California Native Plant Society
Livestock Management Proposal
for USDA Forest Service
Sierra Nevada Framework Project

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Introduction

This alternative is based on the idea that of grazing management should be determined by the health of the ecosystem. The goal is to develop grazing management systems that protect the health of all resources on USFS lands in the Sierra. The alternative proposes some starting points for improved management, including evaluation of current condition, grazing suitability analysis, and improved monitoring. The alternative then allows ecological monitoring results to set the amount of grazing that is allowed and the season during which grazing takes place. This approach is designed to use adaptive management to ensure that grazing management is progressively adjusted until resources are in healthy condition and grazing management is sustainable.

This alternative is also designed to bring Forest Service livestock management into compliance with applicable laws and policies including the Multiple-Use Sustained Yield Act (MUSY), the National Forest Management Act (NFMA), the Clean Water Act, the

federal Endangered Species Act (FESA), the National Environmental Policy Act (NEPA), and Forest Service Manual (FSM) direction.

Desired Condition – Sierra Wide

Grazed ecosystems are healthy and sustainable over the long term. No component of grazed ecosystems is degraded due to livestock management. Grazing occurs only in areas that that are both capable and suitable for livestock use. Grazing does not occur in habitat for rare species that are adversely impacted by grazing. Areas that are legislatively or administratively designated to be managed for their pristine character display no or very minimal livestock impacts and facilities are minimal and inconspicuous. Livestock use does not degrade water quality or adversely impact the timing or amount of water leaving Sierra Nevada watersheds. Water that is produced by grazed watersheds is clean, of appropriate temperature, and flows throughout the year where appropriate. Conflicts between grazing and recreation are eliminated or minimized. Grazing management is consistent with national, regional, and Forest Plan management direction. Grazing permits are up to date and comply with NEPA and all other applicable laws.

Range Management Program

This alternative proposes that four things shall occur in a timely manner:

I. Grazing damaged allotments will be identified and management will be adjusted as needed

II. Forest grazing-related standards and guidelines will be evaluated for adequacy and amended where necessary

III. Scientifically sound and implementable monitoring plans will be developed and implemented

IV. Adaptive management will be implemented

I. NEPA and initial management adjustment

Step 1. Prioritize allotments for NEPA analysis based on resource damage.

Each forest shall prioritize allotments for NEPA review based on resource condition. Each Forest will perform a minimum of 4 livestock management NEPA analyses per year, beginning with allotments showing the most severe grazing impacts and ending when NEPA is current for all allotments. Ecologically similar or geographically adjacent allotments may be combined for NEPA analysis. Impacts to be evaluated for prioritizing allotments should include, but not be limited to:

- riparian health assessments (e.g. Proper Functioning Condition (Bureau of Land Management, 1995; 1994))
- presence and rate of spread of undesirable invasive plants or animals
- range health evaluation (National Research Council, 1994)
- record of compliance with Land Management Plan standards and guidelines
- presence of rare, sensitive, or listed species that are adversely impacted by livestock.

Step 2. NEPA Analysis And Management Plans

All NEPA analyses shall tier to appropriate watershed analyses, if available, but NEPA should not be delayed pending watershed analysis. All NEPA analyses will be conducted by an interdisciplinary team (see below) and meet all requirements of FSM § 2212 and NFMA (e.g. 36 CFR § 219.20). NEPA analysis shall include at a minimum, the following elements (see expanded explanations of NEPA components, below):

- Suitability and capability analysis following NFMA and FSM direction. This should evaluate which areas can support grazing with careful monitoring and management, and which areas must be excluded from grazing
- Staffing analysis comparing available staffing with monitoring, mitigation and enforcement workload for the allotment and disclosing the likelihood that monitoring, mitigation and enforcement commitments will be met
- Recreation use analysis and recreation conflicts analysis
- Cost analysis including costs of resource degradation (e.g. any reductions in the quality and/or quantity of water flowing from a watershed), monitoring, facilities maintenance, applicable administrative overhead, restoration projects, etc. The cost analysis shall also include disclosure of the costs of obtaining equivalent forage on private grazing lands
- Current survey data for rare species for entire