLLM	MMMMM	MMMMM	M	Whiplash willow
Salix lemmonii	MLLHH	MMMMM	LLLLM	MMMMM	MMMMM	M	Lemmons willow
Salix lutea	MLLHM	HMMHH	HMMHH	HMMHH	HMMHH	M	Yellow willow
Salix planifolia	MLLHH	MMMMM	LLLLM	MMMMM	MMMMM	M	Planeleaf willow
Salix nigra	MLLHM	MMMMM	MLLMM	MLMMM	MLLMM	M	Black willow
Salix reticulata	LLLMM	MMMMM	LLLLL	HMMHH	HMMHH	M	Snow willow
Salix scouleriana	MLLHH	MMMMH	LLLMH	HHHHH	HHHHH	M	Scouler willow
Sambucus cerulea	MLMHM	MLMHH	LLLMM	HHHHH	HHHHH	M	Blueberry elderberry
Sambucus racemosa	HHMHH	HMMHH	MMMMM	HMMMH	HMHHH	M	Elder
Sarcobatus vermiculatus	LLLML	MMLMM	MLLMM	MMLMM	LLLLM	M	Black greasewood
Shepherdia argentea	LLLLL	MLMMM	LLLLL	MLMMM	MLLMM	M	Silver buffaloberry
Shepherdia canadensis	LLLLL	MLMMM	LLLLL	MLMMM	MLMMM	M	Russet buffaloberry
Shepherdia rotundifolia	LLLLL	MLMMM	LLLLL	MLMMM	MLMMM	M	Roundleaf buffaloberry
Spiraea betulifolia	LLLML	MLMML	LLLLL	MLMML	MLMML	M	Spirea
Symphoricarpos albus	MLLMM	MLMHH	MLLMH	MLMHH	MLMHH	M	Common snowberry
Symphoricarpos longiflorus	MLLMM	MLMHH	MLLMH	MLMHH	MLMHH	M	Longflower snowberr
Symphoricarpos occidentalis	LLLMM	MMMML	LLLML	MLMMM	MLMMM	M	Western snowberry
Symphoricarpos oreophilus	LLLMM	MMMMM	LLLMM	MMMHH	MLMMM	M	Mountain snowberry
Tetradymia canescens	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Gray horsebush
Tetradymia glabrata	LLLLL	LLLMM	LLLLL	LLLLL	LLLLL	M	Littleleaf horsebush
Tetradymia nuttallii	LLLLL	LLLLL	LLLLL	LLLLL	LLLLL	M	Nuttal horsebush
Tetradymia spinosa	LLLLL	MLMLL	LLLLL	LLLLL	LLLLL	M	Cottonhorn horsebush
Vaccinium caespitosum	LLLML	MMLMM	LLLLL	HHLHM	HHLHM	H	Dwarf blueberry
Vaccinium mambranaceum	LLLML	MMMMM	LLLLL	MMMHM	MMMMM	M	Big whortleberry
Vaccinium myrtillus	LLLML	MMLMM	LLLLL	MHLHM	MHLMM	L	Myrtle whortleberry
Vaccinium scoparium	LLLML	MMMMM	LLLLL	MMMMM	MMMMM	M	Grouse whortleberry
Vitis arizonica	LLLLL	MLMML	LLLLL	LLMML	LLLML	M	Canyon grape
Vitis riparia	LLLLL	MLMML	LLLLL	LLMML	LLLML	H	Grape
Yucca baccata	LMLLL	LMLLL	LLLLL	LMLLL	LLLLL	M	Datil yucca
Yucca brevifolia	LMLLL	LMLLL	LLLLL	LMLLL	LLLLL	M	Joshua-tree yucca
Yucca glauca	LMLLL	LMLLL	LLLLL	LMLLL	LLLLL	M	Yucca

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CHAPTER 20 - RANGELAND INVENTORY AND ANALYSIS

27.5 - Soil Ratings for Ecological Types. Erosion rates are difficult to measure directly. On a given type, erosion hazard is related mainly to effective vegetation, litter and other soil surface cover. Ground cover can be determined from the nested frequency frame point samples (see section 44.4). Minimum amounts of vegetation and litter cover should be determined for each ecological type by comparison with areas considered to represent natural erosion rates for the type. These comparisons or standards may have to be adjusted for slope and aspect. The soil rating can be expressed as the ratio of vegetation-litter cover on the test location to vegetation-litter cover on a reference area representing natural erosion for the type.

27.6 - Correlation with Old Range Condition Ratings. If there is a management need, ecological status can be correlated to old range condition classes (which were based on production and watershed protection) by a discriminate function analysis. The crosswalk between ecological status (based on production) is made by sampling on old production collection sites. A discriminate function analysis between the two produces equations that form the basis to equate and correlate an old range condition class to an ecological status. (Reference: Mosley, Jeffrey Clyde. November 1983. Determining Range Condition from Frequency Data in Mountain Meadows in Central Idaho. Master of Science Thesis, University of Idaho. 81 pages.)

27.7 - Rangeland Condition. Rangeland condition (or rangeland health) is the state of vegetation and soil cover in relation to a standard or ideal for a particular ecological type.

Rangeland condition will be described through the desired future condition of vegetation, soils and associated resources for which objectives have been stated. Objectives could be stated by what desired ecological status is needed to achieve certain specified resource values, or it could be a description of plant community and soil attributes. Since an optimum value cannot be achieved for all resource values, many resources will be managed at some compromised level while meeting minimum standards, guidelines and management requirements for all resources. The desired future condition will be the result of all combined resource values desired on an ecological type.

Rangeland condition will be defined using the terms satisfactory or unsatisfactory condition. Satisfactory rangeland condition is when acres are meeting a desired future condition identified in long term specified management objectives, standards, and/or guidelines. Acres are also in satisfactory rangeland condition when short term objectives are being met. For example: if the objective is to achieve 90 percent ground cover and a late seral state for an ecological type and these objectives are met, the rangeland is in satisfactory condition. If the short term

objective is to move from 40 to 70 percent ground cover in five years (while moving toward the long term objective of 90 percent ground cover) and have an upward trend in ecological status and these objectives are being met, then satisfactory progress is being made toward meeting the long term objective.

Unsatisfactory rangeland condition occurs when the desired future condition is not being met and short term objectives are not being achieved to move the rangeland toward the desired future condition.

28 - UPDATING RANGELAND INVENTORIES. Rangeland inventories shall be updated whenever basic information in an analysis proves inadequate for use in current land and resource management planning and for making rangeland management decisions. To provide continuity of data and verification of trend, measurement transects should be read as determined in the allotment management plan monitoring section.

28.1 - Review Procedures. Review existing analysis to determine if it contains the necessary ingredients for making management decisions. Some of the questions a current analysis should answer:

1. Are stocking rates proper for the existing management situation?

2. Are resource conflicts identifiable?

3. Are coordination measures necessary to minimize conflicts spelled out?

4. From the information available, can an effective management plan be developed or revised?

5. Can suitable progress be determined in meeting management objectives as specified in the allotment management plan?

6. Is information available to detect need for change of direction or emphasis for subsequent annual operating plans or refinement and update of the allotment management plan?

7. Is information available to see if the Forest Plan Standards and Guides, the grazing permit, the Allotment Management Plan, and the Annual Operating Plan are being complied with?

8. Is information available to meet range resource information needs from the base level inventory as described in section 21.21?

If the answer to the majority of these questions is not affirmative, then perhaps an updated inventory and analysis is needed.

28.2 - Annual Maintenance. This consists of the continual collection of new or more correct information about the allotment. It includes an assessment of fence locations, previously unmapped seeps, springs, or trails, any new developments, actual use, changes in management, changes in browse condition or the forb and shrub community, and so forth. Data that can be mapped should be entered on the base map. Written or tabular data should be placed in the allotment folder for a periodic update.

29 - GRAZING CAPACITY DETERMINATIONS. Grazing capacity is defined as the number of animals that can be grazed on a land unit for a specific period of time while meeting basic resource needs and associated resource management goals.

On ranges where management objectives are not being met, it is necessary to consider grazing capacity in terms of improving the resource value(s) as emphasized in the Allotment Management Plan (AMP) and Forest Plan management objectives, such as forage condition or soil stability. The existing grazing capacity must be based on the current condition of the rangeland and the system and quality of management being applied.

Grazing capacities shall be based on allowable use determinations for a period of a minimum of three years on season-long grazing allotments and a minimum of a full rotation on rest or deferred systems. This time period for proper-use determinations allows for vegetative production fluctuations due to weather and due to the grazing-rest sequence on allotments under rotation management. The findings shall be used to firm and verify the grazing capacity. The proper-use determination shall be based upon meeting the objectives in the AMP and Forest Plan and will give consideration to the needs and welfare of all the resources and uses on the allotment.

29.1 - Forage Allocation. Five basic issues should be examined when defining grazing capacity:

1. Forage available to meet planning objectives. Forage production is never static, therefore, initial forage allocation decisions must be coupled with appropriate monitoring as described in chapter 40 to ensure proper use of the resource. Periodic adjustments in user levels, time of use or locations may be needed to assure resource goals and objectives are met. Forage allocation shall be based on proper use of all resources, not on the variable supply of the forage resource.

Ecological status of the range resource is also an important factor in the competition between animal species on specific areas. Different seral stages will have a different diversity of plant species. Select the proper ecological status to provide the most desirable forage that meets resource objectives. This can result in greater forage availability and reduced competition.

2. The past, present and desired demands by different users for forage. The forage demand problem is more complex because of the presence of multiple, competing users. Both consumptive (for example, livestock and wildlife) and non-consumptive (for example, watershed) users must be considered.

Historical level of use by both wildlife and livestock shall be considered in making allocations. Permittees, as well as annual records of use, can furnish much background information on past livestock and wildlife use. Records on big game herd units, state game personnel and local Forest personnel, along with tagging, trapping, and harvest statistics can furnish much usable information on game use.

Ecosystem analysis procedures, historical records, personal contacts with biologists, permittees, and so forth, will help identify specific locations where conflicts for forage are taking place on given rangeland areas.

3. Forage allocation analysis. After the supply, (vegetation), and demand, (user) sides of the problem are properly characterized, the acceptable level of user can be determined to maintain or reach desired conditions. This is done by stating objectives for specific amounts, kinds, and locations of vegetation for non-consumptive uses (for example, plant maintenance requirements, watershed protection, esthetics, wilderness). Once this is done, objectives for amounts, kinds, locations, and times of use of consumptive users can be designated for the remaining available vegetation.

When two resource uses are completely incompatible, the management alternatives are fairly simple, though the decision may be hard; all of one use - none of the other. When two users are completely compatible, so that management for one purpose completely achieves the management objectives for the other purpose, there is equally no problem. However, in the instances where users such as wildlife and livestock are only moderately or partially compatible, allocation decisions require considerable thought and skill.

Through range analysis processes (analyzing inventory and monitoring results), areas of conflict should be identified and basic information necessary to consider management alternatives collected. The time of the year, the vegetative mix, the species of animals, and the intensity of use of the range all affect the degree of competition. Even where game and livestock use the same general area, the different animal species often have preference for different vegetative types, topography, cover, and forage species. The most important thing that should come out of planning for use of rangelands is a clear recognition of where the conflicts actually occur, what the alternatives are in meeting these conflicts, and what the trade offs are.

4. The effects of management. Vegetation allocation must be based on today's management goals and objectives, and also on the effect these management decisions have on the future or desired forage and animal population situations. Management objectives and decisions must be made within the bounds of potential natural community site potentials to be practical and achievable.

5. Recognition of limiting factors. There are also limiting factors to consider in the vegetation allocation process. A desired future condition can specify use of a key species or vegetative community to achieve desired plant cover, density, or population composition which then will be a limiting factor determining the amount of allowable use. When allowable use is reached on a key species proper use has been achieved on the area and use should be terminated for the season, even though allowable use has not been reached on non-key species.

The problem concerning some of the allocation decisions that have been made is that they are applied across broad areas of land with simplistic mathematical formulas which may apply in specific local areas but do not apply to larger areas. For instance, on a given area such as a grazing

allotment, an allotment management plan states that 685 Animal Unit Months (AUM) of forage is reserved for use by big game on that allotment. Generally, when it is traced down where the 685 AUM figure came from it is found that someone has determined there are "X" number of deer grazing on the allotment for "X" months plus "X" number of elk on the allotment for "X" months and this adds up to 685 AUMs. The grazing capacity of the allotment on the suitable range is figured for livestock and find out they have 2,498 AUMs. When 685 wildlife AUMs is subtracted from 2,498 AUMs, there remains 1813 AUMs of grazing available for livestock grazing. This is an erroneous approach and shall be discarded. For instance, how many of the 685 wildlife AUMs are grazed on areas unsuitable for livestock grazing. If half of the use by wildlife is on range not grazed by livestock, then there is no competition between livestock and wildlife for those AUMs.

Even on the range used by livestock, there are many species of plants upon which there is little or no competition. For example, cattle may eat a great deal of slender wheat grass while deer use on slender wheat grass is negligible. On the other hand, deer may relish sweet anise, but cows pass it by. Often, there is little or no competition for various plant species even on rangelands suitable and used by the various animal species. In the above example, instead of subtracting 685 AUMs from 2,498 AUMs to come up with the carrying capacity of the allotment for cattle, maybe there really is competition for only 100 AUMs of forage.

The following approach, therefore, shall be used for forage allocation. A simple example is using only two species competing for the forage resource on a cattle allotment that extends from low elevations at the forest boundary to high elevation summer range. On this allotment, there is 2,000 AUMs of cattle use permitted to graze during the summer months. The other competing species for the forage is a herd of deer. Total deer and/or cattle numbers on the allotment are immaterial. The limiting factor as to the number of deer the allotment will support is the deer winter range in the lower elevation areas. Likewise, the limiting factor for cattle grazing is proper use of key species on key areas or whatever criteria or management objective is set up in the management system on the allotment. There may be forage available for 5,000 deer on the summer range but the capacity of the deer winter range is only 400 deer. This is true if allocation of all the forage on the deer winter range is for deer and excludes cattle from this deer key area.

In this example a percentage of the forage on the summer range should not be allocated to the deer. On the summer range areas preferred by cattle, deer use is minimal. If all the cattle were removed there would not be enough use made by deer that it could even be measured.

If the criteria for use by cattle (and deer) on this summer range areas is 50 percent use of certain key species, then the cattle should be removed when the use on these key species reaches 50 percent. If the deer get a percentage of the 50 percent use allowed it does not matter. The key is the total use by both cattle and deer on this summer range area is 50 percent use of certain key species and when the 50 percent is utilized, the cattle are removed.

Likewise, on the deer winter range the browse species are the key species for the deer. Allocation may be 100 percent of the available browse for

use by deer. In other words, allow no cattle use on browse species. A management strategy may, however, let cattle graze the area in the spring to utilize some of the grass on the site, reduce herbaceous competition with the browse species, and actually help or improve conditions for the deer.

The allocation of forage to various competing animals must be made on the basis of areas where there are conflicts or competition for forage on specific sites. The allocation for forage on these specific sites will be made on the basis of the importance of the site to the competing species, as well as other direction and priorities found in Forest Land Management Plans. In the example used, nearly as many cattle could be grazed with the 400 deer as could be grazed if there were no deer on the allotment. Likewise, as many deer could be grazed as could grazed if there were no cattle on the allotment. Certainly it should not be figured there are 400 deer on the allotment for 12 months/year, 4800 deer months and 960 AUMs so the permitted grazing is reduced by the cattle by 960 AUMs.

In this example, the deer winter range is the limiting factor for the deer and it is critical to their existence and well being. Deer should receive high priority in the allocation of the forage on this deer winter range.

Another example may be key areas for livestock. For instance, a mountain meadow may have early season elk use. If Forest Plan direction favors livestock in this area or portion of the allotment, then the vegetation shall be properly managed for livestock and the forage shall be allocated to livestock if competition develops with elk. This key area for livestock should be available for the scheduled livestock use and shall not exceed the standards of plant health and maintaining or reaching desired conditions before or after the livestock use the area. If early season elk use causes proper forage utilization before cattle enter the area, wildlife numbers should be reduced. The same ideas apply to whatever species might be involved, whether it be sheep, cattle, elk, sage grouse, or whatever. Where management of the wildlife is required, it is essential to coordinate the monitoring and necessary management with the State agencies.

Figure out the areas where competition occurs, how much competition there is on those areas, what the limiting factors are for the various animal species involved and then write a management prescription with all the various uses coordinated into the optimum use of the area. The management prescription should be made on an interdisciplinary basis, with the best thinking, data, historical records, and any other information coordinated into the best management prescription for all of the resources and uses on a given area of land.

The examples used above are simplistic, certainly many areas have more complex situations.

29.2 - Allocation Procedure. The following summarizes the procedure to be used when allocating the vegetative resource to various classes of users:

1. First priority for use of the vegetative resource should go to the non-consumptive values. The basic resources of soil, water and vegetation must be maintained or improved. Whatever percentages of the vegetative resource which must be reserved to maintain the basic resource is allocated first.

2. After the percentage for non-consumptive values is allocated, usually there will be a residual amount of the vegetative resource left for consumptive users. In many cases, the consumptive users will be livestock or big game. In areas where there is no competition (or negligible competition) between the consumptive users there is no problem. For instance, on range not used by livestock, the vegetative resource available for consumptive use can all be assigned to game species. However, there may be a situation where game species are in competition between themselves and an allocations needs to be made between the various wildlife species. On range unsuitable for livestock, one factor, livestock, has been removed from the allocation process. In Region 4, over half the total area in allotments is not suitable for livestock grazing or has been closed to livestock grazing. This area is available for use by native ungulates, unless this use would cause soil/water deterioration.

3. The allocation process gets complicated only on the areas where there is competition between two or more consumptive users. These areas must be identified and allocation decisions made on those key areas. This is a key factor in all allocation decisions. The areas of competition are the key areas and these areas must be defined and proper use standards established for the soil and vegetation.

4. Once the areas where competition for the available forage are defined, decisions shall be made as to which of the competitors get what percentage of the resource. These decisions must be based on many factors. Some of these factors are:

a. Forest Service direction and policy.

b. Allocation decisions in land management plans.

c. The needs and desires of the public.

d. The historical level of use by the various species of competitors.

e. Interdisciplinary efforts are needed. The interdisciplinary team should be involved in evaluating and determining allocation of vegetative resources in the key areas where competition exists.

f. Limiting factors must be identified.

g. Species preferences and time of use.

h. How critical the area is to each species survival or use of the area.

29.3 - Verifying Grazing Capacity. Verifying grazing capacity is the process of comparing the results of applied range management activities with the objectives established in the Allotment Management Plan and Forest Plan. Objectives must be monitored in verifying grazing capacity.

29.31 - Cattle Range. Benchmarks and key areas on the allotment shall be checked and the necessary evaluation studies, as described in the AMP and Forest Plan, shall be made to determine the estimated date that proper use is reached. This should be accomplished as near the date of proper use as possible and should be coupled with general observations made over the entire allotment.

Accurate actual-use records for each unit of range on the allotment are essential. The number of use days a grazing unit receives when proper use is reached on key areas and benchmarks under a specific stocking rate and management scheme is the figure verified as a carrying capacity. If monitoring indicates that the management objectives are being achieved at the prescribed rate, this documentation will suffice to show that the actual grazing use is within the grazing capacity of the unit.

The type of studies which are placed on benchmarks and key areas on the allotment shall be determined by the management objectives and identified in the evaluation or follow-up portion of the AMP. Long-term trend studies are essential on all allotments, irrespective of the type of management being applied. Under season-long type management, proper use, as expressed in percent utilization of key species and/or percent soil disturbance, will usually be necessary.

Studies may be needed to determine grazing impact on such items as riparian habitats, meadows used by sage grouse, or browse utilization by livestock on big game winter ranges.

29.31a - Calculations. Capacity is calculated by a ratio of utilization achieved per use days. The following example is of a pasture that is grazed with 700 head of cattle.

Proper utilization for this pasture is 55 percent. Utilization measurements were taken 14 days into the grazing season on key areas and the measurements showed an average of 30 percent use. A ratio of percent use to use days shows 12 days of grazing left under the current stack rate and management philosophy.

$$\frac{\text{Measured use}}{\text{Current use days}} = \frac{\text{Proper use}}{\text{Allowable use days}}$$

$$\frac{30\%}{14 \text{ days}} = \frac{55\%}{X \text{ days}}$$

$$14 \times 55\% / 30 = X$$

$$770 / 30 = X \text{ days} \qquad X = 26 \text{ days}$$

Total allowable use in this pasture is 26 days. 26 days minus 14 days of current use equals 12 days capacity left under the current stocking rate and grazing system.

An alternate method of calculating days left is by figuring use remaining. With proper use at 55 percent and current use at 30 percent, there is 25 percent use remaining before proper use is reached.

$$\frac{\text{Measured use}}{\text{current days use}} = \frac{\text{Use remaining}}{\text{allowable days use}}$$

$$\frac{30\%}{14 \text{ days}} = \frac{25\%}{X \text{ days}}$$

$$14 \times 25 / 30 = X$$

$$350 / 30 = X \qquad X = 12 \text{ days of use left to reach 55\% use.}$$

Capacity is based on proper use of key areas and/or benchmarks, no matter what the stocking rate or management system is. Management should focus on the best utilization of the rangeland resources. If the data indicates the total pasture is overstocked with the current management system, several of the following alternatives could be considered.

1. Shorten season of use to correspond with 55 percent use objective.

2. Adjust stocking numbers.

3. Develop a pasture management system which allows for more control in unused areas.

4. Change season of use that would encourage livestock to utilize more of the pasture acreages (that is, timing of use).

5. Develop additional water.

6. Use better salting practices.

7. Utilize more riding to encourage better distribution.

29.32 - Sheep Range.

1. Management Unit Inspection. After a sheep allotment has been analyzed and a grazing capacity determined, yearly inspections of the allotment shall be made unit-by-unit. These yearly inspections shall follow grazing use. These inspections should note use intensity and use patterns. Band days use of the suitable range in each grazing unit shall be determined and band days of over-use or under-use should be estimated.

2. Recording and Interpreting Proper Use Determinations. A table may be used to summarize proper-use data on sheep allotments. Where areas of suitable range have been missed or lightly grazed, an estimate shall be made of the band days lost. This will be balanced against overused portions within the unit to help the manager improve overall distribution of use. Remember, however, that verifying capacity must focus on managing for the limiting proper use criteria.

The type of livestock operation must be considered in verifying carrying capacity on sheep range. An early lamb operation where the lambs are shipped after one month of a three-month grazing season would be different than a late lamb operation where the lambs remain in the herd until the end of the permitted grazing season.

29.4 - Further Consideration of Grazing Capacity. Although grazing capacities should be used as guides to rates of stocking, they will not be considered as static figures. Capacities shall be periodically reviewed and adjusted as required to bring them into line with changing conditions. Forage production may fluctuate considerably from year-to-year because of weather variations. Consequently, stocking rates should allow a safety margin to provide for low forage-producing years. The quality of management and system of use also have a marked effect on grazing capacity. Under good management, maximum use can be made of the grazing resource. Under poor management, there is a resource loss to both the operator and the public.

29.5 - Potential Additional Capacity. The possibility of increasing grazing capacity through improved management, fences, water developments, seeding, application of herbicides, or the increased use of unsuitable range because it has for some other reason become suitable should be recognized and noted during the analysis. These determinations should be reflected in the planning and development program for the allotment. This information is also needed in connection with the economic analysis which is required for each management plan.

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CHAPTER 30 - RANGE ALLOTMENT PLANS

31 - NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) PROCESS. Once the steps in the NFMA process (sec. 15) have been completed, the next step is to propose specific action(s) for implementation. This initiates the NEPA process. To adequately complete NEPA analysis and documentation, several cycles through these five steps may be necessary as the proposed action, issues, and alternatives are refined. The purpose of these five steps are to:

1. Meet the twin aims of NEPA which are:

   a. To consider every significant aspect of the environmental impact of our proposed actions, and alternatives, and

   b. To inform and involve the public.

2. Build an adequate record of the analysis focusing on relevant issues.

3. Avoid unnecessary and redundant work.

The five steps are:

1. Scope and identify issues (public sensing).

2. Identify proposed actions and purpose and need.

3. Analyze.

   a. Develop alternatives.

   b. Identify effects.

   c. Develop mitigation and monitoring requirements.

4. Finalize analysis.

5. Document.

The last step in the process provides for packaging the information from steps 1-4 into the appropriate document. A more detailed discussion of the above steps will be included in discussion of the corresponding sections of the NEPA document that follows.

31.1 - Purpose and Need.

1. Proposed Action. This section describes the specific proposed action. The proposed action should answer the questions of who, what, when, where, and the types of actions being considered in terms of similar actions or connected actions. It should begin with: "The Forest Service proposes to ..." The description should be specific stating the grazing system to be employed, specific range improvements being proposed including acres of treatment, miles of fence, or numbers and types of other improvements, numbers of livestock to be grazed, and season and duration of grazing.

2. Purpose and Need. This statement should answer the question of "why" the need for the proposed action. In the case of revision or updating of Allotment Management Plans (AMP), it should be explained that the difference between the desired future conditions identified in the Forest Plan and the existing conditions found on the allotment have brought about the need to develop or revise the AMP in order to implement actions that will bring existing conditions in line with Forest Plan direction. It is critical that the proposed action, purpose and need be clearly defined because it provides the basis of alternative development and the scope of the analysis and decision to be made.

3. Purpose of this Environmental Assessment (EA). This section should state that the EA documents the analysis of site-specific, on the ground proposals, and that it is not an allotment management plan. It should state that the EA is tiered to the Forest Plan. It should state that it does not re-analyze decisions already made in the Forest Plan. (Further discussion of the decisions made in the Forest Plan and appropriate alternatives is included in the following section on Alternatives.) This section should also state that this document is not a decision document and does not describe the decision of the line officer. It should state that the line officers decision is explained in the accompanying Decision Notice. This section should state that each of the alternatives, if selected by the deciding officer, could become the allotment management plan for the allotment. It should state that the document does disclose the environmental consequences of the proposed action and alternatives to that action.

4. Scope of Proposed Activities. This section defines the area, the time frame, and administrative extent of the proposed action, as well as the scope of the analysis as it pertains to actions, alternatives, and impacts. Sample text is included in the attached Model Text Environmental Assessment in section 31, exhibit 01.

31.2 - Alternatives. Having clearly defined the proposed action, the purpose and need, and identified significant issues through the scoping process, it will be possible to develop alternatives that address the purpose and need and sharply define the issues. Alternatives to the proposed action will partially or wholly meet the purpose and need and respond to the issues.

The Alternatives Section is the heart of the environmental document. Based on information and analysis presented in the section on the affected Environment and Environmental Consequences, it should present the environmental impacts of the proposed action and alternatives in a

comparative form. This will provide for a sharp definition of the issues and a clear basis for choice among options by the line officer and the public. Refer to section 31, exhibit 01 Model Environmental Document for a description and example of the various sub-topics to address in this section.

The Alternatives Section shall cover the following requirements.

1. Explore and evaluate all reasonable alternatives.

2. Explain reasons why some alternatives were eliminated from detailed study.

3. Give substantial treatment to alternatives considered in detail.

4. Include alternatives outside our jurisdiction.

5. Include the no-action alternative.

6. Include appropriate mitigation measures.

These requirements deserve further discussion as they often lead to confusion in the development of alternatives.

31.21 - Reasonable Range of Alternatives. A reasonable range of alternatives is a range that achieves the purpose and need and responds to the issues that are identified, along with the no action alternative.

31.22 - The No-Action Alternative. A discussion of the no-action alternative is always appropriate, even if the agency is under a court order or legislative command to act. There are two types of no-action alternatives. In either case, the no-action alternative presents a benchmark from which the agency can consider and disclose altering the status quo.

The more typical situation involves a single, one-time project decision such as approval of a water development project or a timber sale. Here the no-action alternative would consider the environmental consequences of not undertaking the action or project at all. This type of action is sometimes called the "go/no go" alternative.

The second type of no-action alternative deals with ongoing activities. In these cases "no-action" is "no change" from current management direction or level of management intensity. To construct an alternative that is based on no management at all would be a useless academic exercise. Therefore, the "no action" alternative may be thought of in terms of continuing with the present course of action until that action is changed. Consequently, project impacts of alternative management schemes would be compared . . . to those impacts projected for the existing plan. In this case, alternatives would include management plans of both greater or lesser intensity, especially greater and lesser levels of resource development.

Therefore, for the purposes of developing or revising AMPs for active grazing allotments with a grazing permit in force or pending reissuance, the no-action alternative is no change from the current management, not a no-grazing alternative. It is recognized that current management may not be consistent with Forest Plan direction. If this is the case, we should clearly state that the no-action alternative is not consistent with the Forest Plan but it should be included in the analysis as a benchmark by which to discuss change.

The first definition of the no-action alternative ("go/no go alternative") may be appropriate is some situations. If we are developing an AMP for a newly created allotment, the no-action alternative could equate to a no-grazing alternative.

31.23 - The No Grazing Alternative. It is important to recognize that if the management area direction contained a strong emphasis for livestock grazing on established grazing allotments, then the "no grazing" may or may not be appropriate. It is also important to differentiate a "no grazing" alternatives from the "no action" alternative. We must understand when a "no grazing" alternative is appropriate and whether it is consistent with the Forest Plan. This is in order to avoid re-analyzing decisions made in the Forest Plan or presenting an alternative that is not consistent with the Forest Plan without making that distinction clear.

The key to understanding and hence communicating whether the "no grazing" alternative is appropriate lies in understanding the Forest-wide and management area direction contained in the Forest Plan.

A number of different situations can exist that will influence whether a "no grazing" alternative should be considered in detail through the analysis or be eliminated from detailed study.

Consideration of a "no grazing" alternative may be very appropriate if developed in response to a particular issue. Whether this alternative was consistent with the Forest Plan and considered in detail throughout the analysis would depend on the direction contained in the Forest Plan. If no particular strong emphasis for some level of grazing was contained in the management area direction, nor direction to continue use at some level of existing grazing allotments, then the "no grazing" alternative would be appropriate, would be consistent with the Forest Plan, and could be considered in detail throughout the analysis.

If public input requests the consideration of the "no grazing" alternative, a determination would need to be made as to whether this request was based on a legitimate resource issue that would realistically require consideration of "no grazing" in order to resolve the issue. If this were not the case, then the "no grazing" alternative could be eliminated from detailed study because it does not respond to resource issues and doesn't meet the purpose and need.

If a legitimate resource concern were identified that would necessitate consideration of the "no grazing" alternative, then it would be appropriate to consider the "no grazing" alternative in detail through the analysis. In this case the Forest Plan overlooked or failed to anticipate a legitimate resource concern resulting in a changed

condition. A description of the alternative should identify that it is currently not consistent with the Forest Plan direction, due to the emphasis for livestock grazing in this particular management area. The description of the alternative should also detail that selection of this alternative would result in a change or amendment of the Forest Plan.

Another variation of this situation would be where a legitimate resource concern could drive an alternative that could propose to defer grazing use until resource conditions could be restored to a different level. In this situation adjustment or amendment to the Forest Plan would not be necessary unless the duration of the deferment was a considerable period of time. Deferment of grazing use for a two to three year period would not normally require a Forest Plan amendment.

31.3 - Affected Environment. This section succinctly describes the environment of the area(s) that will be affected by the proposed action and alternatives to it. It serves as the foundation against which the environmental effects are evaluated. Refer to section 31, exhibit 01, Model Environmental Assessment for a description and example of what should be included in this section.

31.4 - Environmental Consequences. This section provides the analytical basis for comparison of alternatives. It discusses the anticipated environmental direct, indirect, and cumulative effects associated with implementation of the various alternatives. Refer to the Model Environmental Assessment (sec. 31, ex. 01) for a description and example of what should be included in this section.

31.5 - Economic Analysis. FSM 2212.03 (8) states that allotment management plans shall contain cost-effective analysis, using prescribed cost-effective procedures. Cost effectiveness analysis may be incorporated as part of integrated analysis to implement the Forest Plan or separately following the direction found in the Range Project Effectiveness Handbook (FSH 2209.11). As previously noted in FLPMA, the AMP prescribes the manner in, and extent to which, livestock operations will be conducted in order to meet multiple use, sustained-yield, economic, and other needs and objectives (36 CFR 222.1 (2)(i)). FSM 1970.1 cites additional legal authorities for use of economic and social analysis at project level of planning.

Project effectiveness analysis (cost-effectiveness) is an analytical approach to solving problems of choice which require the definition of objectives, identification of alternative ways of achieving the objective, and identification of the alternative that yields the greatest effectiveness for any given cost, or conversely, that yields a required or chosen degree of effectiveness for the least cost. What this amounts to is measuring the relative economic effectiveness among alternatives. Cost-effectiveness analysis provides a basis to judge the relative economic efficiency and permittee and community economic effects resulting from changes in outputs from a proposed plan or project.

Project effectiveness is determined through bringing economic, social, and environmental quality factors together in the aggregate. It serves as an overall measure of the degree of desirability of a proposed project or alternative. A completed example of project effectiveness worksheets are included in the Appendix A of the allotment management plan in

section 31, exhibit 02. A computerized spreadsheet is also available from the Supervisor's Office or the Range Management Staff in the Regional Office. Complete instructions for completing the project effectiveness analysis are contained in FSH 2209.11.

An analysis of regional economic impacts through IMPLAN or other models should be used when alternatives showing significant grazing reductions are evaluated in detail. Failure to do so leaves questions about impacts of the decisions to the social well being of impacted communities.

31.6 - Decision Documents. The purpose of the decision document is to provide a rational basis for the decision. The document must contain sufficient information to inform the reader of what the decision is and how and why it was made. An example Decision Notice/FONSI is included in section 31, exhibit 02.

31 - Exhibit 01

Model Text

**Environmental Assessment
for
(... Name...) Allotment Plan
on the (...Name...) National Forest
(... Name...) Counties, State**

INTRODUCTION

The (Name) District of the (Name) National Forest has prepared this Environmental Assessment to document the analysis of alternative management actions, including the no-action alternative or current management direction that is documented in the [Use this language only if an AMP currently exists] (Name) Allotment Management Plan (AMP) dated (_____). The AMP (is or is not) consistent with the Forest Land and Resource Management Plan. [Use this language if an AMP does not exist] Currently the (Name) allotment does not have an AMP that addresses how management should be carried out to meet the direction contained in the (Name) LRMP. Existing conditions on the allotment (do or do not) meet the desired future conditions identified in the LRMP. Because of these conditions, it is necessary to prepare a (new or revised) AMP to meet present Forest Service policy and direction.

The Federal Land Policy Management Act, as amended by the Public Rangelands Improvement Act allows for AMPs to be included in grazing permits at the discretion of the Secretary of Agriculture. (43 USC { 1752(d), as amended by 92 Stat. 1803 (1978). The Secretary has elected to exercise this discretion, and has delegated his authority to issue regulations in the area to the Chief of the Forest Service (See 36 CFR 222.1 and 222.2).

An AMP is defined in FLPMA as a document prepared in consulation with lessees or permittees applying to livestock operations on the public lands prescribing (1) the manner in and extent to which livestock operations will be conducted in order to meet multiple use, sustained-yield, economic, and other needs and objectives, (2) describing range improvements to be installed and maintained, and (3) containing such other provisions relating to livestock grazing and other objectives found by the Secretary to be consistent with the provisions of FLPMA.

The allotment area is located approximately (##) miles (Direction) of (Town, State) in portions of Township (#), Range (#), Sections (#,#,#,#,), Meridian.

The Environmental Analysis and Assessment were developed under the implementing regulations of the National Environmental Policy Act (NEPA), Council on Environmental Quality, Title 40, Code of Federal Regulation, Parts 1500-1508; and the National Forest Management Act (NFMA), Title 36, Code of Federal Regulations, Part 219. Further direction is provided in the 19(##) (Name) Land and Resource Management Plan.

31 Exhibit 01--Continued

SECTION 1: PURPOSE AND NEED

Proposed Action

The (....name....) Ranger District of the (....name....) National Forest proposes to....(do what - state action)...(where and when).

EXAMPLE

The Forest Service proposes to implement a four pasture rest rotation grazing system. Construction of 6 miles of four strand barbed wire fence and the construction of five water developments will be necessary to implement this management system. In addition, the Forest Service proposes to burn approximately 600 acres of sagebrush in 4 seprate locations of the allotment, as shown on the attached map. A total of 200 head of cattle will graze on the (Name) Allotment, from 6/1-9/30, annually.

Purpose and Need: **[DESCRIBE EXISTING THEN DESIRED CONDITION & DOCUMENT HOW THE PROPOSED ACTION IS HELPING TO MEET THE DESIRED CONDITION.]**

The proposed action is designed to implement and incorporate the goals and objectives of the 19## (Name) National Forest LRMP. The (Name) allotment that these actions are being proposed on (does or does not) have an allotment management plan. [If a plan exists] The AMP (is or is not) consistent with the (Name of Forest) LRMP.

Existing conditions on the allotment (do or do not) meet the desired future conditions identified in the LRMP. Because of this situation , actions selected by the deciding officer will be incorporated into the (new or revised) AMP. More specifically, the proposal has the following purposes:

(EXAMPLE)

Riparian areas contain vegetation communities which are at an earlier successional stage with lower resource values for riparian dependent species, than vegetation communities which have the potential to occupy these sites and meet the desired future conditions described in the LRMP. The existing, desired, and potential vegetation communities can be seen in Table X.

Adjacent upland sites also exhibit vegetation communities that are at an earlier successional stage with correspondingly lower resource values than desired plant communities that could occupy these sites and more fully meet the desired future conditions identified in the LRMP.

The majority of upland range sites are at or near their potential vegetation community. While the majority of these communities are meeting desired future conditions, there is an opportunity for increased use by livestock while maintaining these desired plant communities.

31 Exhibit 01--Continued

The grazing season being proposed would adjust the current season to provide for grazing use earlier in the season when riparian areas were wetter and less desirable. The proposed grazing season would also remove livestock from the allotment earlier in late summer when riparian areas are more heavily utilized by livestock.

The four pasture rest-rotation grazing system combined with riparian utilization standards is in direct response to decreasing livestock use on lower elevation areas while increasing use on uplands. Water developments being proposed are to attract and hold livestock on upland areas. Fencing being proposed is necessary to facilitate the grazing system.

Purpose of this EA

This EA documents analysis of site-specific, on-the-ground proposals. It is not a general management plan for the (Name) Allotment. Actions selected by the deciding officer as a result of the analysis documented in this EA will be documented in an AMP that will guide future management of the (Name) allotment. The environmental analysis documented in this Environmental Assessment is tiered to the Forest Plan and FEIS approved on (....date....). It does not re-analyze the Management Area allocations already specified in the LRMP. The scope of the analysis is limited to consideration of the proposed action and its alternatives, subject to existing programmatic goals, objectives, standards, and guidelines set forth in the (Name) LRMP.

This Environmental Assessment is not a decision document: it does not describe the decision to be made by the deciding officer with regard to the proposed action. This Environmental Assessment discloses the environmental consequences of implementing the proposed action and alternatives to that action. The Forest Supervisor's decision is stated and explained in the Decision Notice accompanying this Environmental Assessment.

31 Exhibit 01--Continued

SECTION 2: **ALTERNATIVES**

Scoping Process

One of the first steps in the scoping process for the (....name allotment) was to identify members of the public who could be affected by the proposed action, or who might have an interest in the decisions to be included in the AMP. Other federal, state and local governmental agencies were considered in this process. These people and organizations were notified that an allotment plan was proposed to implement the Forest Plan in the (....) area of the Forest, and were informed about the kinds of decisions to be made. They were asked to comment on or involve themselves in the analysis of the proposed action and its alternatives. In addition, **(describe all activities used to inform/involve publics, e.g. notices in papers, meetings, field trips, letters, personal contacts, etc.)**

In this correspondence, the proposed action was described as including **(kinds of activities)** and occurring in ....**(type of forest, rangeland, riparian area, etc.)**. It was explained that selected actions would be included in an AMP for the **(Name)** allotment. Notification of the project also explained that the proposed actions, at this preliminary stage, were thought to be **(consistent/not consistent)** with the Forest Plan, and that **(no amendment/amendment)** to the Forest Plan was thought to be necessary for the project.

The following individuals, groups, organizations and agencies were notified of the proposed project and invited to comment on any aspect of it, either in writing or through conversation with ..... **(Ranger or other responsible staff official's name)**.

[EXAMPLES]

1. **Livestock interest - provide livestock permittee's position.**
2. **Environmental interests - Provide the positions held by the environmental community.**
3. **Other publics - provide the positions held by other publics.**
4. U.S. Fish and Wildlife Service/National Marine Fisheries Service - request a species list to comply with the Endangered Species Act.
5. Wildlife interests - Provide positions from hunting, fishing, and watchable wildlife.

Documentation of the scoping and public involvement process is included in the project file available at the **(Name)** Ranger District Office.

Environmental Issues

Approximately (....) people, groups, organizations and agencies responded to the invitation to comment on the proposed project, or involved themselves in the analysis of the project. The Interdisciplinary Team reviewed Forest Planning documents and other available literature on (the action.....). Based on the scoping process, and after reviewing

31 Exhibit 01--Continued

opportunities to improve management of the land and resources, a list of the major issues, concerns and opportunities to be considered in the analysis was developed. The following is the list of the major issues, concerns and opportunities; and the indices of measurement for each.

(Include relevant Forest Plan issues needing site-specific resolution. Issues should be written in a cause/effect format.)

Example: The effects of proposed water developments on potential displacement of the local elk herd from key summer habitat.

ALTERNATIVES

Alternatives Considered and Analyzed In Detail. Utilizing the issues identified in the analysis, the interdisciplinary team (ID Team) developed **(How many?)** alternatives in detail with others being eliminated from detailed study. The alternatives represent a range of management strategies and outputs to meet Forest Plan and allotment objectives. The detailed alternatives considered are:

Alternative 1. No action. **[Short paragraph or set of paragraphs describing the alternative, what it is and would do, the intent or purpose of the alternative, and any other necessary description. Make this site-specific by including detailed actions, locations and schedules to be implemented in each alternative. Show significant variation between alternatives to establish a range of alternatives that address issues and achieve the purpose and need.]**

> **We are required (40 CFR 1502.14(d), and Forest Service Handbook 1909.15, 23.1) to consider the No Action alternative in detail, and to use it as a "baseline" for comparing the effects of the other alternatives.**

Alternative 2.

> **[Short paragraph or set of paragraphs describing the alternative, what it is and would do, the intent or purpose of the alternative, and any other necessary description.]**

Alternative 3.

> **[Short paragraph or set of paragraphs describing the alternative, what it is and would do, the intent or purpose of the alternative, and any other necessary description.]**

[ETC.]

Alternatives (#,#,#) are consistent with Forest Plan management direction and with the management area prescription found in ..... **(Forest Plan, pages III-... through III-..., and Appendix ....)** for the area the proposed action would take place in. Any of these alternatives could be implemented without amending the Forest Plan.

31 Exhibit 01--Continued

Alternatives (#) and (#) are consistent with the General Forest Plan Management Direction, but are not consistent with Management Area Prescription (... .) Implementation of these alternatives would require making an amendment to the Forest Plan. The amendments needed would deal with [....]. Sample amendments for these alternatives are shown in Appendix (...). (These are connected actions that would need to be decided together.)

Alternatives Considered But Eliminated From Detailed Analysis.

Alternative (#). [Short paragraph or set of paragraphs describing the alternative, what it is and would do, the intent or purpose of the alternative, and any other necessary description.]

This alternative was eliminated from detailed study because:

[EXAMPLES]

1. ..... This alternative probably would result in more environmental damage than ....

2. ..... This alternative would cost more than the value the Forest Service would realize through the proposed project. .....

3. .... (other reasons)

Alternative (#). [Short paragraph or set of paragraphs describing the alternative, what it is and would do, the intent or purpose of the alternative, and any other necessary description.]

This alternative was eliminated from detailed study because:

(THIS SECTION IS OPTIONAL. THE AFFECTED ENVIRONMENT AND THE ENVIRONMENTAL CONSEQUENCES SECTIONS CAN BE COMBINED WHEN DISCUSSING ENVIRONMENTAL CONSEQUENCES AS LONG AS THE CURRENT SITUATION IS DESCRIBED FOR THE RELEVANT ISSUES)

SECTION 3: AFFECTED ENVIRONMENT

The allotment includes Management Areas (#, #, #, and #). Each of these MAs has specific management prescriptions relating to livestock, timber, recreation values, and maintenance of wildlife and watershed values. Detailed management prescriptions are displayed in the 198(#) (Name) Land and Resource Management Plan on pages (#) and (#).

31 Exhibit 01--Continued

Elements of the Affected Environment

This section succinctly describes the environment of the area(s) that will be affected by the proposed action and alternatives to it. It serves as the foundation against which the environmental effects are evaluated.

(Sample List In Order Of The Flow Of Effects In The Environment)
(This list is not exhaustive. Add relevant items to it as needed.)
(The elements considered must visibly tie to issues)

Geology
Soil Resources
- **Soil Productivity**
- **Soil Instability**

Air Quality
Water Resources
- **Water Yield**
- **Water Quality**

Riparian Areas and Wetlands
Forest Vegetation, including TES
Range Vegetation, including TES
Unroaded Areas
Wildlife and Fish, including TES
Probability Of Insect and Disease Epidemics
Wildfire
Visual Resources
Recreation
Social and Economic Effects
Public Health and Safety

SECTION 4: ENVIRONMENTAL CONSEQUENCES

This chapter of the EA provides the analytical basis for comparison of alternatives. It discusses the anticipated environmental direct, indirect and cumulative effects associated with implementation of the various alternatives.

Elements of the Environment and Issues Considered

(Sample List In Order Of The Flow Of Effects In The Environment)
(This list is not exhaustive. Add relevant items to it as needed.)
(The elements considered must visibly tie to issues.)

31 Exhibit 01--Continued

(EXAMPLE OF NO EFFECT)

Geology

Geology (meaning geologic material, topography, and the forces of water and wind on the geologic materials) interacts either directly or indirectly with all other environmental factors. The Forest's geological materials have a major influence on soil development, plant species composition, and plant growth rates.

Implementation of the alternatives will not affect the geological material, topography or the geomorphological processes taking place on these National Forests.

(EXAMPLE IF EFFECTS EXIST. MUST ADDRESS THESE FIVE TOPICS AS A MINIMUM TO MEET BASIC NEPA REQUIREMENTS)

Soil Resources

How Range
Management Affects
Soil Productivity
Soil Stability

The Direct and Indirect Effects

Need For
Mitigation

Cumulative Effects

It is sometimes the case that the combined environmental effects of actions taken by several landowners or regulatory agencies are both more substantial than those of individual actions, and of a qualitatively different nature. Because the proposed action will alter a large amount of vegetation for a long period of time, the Forest Supervisor must consider the cumulative effects of this action along with other Forest Service activity in the area.

Conclusion

(Consistency with the Forest Plan)

31 Exhibit 01--Continued

(SAMPLE LIST OF ELEMENTS TO CONSIDER IN ENVIRONMENTAL CONSEQUENCES. THEY MUST BE TIED VISIBLY TO ISSUES.)

Air Quality
Water Resources
    Water Yield
    Water Quality
Forest Vegetation
Range Vegetation
Riparian Areas and Wetlands
Unroaded Areas
Wildlife and Fish
Probability Of Insect and Disease Epidemics
Wildfire
Visual Resources
Recreation
Social and Economic Effects
Public Health and Safety
TES Plants and Animals and FIsh Species

Consultation and Coordination

(Briefly describe public notification and involvement history here.)

All comments received through the public involvement process were addressed in developing the list of issues, concerns and opportunities which guided analysis of the proposed action. The issues, concerns and opportunities are presented in the second section of this Environmental Assessment.

Members of the Public Who Commented On The Proposed Project

[Name them..... and state what was said (liked or disliked).]

Interdisciplinary Team

Member	Area Of Responsibility

Agencies and Organizations Consulted

Name them..... and state what was said (liked or disliked).....

Appendix A
Economic Analysis of the Alternatives

EXAMPLES CAN BE FOUND IN FSH 2209.11 RANGE PROJECT EFFECTIVENESS ANALYSIS HANDBOOK.

31 - Exhibit 02

MODEL TEXT
DECISION NOTICE
AND
FINDING OF NO SIGNIFICANT IMPACT
FOR
(NAME) ALLOTMENT PLAN ENVIRONMENTAL ASSESSMENT
ON THE (NAME) NATIONAL FOREST
NAME COUNTIES, STATE

The (Name) District, of the (Name) National Forest, has prepared an Environmental Assessment to document the analysis used to assess alternative management actions for the development of a (new or revised) allotment management plan for the (Name) Allotment. The allotment area is located approximately (##) miles (Direction) of (Town, State) in portions of Township (#), Range (#), Sections (#,#,#,#,), Meridian.

The Environmental Analysis and Assessment were developed under the implementing regulations of the National Environmental Policy Act (NEPA), Council on Environmental Quality, Title 40, Code of Federal Regulation, Parts 1500-1508; and the National Forest Management Act (NFMA), Title 36, Code of Federal Regulations, Part 219. Further direction is provided in the 19(##) (Name) Land and Resource Management Plan.

The allotment includes Management Areas (MA) (#, #, #), and (#). Each of these MAs has specific management prescriptions relating to livestock, timber, recreation values, and maintenance of wildlife and watershed values. Detailed management prescriptions are displayed in the 198(#) (Name) Land and Resource Management Plan.

Analysis of the proposed action(s) was initiated through a (How much?, e.g. extensive public, inter-agency and intra-agency) scoping process. A public notice describing the action was issued and distributed to (Identify). Through the scoping process, an Interdisciplinary Team of resource specialists, identified a list of issues to be considered in the analysis. Documentation of the scoping and public involvement process is included in the Environmental Assessment and the project file available at the (Name) Ranger District Office. Major issues included (List):

Utilizing the issues identified in the analysis, the ID Team developed (How many?) alternatives in detail with others being eliminated from detailed study. The alternatives represent a range of management strategies and outputs to meet Forest Plan and allotment objectives. The detailed alternatives considered are:

(EXAMPLE)

Alternative 1: No action, which would continue with current management and stocking levels;
Alternative 2: Some change in management (that you define);
Alternative 3: Some additional changes in management;
List and describe all other alternatives.

31 Exhibit 02--Continued

DN/FONSI Example Page 2

Based on my review of the Environmental Analysis, it is my decision to select Alternative (Which one?). I believe that Alternative (Which one?), with it's mitigating measures, best meets the goals, objectives and standards for the affected Management Areas as described in the (Name) National Forest Land and Resource Management Plan and fully meets the intent and implementing direction of the NFMA. The following paragraphs discuss my reasoning for the finding: (List them).

(Provide specific reasons for your selection of the alternative. Show [through "evidence"] how it "best" addresses the issues and Land and Resource Management Plan for the (Name) National Forest.)

Alternative (Which one) was not selected because (tell why).

Alternative (Which one) was not selected because (tell why).

(ETC.)

I have determined that these actions are not a major federal action, individually or cumulatively, and will not significantly affect the quality of the human environment. Therefore, an Environmental Impact Statement is not needed. This determination is based on the following factors:

(Address each of the 10 items for significance found in 40 CFR 1508.27. In the discussion provide the "evidence" as to why there is no significance related to that item.)

This decision (is not likely to adversely affect / will have no effect) on threatened, endangered and sensitive species as determined through the biological evaluation process. (It is not sufficient to say there will be no effect on T&ES without supporting this in a Biological Evaluation and Decision Notice should refer to the Biological Evaluation. The Biological Evaluation must be signed prior to the decision.)

Implementation of this decision may take place seven days following this decision. **(If floodplains and wetlands are involved, you may have a 30 day waiting period for review - See FSM 2527.2). (New policy may require you wait 45 days after decision before implementing.)**

This decision is appealable in accordance with Secretary of Agriculture Appeal Regulations 36 CFR 217. A written notice of appeal must be filed with the **(Give name and address)**, within 45 days of the date of this decision with a copy simultaneously sent to the **(Give name and address)**. The notice of appeal must also include the information described in 36 CFR 217.9. For more information, contact **(Give name, address and phone number)**.

_____ _____

Name of Individual Deciding Officer — Date **(Must sign and date.)**

FSH 2209.21 - RANGELAND ECOSYSTEM ANALYSIS AND MANAGEMENT HANDBOOK
R-4 AMENDMENT 2209.21-93-1
EFFECTIVE 5/18/93

CHAPTER 30 - RANGE ALLOTMENT PLANS

32 - THE ALLOTMENT MANAGEMENT PLAN (AMP). As previously mentioned, the authority for AMPs lies within Federal Land Policy and Management Act of 1976 (FLPMA) and 36 CFR 222.1 and 222.2. The AMP is the implementation plan for the actions that were analyzed in the environmental assessment and selected in the decision document. The AMP integrates the actions needed to manage rangeland resources for livestock grazing. The AMP must integrate resource goals, objectives, standards, guidelines, and management requirements for the management of rangeland resources including soil, water, wildlife, fisheries, and vegetation for a wide array of resource uses with livestock grazing. A Model Text Allotment Management Plan can be found in section 32, exhibit 01.

32.1 - Elements of the Allotment Management Plan. Each allotment management plan should contain sections on objectives, management actions, improvements, and monitoring and evaluation.

1. The Goals and Objectives Section. This section must contain goals and objectives for management of rangeland resources and livestock grazing. Goals shall describe the desired future condition for rangeland vegetation and other rangeland resources, desired or anticipated level of livestock use and management strategies, and integrated rangeland management techniques and strategies for accomplishing multi-resource goals. This section also contains a brief summary from the Environmental Assessment on what the present allotment condition and situation is, to put into perspective the pathway from the present situation to the desired future condition. Objectives must be clear and specific statements of planned results to be achieved within a stated period of time. The results indicated in the statement of objectives are those which are designed to achieve the desired future state or process represented by the goal. Objectives must be sufficiently specific, concise, quantifiable, measurable to allow for monitoring, relate to desired future conditions, and contain a projected date for planned achievement.

2. The Management Actions Section. This section must establish the number, kind, class of livestock, season of grazing use, and grazing system to be used. The grazing system or formula can be described in words and/or graphic or tabular form so it is very clear to all parties. This section should describe how each grazing treatment contributes toward meeting the objectives. This section should also state the management actions needed to meet the objectives for other resources and uses. This section should incorporate applicable standards, guidelines, and management requirements from the forest plan. This would include utilization guidelines identified in the forest plan or refined through the site specific project analysis.

Proper use criteria shall be put in writing for each unit or special management situation on the allotment. The criteria shall specify maximum utilization guidelines for benchmark ecological types, by seral stage for the proposed grazing management system. The criteria shall specify maximum acceptable disturbance levels for streambanks and vegetation components in riparian areas. The criteria shall also specify maximum acceptable ground cover disturbance, if appropriate, to protect soils by benchmark ecological types and seral stage.

3. The Improvements Section. This section must include a schedule for treatment of ranges that do not meet management objectives, a schedule for initiating range improvements, and a schedule for improvement maintenance. The schedules for initiating and maintaining range improvements should include priorities, responsibility, and planned completion dates.

4. The Monitoring and Evaluation Section. This section should outline monitoring actions to measure three aspects of monitoring and evaluation. From an administration standpoint, evaluation or monitoring procedures should be planned within the resources available to do the job. It may be helpful to list monitoring activities in priority of importance or specify minimum monitoring requirements. Members of the ID team should help decide what specific monitoring information will be needed in order to determine if the goals and objectives of the management plan are being met. Long-term soil and monitoring techniques should be employed to evaluate and document short term dynamic occurrences. Reference section 40.1 for a complete discussion on monitoring and evaluation.

32.2 - Grazing Systems.

32.21 - Grazing System Design. Management system design is an extremely important part of the AMP for any allotment. Current management system designs in Region 4 are developed under one of three principal management models:

1. Proper-use model as expressed in the key area-key species approach to management.

2. Planned-rest model.

3. Deferred-rotation model, or a combination of the above.

Most, if not all, of the following criteria must be met or exceeded by a grazing system if it is to be evaluated as successful. Success is measured not only by the land manager but by the user and interested publics as well. The key words and phrases in the eleven criteria listed below refer to the measures of success needed for the three grazing systems given above.

A successful grazing system must:

1. Maintain or improve plant vigor and move toward the desired future condition.

2. Provide watershed protection.

3. Provide sustained production for livestock and wildlife.

4. Be flexible to allow for unpredictable seasonal precipitation and forage production.

5. Provide forage reserves for drought periods.

6. Maintain or enhance habitat for wildlife and fishery resources.

7. Be integrated as closely as possible with overall ranch plan and objectives.

8. Be simple, workable, and easily understood and followed.

9. Be compatible with or enhance other resources and uses on the land.

10. Be tailored to the inherent characteristics of the soil, vegetation, and topography.

11. Be cost-effective in terms of construction, maintenance of necessary range improvements and management, and administration time.

The grazing formula itself is merely a means of applying the desired management model to a specific area of land to obtain or maintain a desired future condition. It may assume an almost unlimited variety of forms under either approach. Because of this, it is important to clearly understand the distinction between the models.

32.22 - Grazing Systems on Sheep Allotments. Much of the material presented in the Range Analysis Handbook is oriented toward cattle management. Generally, the conceptual approach and the procedures apply equally well to sheep management but some differences should be recognized. The following information describes some of the features of sheep management and handling that must be kept in mind during management planning for sheep allotments.

1. Sheep Grazing Situations. Sheep allotments can be categorized as presenting one of three different general situations. The differences must be recognized and given full consideration in planning the management program.

a. Allotments with large areas of suitable range. This is the most common situation. Most of each allotment is suitable for grazing. Management control is exercised by dividing the allotment into several defined units. In this situation, it is more practical to predict potential capacity and record actual use in terms of band days than sheep days.

b. Allotments with stringer or patchy suitability patterns. Some allotments contain large amounts of nonrange or unsuitable ecological range sites. Forage production is limited to stringers, pockets, basins, etc. in this situation the key to sheep grazing is the design of planned routes of travel for the band. Original suitability classifications must be adjusted and

firmed up to reflect the opportunities for moving the herd over the allotment. Grazing capacity is estimated from the actual time required for the band to traverse the various routes of travel. The whole band must either make the trip or not make it. Grazing capacity estimates at some level in between are meaningless. Evaluation follow up must be especially attentive to the acceptability of grazing impacts along the routes. If actual impacts are acceptable, grazing capacity equals the band days required to traverse the route. If impacts at any point along the way are unacceptable and cannot be lessened, then the grazing capacity becomes zero because the route cannot be used. Management program design must fully consider these points, and could be summed up under a proper use criteria limiting soil disturbance over vegetation use by sheep.

c. Allotments under herderless management. Because we have little experience with this form of management, no attempt is made to define specific requirements. Each situation of this type will have to be studied and methods and procedures formulated to fit each situation.

2. Sheep Grazing Habits. Good sheep husbandry is not normally compatible with a heavy degree of use. Sheep should be allowed to seek their own level of forage utilization. They prefer different plants at different times of the year and this should be considered in designing the management prescription. Once-over grazing is highly desirable, even under rest-rotation type of management.

Sheep are finicky feeders in the morning and choose only tidbits of the choicest plant. They settle down and feed better in the evening and are not nearly as selective in their choice of forage at this time. The less the herder handles the herd, the better the animals thrive. However, in order to systematically graze an allotment, checks and controls must be applied by the herder.

Sheep prefer fresh feed each day. However, elapsed time will allow the feed to freshen up, particularly after a rain. Open herding results in less travel. If use is forced, it requires the herder to tighten up the spread of the herd resulting in trampling damage to the range and adverse effects on the sheep.

3. Factors Affecting Sheep Movement and Herding. Moderate topography is best for ease of handling. Thick brush acts as a barrier to grazing sheep even though there are travel ways through the brush. Heavy stands of sagebrush are also barriers to a grazing herd. On most summer allotments, sheep will graze up slope after leaving their afternoon watering and bedding site. They will then come together and bed down for the night on a ridgetop or some other high vantage point. They instinctively use these high points for protection and vantage. Sheep do not like to night bed in thick trees or in the bottom of basins, or depressions. From the high point, they will usually begin grazing at daybreak. It is very important that the herder be with the flock to influence the direction when they first begin to graze. The sheep will otherwise often graze the same direction as they did the previous day, watering at the same site and bedding down on the same bed ground. This results in poor lambs and excessive trampling along the persistent routes

of travel. When sheep leave the shade-up area during warm weather, they will tend to graze on the shady side of the canyon and avoid open slopes. Sheep will usually not graze downhill in the evening.

It is difficult to force sheep to shift from succulent forage to that of lower quality, such as shifting from forbs to mature grass. Feed is generally more succulent on the cooler north and east aspects. During warm weather, sheep make good use of aspen and similar type range. They prefer to graze in the shade of the trees in the afternoons after leaving the shade-up area.

During cool or stormy weather, the sheep have a tendency to travel. During warm summer days, the sheep shade-up from midmorning to late afternoon. Under these conditions, the sheep begin grazing at daylight and again from late afternoon until dark.

Water distribution and location is important to sheep. The ideal situation is to have water available in the bottom of every canyon. It is sometimes an advantage to management to pipe water from hillsides to developments in the canyon bottom. It is difficult to force sheep to use the slopes below available water on hillsides. Watering sites should be close enough so excess trailing is unnecessary. Sheep should not be required to go more than a mile to water. Doubling the distance sheep have to travel to water increases the grazing use adjacent to the water source several times.

It is difficult to get sheep off from steep slopes once they are established there. The herd will delay going to water until they are very thirsty. They will then trail (often on a run) off the slope with resulting damage to the range and slopes.

4. Factors Contributing To Overgrazing and Undergrazing Portions of the Range. Both the herder and the sheep follow the path of least resistance. The most accessible and easily herded portions of the range will be grazed most heavily. Areas adjacent to water, especially if water is scarce, receive heavy grazing pressure. If shade-up areas are limited, the available shady areas will receive heavy use during warm weather. Shading up too often in one place is as damaging as repetitive use of bedgrounds.

Sheep also prefer the upper half of slopes and ridgetops. These areas, particularly the ridgetops, should be closely watched and evaluated. On the other hand, some portions of the range tend to be under utilized. Small isolated corners, slopes cut up or isolated by rocks or brush, the lower portions of long slopes, slopes below available water, steep, rough country, and some of the timbered areas fit into this category.

5. Other Factors Which Should Be Considered When Designing Grazing Management On Sheep Allotments:

a. Where possible, avoid placing allotment boundary lines (common to two allotments) on ridgetops. Sheep naturally prefer to graze the upper portions of slopes and ridgetops. When

allotment lines are placed on ridgetops, the result is double use on these areas. Sheep from both sides of the ridge graze and may bed on the ridgetop. Some problems can be alleviated or corrected by placing common boundaries on drainage bottoms.

It is recognized that many boundaries are more or less fixed and are difficult to change. Where this situation occurs, provision should be made to alleviate problems with special instructions to the permittee and the herder. These instructions normally should be placed in the Annual Operating Plan. The instructions may prohibit bedding the sheep on certain ridgetops and/or specify that these areas receive only light use.

b. Sometimes there are small unsuitable areas within large areas of suitable range. These areas may have shallow soils with very little vegetation which should not be grazed. These areas are sometimes delineated on maps furnished to the herder and owner and shown as "closed to grazing." This creates an impossible situation for the herder due to the unpracticality of keeping sheep off many of these small areas.

When this situation exists, the range manager must choose between two options:

(1) Change in the grazing formula which would either protect these areas or enable them to be grazed in a manner that they would not be damaged.

(2) Close a large enough area around the unsuitable sites so that it is possible for the herder to keep the sheep off them.

c. Rest-rotation and deferred rotation grazing on sheep allotments. Sheep should be managed on the basis of "once-over" grazing under rest-rotation or deferred rotation management. On cattle allotments, the cattle are placed in a pasture or grazing unit and confined there until the desired degree of use is obtained. This approach is undesirable with sheep. The permittees usually want their sheep with lambs on fresh feed every day to put weight on their lambs. If the sheep are kept confined in a grazing unit until heavy utilization is attained, the lambs will not do well and the permittee will be opposed to the grazing management system. Likewise, if the sheep are confined to a grazing unit until relatively heavy utilization is attained, the soil damage from trailing and trampling by the sheep is usually unacceptable.

32 - Exhibit 01

MODEL TEXT
ALLOTMENT MANAGEMENT PLAN

for

(... Name ...) Allotment Management Plan
(... Name ...) Ranger District
(... Name ...) National Forest
(... Name ...) Counties, State

Prepared by_____ Date_____
Title

Reviewed by _____ Date_____
Permittee

Reviewed by _____ Date_____
Permittee

Reviewed by_____ Date_____
Permittee

Recommended by _____ Date_____
Range Conservationist/District Forest Ranger

Approved by _____ Date_____
District Ranger/Forest Supervisor

This Allotment Management Plan is made part of your (Term/Temporary/Private Land) Grazing permit in accordance with Section (...) of that permit, approved on (.....).

(....name...) Allotment Management Plan
(...name...) Ranger District, (...name...) National Forest

32 - Exhibit 01--Continued

INTRODUCTION

The Federal Land Policy Management Act (FLPMA), as amended by the Public Rangelands Improvement Act (PRIA) allows for Allotment Management Plans (AMP's) to be included in grazing permits at the discretion of the Secretary of Agriculture (43 U.S.C. (1752(d), as amended by 92 Stat. 1803 (1978)). The Secretary has elected to exercise this discretion, and has delegated his authority to issue regulations in this area to the Chief of the Forest Service (36 CFR 222.1 et. seq.).

An Allotment Management Plan is defined in FLPMA as a document prepared in consultation with lessees or permittees applying to livestock operations on the public lands (1) prescribing the manner in and extent to which livestock operations will be conducted in order to meet multiple use, sustained-yield, economic and other needs and objectives, (2) describing range improvements to be installed and maintained, and (3) containing such other provisions relating to livestock grazing and other objectives found by the Secretary to be consistent with the provisions of the FLPMA (43 USC 1702(k), and 36 CFR 222.1(b)(2)., and FSM 1023).

The AMP integrates actions needed to manage vegetative rangeland resources to meet established goals and objectives with livestock grazing. The AMP must integrate desired future condition guidelines and management requirements for the soil, water, wildlife, fisheries, and vegetation to achieve a wide array of resource uses including livestock grazing.

I. GOALS AND OBJECTIVES.

A. GOALS. Meet the following Goals, Standards and Guidelines contained in the (... Name ...) National Forest Plan.

Briefly reference the Goals, Standards and Guidelines applicable to this particular allotment, listing the Forest Plan page number. The referenced goals should describe the desired future condition of rangeland vegetation and other rangeland resources, desired or anticipated level of livestock use and management strategies, and integrated rangeland management techiques and strategies for accomplishing multi-resource goals.

B. Put a brief summary from the Environmental Assessment on what the present allotment condition and situation is, to put into perspective the pathway from the present situation to the desired future condition.

(EXAMPLE)

Riparian areas contain vegetation communities which are at earlier than desired ecological successional stages with low resource values for riparian dependent species, than vegetation communities which have the potential to occupy these sites and meet the desired future conditions described in the LRMP. The existing, desired, and potential vegetation communities can be seen in Table X.

32 - Exhibit 01--Continued

Upland sites adjacent to riparian areas also exhibit vegetation communities that are at earlier ecological stages with corresponding low resource values than desired plant communities that could occupy these sites and more fully meet the desired future condition identified in the LRMP.

The majority of upland range sites are at or near their potential vegetation community. While the majority of these communities are meeting desired future conditions, there is an opportunity for increased use by livestock while maintaining these desired plant communities.

C. **OBJECTIVES.** Objectives should be a clear and specific statement of planned results to be achieved within a stated time period. The results indicated in the statement of objectives are those which are designed to achieve the desired future state or process represented by a goal. Objectives must be sufficiently specific and measurable to allow for monitoring. This section could contain numerous objectives involving coordination with other multiple-uses on the allotment. Examples - dispersed recreation, wilderness, wildlife needs, watershed protection needs, fish habitat, and other items as applicable.

EXAMPLES of Objectives:

1. By the year 2000, improve all the riparian areas to their desired future condition as described in the (...name...) Forest Plan, pages ...-... .

Show in terms of vegetation (ecological status &/or species composition for a short &/or long term time period), stream bank, channel, or other conditions; what the desired future condition of riparian areas is to be. If some riparian areas cannot be improved to the desired future ecological status by the year ...., show when you think they will be.

2. By 1995, bring the ground cover of Stand X, Map Unit 7, to at least 70 percent.

3. By 2000, improve terrestrial areas to their desired future condition as described in the (..name..) Forest Plan, pages ..-.. .

Show in terms of ecological status and pertinent resource values like watershed protection (ground cover), livestock forage, and other parameters, what the desired conditions will be, as applicable. Particular sore spots needing improvement, plant diversity, TES plant and animal species protection, noxious weed control, and other items as applicable could be described or referenced.

Show needed improvements in management or other items as applicable to the allotment or units of the allotment and achievable dates. Refer to other sections of the AMP and/or Annual Plan of Use where more details are located concerning construction, reconstruction, and maintenance of improvements, vegetation improvement projects, and management responsibilities.

32 - Exhibit 01--Continued

4. By 1995, introduce Hawkmoth on the leafy spurge infestation just inside the NF boundary in Boney Cow Canyon. Contain leafy spurge infested areas to those currently infested, and reduce spurge plant densities by 80% by 2000 .

5. Bring stocking into balance with allowable use by the year 1995.

II. ACTION ITEMS

A. Livestock kind, class, numbers permitted, season and other.

Permitted Number	____ sheep (cattle)
Class of livestock	cow-calf/yearling/other
Season of Use	7/1 thru 9/30
Head Months (optional)	____ HMs
Animal Unit Months (optional)	____ AUMs

A statement should be included here that numbers, class or season may be adjusted after the first grazing cycle is completed if proper use, as described in Part III, is not achievable under the current system.

B. Grazing System - A (...rest-rotation/deferred-rotation/other ...) grazing system will be used with the following units and dates [may sometimes need to be approximate, particularly on cattle allotments. Maps, tabular, pictures and words should be used to make it clear to those involved.

Year	Boney Cow Cyn Unit 1	(Name) Unit 2	(Name) Unit 3	High Top Unit 4	(Name) Unit 5
1 19__	7/1-7/30	8/1-8/30	7/1-9/30	Rest	7/1-9/30
2 19__	Rest	[show dates]	[show dates]		
3 19__					

It is often desirable to include an explanation of the purpose of each treatment - such as that livestock should be moved into the last unit of the season after seed maturity. Items that often change each year would best be covered in the annual plan of use; whereas items that remain the same from year to year could likely best be included here. Sheep band days or cattle days per unit may be shown. Show how the actions will help meet objectives.

C. Management Requirements. This section should describe the actions that are needed to provide for other resource values and uses, and for resolving conflicts. Applicable standards, guidelines, and management requirements of the forest plan or applicable mitigation measures identified in the decision document should be included here. Needed adjustments in livestock numbers and/or season of use would likely be described here. Explain how the actions help meet objectives.

32 - Exhibit 01--Continued

Address actions needed to coordinate needs of TES plants and animals as applicable to the allotment. Part of the information could be covered by reference to recovery plans or various environmental documents. Explain how the actions help meet objectives.

III. RANGE IMPROVEMENTS

Both existing and proposed should be listed. Examples of headings are shown. A schedule for initiating range improvements, with responsibilities for costs and labor incurred, rehabilitation of unsatisfactory ranges including noxious weed infestations if Range Betterment Funds are planned for treatment. Needed economic evaluations should be included in this section or a reference made to where they are located. General maintenance standards could be explained here or by reference to the annual plan of use. Explain how the actions in this section help meet objectives. Existing improvements should also be in Part 3 of the grazing permit.

Improvement Number Name & Type	Year Const'd	Size	Who has Maintenance Responsibility	Condition	Location Sub	Sec	Tp	Rg
206E9A Hiline fence	1965	2 Mi	Permittee	Satisfactory	13/14		3N	31E
Property New Water Dev.	19__	100 Ft	Permittee		NENW	12	3N	31E
Property New Reveg	Proposed	500 Ac	USFS Range	Badly Needed		13	3N	31E
Spurge Hawk-moth Introduction	Proposed	1 Ac	USFS Range	Old Infestation	SWSE	12	3N	31E

IV. EVALUATION SECTION

Include evaluation needed to check whether satisfactory progress is being made toward meeting Section I Objectives on a timely basis, as appropriate. Also include minimum monitoring requirements.

A. Actual use by cattle will be documented annually in the 2210 allotment file. The dates cattle entered and were moved from each unit and the number will be shown. If a unit was rested, burned, or revegetated; this will also be documented. The general type of growing season and forage production level should also be documented in the allotment file or in a general file for the (...NAME...) Ranger District.

32 - Exhibit 01--Continued

B. Ecological Status of Rangeland

[EXAMPLE]

Ecological Status

Map Unit	Current Community	% Similar to Desired Plant Community	Desired Plant Community	Potential Plant Community	Meets FP & AMP Standards Yes Acres	No Acres
11	Chvi/Bote	20	Artrv/Feid	Artrv/Feid	0	243
6	Sage/Popr	45	Sage/Caro	Sage/Caro	60	22

C. Trend of Benchmark Ecological Types & Other Suitable Rangelands.

(EXAMPLE)

Map Unit Number	Benchmark Ecological Type	Study Type	Trend	Reread
21	Agsp/Feid	Nested Freq.	Not Meeting	1996

Schedule doing each job, (trend studies, proper use studies, use intensity mapping, review of data to confirm capacity) with implementation schedule and grazing rotation schedule. Unit examinations should be scheduled as needed to check on compliance with Annual Operating Plan, other management requirements of the Forest Plan and AMP; inventory noxious weeds; discuss what is happening with the permittee/association representatives on the ground; and other items as needed for the particular allotment situation. Stocking rates will be adjusted, based on results of the review, which will include comparisons of past actual use data (livestock numbers, season and animal unit months) with range condition and trend data.

33 - ANNUAL OPERATING PLAN. The annual operating plan prescribes the annual actions that are necessary to implement and comply with the AMP. It should specify clearly the permittee's obligations as well as those of the Forest Service for the current year. It is the working agreement with the permittee for carrying out the management action prescribed in the AMP for that year.

Annual operating plans should be mutually developed by the District Ranger and permittee. The permittee must understand the management objectives and how the annual plan is used to achieve these objectives. Permittees must clearly understand their role in program implementation. The plan should spell out clearly and concisely what both the permittee and the Forest Service are expected to accomplish.

The annual operating plan shall consist of written and graphic sections.

1. The written section should include:

   a. Number and class of livestock and grazing season dates.

   b. Clear and definite instructions concerning management of livestock while on the allotment. This should include the schedule for each unit to be grazed, expected amount of time each unit will be grazed, how the livestock will be moved from unit to unit, and criteria for getting all the livestock moved and out of a grazing unit.

   c. Range improvement maintenance responsibility for the current year, when the maintenance will be accomplished and the maintenance level to be attained.

   d. A list of range improvement projects to be started or completed during the current year. (Show part contributed by Government and by the permittee.)

   e. Any necessary instructions concerning trailing and/or trucking livestock to and from the allotment.

   f. Special instructions on camp sanitation and fire prevention responsibilities of permittee.

   g. Multiple-use coordination requirements with which the permittee is expected to comply, including animal control practices and compliance with endangered and threatened species requirements.

2. The graphic section should include:

   a. A map showing allotment and management unit boundaries, range improvements, closed areas, and special management situations.

   b. Acceptable forms for recording actual use, losses, improvement maintenance, and other management data.

Care should be taken to avoid actions within the Annual Operating Plan that are outside the scope of the direction in the AMP. Historically, we have exercised a great deal of flexibility in adjusting or refining the AMP annually through the Annual Operating Plan. In some cases these adjustments have essentially been actions that were clearly outside the scope of actions outlined in the AMP. If it becomes apparent through monitoring or other information, that conditions have changed, then the appropriate action would be revision of the AMP with the appropriate level of NEPA compliance. We must be careful to avoid stepping outside the bounds of actions identified in the AMP or we will essentially be creating a new decision point with the Annual Operating Plan. This is inconsistent with current direction and would subject Annual Operating Plans to NEPA compliance. See exhibit 01 for a model Annual Operating Plan.

33 - Exhibit 01

MODEL OUTLINE

(...NAME...) ALLOTMENT
ANNUAL OPERATING PLAN

Grazing Season 19__

(... Name ...) Allotment
(... Name ...) Ranger District (... Name ...) National Forest

[AOPs shall consist of written & graphic sections, as appropriate.]

I. Number and class of livestock, permittee(s) and season:

Unit No. & Name	No. & Class of Stock	Planned Season
1 (... Name ...)	_____ cow/calf	7/1 - 7/30
1 (... Name ...)	_____ cow/calf	7/1 - 7/30

2 Gates between units 1 & 2 are to be opened between 7/27 & 7/30 and all cattle are to have been moved from unit 1 to unit 2 by 8/5, and the gates between the units closed. During the ride planned for July 20, it will be decided whether cattle will need to be moved to unit 2 earlier than planned due to the poor growing season and other factors.

3 (... Name ...)	_____ yearlings	7/1 - 9/30
4 This unit is scheduled to be R E S T E D this year.		
5 (... Name ...)	_____ cow/calf	6/15- 9/30

6 Trespass Gulch - R E S T E D

II. Permittee Management Responsibilities

A. Livestock Distribution & Salting

1. During the first week after livestock enter a unit, they are to be moved to encourage use of areas that normally tend to be under utilized.
Salt will be placed in these areas as shown on the attached salting plan map which has been recently updated.

2. After initial distribution, cattle will be moved to encourage use of the bench areas away from the streams.

[Other management responsibilities should be added as needed.]

33 - Exhibit 01--Continued

III. Range Improvement Maintenance Responsibilities

Water developments, fences, gates, and other improvements will be checked during the season to assure that they are properly functioning. If the screen on the end of the pipe in the headbox gets clogged so that there isn't enough water, the cattle may need to come off the Forest earlier than they would otherwise.

Improvement Number	Name and Location	Sub	Sec	Tp	Rg	Date Must Be Done	Permittee
206E9A Hiline Fence	North to So. Fk.		13/14	3N	31E	June 20	Permittee
206F9A Lost	LF of North Fk.	NWSE	12	3N	31E	June 25	Angus Doe

Improvement Maintenance Standards

All improvements will be maintained to the standard from which they were constructed. Any needs for specific deviations from these improvement maintenance standards will be addressed in this Annual Operating Plan. Maintenance includes the permittee responsible responsible for furnishing the materials needed for repairs.

Improvements will be maintained before cattle are allowed onto the allotment at the beginning of the grazing season.

Improvements must be maintained in years of total nonuse and total rest. This includes putting up and taking down fences if needed for adjacent pasture management and turning water on and off for wildlife/recreation purposes.

A. Fence Maintenance Standards

WIRE

Broken wires must be spliced. Wire spacing and weighting should be consistent with the original construction, no wire twisting to take up slack.

Loose wire must be restretched. Damaged clips and stays need to be replaced, staples should be driven to a point where wire can still slip through staples to be tightened.

POSTS

Damaged wood posts must be replaced. Solid posts that have been pushed by snow or wire tension will need to be reset.

Bent steel posts need to be straightened or replaced.

Badly rotted sections of fence need to be replaced.

33 - Exhibit 01--Continued

BRACES

Loose or missing brace wires must be tightened or replaced.

Rotten braceposts must be replaced. Straighten and retamp any posts that have settled or are crooked.

CLEARING

Fallen trees and debris need to be removed from fence lines. Excess or old wire will be removed.

LET-DOWN FENCES

Take down fences will be put up before the beginning of the grazing season and taken down at the end of the grazing season.

The let down design of the fence will be maintained. Retighten let down spans that have loose wire, replace broken stays, and replace missing staples or wire loops.

B. Water Development Maintenance Standards

SPRINGS

Sediment and foreign objects need to be removed from headbox

Damaged headbox covers need to be repaired or replaced

Repair any damaged fence around springs

A galvanized screen must be kept on the intake pipe in the head box. Replace and repair as needed.

Water must be turned on at the beginning of the grazing season and turned off at the end of the grazing season.

PIPELINES

Cracked or broken pipelines need to be replaced.

Clean plugged pipelines.

Drain pipe must be kept open, operating, and able to drain overflow away from trough at least 20 feet.

33 - Exhibit 01--Continued

TROUGHS

Clean out sediment from troughs.

Repair and clean overflows and float valves.

Level troughs and reset when needed.

Replace broken trough braces.

STOCK PONDS AND RESERVOIRS

Clean stockwater ponds and spillways of debris, dead animals, etc.

When siltation builds to one half the capacity of the pond it must be cleaned out.

IV. Range Improvement Projects this Year

Permittee is to furnish the labor and the Forest Service the materials to construct the new South Sage Bench water development in NE 1/4, NW 1/4, Section 12, Township 3 N., Range 31 E.

The Forest Service plans to complete construction of the exclosure in Lower Boney Cow Canyon early in the season and introduce hawkmoths on the leafy spurge. Since the hawkmoths are sensitive to people and animals, please avoid disturbing them as much as possible. Since rodents like to eat them, poison is to be used in the exclosure to control rodents for at least this season.

V. Trailing &/or Trucking Information

Add applicable information - i.e. scheduled days on trail, route, stopping places, safety items.

VI. Fire Prevention & Camp Sanitation

Add applicable instructions - i.e., required fire tools in camps; burning, burial, and carry out of camp trash; open fire rules; and other.

VII. Multiple-use Coordination Requirements

Add as needed - i.e., saddle & pack animal control practices, noxious weed free feeds, compliance with threatened, endangered and sensitive animal and plant requirements, disposal of dead animals, removal of rocks and debris drug onto roads and trails where sheep crossed them, use of riparian areas, closed areas, and other.

33 - Exhibit 01--Continued

VIII. Name, address and phone number of Forest Service range person contact this season.

The graphic section should include a high quality map (preferably an ortho-photo), showing allotment and unit boundaries, range improvements, closed areas, special management situations and other as needed. Also forms for recording actual use, improvement maintenance, locations of possible needed improvements (likely to also be marked on the map), and other management data.

34 - MAINTENANCE OF ALLOTMENT MANAGEMENT PLANS. Allotment Management Plans, as part of the grazing permit, should be maintained annually with minor corrections and proposed changes incorporated with pen-and-ink corrections. However, when changes other than minor corrections are made, the revised plan should be submitted to the appropriate line officer for approval. After approval, a revised copy should be furnished to the permittee. When management plans are rewritten, they should follow the prescribed format.

FOREST SERVICE HANDBOOK
REGION 4

FSH 2209.21 - RANGELAND ECOSYSTEM ANALYSIS AND MANAGEMENT HANDBOOK
R-4 AMENDMENT 2209.21-93-1
EFFECTIVE 5/18/93

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CHAPTER 40 - RANGELAND MONITORING AND EVALUATION

40 - MONITORING AND EVALUATION. Monitoring and evaluation of the resources and uses on rangelands is a part of the total range management job. The analysis and planning job is complete when the goals and objectives of the Forest Plan and Allotment Management Plan (AMP) are being achieved.

Monitoring and evaluation may be described as the gathering of sufficient information so the manager knows what is happening on the ground and why it is happening. The objective of monitoring and evaluation is to test, under actual use, the predictions made during the planning process. Follow-up is done specifically to determine if the management program is accomplishing the management goals and objectives established for the allotment.

Considerable attention must be given to monitoring and evaluation during the years immediately following implementation of the management plan. Usually, this phase will extend through the first full cycle of the management system. At that point, the system should be operating fairly smoothly and opportunities for improvement found and applied.

No plan can be considered as static and final. Goals and objectives are subject to periodic change. Environmental conditions and management efforts by permittees are dynamic and constantly changing over time. For these and other reasons, some monitoring and evaluation must continue indefinitely.

40.1 - Types of Monitoring and Evaluation. There are three types of monitoring to consider when carrying out monitoring and evaluation activities. These are implementation, effectiveness, and validation monitoring.

Implementation monitoring is short-term or annual monitoring. It is used to determine if goals, objectives, standards, and management practices are implemented as detailed in the AMP and Forest Plan. The question being answered with this type of monitoring is "Did we do what we said we were going to do this year?"

Effectiveness monitoring is long-term monitoring that occurs over several years time. It is used to determine if management practices are effective in meeting Forest Plan and AMP goals, standards, and objectives. The question being asked is "Did the management practices do what we wanted them to do over time, or in other words - did they meet the objectives?" Example of monitoring actions would include measurement of vegetation to determine if it was moving toward the identified desired plant community on benchmark sites, including noxious weed infestation areas. Collection of utilization information to determine if we were actually bringing about the desired change.

Validation monitoring is used to determine whether the information used to determine standards, guidelines, and objectives is valid and correct. The question being asked is "Is there a better way to measure meeting Forest Plan and AMP goals and objectives.?"

40.2 - Monitoring and Evaluation Sufficiency. Sufficient monitoring and evaluation must be performed to accomplish the following:

1. Check on compliance with the annual plan of use.

2. Make needed changes and improvements in the management scheme and range improvement development schedule.

3. Check results against the predicted and/or prescribed management objectives for the allotment (planned versus actual outputs, 36 CFR 219.12(k)(1) and costs 36 CFR 219.12(k)(3)). If the objectives are not being met, determine what changes are needed or if the objectives are unrealistic.

4. Verify carrying capacity.

5. Make needed changes in next year's plan of use.

6. Gather data and information needed for interpretation of both apparent and long-term trends.

7. Identify the need for cultural treatment and adequacy of management of past treatments.

40.3 - Monitoring and Evaluation Plan. Monitoring and evaluation must be very specific and must be thought out and carefully targeted. Each allotment management plan must have a detailed monitoring and evaluation plan (See section 32).

To select what attributes to monitor and at what level of intensity, take a detailed look at what the prescription is trying to achieve. This starts back at the original scoping efforts and the issues, concerns, and opportunities that drove the analysis and selection of a preferred alternative. The main reasons are the objectives of the Allotment Management Plan. The results indicated in the statement of objectives are those which are designed to achieve the desired state within a specific time frame. They must be sufficiently specific and measurable to allow for (and guide) monitoring, and they should clearly tell what the monitoring needs are.

Monitoring is on a sampling basis with an intensity commensurate with the level of grazing use and the complexity of the overall allotment situation. Select those things to be monitored based on management's need for information on a specific set of applied activities. Ask some specific questions that will guide both short and long term monitoring:

1. Are things going as the AMP/AOP (Annual Operating Plan) intended? Are objectives being met?

2. Are forage utilization levels consistent with applicable allotment management, annual operating, and forest land management plans standards?

3. Is vegetation at or moving toward a desired future condition and trend being maintained or improved?

4. Are other resource concerns being adequately met?

5. Does use by different classes of grazing animals need to be separated?

The AMP is to provide direction for monitoring and that direction must be results oriented and specifically targeted in the monitoring plan. The monitoring plan is a part of the AMP and needs to:

a. Identify specific soil and vegetative attributes to monitor. Potential categories include: cover, density, frequency, forage utilization, and trend.

b. Develop specific monitoring schedules and techniques. Be realistic in terms of what should be done and what can be done within the constraints of need, time, and personnel (money).

c. Identify who's actually going to do the work.

d. Specifically direct how and where information is going to be stored and retrieved.

The following describe some methods commonly used in evaluations. Some of the methods are mandatory on all allotments, such as selection and description of benchmark areas, determining allowable use criteria, and long-term trend determination. Several methods and procedures are optional.

State Interagency Monitoring Handbooks may supplement this Regional Handbook.

40.4 - Benchmarks and Key Areas. Areas within the suitable rangeland shall be selected to serve as benchmarks and key areas on which observations and studies will be made. Benchmarks and key areas must be representative of the suitable rangeland and must be areas that will be sensitive to changes in livestock management and/or wildlife management. Data extracted from these areas will be indicative of the management of the areas represented. The number of areas required will depend on the complexity of the soil, vegetation, topography, management objectives, and the livestock and wildlife species using the area. As a guide, there should be one benchmark area for each grazing unit of each allotment. Large or complex grazing units may need two or more benchmark areas. Key and critical wildlife areas may need sampling. Benchmark and key area studies should be selected to determine if the proper use criteria and the goals and objectives of the AMP and Standards and Guides of the Forest Plan are being met.

Benchmarks or key areas may need to be changed or new ones selected when the pattern of use is significantly modified because of a difference in

season of use, kind or classes of grazing animals, pasture size, water supplies, or other factors affecting use distribution. If this occurs, do not discard the old information as it may prove valuable in future interpretations and analysis.

Key areas will be selected to perform short-term (annually) monitoring studies on, to see if proper use is not being exceeded in the management unit, and to assist in firming up capacities.

Long-term (several years between readings) trend studies shall be placed on benchmarks. Benchmarks can be placed in key areas, thereby directly correlating measured use with measured trend. Benchmark areas shall be described and delineated according to the below criteria. Select a date for installation of trend studies when plant species are easily identified, such as during a rest period or prior to significant use of the site by grazing animals. Study measurements must be comparable at different points in time. Future measurements should be made within two weeks of the previous measurements for phenology comparability purposes.

40.41 - Selecting Benchmarks.

1. Benchmark areas should be selected and/or approved by the most experienced and qualified personnel available, and agreed upon or coordinated with permittees and in some cases other interested agencies, individuals or groups. Benchmarks should be permanently marked on the ground and must be delineated on aerial photographs or GIS base maps. They should be located where the ecological situation is well understood and selected only after a careful evaluation of the current pattern of use.

2. ID team personnel shall be involved in the selection of benchmarks, selection of the types of studies, methods to be used, and the monitoring of the various studies pertinent to their area of expertise. Benchmarks should be located on a site which is representative of one of the predominant, suitable range ecological types in the monitored unit. The need for monitoring riparian areas should be considered when selecting benchmarks. Avoid unique situations which may not be comparable to the suitable range areas, and areas along fence lines, salt grounds, water developments, unsuitable and inaccessible terrain.

3. Select a site which will be sensitive to changes in management or administration of the livestock and/or the wildlife species using the area. The ecological situation should be understood and the attributes of the management goals and objectives monitored must be present on the area. Badly depleted or shallow soil areas may not be capable of responding to management changes and are poor barometers of expected change. On big game ranges, study sites could be established on a selected portion of the winter range, summer range, or some other limiting habitat requirement. On domestic sheep ranges, sites may be located on critical slopes or open ridges within the suitable range type. On cattle allotments, they may be located on riparian and meadow areas or sensitive upland areas.

4. A Benchmark Analysis Form R4-2200-40 (ex. 01) shall be prepared by the ID team for each benchmark selected. Thoroughly document the study site characteristics, including soil, vegetation, topographic features, and animal species using the area. Describe any cultural treatments which have occurred on the site.

Landform and soil taxonomy shall be defined by a soil scientist on each benchmark area and the soils portion of Benchmark Analysis Form, R4-2200-40, completed.

40.42 - Key Species. Key species should serve as indicators of change that may occur in the desired plant community complex. There are general criteria that a key species should reasonably satisfy. Increased care in the selection procedure, more than any other factor, can determine effectiveness of the key area and benchmarks in providing the necessarily sensitive index to balance or imbalance the desired plant community. Some criteria in the selection of a key species are:

1. High relative palatability plant.

2. Reasonably resistant to grazing pressure.

3. Resistant to competition from other species.

4. Sufficiently abundant to be an important component of the plant community.

5. Nutritious.

6. Have a soil holding capability.

7. Produce a considerable volume of forage.

8. Pattern of use is gradual and continuous throughout the grazing period.

Selection of the plant species on which to key management is an important first step. It may be a continuing process of modification as additional information is gathered. Data on more than one species are frequently required to adequately reflect use of the total resource. Species that satisfy the criteria in one area may not be suitable in another depending upon their relative importance in community composition, forage production, season of use, elevation, and climatic conditions. A basic assumption of the concept is that when the key species is (are) properly used, other less important, less palatable, species will not be over-used.

40.41 - Exhibit 01

USDA Forest Service

R4-2200-40 (4/86)

BENCHMARK ANALYSIS
(Reference FSH 2209.21)

Forest High Mountain District Open Range Date 08/27/93

Examiner(s) S. Smith and J. Jones Allotment Name Coyote

Name and Location of Benchmark Area Upper Coyote Valley at the south end of the valley

Number and Location of Aerial Photograph upon which Benchmark Area is delineated:

477-252 (Number) 2210 Allotment folder (File designation - where aerial photo is located)

Ecological Site Name Deschampsia caespitosa, Carex scopulorum/Loamy uplands

Present Seral Stage Mid Apparent Vegetative Trend Stable

Apparent Soil Trend Stable Present Ground Cover % 85 (veg./litter/rock)

Potential Ground Cover % 100 Is Soil Stable Yes Soil Disturbance % 0

Cause of Soil Disturbance and Movement None

Cultural treatments which have occurred on the site including wildlife and fish habitat improvements None

Key species Deschampsia caespitosa, Carex aquatilis, Carex scopulorum, Juncus articulatus

Principal Forage Species Eleocharis paciflora (in order of comparative abundance)

Reasons or criteria why this area is selected as a benchmark Area is representative of the meadow type, receives moderate to heavy use by livestock, is capable of reacting to change in management (will show trend) and has ease of access.

List Proper Use Criteria, as determined by the ID Team, and recommended limits of use Under a noncontinuous grazing system, forage utilization not to exceed 65%. Streambank disturbance not to exceed 20%. Forest-wide criteria could be included here also.

Studies to be read on this benchmark area Riparian cross-section plant community composition at 4 to 5 year intervals, during the rest cycle. (to measure long-term trend and/or measure to determine if proper use criteria are being met.)

40.5 - Monitoring and Evaluation Methods. Allotment monitoring should be an open, cooperative process jointly accomplished by the Forest Service, range users, and other rangeland interests. Monitoring is the day-to-day routine in collecting data on an allotment and should not be a sporadic task-force assignment. Information gathered should meet both short and long-term objectives.

1. Short-term information includes annual observations that should serve as a basis for next year's operating plan:

a. Actual-use records. Record number, kind and class of livestock, season of use schedule of pasture or unit used, and number of days in each pasture or unit.

b. Intensity and distribution of vegetation utilization. Under and over utilization are recorded along with probable reasons why. Vegetative utilization methods described in Section 42 are:

(1) Utilization Cages.

(2) Utilization Gauge (or height-weight curves).

(3) Stubble height.

(4) Photo Guides.

(5) Ocular estimates by plot (upland and riparian).

(6) Utilization mapping.

c. Other events that occurred with important effects on vegetation production that year, such as climate and biotic (insect and disease).

d. Condition and maintenance of improvements.

2. Long-term trend monitoring tracks allotment changes over time and the achievement of goals and objectives that are stated in the AMP and Forest Plan. These studies should:

a. Be tied to a specific area and ecological type with results that can be extrapolated.

b. Have specific measurements that are repeatable and quantifiable.

c. Be interpreted to assess factors that cause and affect change.

d. Be a reference point for historical perspectives and program credibility.

e. Be designed to take advantage of the attributes the resource inventory is based on, where possible.

f. Long term vegetative and ground cover trend methods described in section 44 are:

(1) Camera points.

(2) Nested frequency.

(3) Point ground cover samples.

(4) Line intercept.

(5) Shrub age and form class and density.

(6) Riparian.

(a) Cross Section Composition.

(b) Green Line Composition.

(c) Woody Species Regeneration.

g. Riparian monitoring should also consider other non-vegetative measures described in the Regional Integrated Riparian Guide.

41 - PROPER USE DETERMINATIONS. To evaluate the impact of grazing on an area, it is necessary to understand the influence of grazing on the soil and vegetation. Through the years, considerable research has been directed toward an understanding of effects of grazing on numerous plant species and on various soil types. This section of the Handbook briefly summarizes some of the findings.

41.1 - Effects of Herbage Removal on the Plants. Studies have shown that the reduction of photosynthetic tissue by clipping will reduce production of both herbage and roots. The lowering of production is directly related to the season, severity, duration, and frequency of herbage removal. Herbage removal may affect production immediately or it may be reflected in the next year's crop. Studies using both cool and warm season species showed that degree of foliage removal had marked effect on root production.

Removal of half or more of the foliage during the growing season upsets the functioning of the root system and the plant as a whole. The reduction of growth in grass plants after cutting or grazing is due partly to the inability of defoliated plants to absorb water.

41.2 - Selective Grazing Habits of the Animals. Selective grazing habits of different classes of livestock and species of big game animals is another factor bearing on the amount of use a range area can stand. When one class of animal uses an area over an extended period of time without rest, the plant composition may change.

41.3 - Mechanical Effects of Grazing on Plants and Soil. Trampling by grazing animals has two major effects on the soil, it disturbs the litter and soil and causes compaction. Soil disturbance by grazing animals was found to be particularly damaging on loose soils such as those of

sandstone or granitic origin. Slopes are also more subject to soil movement due to grazing than are level areas, especially when over 40 percent in slope and on south and west aspects.

Soil compaction, especially around watering and salting areas, is one of the more detrimental effects of grazing. Soil compaction can be defined briefly as the packing together of soil particles by forces exerted at the soil surface resulting in an increased soil density through a decrease in pore spaces. Some of the important basic results of compaction should be understood by the range manager so that they can be minimized through proper stocking and management.

Some of the effects of compaction are reduced infiltration capacity and slower water movement in the soil, an increase in surface runoff because water cannot enter the soil as rapidly as it is applied, accelerated soil erosion resulting from surface runoff, and reduced pore space which restricts air circulation in the soil and results in poor aeration of the roots. All of the above effects will have an influence on growth and production of herbage. Herbage not only furnishes forage for grazing animals, it also gives protection and recycles nutrients to the soil resource.

41.4 - Trend. Trend on grazing allotments is a result of grazing use, management, and other environmental and physical factors affecting the site. Other measurements and observations are, at best, only approximations and final interpretations eventually must be tied to trend. Therefore, proper-use determinations on grazing allotments should be supplemented by long-term trend studies on all cases. See section 44 for methods and procedures for determination of trend.

41.5 - Forage Utilization. Forage utilization is a good method to measure factors used in judging proper use on season-long grazed areas and on many areas grazed under deferred-rotation and rest-rotation grazing systems. Forage plants should be utilized only to the extent they can be maintained in a vigorous condition.

Where forage utilization is used to determine proper use, the interdisciplinary team should develop and specify utilization standards in the AMP, tiered from the utilization standards in the Forest Plan. The resultant standard may be the same level as specified in the Forest Plan.

Forage utilization is just a method used to obtain the desired future condition as described in the Forest Plan and AMP. Meeting utilization levels is not in itself an objective of management, but a tool to reach and/or maintain a desired condition.

Forage utilization should not be stressed on sheep ranges as a primary proper use criteria. Soil disturbance and ground cover should be first.

41.6 - Plant Vigor. A good way to check vigor is by use of paired utilization cages. One cage is maintained on the same spot for a few years while the other is moved each year. Comparing the average maximum leaf length and width of the protected and unprotected grasses provides some indication of grazed and ungrazed plant vigor.

41.7 - Ground Cover. One of the main objectives of proper rangeland use is to maintain sufficient vegetation and litter on the ground to adequately protect the soil. Management objectives shall include specifics for soil stability and protection under the resource uses defined whether the resource values are livestock forage, big game cover, riparian habitat, or fish habitat.

In tall forb communities, the maintenance of adequate ground cover under grazing use is a problem. The sparse litter cover which makes up much of the ground cover under this type disappears quite rapidly under heavy grazing use, thus leaving the soil without adequate protection. Under a full stand of tall forbs, the herbaceous crown cover can give a high degree of protection to the soil provided the grazing use is conservative. Under normal grazing use, the highly palatable plants common to the tall forb type are grazed down to the main stems. This leaves the soil exposed to the full force of the elements for a part of the season. Often, even with no grazing, these soils will be bare part of the year.

In planning proper use in tall forb types, provisions should be made to allow for adequate cover after grazing to protect the soil. This may mean that as much as three-fourths of the total vegetation must remain after grazing.

In riparian areas ground cover as well as type and vigor of root systems are critical factors in maintaining stream bank stability. Native species with strong deep roots are necessary for binding soil particles and soil horizons deep in the profile.

Management must be geared to maintain vigor of riparian species since vigor also is reflected in the size, strength, and depth of the root system. Management also must be directed toward maintaining those deep rooted species, both herbaceous and woody, which have developed as a part of the natural armament of riparian systems.

41.8 - Coordinating Requirements of Resources Other Than Grazing. Under rest-rotation grazing systems, the maintenance and/or improvement of the forage species and the ground cover is designed into the grazing system. The limiting factor, as to the degree of grazing allowed, may be the degree of use of key species in riparian habitats, trampling of streambanks and resultant damage to fisheries, degree of use allowed on critical wildlife habitats, such as big game winter ranges, calving areas, nesting, and brooding areas, esthetics, etc. The limiting factor in each case must be identified and studies installed using allowable use to determine proper use. Wildlife and aquatic habitat biologists and/or other disciplines should be used to help identify limiting factors and help design and monitor the studies necessary to determine when proper use has been reached. On many areas where rest-rotation grazing is practiced, the limiting factor as to determining proper use will be a coordination requirement for some other resource, such as wildlife, fisheries, timber, or recreation.

Where riparian and fishery habitats as well as other sensitive areas are involved, grazing animals must be totally removed from the grazing unit when proper use has been attained. Stragglers left in units which have

reached proper use tend to concentrate along canyon bottoms and in riparian areas and may negate the objectives of the grazing system.

41.9 - Proper Use Criteria. Proper-use criteria shall be established in writing for each unit of each grazing allotment. See exhibit 01 for a sample of proper-use criteria. It could be percent utilization of forage, stubble height, percent ground cover, percent trampling damage, a measure of the allowable impact on other resources or uses, or any other measurable factor on a particular site. Proper-use criteria should be easily observable and measurable.

Proper-use criteria are a mandatory part of each AMP (sec. 32). Long-term trend studies are also mandatory to determine if the proper-use criteria are correct.

Proper-use criteria shall be developed from interdisciplinary input, for example, fishery surveys, ecological type transects, research findings, coordination requirements, observations, and good judgment. It is necessary that they be based on the factor that becomes critical first, the limiting factor. Where similar soils, ecological types, and coordination requirements extend over an entire allotment, a given set of proper-use criteria may be applicable to an entire allotment. On the other hand, where a mosaic of soils, vegetal types and coordination requirements exist, it is necessary to develop separate criteria for each important situation. On some range units or pastures, it may be necessary to establish more than one set of proper-use criteria. This is especially true where riparian areas are involved.

In setting up limiting factors and proper-use criteria, observe the following:

1. Soil, water and vegetation are the basic resources. The condition of these three resources must be maintained or improved. If they are in the desired future condition, they must be maintained in this condition. If they are in another state than the one managed for, allowance must be made in management for movement toward the desired condition. Any use causing a trend away from desired conditions of these three resources should be modified or eliminated, whether caused by livestock, wildlife, or any other use.

2. Other Considerations. After the needs of the soil, water and vegetative resources are taken care of, the other resources, such as livestock grazing, wildlife, and esthetics, can be considered. This is the point where the ID team should become involved.

Tradeoffs must be recognized and displayed. For instance, rarely does an area look as good from an esthetic standpoint after being grazed as it looked prior to grazing. Therefore, if grazing is to be allowed, some esthetic values are foregone. How much grazing will be allowed may depend upon how sensitive the area is from an esthetic and/or resource value standpoint. Big game winter ranges, calving and fawning areas, riparian zones, and sage grouse habitat are examples of other areas where coordination is needed. All of these areas where coordination is needed will require tradeoffs to some degree.

41.9 - Exhibit 01

SAMPLE

PROPER-USE CRITERIA

Bear Creek C&H Allotment

Prepared: June 16, 1993

By: JOHN BROWN

As a result of observation and trend study results, the following use criteria will be followed:

1. On benchmarks 1, 2, and 7 (meadow types in management unit #1), the overall use of 45 percent is considered to be proper. Paired cages showed lowered vigor and production at all plot sites where this use was exceeded.

2. The sagebrush benches in lower Bear Creek (management unit #2), with slopes under 10 percent--benchmarks 3, 4, 5, and 6--are on moderately deep to deep basalt soils with low erodibility. The following key species should be grazed not to exceed 45 percent: Festuca idahoensis and Poa nevadensis.

3. Within management unit #5, the coarse-textured granitic soils on slopes above 20 percent become unstable when trampling disturbance exceeds 15 percent. In this unit, soil disturbance becomes a limiting factor before forage utilization. Proper use in this unit will, therefore, be soil disturbance not to exceed 15 percent.

4. The riparian area in management unit #4 contains important spawning areas for anadromous fish. Cattle like to concentrate in this area due to the lush vegetation and easy access to water. In order to maintain the fishery values, at least 80 percent canopy cover will be maintained on stream banks and use of willows will be limited to 30 percent of current year's growth. Whichever of these factors are reached first will determine the date of proper use.

5. Management units 3 and 4 are on critical deer and elk winter range. It is, therefore, necessary to leave adequate feed in these two units to carry the big game animals through the winter period. In order to do this livestock use on the bitterbrush will not exceed 15 percent and use on the bluebunch wheatgrass will not exceed 25 percent. Whichever of these species reaches proper use first will determine the proper use for livestock.

Data to support the above criteria are filed in section 5 of the Bear Creek Allotment Management Plan folder and consists of grazing analyses of the benchmarks, soil evaluations, and wildlife and fishery habitat studies.

FSH 2209.21 - RANGELAND ECOSYSTEM ANALYSIS AND MANAGEMENT HANDBOOK
R-4 AMENDMENT 2209.21-93-1
EFFECTIVE 5/18/93

CHAPTER 40 - RANGELAND MONITORING AND EVALUATION

42 - SHORT TERM MONITORING METHODS. Short term information (that is, annual observations) shall be used to adjust annual operating plans, to determine and adjust to proper carrying capacities, and to maintain improvements to standard. Beside tracking actual use records, inspection notes and utilization determinations shall be used for adjustments. The short term approved monitoring techniques and methods are:

1. Unit exams (allotment inspections).

2. Utilization cages (paired plot method).

3. Utilization gauges (height-weight curves).

4. Stubble height.

5. Photo Guides.

6. Ocular estimate method (key upland forage species).

7. Ocular estimate method (total herbaceous riparian species).

8. Utilization mapping.

In the selection of a utilization study method, remember that no one method is suitable for all situations and that utilization sampling provides only an estimation of overall use. Carefully consider the advantages and limitations of each method with respect to the issues present, the area and the purpose for which the study will be conducted. Estimation methods permit collection of a greater number of samples than methods that require measuring or clipping and weighing (with the same time and personnel). However, the accuracy of the estimates is dependent on the training and experience of the examiners.

42.1 - Unit Exams. Unit exams are allotment inspections where certain items of information is field collected for verficiation of stocking rates, objectively analyze the grazing management system , and to determine if standards and guides and goals and objectives are being accomplished. The Unit Examination Record Form (Form R4-2200-15, ex. 01) provides a convenient means for recording such information. Other similar forms of local design may be substituted, if desired.

This form is designed to facilitate documentation of facts and relevant information gathered from a unit of an allotment as a whole rather than on specific benchmark areas. It is a supplement to the studies and information which are gathered on benchmark areas. Add additional sheets for further information, as needed.

42.1 - Exhibit 01

USDA Forest Service

R4-2200-15 (4/86)

UNIT EXAMINATION RECORD
(Reference FSH 2209.21)

FOREST High Mountain RANGER DISTRICT Open Range DATE 9/30/93

ALLOTMENT Antelope UNIT Prairie

1. Number of Livestock and dates of use

300 head June 1 to September 30

Total AM use 1200

2. Phenology

Seed scattered

3. Indicators of apparent vegetation trend

Trend appears stable under proper utilization, plants are in good health and vigor.

4. Indicators of apparent soil trend

Soil in good health, no displacement or rilling noted.

5. Use intensity and distribution patterns

Livestock well distributed throughout unit with no utilization over 40%. See map for intensity and distribution pattern.

6. Livestock reactions

Good calf weights from good condition feed, and water.
No adverse reactions in livestock.

7. Effectiveness of coordination measures

There is no conflict between the current livestock management system and the resident antelope herd.

8. Other remarks

All instructions in the Annual Plan were followed. Maintenance is needed next year on the inlet pipe to Bullfrog water trough.

9. Inspector's Name

S. Smith and J. Jones

42.1 Exhibit 01--Continued

Guide for Completing the Unit Examination Record

(Collect data by field observation. Initial and date all entries. Use telegraphic style of writing. Use additional sheets as needed.)

1. Enter number of livestock and dates of use as accurately and in as much detail as you can. Breakdown by age groups is desirable. Permittees and/or herders and riders are a good source of information.

2. Note the specific flowering and seed maturity dates for important forage species in the composition. Mature seed has usually lost its green color and is difficult to compress between thumb and forefinger.

3. Note vigor of the plants and seedling establishment. Relative seed production is also an important indicator to note.

4. Note the relative amounts of displacement, compaction, current rilling and gullying, surface soil losses and depositions, and other indicators of apparent soil trend.

5. Record overall use of total available forage by showing distribution patterns and relative use intensities. Describe locations and general use levels. Sketching of use intensity patterns on a map is generally preferable to notes for recording this information. If mapping is used, cross reference this item. Periodically recheck the accuracy of ocular estimates.

6. Record livestock reaction to the grazing system using field observations and information obtained from permittees. Note adequacy of feed and water, trailing distances and frequency, movement problems, fence walking, congregation, weights, and relative physical condition.

7. Investigate the effectiveness of the management system in meeting coordination requirements. Note those situations that are working effectively as well as those that are not.

8. Note all deviations from instructions in the annual plan of use as well as other items that will help to improve the design and/or operation of the management system. Note items that should be placed in the annual plan of use for next season.

9. Inspector's name.

42.2 - Utilization Cages (Paired Plot Method).

42.21 - Kinds of Utilization Cages. Any exclosure that will give protection from grazing to a small representative sample of forage during the grazing season and that will not appreciably disrupt normal vegetation growth can serve as a utilization cage. Two commonly-used cages are:

1. "Hanson" Net Wire Type. This type is made from 48-inch wire netting with 6-inch mesh. The bottom and top wires are No. 9, the inner wire No. 12. Steps in construction are:

a. Cut net wire into approximately 12-foot lengths. To obtain a 12-foot length, the netting must be cut at the twenty-fourth 6-inch mesh. However, to allow the "nesting" of three baskets, they can be made by cutting the net wire at the twenty-third, twenty-fourth, and twenty-fifth 6-inch mesh.

b. Cut the top three wires at each quarter.

c. Fold the cut quarters as in closing a cardboard box and wire together with the loose ends.

2. Rigid Steel Post Cage. These are constructed by driving four steel posts in the ground to mark off the area desired to protect, making them firm by bracing from one post to another and encircling with either net or barbed wire. These are very stable but difficult to move. They are also expensive.

42.22 - Use of Utilization Cages.

1. Provide a guide to utilization on the study area. Both shrubs and herbaceous vegetation can be protected from grazing by these cages. THE CAGES MUST BE MOVED EACH YEAR AT THE BEGINNING OF THE GRAZING SEASON. This will allow for comparison of the rangelands inside and outside the protected plot.

2. Provide demonstration plots to show utilization rates to stockmen and other interested people.

3. Collect information on forage production fluctuations due to yearly climatic changes.

4. Determine proper use of meadows and seeded areas where use is based on maintenance of optimum vigor.

5. Help determine use between class of animals by moving cages when another class of animal begins grazing.

42.23 - Methodology. Under the Paired Plot Method, forage from protected and unprotected plots is clipped and weighed at the end of the foraging period. The difference represents the amount of forage consumed by animals or otherwise destroyed during that period.

42.23a - Areas of Use. This method is suitable for all vegetation growth forms for which production and utilization data are commonly desired. It is particularly applicable where periods of use are short, utilization relatively uniform, and regrowth after foraging is not significant.

42.23b - Advantages and Limitations. The method is a simple and direct way of measuring forage utilization. Little training is required and accuracy is higher than other less intensity utilization measurements. The chief limitations are that it is time-consuming and that a check area, protected from foraging, is required. The density of plants inside and outside the cage must be the same; this is especially important in riparian settings. Where periods of use are long, the method does not provide information about the cumulative production of foraged plants unless the cages are moved at short time intervals. If duel use occurs, the method will not differentiate use between class of animal.

42.23c - Training. The paired plot method does not require intensive training for field applications. Examiners must be able to identify plant species. Examiners can perform the actual clipping and weighing after only a short training period.

1. Plot Location. Locate paired plots within key area(s). Mark the location of the plots so they can be relocated. Record the location and documentation of the study and maintain in the 2210 files.

a. Plant Composition and Growth. Plant composition and amount of growth must be similar in both plots. Each plot must contain the key species.

b. Continuing Study. Clipping the plants has a marked influence on their physiological activities and the ecology of the site. Therefore, plots cannot be used again after they are clipped. New plots must be selected for continuing study.

2. Number of Plots. Establish at least three sets of paired plots (three protected and three unprotected) in each key area selected for study.

3. Protected Plots. Protect one plot of each pair from foraging. Flip a coin to decide which plot to protect.

a. Cages. Anchor a cage over one of the paired plots at each plot location. The base of a cage should be large enough to provide at least a 6-inch buffer zone between the edge of the plot and the side of the cage. The lower portion of the cage (to approximately one to two feet high) may be covered with wire netting small enough to exclude rabbits and rodents. Generally, the larger the mesh, the less influence the cage has in modifying the environment.

b. Exclosures. Protected plots may be located in exclosures. These plots need not be caged unless it is necessary to exclude rabbits and rodents.

Permanent Exclosures. If protected plots are located within permanent exclosures, caution must be exercised to ensure that these plots are representative of the unforaged situation outside the exclosures.

4. Unprotected Plots. Leave one plot of each pair open to foraging. If past experience shows that foraging is particularly uneven, leave two or more plots open for each one caged in order to average the unevenly foraged conditions. Animals are attracted to cages and may trample unprotected plots if located too near protected plots. Therefore, establish unprotected plots a minimum of 20 feet from protected plots if possible. Unprotected plots should be inconspicuously marked to avoid attracting animals.

42.23d - Sampling Process. After examiners are trained, proceed with the collection of utilization data.

1. Clip current year's growth on key species from protected and unprotected plots.

2. On herbaceous species, clip all current year's growth to ground level.

3. Put the clippings from the protected and unprotected plots in separate paper sacks for weighing.

4. Weigh the sacks of clipped plants and record separately the weight from the protected and unprotected plots on the Utilization Study Data - Paired Plot Method Form. Subtract the weight of the sack before recording the weights of the plants.

42.23e - Calculating Percent Utilization. Calculate the percent utilization as follows:

$$\% \text{ utilization} = \frac{\text{total protected weight - total unprotected weight}}{\text{Total protected weight}} \times 100$$

If an unequal number of protected and unprotected plots are used in the study, calculate the percent utilization as follows:

$$\% \text{ utilization} = \frac{\text{average weight for protected plots} - \text{average weight for unprotected plots}}{\text{average weight for protected plots}} \times 100$$

Record the percent utilization on the Utilization Study Data - Paired Plot Method Form. (See exhibit 01).

42.23d - EXHIBIT 01 IS A SEPARATE DOCUMENT.

UTILIZATION STUDY DATA
PAIRED PLOT METHOD

42.23d - EXHIBIT 01 IS A SEPARATE DOCUMENT.

42.23d - Exhibit 01

UTILIZATION STUDY DATA
PAIRED PLOT METHOD
(Reference FSH 2209.21)

USDA Forest Service

R4-2200-46 (1/93)

STUDY NUMBER	DATE	EXAMINER
14-01-65	8/15/93	Judith Jones

ALLOTMENT NAME & NUMBER	PASTURE
Lava Creek - 2387	Left Fork

KIND AND/OR CLASS OF ANIMAL	PERIOD OF USE
Sheep - Ewes and Lambs	6/1 - 8/15

KEY SPECIES	PLOT	WEIGHT IN GRAMS BY PLOT 1	2	3	4	5	TOTAL WEIGHT ***	WEIGHT DIFFERENCE (P-U)	PERCENT UTILIZED (P-U X 100) P
1	P*	25	40	38	30	28	161		
Agsp	U**	15	25	15	18	12	85	76	46%
2	P	30	28	19	43	25	145	80	55%
Pone	U	16	13	8	17	11	65		

LOCATION OF PAIRED PLOT 1 Caged plot is .5 miles south of road junction in Sec 32 - then 300 feet west of road. Uncaged plot is 700 feet SW of caged plot - compass bearing 220 degrees. Marked with a reinforcing rod.

LOCATION OF PAIRED PLOT 2 Caged plot is 1500 feet noth of caged plot #1 - compass bearing 350 degrees. Uncaged plot is 150 feet west of caged plot- compass bearing 265 degrees - marked with reinforcing rod.

LOCATION OF PAIRED PLOT 3 Caged plot is .7 miles west of Springcreek Reservoir. Uncaged plot is 75 paces north of caged plot - marked with reinforcing rod.

LOCATION OF PAIRED PLOT 4 Caged plot is 500 paces south of caged plot 3. Uncaged plot is 50 paces east of caged plot - marked with reinforcing rod.

LOCATION OF PAIRED PLOT 5 Caged plot is .3 miles noth of Buckboard cattleguard - then 700 feet east of raod. Uncaged plot is 200 feet north of caged plot - compass bearing 15 degrees - marked with reinforcing rod.

NOTES (USE OTHER SIDE OR ANOTHER PAGE, IF NECESSARY)

*PROTECTED PLOTS **UNPROTECTED PLOTS ***MINUS WEIGHT OF THE SACK

42.3 - Utilization Guage. A utilization gauge is a quick and accurate method to determine grass utilization. Utilization curves developed by the Rocky Mountain Experiment Station or those curves for California, Oregon, Idaho, and Washington can be used if applicable to your ecological types, or the Forest can develop their own utilization curves for their key species. Exhibit 01 shows a utilization gauge with a species slide.

Instructions for use of a utilization gauge are:

1. Measure and record by key species the heights of ungrazed plants. Total, and divide by the number to determine average ungrazed height. If sufficient ungrazed plants do not occur on sampling area, measure plants adjacent to it. Cages can be used to determine ungrazed heights.

For seedstalk-producing (culm) plants, measure tallest seedstalk to nearest 1", nonseedstock-producing (culmless) plants, the tallest leaf heights to 1/2".

Measure at least 30 grazed and ungrazed plants to have a adequate sample size.

2. Measure and record by key species the heights of grazed plants. If plants are not cropped off evenly, measure average stubble height of each plant.

Measure all grazed plants to nearest 1/4".

3. Pull slide out of envelope until scale for species concerned appears in window.

4. Turn dial until average heights determined in #1 appears opposite arrow so designated.

5. On dial, find grazed heights recorded #2 and opposite on slide, read percent utilization for each plant.

6. Repeat operation for each grazed height, total utilization percentages, and divide by the total number of plants. This gives average percentage utilization.

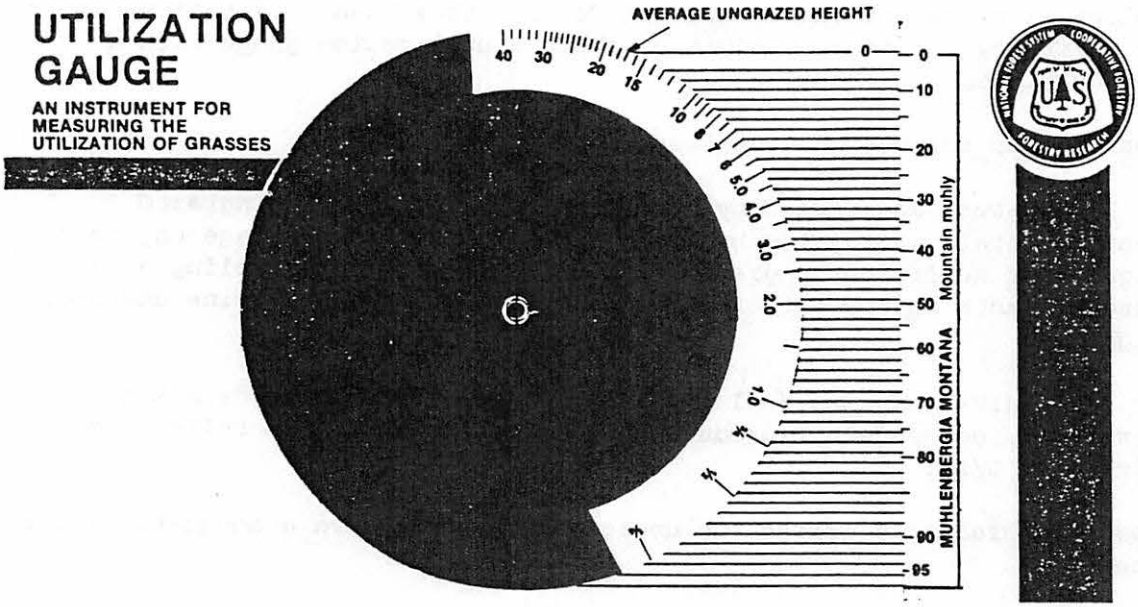
Utilization Guages can be obtained from the Colorado State University Bookstore in Fort Collins, Colorado (303-491-6692). The charts for Washington, Oregon and Idaho can be obtained from the Regional Office Range Management Staff.

(970)

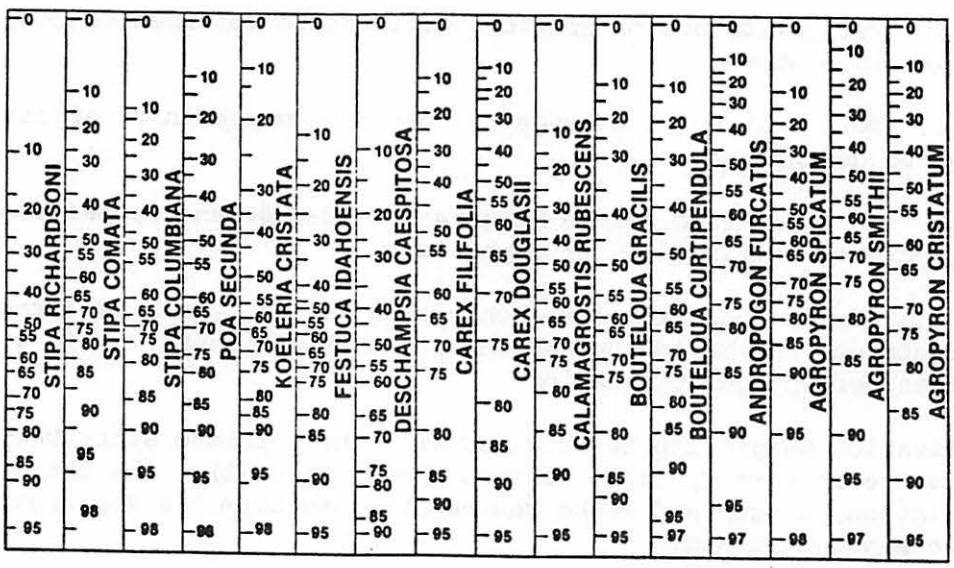
Judy
491-1660
4.75 ea ordered
20 ea

42.3 - Exhibit 01

Utilization Gauge



U.S. FOREST SERVICE, ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION



42.31 - Preparation of Utilization Curves. There are four published utilization curve charts in use in the Intermountain Region. If these published charts do not fit the local area, develop local site height-weight curves into local species charts. The following described method provides a mechanical tool which can be used for training, checking personal judgement, and promoting uniformity of results between examiners as well as for determining percent utilization.

42.31a - Preparing Utilization Scales. Utilization scales used with the utilization gauge are prepared from height-weight curves developed for individual grass and grasslike species. Previously prepared utilization scales must be checked to see whether or not these scales fit the species on the rangeland where they will be used. Where existing utilization scales do not fit, new scales will have to be prepared. Scales for a number of species are included on the same card.

1. Developing Height-Weight Curves. Develop height-weight curves by collecting plants of a given species and determining the height-weight relationship for that species. The curve for any given species must be checked for variation between range sites and climatic regions. It is necessary to develop separate curves for culm-producing plants and culmless plants when a species only sporadically produces culms.

a. Sampling Plants. Sample at least fifty plants of a given species at random over the District to obtain a 20% significance and 90% accuracy. Select only these plants which have reached maximum growth.

(1) At each interval along a pace transect, choose the ungrazed plant of the given species nearest the toe. Use one square inch as a unit area for sod-forming species and a comparable number of stems as a unit area for single stem species.

(2) Remove all old leaves and stems of previous year's growth.

(3) Clip the plant to within 1/4 inch of the ground.

(4) Wrap the clipped plant with thread from base to top to retain all leaves and culms in their natural position.

(5) Separate the plants with culms from plants without culms and consider each as a separate sample.

(6) Measure heights of clipped plants to the nearest inch and determine the average height. almost height = 10"

(7) Sample additional plants, if necessary.

(8) Measure the maximum height of each plant.

(9) Clip the top 10 percent by height of each plant and place the clippings in a paper sack labeled 0 to 10 percent. Clip additional height segments in 10 percent increments and place clippings in appropriately labeled sacks--11 to 20 percent, 21 to 30 percent, 31 to 40 percent, 41 to 50 percent, 51 to 60 percent, 61 to 70 percent, 71 to 80 percent, 81 to 90 percent,

and 91 to 100 percent. A large paper trimmer with a guide to hold the plants in their proper position on the platform may be used to clip plants into segments. Label the sacks to show species, date, and location. Place a given height segment for all plants of a species collected in one paper sack.

(10) Dry the clippings until a constant weight, to the nearest tenth of a gram, is achieved. Leave clippings in the paper sacks for drying.

b. Determining Height-Weight Relationships.

(1) Weigh and record the weights for each of the ten height segments to the nearest tenth of a gram. Subtract sack weight before recording the dry weights of each height segment.

(2) Total the dry weights of the ten height segments and record the total dry weight of the collected plants.

(3) Record the cumulative weight for each segment. This includes the weight of the segment plus the weights of all preceding segments starting from the top of the plant.

(4) Calculate the cumulative percent weight removed at each height segment by dividing the cumulative weight for each segment by the total weight and multiplying by 100.

(5) Plot the cumulative percent height removed against the cumulative percent weight removed on graph paper. The resulting curve portrays the height removed-weight removed relationship for the species.

2. Transferring Data from Curves to Scales. Transfer the height-weight relationship data portrayed on the height-weight curve to a utilization scale for use in the utilization gauge.

a. Turn the dial on the utilization gauge so that 10 inches is at the arrow designated "Average Ungrazed Height." With the dial set at 10, each inch increment from 9 to 0 on the dial represents 10 percent of the height.

b. Slide a blank card into the utilization gauge.

c. Use the height-weight curve to determine the percent height that would be removed when 10 percent, 15 percent, through 95 to 98 percent of the weight is removed.

d. Enter 10 percent, 15 percent through 95 to 98 percent weight removed on the scale in the window of the utilization gauge across from the point on the dial representing the corresponding percent height removed. With the dial set at 10 inches for "Average Ungrazed Height," the percent removed can easily be converted to inches removed.

3. Documenting Scale Preparation. For each utilization scale prepared, maintain a record of the species, the data used to prepare the scale, the date the scale was prepared, and the areas of applicability.

42.4 - Stubble Height. Adequate stubble height is needed in riparian systems for the maintenance of riparian plant vigor and streambank protection, and to aid in deposition of sediments to rebuild degraded streambanks. Stubble height values are measurements of minimum herbage stubble heights that should be present on streamside areas at the end of the growing season, or at the end of the grazing season if grazing occurs after frost in the fall.

42.41 - Areas of Use. As a minimum, stubble height measurements are used along the green line of key riparian complexes that adequately depict effects of current management systems in a grazing unit within the current floodplain. They can also be used on upland transects.

42.42 - Advantages and Limitations. This method is relatively rapid and does not require ungrazed areas for training purposes. Measurements are made of heights of plant material remaining at the end of the growing or grazing season. The method is relatively simple and allows a direct way to measure remaining herbage.

42.43 - Equipment. No specialized equipment is needed besides a note pad and ruler.

42.44 - Training. Examiners must be able to identify plant species both before and after they are grazed and understand the green line concept in riparian monitoring.

42.45 - Establishing Studies. Measurements need to be made on key riparian areas that have been cooperatively identified between users and interdisciplinary teams. See the Intermountain Region Integrated Riparian Evaluation Guide. These areas should be indicative of effects of management on the total grazing unit. Riparian plant species whose stubble height will be monitored and measured should also be cooperatively agreed upon. Monitored plants should be selected from those included in the late ecological status grouping and represent management goals and objectives. Normally, only 1-3 plant species need to be monitored.

42.46 - Sampling Process. Sampling should be done along a 363 foot green line monitoring segment of a stream, doing both sides of the stream. (See Intermountain Region Integrated Riparian Evaluation Guide.) This is the same monitoring unit as in the green line trend studies. At every tenth step along this sampling unit, record the stubble height of the key species being monitored that is nearest to the toe of your right foot. This will result in a total of approximately 36 samples (eighteen on each side of the stream) being taken along the green line monitoring area. An average of the 36 samples will be indicative of the stubble height remaining for that species.

42.47 - Stubble Height and Utilization. Through an interdisciplinary process, an agreed upon stubble height should be selected for each sampling location. A stubble height of 3 to 4 inches should maintain plant vigor, provide streambank protection, and aid deposition of

sediments to rebuild degraded streambanks. For reference, research data suggest that average utilization levels of 24 to 32 percent were obtained when riparian graminoids were grazed to a 6-inch stubble height, that average use levels of 37 to 44 percent were obtained when grazing to a 4-inch stubble height, and that average use levels of 47 to 51 percent were obtained when grazing to a 3-inch stubble height. However, additional stubble height, such as 6 inches or more, may be necessary to protect special riparian ecosystem functions, such as a critical fisheries.

42.5 - Photo Guides. Photo guides provide a grazed class standard method for comparison and increase consistency and accuracy in estimating utilization of selected forage species. The procedure is based on the concept that when one or more key species of an area representative of a larger rangeland type have been properly utilized, optimum use of that rangeland has been made. The method classifies grazed plants into utilization classes, based on the percent of total plant weight removed. The classes are 0, 10, 30, 50, 70 and 90 percent use. Photographic guides, developed from height-weight relations of the chosen species are used to guide placing grazed plants into their respective utilization classes.

Three photo guides are currently applicable for use in the Region of this this printing date. They are:

1. The University of Arizona, Cooperative Extension Service and Agricultural Experiment Station. 1978. Estimating Range Use With Grazed-Class Photo Guides. Ervin M. Schmutz. Bulletin A-73 (Revised). 14 pages.

2. Montana State University Extension Service. July 1988. Forage Use, A Tool for Planning Range Management. EB 30. 12 pages.

3. University of Idaho Forest and Range Experiment Station. June 1992. The Grazed-Class Method to Estimate Forage Utilization on Transitory Forest Rangelands. J.L. Kingery, C.Boyd, P.E. Kingery. Bulletin Number 54. 21 pages.

42.6 - Ocular Estimate Method - Key Upland Forage Species. The Key Forage Plant Method is an ocular estimate of forage utilization on uplands within one of six utilization classes. Observations are made of the appearance of the rangeland and especially the key species, along a transect which traverses the key area.

42.61 - Areas of Use. This method is adapted to upland areas where perennial grasses and/or browse plants are the key species and utilization data must be obtained over large areas using few examiners.

42.62 - Advantages and Limitations. This method is rapid and does not require unused areas for training purposes. Estimates are based on a descriptive term representing a broad range (class) of utilization rather than a precise amount. Different examiners are more likely to estimate utilization in the same classes than to estimate the same utilization percentages.

42.63 - Equipment.

1. Utilization Study Data - Key Forage Plant Method Form.

2. Tally counter (optional).

42.64 - Training. Personal judgement is involved in any estimation method. Estimates are only as good as the training and experience of the examiners. The training described for the Ocular Estimate Method often helps examiners using this method make the utilization class estimations. This method requires that the examiners be trained to:

a. Identify the plant species.

b. Recognize the six herbaceous or six browse utilization classes using the written class descriptions.

c. Think in terms of the general appearance of the rangeland (slightly used, heavily used, and so forth.) at each observation point, rather than weight or height removed.

42.65 - Establishing Studies. Select key area(s) and key species and determine the number, length, and location of the transects. Document the location and other pertinent information concerning a transect on the form. Two to three transects of 20 plots five paces apart may be adequate for this study.

42.66 - Sampling Process. After examiners are trained and have confidence in their ability to judge utilization by utilization class ("light", "heavy", etc.), proceed with the collection of utilization data. At each observation point along the transect, estimate the utilization class using the written description of the class. In those cases where part of a class description does not apply (example: percentage of seedstalks remaining), judge utilization based on those parts of the description that do apply. An observation point is the immediate area containing the key species visible to examiners when standing at a particular location along the transect. Record the estimates by dot count by utilization class on the Utilization Study Data - Key Forage Plant Method Form (ex. 01).

1. Herbaceous Utilization Classes. Six utilization classes are used to show relative degrees of use of key herbaceous species (grasses and forbs). Each class represents a numerical range of percent utilization. Estimate utilization within one of the six classes. Utilization classes are described as follows:

a. No Use (0-5%). The rangeland shows no evidence of grazing use; or the rangeland has the appearance of negligible grazing.

b. Slight (6-20%). The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seedstalks and young plants of key herbaceous species are little disturbed.

c. Light (21-40%). The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed and 60 to 80 percent of the number of current seedstalks of key herbaceous plants remain intact. Most young plants are undamaged.

d. Moderate (41-60%). The rangeland appears entirely covered as uniformly as natural features and facilities will allow. Fifteen to 25 percent of the number of current seedstalks of key herbaceous species remain intact. No more than 10 percent of the number of low value herbaceous forage plants are utilized. (Moderate use does not imply proper use.)

e. Heavy (61-80%). The rangeland has the appearance of being complete searched for feed. Key herbaceous species are almost completely utilized with less than 10 percent of the current seedstalks remaining. Shoots of rhizomatus grasses are missing. More than 10 percent of the number of low value herbaceous forage plants have been utilized.

f. Severe (81-100%). The rangeland has a mown appearance and there are indications of repeated coverage. There is no evidence of reproduction or current seedstalks of key herbaceous species. Key herbaceous forage species are completely utilized. The remaining stubble of preferred grasses is grazed to the soil surface.

2. Browse Utilization Classes. Six utilization classes show relative degrees of use of available current year's growth (leaders) of key browse plants (shrubs, half shrubs, woody vines, and trees). Each class represents a numerical range of percent utilization. Estimate utilization within one of the six classes. Utilization classes are described as follows:

a. No Use (0-5%). Browse plants show no evidence of use; or browse plants have the appearance of negligible use.

b. Slight (6-20%). Browse plants have the appearance of very light use. The available leaders of key browse plants have the appearance of very light use. The available leaders of key browse plants are little disturbed.

c. Light (21-40%). There is obvious evidence of leader use. The available leaders appear cropped or browsed in patches and 60 to 80% of the available leader growth of the key browse plants remains intact.

d. Moderate (41-60%). Browse plants appear rather uniformly utilized and 40 to 60% of the available leader growth of key browse plants remains intact.

e. Heavy (61-80%). The use of the browse gives the appearance of complete search. The preferred browse plants are hedged and some plant clumps may be slightly broken. Nearly all available leaders are used and few terminal buds remain on key browse plants. Between 20 to 40% of the available leader growth of the key browse plants remains intact.

f. Severe (81-100%). There are indications of repeated coverage. There is no evidence of terminal buds and usually less than 20% of available leader growth on the key browse plants remains intact. Some, and often much, of the second and third years' growth of the browse plants has been utilized. Hedging is readily apparent and the browse plants are more frequently broken.

42.66 - EXHIBIT 01 IS A SEPARATE DOCUMENT.

42.67 - Calculating Percent Utilization. Calculate the percent utilization as follows:

1. Convert the dot count to the number of observations for each utilization class.

2. Multiply the number of observations in each utilization class times the midpoints of the class intervals.

3. Total the products for all classes.

4. Divide the sum by the total number of observations on the transect.

5. Record the average percent utilization on the Utilization Study Data - Key Forage Plant Method Form (sec. 42.66, ex. 01).

UTILIZATION STUDY DATA
KEY FORAGE PLANT METHOD

42.66 - EXHIBIT 01 IS A SEPARATE DOCUMENT.

42.66 - Exhibit 01

USDA Forest Service

R4-2200-47 (1/93)

UTILIZATION STUDY DATA
KEY FORAGE PLANT METHOD
(Reference FSH 2209.21)

STUDY NUMBER	DATE	EXAMINER
Mooncreek #1	6/30/93	Diane Chugwater

ALLOTMENT NAME & NUMBER	PASTURE
Mooncreek - 15-02-23	Rabbit Spring

KIND AND/OR CLASS OF ANIMAL	PERIOD OF USE
Cattle - cows and calves	5/1 to 7/30

CLASS INTERVAL	INT MID (M)	KEY SPECIES Agcr DOT COUNT	NO BY CLASS (C)	NO X MIDPT (C)(M)	KEY SPECIES DOT COUNT	NO BY CLASS (C)	NO X MIDPT (C)(M)
NO USE 0-5%	2.5		6	15			
SLIGHT 6-20%	13		4	52			
LIGHT 21-40%	30		16	480			
MODERATE 41-60%	50		12	600			
HEAVY 61-80%	70		2	140			
SEVERE 81-100%	90						
		TOTALS	40	1287	TOTALS		

AVG. UTIL. = $\frac{\Sigma(CM)^*}{\Sigma C}$ = $\frac{1287}{40}$ = 32%

NOTES (USE OTHER SIDE OR ANOTHER PAGE, IF NECESSARY
The ranch foreman, bud Glossy, participated in the collection of the utilization data. He felt that the average % utilization obtained by the study accurately reflected the amount of use.

*WHERE C = THE NUMBER OF OBSERVATIONS WITHIN EACH CLASS INTERVAL (C COLUMN), M = THE CLASS INTERVAL MIDPOINT (M COLUMN), AND Σ = THE SUMMATION SYMBOL.

Herbaceous Utilization Classes (Browse utilization classes are on the other side.)

1. No Use (0-5%) The rangeland shows no evidence of grazing use; or the rangeland has the appearance of negligible grazing.

2. Slight (6-20%) The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seedstalks and young plants of key herbaceous species are little disturbed.

3. Light (21-40%) The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed and 60 to 80 percent of the number of current seedstalks of key herbaceous species remain intact. Most young plants are undamaged

4. Moderate (41-60%) The rangeland appears entirely covered as uniformly as natural features and facilities will allow. Fifteen to 25 percent of the number current seedstalks of key herbaceous species remain intact. No more than 10 percent of the number of low value herbaceous forage plants are utilized. (Moderate use does not imply proper use.)

5. Heavy (61-80%) The rangeland has the appearance of complete search. Key herbaceous species are almost completely utilized with less than 10 percent of the current seedstalks remaining. Shoots of rhizomatous grasses are missing. More than 10 percent of the number of low value herbaceous forage plants have been utilized.

6. Severe (81-100%) The rangeland has a mown appearance and there indications of repeated coverage. There is no evidence of reproduction or current seedstalks of key herbaceous species. Key herbaceous forage species are completely utilized. The remaining stubble of preferred grasses is grazed to the soil surface.

42.7 - OCULAR ESTIMATE METHOD - TOTAL HERBACEOUS RIPARIAN SPECIES. The total herbaceous riparian plant method is an ocular estimate of forage utilization in riparian areas within one of six utilization classes. Observations are made of the appearance of the riparian complex, along a transect which traverses the key area.

42.71 - Areas of Use. This method is adapted to riparian herbaceous areas where perennial grasses and forbs are the herbaceous species and utilization data must be obtained over large areas using few examiners.

42.72 - Advantages and Limitations. This method is rapid and does not require unused areas for training purposes. Estimates are based on a descriptive term representing a broad range (class) of utilization rather than a precise amount. Different examiners are more likely to estimate utilization in the same classes than to estimate the same utilization percentages.

42.73 - Equipment.

1. Utilization Study Data - Total Forage Plant Method Form.

2. Tally counter (optional).

42.74 - Training. Personal judgement is involved in any estimation method. Estimates are only as good as the training and experience of the examiners. The training described for the Ocular Estimate Method often helps examiners using this method make the utilization class estimations. This method requires that the examiners be trained to:

1. Recognize the six herbaceous utilization classes using the written class descriptions.

2. Think in terms of the general appearance of the riparian rangeland (slightly used, heavily used, etc.) at each observation point, rather than weight or height removed.

42.75 - Establishing Studies. Within the riparian area, select a site of two or three separate sites that represent grazing use and relate to management objectives. The site may be the narrow greenbelt along the right and left bank of a stream or a meadow complex of several acres.

42.76 - Sampling Process. After examiners are trained and have confidence in their ability to judge utilization by utilization class ("light", "heavy", etc.), proceed with the collection of utilization data. The sample plan consists of randomly locating a cluster of three transects within a site. When grazing use appears to be closely used or higher, the sample is ten (10) plots per transect. When use is moderately used or lightly, twenty (20) plots per transect is the sample. Transects maybe placed in a straight line, zig-zag fashion, as wheel spokes, or parallel of each other, depending upon the shape of the site. The plot is 4.8 sq. ft. or 50 sq. dm.

For each plot, observe the degree of grazing. Select the appropriate vegetative use class. Record the use class on the form, using a five or ten count tally. Six vegetative use classes are used because they allow for determining use in relation to proper use criteria and give an indication of the severity of use.

Vegetative utilization classes and descriptions:

1. No Use (0-5%).

2. Slightly Used (6-20%). Herbaceous cover shows some cropping, beginning to look ragged. Seed heads and blossoms of plants liked best are selectively taken. Surface objects are masked. Separate plants are not easily recognized. The soil surface, when viewed from above is usually hidden by foliage. Palatable shrubs show no or slight use. A grazing line is not evident on shrubs or it is only observable because of past use. Sod mounds are difficult to see.

3. Lightly Used (21-40%). Herbaceous cover is cropped lightly, having a patchy, ragged look. Small surface objects, such as a tennis ball or dung heap, are masked. The soil surface, when viewed from above, is starting to show. The stems as well as the seed heads and blossoms of the best plants are being taken. Low value plants remain untouched. Separate plants are not easily distinguished. Palatable shrubs, particularly the new growth, may show light use. No grazing line is evident from this year's grazing. Sod mounds are difficult to see.

4. Moderately Used (41-60%). Herbaceous cover is cropped, patchy, and ragged, having a grazed look. Enough stubble remains to mask a tennis ball for the most part. Only the highest value plants show close cropping. Low value grasses and grasslike plants may be lightly cropped. Low value forbs and shrubs are ungrazed. Ground hugging plants are not easily seen. Forbs and low value grazes are becoming conspicuous. Palatable shrubby forage within easy reach is evidently being grazed. A grazing line from this year's use is starting to show. The shape of sod mounds is becoming evident.

5. Closely Used (61-80%). Herbaceous cover has a definite, mowed look. A tennis ball is visible whereas a golf ball is partly masked. All grasses and grasslike plants except the low value ones are closely cropped. Some hairgrass leafage may be left when present in the community. Forbs of value are cropped. Only the very lowest value forbs are easily seen. Ground hugging plants are becoming conspicuous. Sod mounds are evident.

6. Extermely Used (81-100%). Herbaceous cover has a closely mowed appearance, making a golf ball plainly visible. Practically all grasses are cropped to their root crowns. Some maybe pulled up. Very low value plants, such as Iris, conspicuously stand out. Foliage is grazed from under shrubs and places hard to get at. Palatable shrubs have a pruned appearance or prominent grazing line. Sod mounds are quite evident.

42.77 - Calculating Percent Utilization. Percent use is computed by dividing the sum of the midpoint values of each plot observation by the number of observations.

42.7 - Exhibit 01

USDA Forest Service R4-2200-48 (1/93)

RIPARIAN AREAS
OCULAR ESTIMATE BY PLOT
(Reference FSH 2209.21)

FOREST: Plateau RANGER DISTRICT: High Hopes DATE: 10/1/93

ALLOTMENT: Great Expectations PERMITTEE: Mr and Mrs Rodeo

Location: Pleasant Meadows Tsp: 1N Rge: 1W Sec: 37

Examiners: Jack and Jill Hill

Class of use	Class Interval (CI)	CI Mid-point (CIM)	Transect Observations T-1	T-2	T-3	Sum T-1,2,3 (n)	(n)x(CIM) (y)
none	0-5%	2.5%	.. ..	. ..	.	8	0
slightly used	6-20%	13%	..	.. ..	. ..	10	105
lightly used	21-40%	30%	..	..	.	5	152.2
moderately used	41-60%	50%	.. .	.. .	.. ..	13	656.5
closely used Heavy	61-80%	70%	. ..	.. ..	.. ..	13	196.5
extremely used Severe	81-100%	90%	.. ..	.. .	.. ..	11	995.5
					Total	60	2826
					Mean (Percent Utilization)		47

Mean (Percent utilization) = sum of column (y) divided by the sum of column (n)

Remarks: Cattle have been in the area for 20 days. Estimate 10% damage to streambank trampling. No active headcuts. Salt is being placed out & away from the area.

42.8 - Utilization Mapping. Use-intensity mapping is a graphic method for the determination of intensity and distribution of use by grazing animals on an entire grazing unit or allotment. This graphic record aids in evaluating weaknesses and desirable modifications in a management program.

The most practical method for accomplishment of use-intensity mapping is the sketch method. The grazing unit being mapped is examined by ocular reconnaissance and the boundaries of the forage-use intensity classes are sketched freehand on aerial photos, maps, or overlays. Use-pattern mapping is best accomplished on a grazing unit-by-unit basis at about the time livestock leave the unit or shortly thereafter. Utilization can be determined by any of the above described methods in sections 42.2 - 42.7.

Mapping is accomplished by use intensity classes. As a prerequisite, examiners must make sufficient measurements in similar types to "set their sights." The examiner must be able to recognize use levels by broad classes. One examiner should do all of the mapping on a given unit.

Interpretation of the data gained from use-intensity mapping is essential. After the mapping is completed, the graphic information may be transferred to a range analysis map of the allotment. Comparing the use-intensity mapping with the condition, trend, and suitability maps is an extremely useful check to see if the suitability mapping on the allotment is correct or incorrect. Likewise, continued heavy use on areas in an early seral stage or with a downtrend in ecological status may pinpoint areas of concern. It may identify areas of light use or areas of excessive use. It may indicate the need for additional range improvements or the need to eliminate some range improvements. Along with other information, it may help determine if stocking is light, heavy, or about right.

Before starting utilization mapping, determine why the information is needed and for what purpose the information is going to be used for.

Once utilization of an area has been determined, it should be mapped on an aerial photo, ortho photo quad., quality 2" map, or by a GIS system. Include all improvements. The procedure involves traversing the pasture and mapping use within a suggested six use categories of none (0-5%), slight(6-20%), light (21-40%), moderate (41-60%), heavy (61-80%), and severe (81-100%).

Complete the map with a legend indicating mapping unit, utilization, key species, size of the use zone (acres), and possibly average stubble height. Take as many photos as needed to show problems, opportunities, comparisons, etc.

42.81 - Office Procedure. Prepare a narrative describing the resource conditions at the time of the study. The objective of the narrative and map is to organize all data and information gathered in the field in such a manner that anyone reviewing the report will have a good mental picture of resource conditions, resource needs, and alternatives to meet these needs.

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R-4 AMENDMENT 2209.21-93-1
EFFECTIVE 5/18/93

CHAPTER 40 - RANGELAND MONITORING AND EVALUATION

44 - LONG-TERM RANGE TREND DETERMINATION.

44.1 - MEASURING AND INTERPRETING TREND - GENERAL CONSIDERATIONS. Trend is the directional change in kind, proportion and/or amount of plant species, or soil characteristics. Trend may be interpreted in an ecological context, in terms of resource value(s), or in terms of a desired future condition or desired plant community (DFC).

The principal criteria to interpret trend in ecological status should be the vigor and reproductive success of plant species that are indicative of later seral stages as compared to those of an earlier seral stage for the type. The PNC is used as the reference plant community. Trend of soil surface conditions is interpreted from evidence of accelerated soil erosion.

Trend in desired future condition, or in resource values when compared to management objective(s), refers to the change in utility of vegetation at a particular location for a specific use. The trend of a particular resource value may be up, for another use the trend may be down, and not apparent for still another. The direction of trend is based on whether the changes in vegetation and soil conditions are desirable or undesirable for specific management objectives.

Because of the variation in trend interpretations, the type of trend must be specified, either as ecological status, as a resource value for a specific use, or as a desired future condition. Desired future condition can be expressed in either ecological status or resource values. Trend in desired future condition should be described as "meeting", "moving toward", or "not meeting".

Most planning discussions concerning trend should speak toward the desired future condition.

A change of fifteen percentage points in similarity between the present plant community and the desired future condition will be considered as trend moving toward or away from. As stated in section 26.3, a value of 75 percent similar or greater in desired future condition may be used to differentiate between meeting and not meeting management objectives.

44.11 - Apparent Versus Measured Trend. (See section 24.5 for further discussion). Apparent trend is the interpretation of direction of change based on the evidence that is obtained at a single observation. It should only be done by an experienced observer and should always be clearly identified as apparent trend.

Measured trend is a quantitative assessment of change based on repeated measurements over time of the kind, proportion, and/or amount of plant

Frequency data, like all other quantitative measures, cannot be used to evaluate ecological status or resource values before potential natural community or desired plant community scorecards are established through prior study. Once standards have been established, frequency data can be used for an objective and consistent method of trend analysis. R-4 scorecards will be developed on the Potential Natural Community Scorecard (sec. 26.1 and 26.1 - Exhibit 01). Frequency can be used to indicate a real change in vegetation but it cannot be interpreted to indicate a specific amount nor the specific property of a species unless additional information is available. Frequency will not interpret whether the change is in density, basal area, or spatial pattern. What has happened must be interpreted by the land manager. In spite of its limitations, frequency is the easiest, least costly, and a reliable kind of quantitative data to collect to detect change in the role of species in a community.

Frequency cannot be efficiently or meaningfully used in all vegetation types. It is more meaningful in perennial grasslands and for interpreting change in the herbaceous and small shrub component in shrub-grass vegetation. For some large forb sites, such as wyethia, balsam root, alfalfa, and geranium, density is a good trend measurement. For large woody plants, canopy cover, density, and age and form class should be the basic measurements to monitor trend.

Soil surface condition can easily be obtained along with frequency by fixing points on the sample frame to record hits on bare ground, litter, gravel, total basal cover of vegetation and other characteristics of the soil surface. However, this method will not usually adequately sample basal cover of individual species because of insufficient number of observations.

In summary, frequency, density, and basal area are relative stable attributes of herbaceous plants; whereas, herbaceous cover and weight are "moving target" type attributes for which community description and trend are confounded with stage of growth, utilization and weather conditions when measurements are repeated over the years. Density is nearly impossible to measure accurately for some herbaceous species, and basal area is realistic only for bunch type species.

44.12a - Approved Trend Study Techniques. The following methods will be used as trend study techniques:

1. Camera Points (for visual representations).
2. Nested Frequency (plant abundance).
3. Point Samples (for ground cover).
4. Line Intercept (shrub canopy cover).
5. Plant Density (shrub age & form class).
6. Riparian.
    a. Cross Section Vegetation Composition.

b. Green Line Vegetation Composition.

c. Woody Species Regeneration.

Old existing Parker Three-Step loop-frequency trend transects have been screened and either converted to nested frequency, canopy cover, ground cover, and/or shrub density studies, a permanent photo point, or dropped entirely. The photographs and data collected through the Parker technique shall be kept permanently in the analysis folder for future reference and comparisons. Any continued collection of Parker data as a means of long term trend monitoring is not recommended.

44.12b - Equipment List for Conducting Trend Studies.

Steel fence post and post driver for marking the study location.

One-hundred-foot fiber tape graduated in tenths.

Two tape anchoring rods (5/8-inch steel pegs 2-1/2- to 3 feet long).

Two 7-foot lengths of 1/8-inch parachute cord.

Angle iron stakes - 18 to 24 inches long with 3/4- to 1-inch flange or 1/2- to 5/8-inch reinforcing rod.

Plumb bob.

Two-pound hammer.

Pliers.

Light Meter (if camera does not have a functional, accurate light meter).

Tripod.

Compass.

Camera, film.

Clinometer and altimeter.

Clipboard.

Range Analysis Handbook.

Plant ID Books.

Intermountain Range Plant Names and Symbols, GTR INT-38.

Forest Species List with RVR ratings.

Two 6-foot folding wood or metal carpenters rulers (for making 3-foot by 3-foot plots).

Crescent wrench (for turning angle iron stakes).

ID card (kraft folder material or chalk board).

Pocket size calculator.

Two binder clips or bulldog clips (for holding corners on the 3-foot by 3-foot plots).

ID card holders.

Felt-tip pen or chalk.

Data and Summary Form.

Aerial photos and/or map.

Calculator.

Nested Frequency Frame.

50cm by 50cm	19.69 by 19.69 inches.
w/nested 25cm by 50cm	9.84 by 19.69 inches.
w/nested 25cm by 25cm	9.84 by 9.84 inches.
w/nested 5cm by 5cm	1.96 by 1.96 inches.

Plant press (optional field equipment).

Zip lock plastic bags (for collecting specimens).

Study plot location tags plus nails.

Mosquito repellent.

44.12c - Forms Needed for the Various Study Methods. The following list contains the forms required for each of the individual study methods. A complete example of each form is presented as an exhibit in the section describing the specific study procedures.

1. Nested Frequency/Shrub Density Method.
Nested Frequency Data R4-2200-22 (4/86).
Apparent Trend R4-2200-25 (1/93).
Range Trend Photo Record R4-2200-7 (6/82).

2. Line Intercept Method.
Line Intercept Record R4-2200-6 (1/93).
Range Trend Photo Record, R4-2200-7 (6/82).

44.13 - Accuracy, Precision, and Probability Statements. Regardless of the type of data collected to evaluate vegetation change, interpretation should be supported with statistical analysis. Vegetation parameters are estimated by measurement from sampling. Accuracy concerns the nearness of the estimated value to that of the actual value. Precision refers to repeatability of the sample estimate. High precision suggests a high degree of accuracy, but this is not necessarily the case when dealing with vegetation.

Precision and probability statements are functions of sampling intensity and population variability. High precision in vegetation sampling is generally very costly to obtain because of the large number of samples required. For trend analysis a compromise between sampling cost and the risk of an incorrect interpretation of data suggests that a precision of ± 20 percent of the mean at a probability of 80 percent should be the minimum acceptable level. Increasing the probability to 90 percent would require an increase in sampling effort of about 50 percent. However, specification of an adequate level of statistical reliability of data will greatly enhance acceptance of related decisions.

44.14 - Interpreting Trend Data. Measured or observed changes in kind, proportion and/or amount of plant species on a site or in soil cover characteristics are interpreted as changes in trend. To decide if a change in management is needed to reverse undesirable trends or to accelerate desirable ones, the causes of trends need to be established. Annual weather and growing conditions should be emphasized in trend interpretations. The following are guidelines for collection and interpretation of trend data:

44.14a - Interpreting Trend at One Location. Differences in measurements obtained at different dates on the same location because of sampling error, personal bias or lack of adequate training should be minimized. The location and size of the sample area must be adequately specified. The sample area should not involve more than one ecological type and sampling design should account for heterogeneity in plant pattern, topography, and microclimate.

44.14b - Interpreting Trend in a Management Unit. It is rarely feasible, nor is it necessary, to obtain a statistically valid sample of an entire management unit (pasture, allotment) for trend monitoring purposes. Each monitoring location should be carefully selected with specified objectives developed for each location. Data from different sample locations should not be combined until after interpretation of each location is made and then only if it is certain no information will be lost. The overall trend on a management unit cannot be determined by averaging trend data from various locations except perhaps under cases of extremely good or poor management.

44.14c - Collateral Data. Collection of collateral data to aid interpretation of soil or vegetation change is essential.

1. Weather data should be collected on or near each monitoring location. National Weather Service or Forest Service storage gauges read monthly or seasonally can be used for precipitation. Max-min thermometers at selected locations may help explain extreme events.

2. Actual use records of livestock and of wildlife should be maintained.

3. Utilization should be measured on each monitoring location whenever trend data are collected and at other times when appropriate and feasible. Utilization data should be collected to represent the same location as other vegetation data. A method should be used which provides quantitative estimates of either percentage utilization or residue remaining. Examples are the grazed class, stubble height, paired

plot, or any number of other techniques suitable in different situations. Caged plots may be used to ensure that some ungrazed plants are present for making comparative kinds of measures.

4. Observations on populations or occurrence of rabbits, rodents, insects, fire, or other disturbances also can be made.

44.14d - Frequency for Collection of Trend Data. To establish the reality of trends and the causes for them, measure trends frequently. This is particularly important where management problems exist but causes are debatable. Because limited resources often dictate that trend monitoring can be done only at intervals of three, five, or more years, a monitoring strategy designed to aid in accurate identification of trends and their causes is important. The following are ways to overcome infrequent measurement:

1. Select a few locations for frequent measurement. The location chosen should be where collateral information relative to management objectives can be obtained. Establishment of a continuous trend in soil/vegetation characteristics in relation to weather, utilization, actual use and other variables will support a more accurate interpretation of data gathered on an infrequent basis elsewhere.

2. Pay special attention to designed comparisons among trend locations. For instance, if vegetation cover is declining on numerous trend locations irrespective of the management system, it may be assumed that weather or factors other than management are responsible. However, if cover of forage species declines on an ecological type in one management unit but increases or is static on the same ecological type in an adjacent unit, a change in management is indicated.

44.15 - Trend Determinations. Trend can be determined for changes in desired future condition, ecological status, ground cover, and for individual plant species.

Trend for DFC and ecological status can be determined by comparing measurements on Ecological Scorecards (sec. 27.3 and 27.3 exhibit 01). If there is a 15 percentage point change from one scorecard measurement to the next scorecard measurement, there will be an upward or downward trend change noted. If the change is less than 15 percentage points from one measurement to the next, a static change in trend will be recorded.

Trend in individual point or plant measurements concerning specifics in the desired future condition can be determined using the Chi-Square table that is in section 47.

44.16 - Trend Study Sites. Reference material on selecting benchmarks and key areas is in sections 40.4 and 40.41.

44.17 - Documentation and Maintenance of the Study Site. Study sites should be located and sufficient instructions and diagrams provided so that it can easily be relocated. (Reference 40.41 exhibit 01).

1. Make a sketch map describing the study site, use compass bearings and measured distances to well-known topographic or cultural features, that is, rocks, trees, cattleguards, and so forth. Describe the

reference points and/or witness marker, for example, 25-inch DBH Douglas fir, limestone boulder, forest road 218, and so forth. Include the positioning and distance of individual transect lines in relation to the witness marker and in relation to each other.

2. Take a general view photograph of the study site from an adjacent ridge or other prominent observation point.

3. Pinprick the study site location on an aerial photo and record the name, number, date, and other identifying information on the back of the photo. Make the photograph a part of the permanent record.

4. The study location should also be identifiable on the ground. Steel posts or other natural features should be used to permanently mark the location. In the event the witness marker is destroyed, a substitute should be located and appropriate notation made on the form describing the change. Missing transect stakes should also be replaced at the time the study is remeasured.

44.18 - Species Identification and Collection. It is important that plant species be properly identified and only approved species symbols be used. If the symbol is inaccurate or incomplete, it may be quite difficult to interpret the data. For example, Artr could be misinterpreted as Artemisia tridentata when actually Artemisia tripartita was intended.

To facilitate identification and consistent use of species symbols, a list of the species present in the immediate area should be included in each long-term trend study folder. Both scientific and common names should be included. In addition, an individual plant collection should be made for each study. The use of plant collections on 5- by 7-inch cards makes them easy to store in the study folder and the carry into the field the next time the study is read.

When a plant cannot be identified in the field, it should be given a descriptive name or a number. A specimen should be collected, pressed, and its identification pursued. If identification cannot be made locally, the specimen should be sent to the Supervisors' Office. Once the plant is identified, the data sheets should be corrected, assuring that all information is complete.

44.19 - Requirements for a Completed Trend Study. The study is not considered complete until the following items have been addressed:

1. Properly-collected field data.

   a. Obtain a representative sample of the site.

   b. Complete all field forms (some forms are printed front and back).

   c. Identify and preserving a collection of all species.

   d. Take and label all photographs.

   e. Summarize all data while in the field.

2. Assimilating, Binding and Filing Data. The final step in conducting trend studies is making sure the information obtained is available for future references. The data should be filed in a folder marked "Permanent Record, Do Not Destroy." Each study folder should contain:

a. Completed data sheets including map, pinpricked aerial photograph, description of the study location, and an apparent trend rating (where appropriate).

b. Completed summary forms.

c. Evaluation and interpretation of the data (where more than one measurement is available).

d. Properly mounted and labeled photographs.

e. Any available soil inventory information on the study site.

f. Form R4-2200-40, Benchmark Analysis, 40.41 exhibit 01.

g. Any narrative information concerning previous grazing impacts, fires, insect infestations, or other factors that would influence the condition of the study area.

h. Notes on visual observations that may help in interpreting the data.

Two complete sets of data along with photographs shall be prepared. One copy is retained at the District Office; the second copy should be submitted to the Supervisor's Office. The value of having two copies cannot be over emphasized. Occasionally records are lost and without benefit of a second copy, the information cannot be replaced. Fire has destroyed a few Forest Offices in the past.

44.2 - Photographic Records.

44.21 - Taking and Maintaining Photographs. Occasionally, the data collected by the various sampling techniques may not portray a visual image of the changes in the vegetative and soil conditions. Photographs can supplement data and serve as a valuable tool in determining and/or interpreting trend. As with the collection of data, the quality of the photographs is very important. Data can also be collected at the time photo point work is accomplished for a more interpretive result. Experience has provided two basic trusims:

1. Photo reference is generally of greatest value in visualizing and understanding current conditions and change over time (trend) of vegetation.

2. Photography is easier and faster than data collection (sampling) and has the potential to provide periodic assessment of an allotment at a relative low cost.

44.22 - Obtaining Quality Photographs.

1. Determine your objective before you begin.

2. Search to find locations that exemplify that you wish to portray.

3. Carefully choose the precise spot from which various scenes are available to the view of the camera.

4. Locate a permanent stake in the ground and document the location.

a. Fix spot on map.

b. Pinprick aerial photo.

c. List location on photo form.

d. Know the capabilities of your camera and how to get maximum use of it.

e. Orient general views with 25-75 percent horizon in the frame.

f. Plumb your picture! Make sure camera is held to a horizontal or vertical plane (that is, actual slope is portrayed).

g. Take all photographs after the transect line is established, but prior to taking any measurements. This procedure is particularly important where measuring of the transect or individual plots would have a tendency to trample the vegetation.

h. Use a tripod when it is important to duplicate focal length and photo angle. General view photographs can be obtained without the benefit of a tripod if the individual is experienced in the use of the camera. Polaroid cameras and film shall not be used.

i. Use of a light meter is highly recommended. Most of the newer cameras contain built-in light meters; however, it is important to insure that it is functional.

j. When retaking photographs, an attempt should be made to duplicate the previous view as nearly as possible.

k. When taking the closeup photograph, focus on the center of the 3x3-foot plot or the 5-foot mark in the tape. On the general view, the camera should be focused on approximately the 50-foot mark. This will provide for a good general view while being able to read the photo identification sign.

44.23 - Kinds and When to Apply Different Types of Photographs.

1. General or long obliques. These photos portray the visual scenes to infinity and aid in future relocation of the photo point stake. In open country, take one picture 180 degrees from the primary general view to help relocate the camera point. A third general view will enable one to triangulate to the final plot center more readily. These photos show change in vegetation composition over time (trend), and they also portray the type of plant community, its landscape characteristics, and condition.

2. Short oblique. These photos portray plant composition and "thickness". They are valuable to show detailed plant composition, current utilization, and condition. Use a frame to highlight the specific piece of ground over time (that is, carpenter's rulers, quadrat).

3. Verticals. These are used to demonstrate spatiality of vegetation. They are best for showing spatial changes over time. Frame the vegetation with a quadrat for defining the area over time.

4. Horizontal close-up shots. These are used for plant stature and vigor. They are the best for plant identification pictures. They can be used to show utilization by placing scale and backdrop behind the plant. They can show community status and plant vigor in same manner. They are also used for individual plant identification pictures (horizontal or slightly elevated above horizontal is best).

44.24 - Number and Location of Photographs. As a minimum, two photographs shall be taken at each study site. Additional photos may be taken if desired. On established studies, the pictorial record shall be maintained as originally established. When a new study is initiated, the photographs shall be taken as described below.

1. General View Photo. Take from the 100.0-foot end of the tape or at the best suitable point along the tape and in the direction that views a major portion of the tape. The tape should also be centered in the photo, and if feasible, approximately 1/4 of the general view photo should contain skyline. This is especially important to assist in finding the study site during future measurements and subsequently locating the stakes and or relocating the stakes in the event they are missing.

2. Close-up Photograph. Take from the 100.0-foot stake in the direction of the general view photo. An exception is where a camera point has already been designated, as would be on the photo-plot transects. If the close-up photograph is located at any other point on the transect, it must be adequately marked and documented so that it can be easily found and retaken. Focus on the center of the 3- by 3-foot or the 95-foot mark on the tape; ensure that none of the plot corners are left out of the photo and that the identification card is legible. Avoid shadows in the photo.

44.25 - Photographic Equipment. Use a 4 by 5 press camera with a 128mm lens, a 6 by 7 or 2 1/4 by 2 1/4 with a 55mm lens, or a good quality 35mm single lens reflex camera equipped with a 28 or 35mm lens. For both

vertical and oblique photography, use a wide angle lens. Protect the camera from the elements as much as possible. Become familiar with the camera before going to the field and do not use a camera that is not working properly. Use a good grade film with a speed of 64-100.

Film can be damaged when subjected to high temperatures and humidity. It should not be kept in a closed vehicle on hot days. Film should be protected from the elements and processed within a relatively short time. If the photographs do not turn out, they can be retaken before any visual change in the vegetation occurs.

44.26 - Identification of Photographs. All permanent record photographs needs to be properly identified. Each photograph should be identified with the use of an ID card. A permanent sign may be developed for each study folder. These are recommended because reflection from the sun can result in overexposed prints or produce a blurred ID sign. Black board signs can also be used and reused. The following information should be displayed on the ID card in 3- to 4-inch letters.

1. District Name or Number.

2. Allotment.

3. Trend Study Name or Number and Transect Number.

4. Date.

The ID card should be placed on the outside of the close-up plot so a complete view of the vegetation and soil can be obtained.

In the general view photos, the ID card should be positioned approximately 25 feet away from and over the transect line. At this distance, the 3- to 4-inch letters should be visible in the print.

Prints can either be black and white or color, and should be no smaller than 3x5 inches. Glossy prints should be obtained. It is recommended only one set of prints be obtained until the quality of the photos and negatives is verified. Upon confirming the quality, two full sets of prints should be obtained and mounted on Form R4-2200-7, (6/82) Range Trend Photo Record (Exhibit 44.27). A caption or explanation which identifies the photograph should be included if the ID card cannot be read. The photographs should then be filed in the permanent District and Forest study folders along with the corresponding data.

44.27 - Photographic Documentation.

1. Diagram the location and directions of photos taken on the reverse side of the Photo Record Form R4-2200-7 (ex. 01).

2. Label all slides and photos upon return from processing.

3. List the sequence of pictures on form R4-2200-7 at time of photography for assistance with labelling of slides and photos later on. Follow the same sequence in your plot photography to establish a pattern to your photography.

4. List camera settings (that is, replicate pictures at different settings to learn how to use light for better pictures.

5. Make notes at time of snapshot photography - (Ask yourself - Why did I take this picture? What appealed to me? What will the picture demonstrate?) Then label all snapshots before filing.

6. An envelope should be permanently attached to the study folder where all negatives can be stored. Frequently, photos of different studies are taken on the same roll of film, these should be cut and placed in the proper study folder.

44.27 - Exhibit 01

USDA Forest Service

RANGE TREND PHOTO RECORD
(Camera Point)
(Reference FSH 2209.21)

Forest Blue Sky District Grand View Allotment Purple Ridge

Study Name and/or Number Mahogany 16-03-10 Date 9/1/93

Photo by John Fingers Camera Location end tape 1

GENERAL VIEW PHOTO

REMARKS:

CLOSEUP PLOT PHOTO

REMARKS:

44.27 - Exhibit 01--Continued

CAMERA POINT RECORD
for
Additional Optional Photographs

Type of Camera 35 mm Aerial Photo Reference UPO -7-189

Camera Height 52" Legal Description NW1/4 SW1/4 Sec 25 BOJ BM

Kind of Film Kodacolor Direction of Photo SW of 100.0 stake

Shutter Speed 1/125 Weather Overcast

Description of Area and Camera Point:

The area photographed was once a well-defined livestock trail which showed signs of active soil loss.

Subject Matter:

Photo shows deep gully which was actively cutting in 1959. It is now healing with vegetation re-established.

Date Photo Taken 6/7/93 Proposed Date to Retake 1996

44.3 - Nested Frequency.

44.31 - Nested Frequency Method. Frequency is defined as the number of times a species occurs in a given number of plots and considers only whether species are present or absent. It is an objective and repeatable means of collecting data for evaluating trend.

The nested frequency concept involves sampling of the vegetation with various sized plots nested within a frame. Samples are taken along randomly selected transect lines confined to a single ecological type. The data collected are a function of plot size, which in turn is related to density and distribution of the vegetation. These data serve as a basis for determining trend and can be evaluated by applying statistical procedures.

The nested frequency procedure has several important advantages over other trend study methods: (1) It is highly objective, (2) relatively easy to perform, (3) repeatable, (4) significantly more reliable than previously used methods, and (5) allows for continuity in noting vegetative changes through the use of nested plots.

It is recognized that the nested plot has apparent replication. As this is a question of statistical bias, two things overcome the possible sampling error. One is that each frame is not an independent sample, therefore, only one degree of freedom is used. Secondly, empirical analysis indicates that if a site is adequately sampled (in this case 400 nested frame samples), the final result is highly similar whether all plots are randomly tested or if a nested plot (with apparent replication) is used.

Presently, the nested frequency sampling methods provides information on changes in vegetal composition.

44.32 - Selecting the Study Site. Frequency sampling shall be confined to a single ecological type. Sections 40.4 and 40.41 should be used as a guide in selecting and screening benchmark locations.

44.32a - Location Description. Upon selecting the study site and/or finding the previously established benchmark, the location should be documented and any changes in reference points or status of the transect noted. This information is recorded on the back of the Nested Frequency Data Sheet, R4-2200-22 (4/86), exhibit 01.

44.32b - Photographs. Photographs are an important part of the study and should portray changes taking place on the ground. They should provide a good visual image of the site and help to relocate the study for future measurements.

As a minimum, a general view and a closeup photo of the 3-foot by 3-foot plot should be taken before taking any measurements. Photos should be taken from the 100.0 mark on belt 1 or at the best suitable point. Additional photos may be taken if desired. Photo points shall be permanently marked (Also refer to material in section 44.33).

44.32a - Exhibit 01

USDA Forest Service

NESTED FREQUENCY DATA

Forest Sawtooth District SNRA Allotment Pole Creek
Study Name and/or Number Pole Creek Pasture #2 Belt Number 1 Direction 23°
Ecological Site Artemisia tridentata vaseyana pauciflora / Festuca idahoensis / Typic Cryerthents
Conducted by Smith & Jones Date 7/9/86

	Species		Sample Number																			Total Frequency
	Symbol	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Grasses	Agsp	Agropyron spicatum	1	2	2	1	2	2	3		1	1	1	2	2	2		1	1	1	4		1	29
	Feid	Festuca idahoensis	4	3	4	2	3	3	4	4	4	4	4	3	3	4	4	4	4	3	3	4	4	71
	kocr	Koeleria cristata	1	4	4	1	3	3	3	4	4	3	4	2	2	3	2	4	4	3	2	2		57
	Sihy	Sitanion hystrix																		4		1		4
	Stle	Stipa lettermanii	1	4	1	1		2	1	1	3	4	1		2	2	2		2					27
	Caco	Carex rostrata		1		1	1	1																4
Forbs	Arho	Arabis holboellii		3	2		2		1	1	2		2	1	1		1			2		1		19
	Arnu	Arenaria nuttallii	1								•													1
	Canun	Calochortus nuttallii	1	1	4	2	3	1		4	3	1	2	2	3	3	2	2	2	1	1			38
	CAST	Castilleja				1				2			1		2									6
	Crac	Crepis acuminata	3	3	4	3	2	3	3	2	4	3	4	2	2	2	2	2	4	3	1	3	4	57
	Erhe	Eriogonum heracleoides																		1	1		1	3
	Erum	Eriogonum umbellatum	3	4	3	3	2	3	1	2	2	2	3	3		1	2	2	2			4		41
	Luar	Lupinus argenteus	1	1	1	2	1		3	2	2	1	1	2		2	1	2	1	1	2	2	2	29
	Meob	Mertensia oblongifolia									1		1										4	8
Shrubs	Artrvp	Artemisia tridentata vaseyana	2	3	2	1	2	1		1				1				4	2	1	1	4		25
	Chvi	Chrysothamnus viscid. florus					2	1			3		2		1	1	1							11

Ground Cover	Veg.	Lit.	Rock	Pave	Moss	Soil	Total
Dot Tally	▪▪	▪▪▪▪	▪	▪	▪▪	▪	
Totals	20	43	3	11	2	1	80

Other Species:

44.32a - Exhibit 01--Continued

SHRUB HEIGHT

Artrvp	Chvi			
20	3			
10	11			
13	7			
19				
10				
24				
6				

SHRUB DENSITY

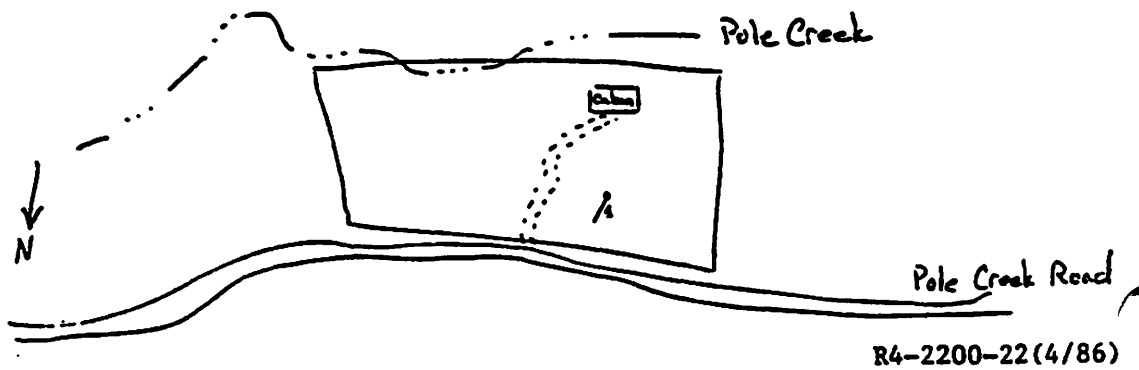
			Artrvp	Chvi				
Species								
Age Class	Seedling Sprout	S	N					
	Young Sapling	Y	N					
	Mature	M						
	Decadent	D						
	Dead	X						
Form Class	All Available	Lightly Hedged						
		Moder. Hedged						
		Closely Hedged						
	Largely Avail.	Lightly Hedged						
		Moder. Hedged						
		Closely Hedged						
Mostly Unavailable								
Unavailable								

LINE INTERCEPT

Species	Artrvp	Chvi			
Inches of Intercept	12	6			
	37	10			
	5	3			
	3				
	23				
	21				
	28				
	18				
	40				
TOTAL	182'	19"			
	15%	1.6%			

N= numerous

Description of Location:



44.33 - Setting Up the Beltlines. The beltlines are defined as the permanent reference part of the study. Beltline layout is displayed in exhibit 01.

44.33a - Location of the Beltlines. The beltline is defined as the randomly selected tape line along which the data are collected. A minimum of five beltlines shall be established. Location of the beltlines has been predetermined using a stratified random sample technique. One beltline shall be established at the five different compass directions radiating from a central point.

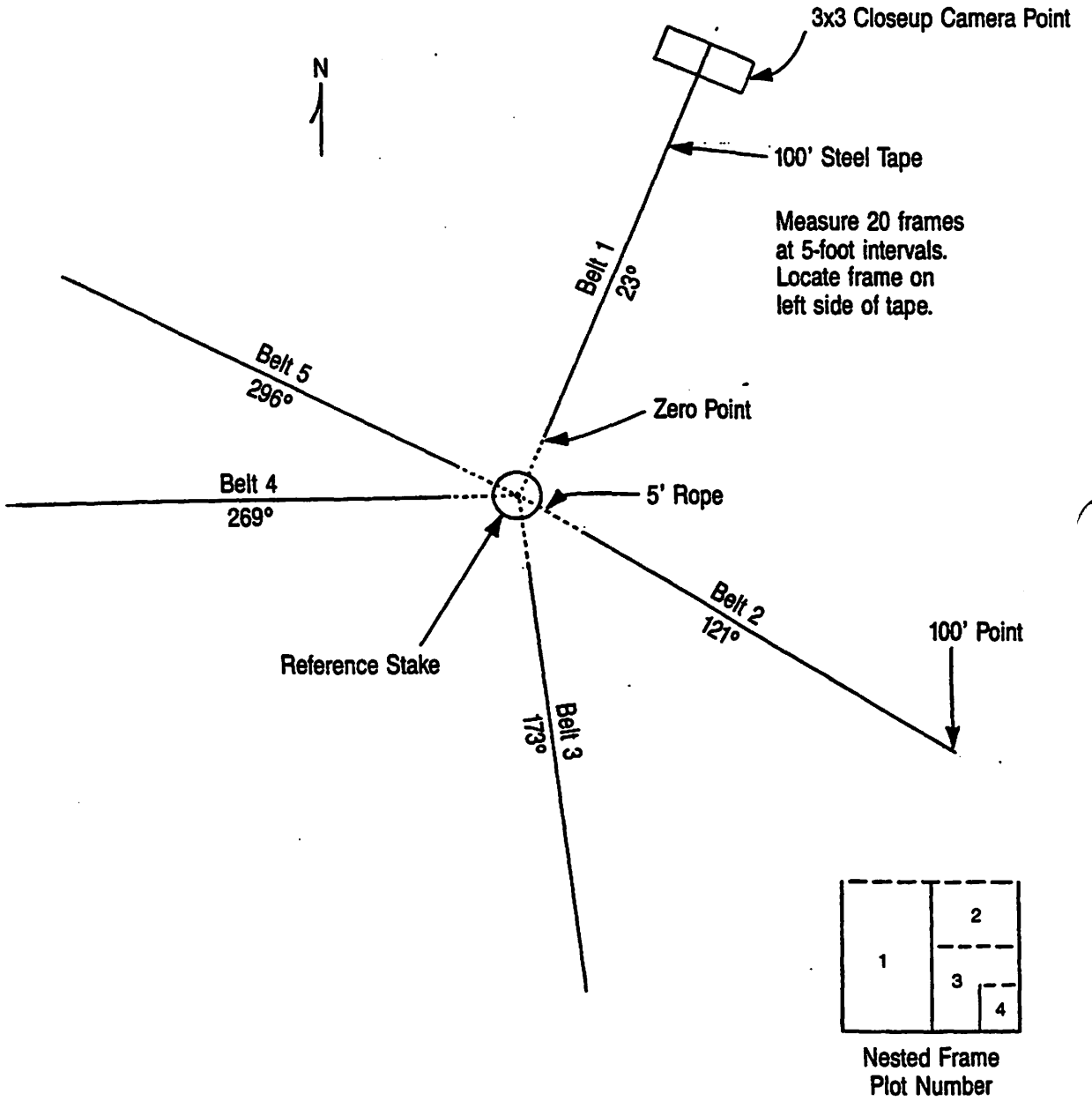
Belt	Compass Direction
Belt #1	23 degrees
Belt #2	121 degrees
Belt #3	173 degrees
Belt #4	269 degrees
Belt #5	296 degrees

The assigned belt location should be recorded on the data form (R4-2200-22). A separate data form is needed for each beltline. If a different belt layout scheme is used, such as a parallel, perpendicular, linear, or random layout, adequately document it in the allotment analysis folder.

44.33b - Setting up the Beltline Transect. The tape should be extended on a 5-foot rope from the center post along the compass direction required. This rope will begin each tape at the 0.0 mark 5 feet away from the center post. If ground circumstances dictate, the compass direction of the tape may be changed as long as it is adequately recorded on the data form. The tape should be stretched reasonably tight and as close to the ground as possible. There is no need to install permanent stakes along the beltlines (except for permanent photo points) as long as the above procedures are followed.

44.33 - Exhibit 01

NESTED FREQUENCY - SHRUB DENSITY
Plot Layout



44.34 - Nested Plot Sampling.

44.34a - Number of Samples (Frames). A minimum of 100 frames shall be sampled at each study site. Twenty frames shall be measured along each of the beltlines at each 5-foot mark with the frame on the left side of the belt pointing toward the 100-foot end. The small 5 x 5 cm plot should lie next to the beltline.

44.34b - Frequency Frame/Nested Plot Size. The nested plot(s) in a frame refer to the size of the sampling units contained (nested) within the frame. Sampling of the vegetation is with four plots of different sizes, where the smaller plots are contained (nested) within a larger plot.

Plot sizes contained within the standard-sized frames are as follows:

50 by 50cm----------approximately 20- by 20-inch	(plot 1)
25 by 50cm (inside dimensions)-------9.84- by 20-inch	(plot 2)
25 by 25cm plot inside dimensions----9.84- by 9.84-inch	(plot 3)
5 by 5cm plot inside dimensions-----1.96- by 1.96-inch	(plot 4)

Exhibit 01 illustrates the frequency frame (collapsible).

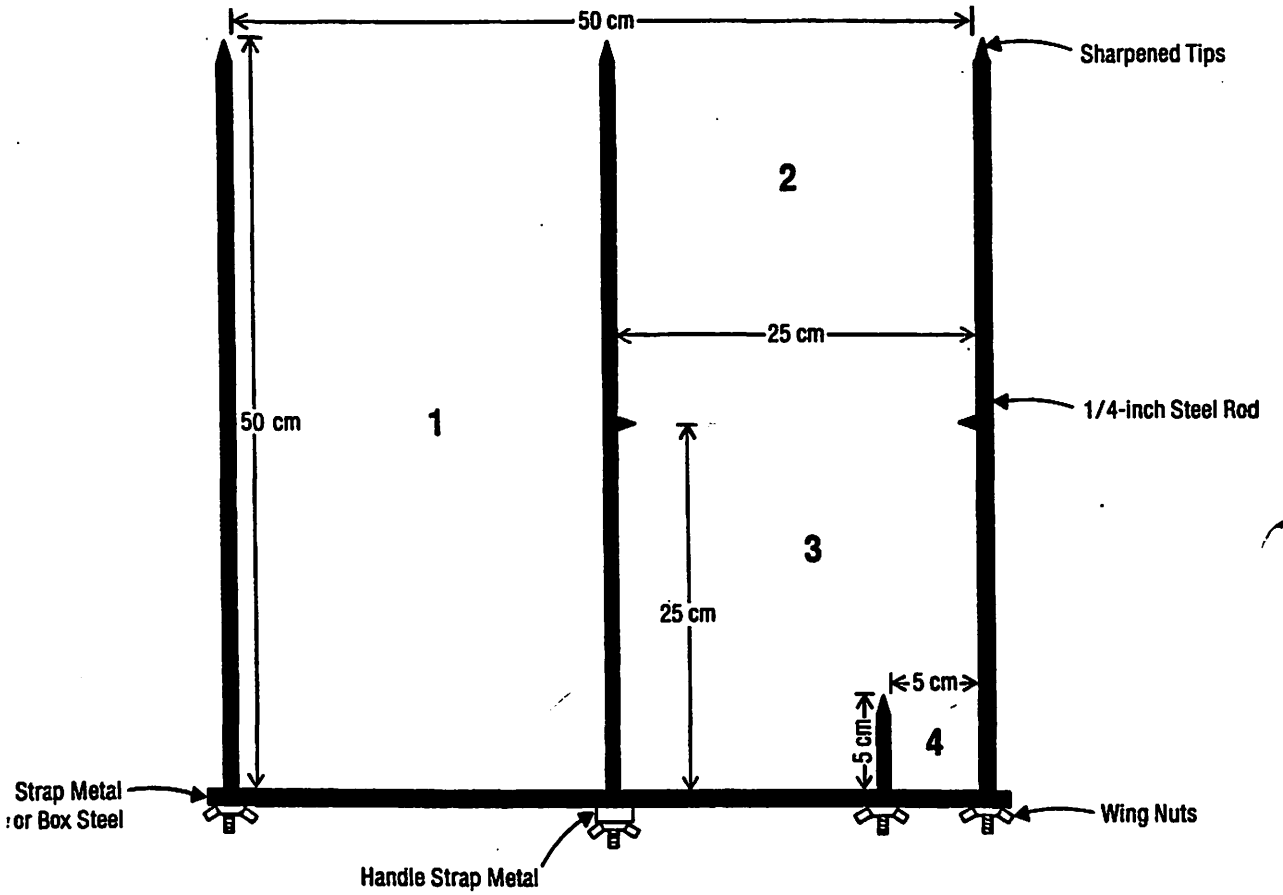
In very sparse vegetation, that is, ecological sites in early seral stages or in desert types, a greater number of samples may be needed in order to monitor the vegetation. Or, as shown in section 27.2 and 27.3, plants not sampled but present on the site should be recorded on the potential natural community scorecard and ecological scorecard.

Most sites contain grasses, forbs, and shrubs mixed in the composition. By using nested plots, data from all four sized plots are collected and evaluated for preferred frequency values.

44.34b - Exhibit 01

NESTED FREQUENCY FRAME (Collapsible)

Numerical Designations and Plot Sizes



1. All dimensions are inside measurements.
2. Materials:
   a. 1/4-inch steel rod: Threaded so that proper dimensions are obtained when tightened. Sharpened at the tips.
   b. 1/8 to 1/4-inch strap metal: and/or ½" to ¾" box steel for back plate and handle.
   c. Wing Nuts: Used to remove the slack out of the rod when threaded in place.

NOTE: The handle is not absolutely necessary, however it does help in lining up the frame with the tape.

44.34c - Numerical Identification of Nested Plots. Since data must be collected from all four plots within the frequency frame, the individual plots within the frame need to be easily identifiable. For the sake of uniformity in recording of data section 44.34b exhibit 01 numerically identifies the nested plots within the frame.

The concept of nested plots can be best described as follows: If a certain species were encountered in plot No. 4, it is automatically contained within plots No. 1, 2, and 3. If a species were found in plot No. 3, it is also in the larger plots (plots No. 1 and 2), but it is not within plot No. 4.

This numerical designation will facilitate recordkeeping according to the various plot sizes. Data taken from plots before 1986 (where the small plot was number 1 and the large plot number 4) should be reversed to this numbering system for data evaluation with adequate documentation in the monitoring folder.

44.34d - Collapsible Nested Frequency Frame. Since part of the sampling will be done in remote locations, the examiner should be able to carry the needed equipment with relative ease. The basic design for a lightweight collapsible sampling frame is illustrated in section 44.34b exhibit 01. Generally, heavier materials are recommended for construction of rigid frames. Using PVC pipe for the base of the frame and for the carrying case of the frame prongs has proved reliable too.

In the event the collapsible frame is to be carried horseback, a leather or canvas pouch could be constructed. Prongs of the frame must not get bent. If this occurs, they should be straightened and/or replaced. A change in dimensions could result in a change in frequencies thereby invalidating the collected data.

44.35 - Reading and Recording Data.

44.35a - Placement of the Frame. Once the belts have been set up, the frame should be placed at regular intervals along the belts. Frames should be placed at 5-foot intervals along the left side of a 100-foot tape except when sampling narrow stringers, that is, wet meadows. In these situations, the frames should be placed at 2-foot intervals along a 50-foot tape.

The frame should be positioned so that the open end of the frame is pointed towards the 100-foot end of the tape with the small plot (plot 4) next to the tape. Once the frame is placed on the footmark, it should not be moved during sampling to include or exclude species. Placing the frame at the specified interval assures that samples are well distributed along the belts and avoids personal bias.

This procedure should be followed until data have been collected from 20 frames along each of the five beltlines.

44.35b - Presence or Absence Measurements. Only species rooted within the frame shall be recorded. No effort should be made to count the number of individual plants. A plant is considered rooted within the plot/frame if any portion of the root crown is contained therein. In case of mat-forming species, any portion of the crown extending into the plot will constitute presence of that plant. Reading and recording shall be as follows:

1. Determine the presence of all species contained within plot 4 (the smallest nested plot). Record their presence on the Nested Frequency Data form by placing a number 4 in the block for that particular sample along the belt. See section 44.32a exhibit 01.

2. Determine the presence of any additional species in the next larger plot. Enter a number 3 for these species. Record a 3 only for species not encountered in the smaller plot (plot 4). The species encountered in the smaller plot (plot 4) are also contained within each larger plot.

3. Determine the presence of any additional species in the third largest plot (plot 2). Enter a number 2 for those additional species encountered.

4. Record the presence of any other species in the largest plot (plot 1); place a number 1 only if additional species are encountered.

5. Record a blank or dash line on the form if the species of concern is missing on all plots for a particular frame.

6. The field portion of the data form should be completed before proceeding to the next beltline. This includes summarizing ground cover, identifying a key species if possible and listing species missed in sampling. Shrub density and cover data should be obtained if they are also evaluation objectives.

7. In rereading monitoring areas, such as riparian, that might have special or limited objectives ties to 4 or 5 indicator species, the monitoring design could be limited to rereading only those species that are delineated for monitoring in the plan. When this is done, ecological status can not be determined because of incomplete data for comparison to the ecological type guide. Statistical analysis using Chi-Square can be used on individual species for individual species trend determinations.

44.35c - Computation of Frequency. Region 4 shall use the sum of all the numbered plots as an individual species frequency number. For example, the frequency for Agropyron trachycaulum along the following belt line is 39:

	Nested Plot Sizes	Plot Number
	50 by 50 cm	1
Frame	25 by 50 cm	2
50 by 50 cm	25 by 25 cm	3
	5 by 5 cm	4

Frame	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Aqtr	1	3	2	4	2	2	2	1	2	2	1	2	1	2	2	3	1	1	2	3	39

This example only shows one beltline. Frequency will be determined using all 100 plots (400 sample frames) on all five beltlines.

Data from all plots shall be used because change will be more sensitive and can be detected quicker using a nested plot (400 samples on five belts) rather than a single plot (100 samples on five belts).

44.35d - Species Found But Not Encountered in Plots. Any species not encountered in the individual plots but found growing along the beltline should be listed at the bottom of the data sheet. These species, although not abundant, may be indicative of the management emphasis needed or be a key indicator species.

44.35e - Nested Frequency Data Summary. Data collected from all five beltlines shall be summed on the Frequency Transects Summary Form (R4 2200-49, exhibit 01) and on the Ecological Scorecard (Form R4-2200-42, see section 27.3). The numerical total of all the nested frequency plot sizes (1-4) from all five beltlines are written in the Ecological Status - Present column.

44.35e - Exhibit 01

USDA Forest Service

R4-2200-49 (1/93)

NESTED FREQUENCY TRANSECTS
SUMMARY FORM FOR A SITE
(Reference FSH 2209.21)

Forest Sawtooth District Burley Allotment Sublett Date 8/22/92

Study Name and/or Number Guard Station 202 Examiner Wallace McKay

Ecological Site Artrv/Agsm

	SPECIES	BELT NUMBER 1	2	3	4	5	TOTAL FREQUENCY
	Agsm	54	69	85	62	51	321
	Stco2	47	48	43	53	38	229
G	Stco1	10	37	31	14	29	121
R	Stle	23	7	16	18	41	105
A	Pose	5	6	11	32	3	57
S							
S							
E							
S							
F	Gevi	41	45	41	48	38	213
O							
R							
B							
S							
S	Artrv	9	6	24	10	30	79
H	Bere	57	39	28	31	25	180
R							
U							
B							
S							

TOTAL FOR SITE	POINT SAMPLING BY BELT NUMBER 1	2	3	4	5	TOTAL HITS	
Vegetation	10	10	3	9	8	40	10.0%
Litter	49	58	59	61	59	286	71.5%
Rock							0 %
Pavement	1		1	1		3	0.8%
Moss							0 %
Soil	21	12	17	9	12	71	17.7%

44.4 - Ground Cover Sample Measurement. Ground cover measurements can be easily obtained by sampling the ground cover under the pointed ends of the prongs of the nested frequency frame. These measurements can be made along the nested frequency five belt sampling layout, or the frame can be used as a measuring tool in a design layout that fits a particular site. Twenty sample frames on five belts should be used to obtain an adequate sample size. This will yield a total of 400 sample points. (Five 100 foot belts x 20 frame placements per belt x 4 samples per frame placement equals 400 samples.)

Record cover and bare soil data by noting the type of ground cover component present at the ends of the four pointed prongs of the frame. The bottom of the Nested Frequency Data form (R4-2200-22) can be used to record the data.

The tips of the prongs should be sharpened to obtain discrete measurements. Actual measurements are made at the point where individual tips come to rest on the ground. The prongs should be pressed against the ground and an observation made of the ground cover characteristic directly under each tip.

For each placement of the frame, four separate cover measurements will be dot tallied. Cover hits will be recorded in the following categories:

1. Vegetation.
2. Rock (greater than 3/4-inch diameter).
3. Bare Soil (Soil particles <1/8 inch dia.).
4. Litter (organic debris, freshly fallen or slightly decomposed).
5. Pavement (1/8-inch to 3/4-inch).
6. Cryptogams (moss, lichens).

FSH 2209.21 - RANGELAND ECOSYSTEM ANALYSIS AND MANAGEMENT HANDBOOK
R-4 AMENDMENT 2209.21-93-1
EFFECTIVE 5/18/93

CHAPTER 40 - RANGELAND MONITORING AND EVALUATION

44.5 - Line Intercept Method for Crown Canopy Cover.

44.51 - Line Intercept Method. The line-intercept technique is particularly well adapted for sampling shrubs. Like the plant-density technique, this procedure can be used in combination with the nested frequency method in order to obtain additional information where shrubs are an important component of the plant community and where canopy cover is an objective for monitoring. When used with nested frequency, line intercept data will be collected along all five beltlines in the nested frequency layout. Line intercept may also be used on herbaceous sites, such as created wheat seedings or sagebrush-bunchgrass ranges, to measure basal area intercept of bunch grasses.

Line intercept basically consists of an established line transect, usually in multiples of 100 feet, where measurements are made of the crown spread of the various plants which are bisected by the line. These crown intercept measurements are recorded by species to the nearest whole inch on form R4-2200-6, Line Intercept Record, exhibit 01, or on Form R4-2200-22, section 44.32a exhibit 01. These measurements provide an estimate of the relative cover for each of the plant species measured on the study site.

Line intercept provides a measure of plant composition based on the crown cover. These measurements should not be confused with nor compared with plant composition determinations based on nested frequency, density, or weight estimates.

Line intercept is fast, accurate, and relatively free of bias and will reflect small changes in the measured parameters provided the methodology is consistent and an adequate sample is measured. However, unless specific standards are employed, it may be difficult to obtain consistent results, especially where plants have open crowns. This problem can be avoided by ignoring any holes or openings in the crown and measuring along the perimeter of the live canopy which bisects the transect line. This technique may be difficult to use in dense stands having several species where the canopy of one species overlaps another and in tall brush.

44.51 - Exhibit 01

LINE INTERCEPT RECORD

Forest Fishlake District Beaver Allotment North Beaver
Study Name and/or Number Baker Canyon - T1, T2, T3 Ecological Type Actr/Feid
Conducted by K. Carter + S. Allen Date 6/30/86
Location 2 miles west of Baker Canyon Spring adjacent to white rocky ledge

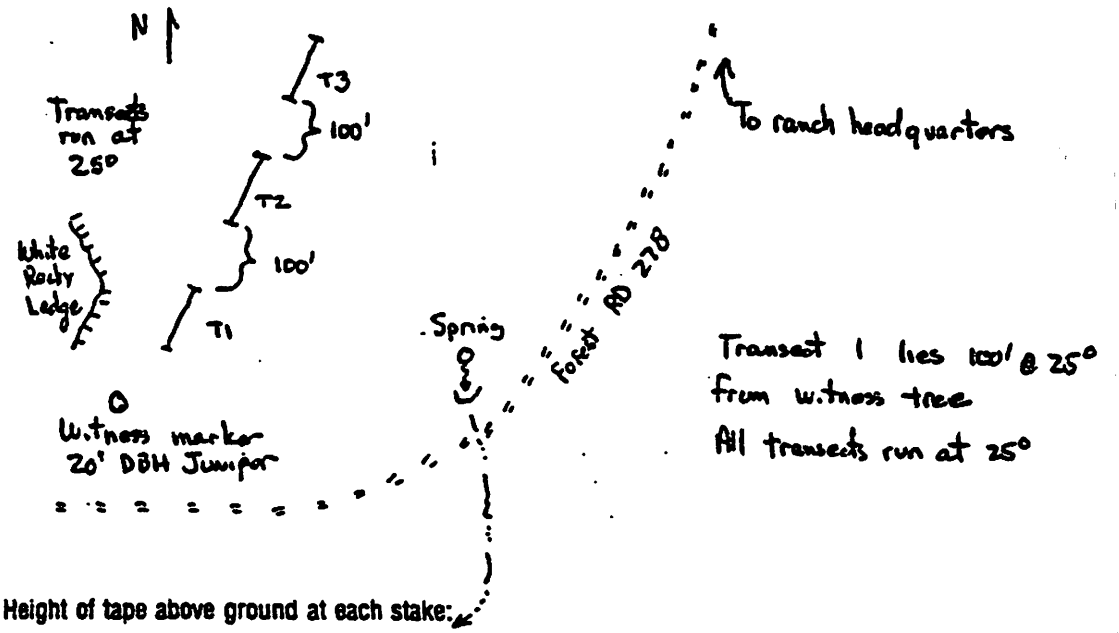
Species: Actr		Species: Chvi		Species: Juos		Species:	
Actual Intercept	Total In.	Actual Intercept	Total In.	Actual Intercept	Total In.	Actual Intercept	Total In.
8'6"- 8'9"	3	8'2"- 8'5"	3	55'-57'	24		
10' - 10'11"	11						
19'8"-20'5"	9						
22'3"-25'	33						
27'11"-28'2"	3						
33'3"-33'10"	7						
35'3"-37'5"	20						
40'1"-40'8"	7						
42'3"-42'10"	7						
47'6"-48'6"	12						
63'-65'3"	27						
67'-68'5"	17						
TOTAL	156		3		24		

Note: Measurements are in inches

Species	Age Class					Form Class						Mostly Unavailable	Unavailable
	S	Y	M	D	X	All Available			Largely Avail.				
	Seedling Sprout	Young Sapling	Mature	Decadent	Dead	Lightly Hedged	Moder. Hedged	Closely Hedged	Lightly Hedged	Moder. Hedged	Closely Hedged		
Actr		▫	::			▫			::				
Chvi		•				•							
Jues		•				•							

44.51 - Exhibit 01--Continued

Description of Location: Diagram



Height of tape above ground at each stake:

10'	14.5'	8'
0.0	50.5	99.5

BROWSE TREND CHARACTERISTICS RATING

Upward Trend	No Apparent Trend	Downward Trend
Desirable* browse plants healthy, vigorous, and have good color for the site. ____ .	Desirable species exhibit good health but may have reduced vigor and poor color for the site. ✓ .	Desirable species unhealthy, lack good color and exhibit lack of vigor for the site. ✗ .
Reproduction of browse species high, all age classes represented. The percent of seedlings and young plants exceed those of decadent and dying plants by more than 5 percent. ____ .	Moderate amounts of reproduction of desirable species. Seedlings and young age classes of the better browse equal to but do not exceed the number of decadent and dying plants. ✓ .	Reproduction of desirable species lacking or nonexistant. Number of old and decadent plants of preferred and staple species exceed seedlings or younger age classes by more than 5 percent. ✓ .
Young plants not being pulled up, trampled out, or otherwise destroyed by use of the area. ✓ .	Browse plants not being trampled out, pulled up, or otherwise destroyed by use of the area. ✓ .	Young browse plants being pulled up, trampled out, or otherwise destroyed by use of the area. ____ .
Crown of desirable browse species normal, loose, and open growing. ____ .	Crowns of desirable browse plants showing moderate hedging. ____ .	Crowns of least desirable browse plants compact and exhibit heavy hedging. ____ .
Two or more year's production of vigorous and healthy regrowth following the heavy seeding of desirable. ____ .	Few dead branches or plants of desirable species. ✓ .	Regrowth lacking following heavy hedging. Annual growth of twigs short and few in number. ✓ .
		Many decadent plants and plants with 50 percent of the branches dead. ✓ .

*Desirable - as defined by the AMP Objectives.

44.52 - Selection of Study Area. Line intercept transects should be located according to the guidelines presented in sections 40.4 and 40.41.

44.53 - Number of Transects. The number of lines needed to get a reliable sample should be no less than three, but may be as many as ten or more. Obtain sample size and reliability by statistical test. Generally, if the sampling error is greater than 10 percent, more transects can be arranged in any pattern desired, such as end-to-end, radiating out in different directions from a central point or parallel with each other. If the line intercept procedure is used in conjunction with frequency measurements, the number and placement of the transect lines should correspond with those established for the frequency study.

44.54 - Establishment of Line Transects. A 100-foot tape is stretched and anchored at the 0.0 and 100.0-foot ends to angle iron stakes. The tape should be set as close to the ground as possible while keeping it straight and enabling the investigator to measure the intercept of all the plants. The maximum height at which intercept measurements will not exceed 5 feet. All future measurements should not exceed the maximum height established during the initial measurement.

44.55 - Photographs. At lease two photographs (a closeup and a general view) should be taken at each study transect. Additional photographs may be taken if necessary to show various plant conditions or soil condition on the study area. All such photographs should be properly identified and located with a permanent camera point so that the photos can be duplicated at a later date. Other information to be recorded should include the camera height and the direction of view for each photograph. More specific instructions for taking photographs are contained in section 44.2. Where line intercept is used in conjunction with the nested frequency study method, only one set of photos is needed.

44.56 - Measuring and Recording Shrub Intercept. Once the desired photos are taken, the next step is to measure and record the inches or tenths of feet along the tape where the tape intercepts the live canopy. When making these measurements, care should be taken to use a tape having the same calibrations that were used in previous measurements. This precaution will avoid having to compare tenths of a foot with inches. Where necessary, a plumb bob can be used in making these intercept measurements and all the measurements should be based on the intercept of old growth rather than current year's growth. Measurements need only be made to the nearest one-tenth of a foot or inch.

Measure herbaceous plants, that is, grasses, grass-like plants, and forbs, on the basal area at ground surface. Measure single-stemmed herbs on the stem diameter. Measure plants that are prostrate, creeping, mat-forming or of rosette form on the intercept of basal leaves. Ignore patches of bare ground occurring within plant tufts if they are too small to accommodate additional plants. If the bare space between tufts appears normal and the vegetation is obviously continuous, count the space as plant cover.

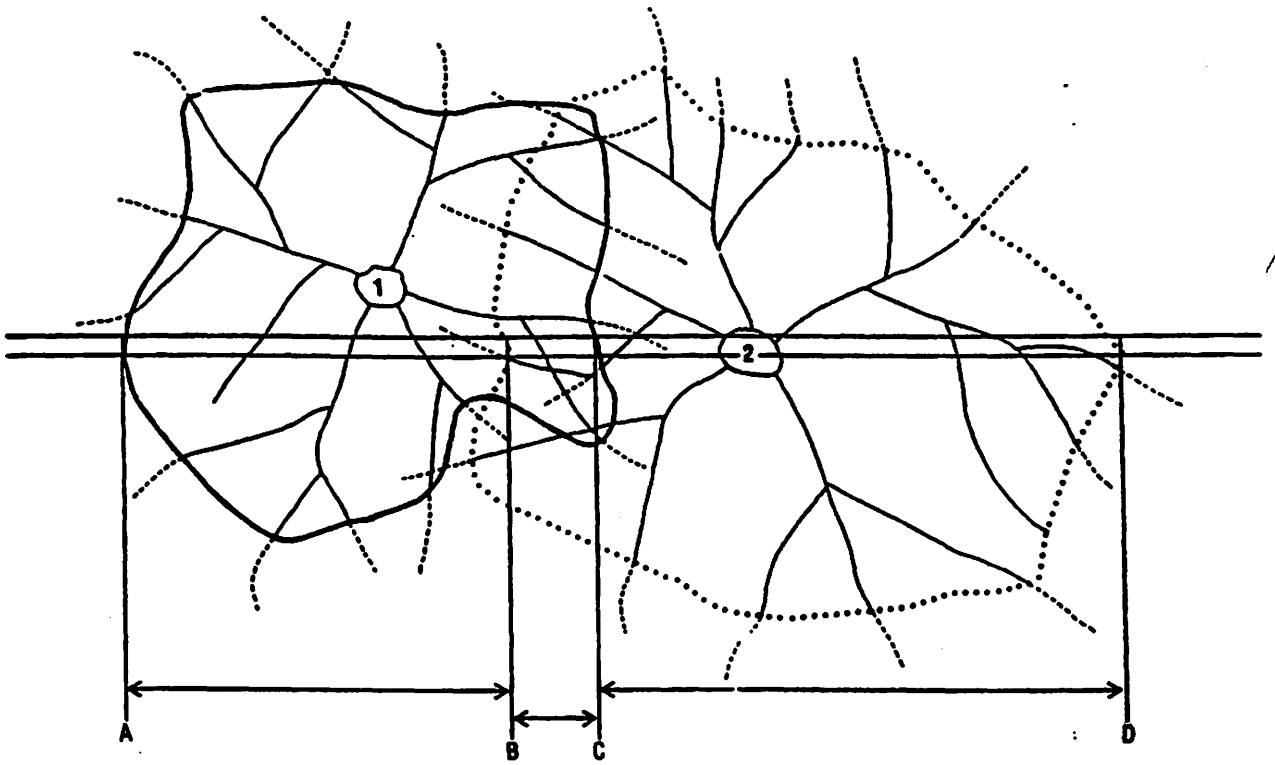
The procedure for measuring the live crown intercept bisected by the transect line is illustrated in exhibit 01. In addition to the line intercept measurement of each transect line, the form and age class should also be recorded per the descriptions of form and age class listed

in section 44.6. This information is recorded by dot tallying both the age and form class for the species. Where shrubs are monitored individually, the actual intercept (the position of the shrub along the 100-foot tape, that is, 3 feet 5 inches - 5 feet 1 inch) needs to be recorded. In these cases, Form R4-2200-6, section 44.51 exhibit 01 should be used.

If the study is intended to merely provide cover data by species, there is no need to record the actual intercept. In these circumstances, only the total number of inches intercepted by the shrub are recorded on either Form R4-2200-6 or R4-2200-22.

44.55 - Exhibit 01

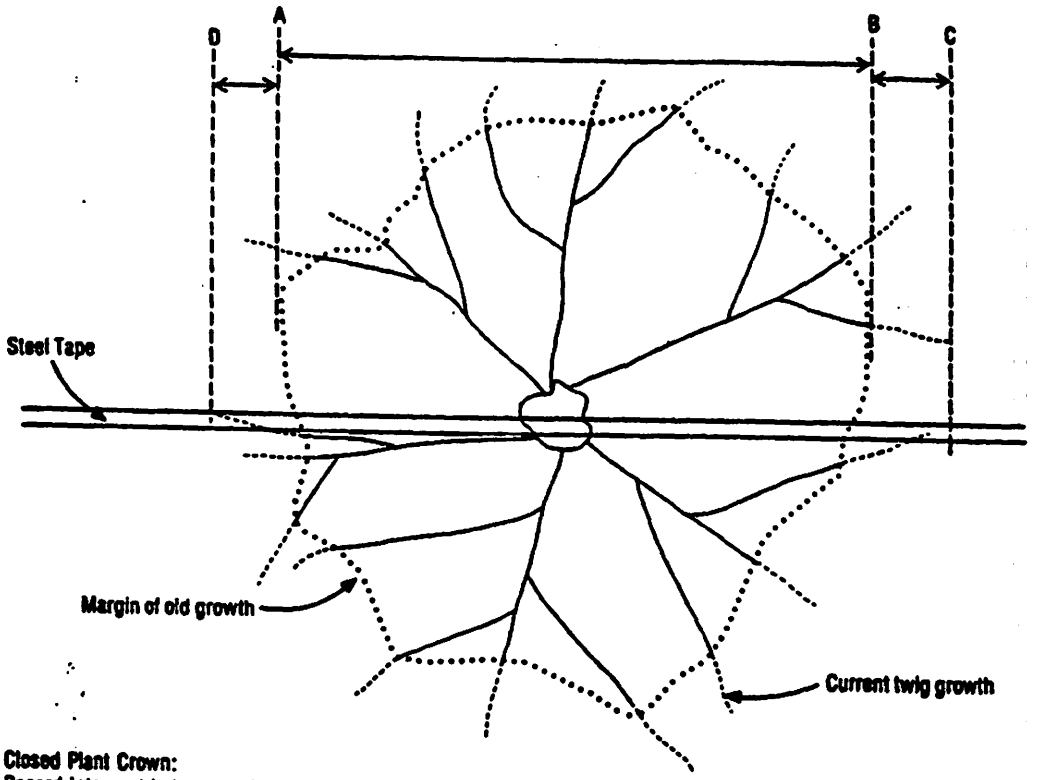
MEASURING SHRUB INTERCEPT



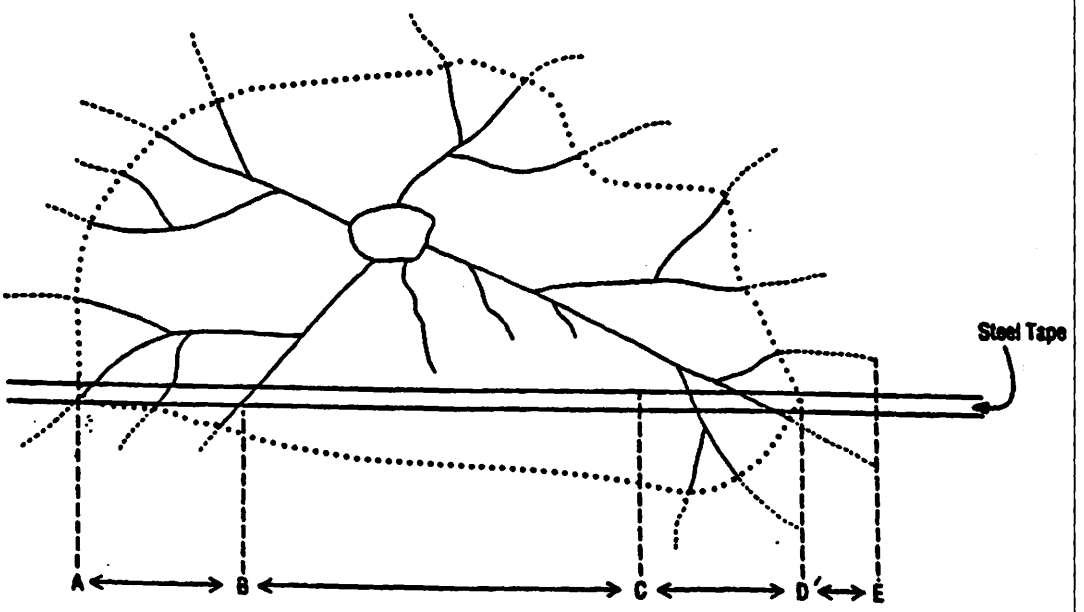
Overlapping Growth:
If plants are of the same species, record intercept between points A-D. If they are different species, record the intercept for the first species between points A-C and between points B-D for the second species.

44.55 - Exhibit 01--Continued

MEASURING SHRUB INTERCEPT



Closed Plant Crown:
Record intercept between points A and B, disregard intercept between points B-C and A-D.



Open Plant Crown:
Record intercept between points A-D, include intercept between points B-C and C-D, disregard intercept between points D-E.

44.57 - Summarizing Data. After all line intercept measurements are taken, the actual intercept should be totaled by species at the bottom of the form. Compile the results from each line, calculating percentages for cover and composition.

44.58 - Evaluation Procedures. Chi Square can be used to determine if there is a significant change between two line intercept measurements. (See section 47.2)

44.6 - Shrub Density and Age and Form Class.

44.61 - Shrub Density Technique. Shrub density data can be used to supplement data collected with the nested frequency method, or be used by itself depending on the monitoring goals and objectives. It should not be employed as the sole basis for determining trend but may be used in lieu of the line intercept procedure. The technique provides plant (shrub) species density along with information on the form and age class of the various shrubs present. This information provides additional data for evaluating condition and/or trend in the shrub community, and is especially important where some form of cultural treatment has been done and/or where the shrub component is important.

44.62 - Density Measurements and Recording. If measurements are taken in conjunction with the nested frequency beltline tape, measurements are taken along the whole 100 foot belt of each line, within 3 feet of one side of the belt. This creates a sample area 100 feet long and 3 feet wide. A similar type study area can be independently set up if measurements are not made in conjunction with frequency belts.

All shrubs (or measured plants) encountered along the belt transect are dot tallied by species and classified according to form and age class. The reverse side of the Nested Frequency Data Form (sec. 44.32a, ex. 01) is used to record this information. Shrub age and form observations taken by a staked line transect (Cole Browse Survey Method) can also be recorded on the back of Form R4 2200-22 if the nested frequency layout is not used. When not using the frequency layout, shrub age and form can be taken along a staked transect. Beginning at the starting stake the nearest selected browse plant is sampled and age and form class is recorded. The next plant sampled is the closest plant past the one just sampled within a 180 degrees when moving generally down the transect line. This sampling procedure continues until 25 to 50 browse plants have been recorded. If the browse stand is not dense, select and sample plants at a paced interval (for example, 5 paces, 1/2 chain, and so forth) in the transect direction and selct the nearest plant in a 180 degree zone.

44.63 - Age Classes. To assure consistency in classifying and recording shrubs by form and age class, the following definitions should be used:

1. Seedling (Sprouts) (S) - A very young plant which has become firmly established yet obviously is a newcomer on the site (first-year seedlings are ignored). It is usually distinguished by its relatively small size, generally single stem, simple or no branching, succulent bark, less than 1/8-inch diameter at the base, and does not possess a large root stock (sprouts may be an exception). No evidence of flowering or seed production.

2. Young (Y) - A relatively young plant, larger than a sprout or seedling (1/8-inch to 1/2-inch diameter at the base, varying with species) with more complex branching, may possess multiple basal stems but are attached to a relatively small root stock (except for saplings), and bark is more fibrous but is not fissured as with a mature plant. Crowns are not rounded and are made up of all living wood. May or may not show signs of flowering and seed production.

3. Mature (M) - A mature plant exhibits complex branching and multiple stems, fibrous fissured bark, rounded growth form, large, heavy, often gnarled stems and a firmly established predominant root stock. The root crown is made up of three-quarters or more living wood. Evidence of flowering and or seed production is present.

4. Decadent (D) - A mature plant which possesses more than 50 percent dead wood in the crown.

5. Dead (X) - A plant which obviously does not possess any live crown, but the root is still firmly attached (downed, unattached, woody stems are considered litter).

44.64 - Form Classes. The form classes are based on availability of browse plants and their degree of hedging. These factors along with age structure can assist in determining the relative health of a browse stand and can aid IN evaluating trend.

Availability represents the relative amount of twig growth which is within reach of grazing animals. Snow depth or duration will have no bearing on availability, as defined in this Handbook. Hedging is the result of repeated utilization and is one of the factors which affects availability of shrubs. The general appearance of the plant is a primary criteria in determining degree of hedging.

The following descriptions are provided as an aid to classifying shrub availability.

1. All available. This category signifies that all of the current year's twig growth is within reach of grazing animals. This type of plant is generally represented by an open crown.

2. Largely available. The bulk of the vegetation in this category is available to the class of herbivores present in the area. A small portion of the current year's growth is unavailable due to:

a. Large crowns.

b. Moderate to heavy hedging.

c. Shrubs height.

d. Steep terrain.

e. Stand density.

3. Mostly unavailable. A large portion of current year's growth is not available for grazing. This may be due to one or more of the reasons mentioned in the largely available category above.

4. Unavailable. These shrubs may produce large quantities of twig growth; however, it is not available to grazing animals. Frequently, a tall growth form places shrubs in this category. A hedgeline is also common where shrubs have become unavailable. Dead or decadent plants often fall in this category.

44.65 - Hedging Categories.

1. Lightly hedged. Shrubs of this nature generally have open, loose crowns and produce a large quantity of vigorous twigs. Frequently, these plants are either all or largely available. Their appearance is that of healthy, fast-growing plants. Unhedged plants are included here.

2. Moderately hedged. These shrubs possess moderately open crowns but show signs of some clubbing. Plants which are hedged to this degree exhibit varying levels of vigor and begin to take on a ragged appearance. Some of the twigs are readily available while the remaining twig growth is generally unavailable due to the tight growth forms and presence of larger clubbed stems on the periphery of the crown.

3. Closely hedged. A closed, compact rounded appearance is usually characteristic of this degree of hedging on a mature plant. Generally, very little twig growth is present on the exterior portion of the shrub; most of the twig growth is confined to the interior.

A decadent plant often shows signs of close hedging on the few larger stems which produce limited leader growth. Young plants are generally not very common in a closely-hedged shrub community.

44.66 - Shrub Density Data Summary. The summary is a total of the dot tallies per area measured and recorded for each individual species on each transect. These totals can subsequently be compared with previous or subsequent measurements of the same stand.

45 - MONITORING REVEGETATION TREATMENTS. Evaluation and monitoring of revegetation improvement projects require different study objectives from that normally used for long-term trend studies. In these situations, the two main objectives are to evaluate the success of the treatment and to provide a data base for predicting the probable results of future projects. Production studies will be the preferred method for monitoring revegetation sites.

45.1 - Treatment Analysis. The recommended procedures for use is paired sites. The paired sites will consist of one or more marked transects located on comparable treated and untreated sites. These studies are not intended to replace long-term ecological trend determinations and should not be used as such. These studies are mainly valuable for monitoring responses of revegetation treatment over a short period of time.

45.2 - Locating and Selecting Plots. The primary purpose for selecting paired study areas is to be able to isolate the effect of the revegetation treatment from all other factors having an influence on the

study site, such as weather, utilization by livestock and/or wildlife, etc. It is, therefore, important to select areas which are as nearly comparable to each other as possible and which represent one of the dominant ecological types found on the treated area. All sample plots from each of the treated and untreated sites should be confined to a single ecological type and similar soil taxonomic unit. The following list provides some of the more important characteristics which should be considered in selecting comparable study sites:

Site Factors	Soil Properties
Ecological site	Depth of soil
Elevation	Thickness of A&B Horizons
Aspect	Rooting Depth
Slope	ph
Accessibility to livestock and degree of use	Texture
	Color
	Structure
	Percent gravels
	Cobble and rock content

It is not necessary to have the study sites located near each other as long as the site factors and soil properties are matched as closely as possible. Both study sites should, however, be in the same management unit in order to have the same sequence and degree of livestock use.

Although it is nice to have an evaluation on each treated area, the objective should be a few high-quality studies on primary ecological types for each treatment method, rather than a mediocre study on each treated area.

45.3 - Installation Management and Reporting. The starting point of each individual transect line should be permanently marked on the ground by means of a reference stake. In addition, the location of the study should be documented as described in sections 40.4 and 40.41.

The initial measurement of both treated and untreated sites should be made at the point of peak standing production prior to any treatment. This provides the baseline data for comparison of future measurements. As a minimum, repeat measurements should be made two growing seasons and five growing seasons after treatment.

All data should be retained in the permanent allotment folder for future reference. A representative sample of some paired transects should be preserved for further monitoring of the longevity of the treatment work.

45.4 - Production Studies. Besides the methods already described (nested-frequency, line intercept, plant density, and age and form class), production information is often useful in analyzing cultural treatments in terms of benefit/cost and additional carrying capacity. The following sections describe procedures to determine total herbage production produced, which can be measured on treated and nontreated plots. As production is variable over time, the information gathered in this type of study is limited to the physical and environmental circumstances the study was conducted under. Production will be determined by the hoop-weight method.

45.5 - Measurement. Plot shapes and sizes for clipping hoops vary, but circular plots .96-square feet in area are convenient because forage weight in grams times 100 equals pounds of forage per acre. In areas of sparse vegetation, 9.6 square-foot plots may be used and the forage clipped times 10 equals pounds per acre.

All forage on the plot is clipped as close to the ground as possible. All old growth and foreign material should be carefully removed. Sampling for production should be done as soon as possible after vegetation has attained maximum growth.

Uncaged or unprotected plots may have been grazed. The sample obtained from a grazed plot would not represent total forage produced; therefore, select unprotected plots with care from an ungrazed area of suitable range that is representative of the type. Avoid concentration areas, whether grazed or ungrazed, to avoid any undue influence on vegetative production due to past activity.

45.6 - Equipment. Good quality grass shears, paper bags (16 lb.), a 200- or 500-gram capacity spring scale, plot loop, and a supply of R4-2200-13 forms. For moving or resetting cages around protected plots, appropriate tools should be included.

Plot Loop Dimensions:

Plot Square Feet	Radius Inches	Circumference Inches	Conversion Factors (grams to lb/Ac)
.96	6.63	41.66	100
4.8	14.83	93.18	20
9.6	20.98	131.80	10

Loops may be constructed using any smooth wire, but No. 12 copper weld wire or equivalent and a Nicopress sleeve to join the ends makes a very good loop.

45.7 - Procedure. Determine the gross area within which the desired number of plots will be clipped. Select the sample points randomly, being sure to stay within the type. Thirty plots are sufficient on our range types.

Place the loop over the sample point directly on the ground and move any vegetation directly under the wire outside the loop. Fence staples pushed into the ground over the wire make good hold-downs that free the hands for clipping.

Remove any old growth, litter, annuals, and so forth, and foreign material from the plot by hand. Weigh and record sack weight. Clip the current year's growth as close to the ground as possible and place in the sack all portions of the plants growing from within the plot. Overhanging portions of outside plants are not considered. Calculation of production by species is the same, except each species is clipped, weighed and recorded separately. Record the weight in grams by plot on Form R4-2200-13. Number each sack with each plot number and location identification. Where plots are unprotected and grazing has occurred, adjust total production by the estimated degree of use, and record.

Green weight x Plot factor - percent left = total forage production

Where no use has occurred, total production equals green weight times the plot factor.

To convert green samples to air-dry samples, loosely close the sample bags and store in a dry place for three to four weeks. Re-weigh, record, divide air-dry weight by green weight, and record as percent. Calculate the average production for the area sampled by dividing the total air-dry pounds per acre by the number of plots clipped. District 2210 files may have dry weight tables for many common plants at different phenological stages. Use them when practicable.

This method may be used on both treated and untreated areas.

45.8 - Photographs. As a minimum, one general view color photograph should be taken from the reference point of each transect looking down the transect line. Other permanent photo points can be established as deemed appropriate. Detailed instructions on taking photographs are contained in section 44.2.

46 - RIPARIAN VEGETATION MONITORING. Several inventory, monitoring and evaluation processes are available to gather and monitor intensive vegetation information in riparian areas. The primary procedures to be used to monitor riparian areas are described in the Intermountain Region Integrated Riaprian Evaluation Guide. The techniques in Section 42 and 44 can also be used if needed, depending on specific needs.

47 - DATA EVALUATION. Chi-Square analysis will be the statistical method used for most analysis to determine if a significant change has been made in the parameter measured from one measurment to another. This statistical method can be used with nested frequency, line interecept, ground cover, and shrub density. Other optional statistical methods that could be used are DUNCANS multiple range analysis, analysis of variance, and discriminate analysis. See exhibit 01.

47.1 - Evaluation of Frequency Data. The data from all five beltlines should be totalled. Each species can then be compared with previous readings and evaluated using Chi Square to determine if the change between measurements is significant. At least two readings are needed in order to use this statistical evaluation. The Chi Square table for determining if there is a significant change, at the 80-percent probability for an individual plant whose frequency is summed from all five transects, is located in section, 47 exhibit 01.

Using Chi Square in 47 exhibit 01, the initial frequency value is the number of plots in which a particular species occurs. If there has been a decrease in the frequency of occurrence from the initial observation, the column to the left is used to determine whether the decrease has been significant at the 80-percent probability level. The column to the right of the initial observation is used if the second observation has increased from that of the initial observation. If the change has been significant at the 80-percent probability level, the second value will be equal to or be larger than that listed. These values are actual observed values, that is, the sum of the plot values in all 400 plots from all 5 belts. Only in situations where there are 400 plots observed is the number of occurrences and the percentage value the same. With a densely populated species it is possible to have a maximum value of 400, based on 100-frame settings (5 belts times 20 frames/belt) and the species could occur in plot 4 in all frames. The table has been developed for such a possibility.

For example, a particular species had a summed value of 42 in the first sample. At a subsequent sampling, the summed plot value was 30. This reduction would be significant at the 80-percent probability level because the second reading was equal to or less than 32. To detect a significant increase from the original value of 42, the second reading would need to be 52 or greater.

The Chi Square calculations are based on the equation: 42-30-

$$\frac{(E - 0 - 0.5)^2}{E} = \text{Chi Square}$$

Where: E is the initial number of occurrences
0 is the number of occurrences in the second observation
0.5 is a correction value for observations fewer than 200-plot placements.

The Chi Square value at 1 degree of freedom @ 80 percent probability is 1.642.

Statistical analysis shows when a significant change occurs between different vegetative measurements. When that measurement method is frequency, one or more vegetative parameters could have changed (either density, cover, or spatial distribution). When a frequency change is recorded, the manager must still determine what changed and why.

47.2 - Cover and Density Evaluation. Ground cover, bare soil, line intercept, and shrub density can be evaluated using the same approach and table as given for frequency. A maximum total of 400 measurement units would be possible for bare soil or vegetation.

47 - Exhibit 01

CHI SQUARE TABLE

Table for determination of significant increase or decrease in plot occurrences (nested frequency) at 80 percent probability (Chi Square = 1.642, with 1 degree of freedom).

LESS THAN	INITIAL VALUE	GREATER THAN
14	22	28
15	23	29
16	24	30
17	25	31
18	26	33
19	27	34
19	28	35
20	29	36
21	30	37
22	31	38
23	32	39
24	33	40
25	34	41
25	35	43
26	36	44
27	37	45
28	38	46
29	39	47
30	40	48
31	41	49
32	42	51
33	43	51
34	44	52
34	45	54
35	46	55
36	47	56
37	48	57
38	49	58
39	50	59
40	51	60
41	52	61
42	53	62
43	54	63
43	55	65
44	56	66
45	57	67
46	58	68
47	59	69
48	60	70
49	61	71
50	62	72
51	63	73
52	64	74
53	65	75
54	66	76
55	67	77
55	68	79
56	69	80
57	70	81
58	71	82
59	72	83
60	73	84
61	74	85
62	75	86
63	76	87
64	77	88
65	78	89
66	79	90
67	80	91
67	81	93
68	82	94
69	83	95
70	84	96
71	85	97
72	86	98
73	87	99
74	88	100
75	89	101
76	90	102
77	91	103
78	92	104
79	93	105
80	94	106
81	95	107
81	96	109
82	97	110
83	98	111
84	99	112
85	100	113
90	105	118
95	110	123
99	115	129
104	120	134
109	125	139
113	130	145
118	135	150
123	140	155
128	145	160
132	150	166
137	155	171
142	160	176
147	165	181
151	170	187
156	175	192
161	180	197
166	185	202
170	190	208
175	195	213
180	200	218
185	205	223
189	210	229
194	215	234
219	220	239
204	225	244
209	230	249
213	235	255
218	240	260
223	245	265
228	250	270
233	255	275
237	260	281
242	265	286
247	270	291
252	275	296
257	280	301
261	285	307
266	290	312
271	295	317
276	300	322
281	305	327
285	310	333
290	315	338
295	320	343
300	325	348
307	330	353
309	335	359
314	340	364
319	345	369
324	350	374
329	355	379
334	360	384
339	365	389
343	370	395
348	375	*
353	380	*
358	385	*
363	390	*
368	395	*
372	400	*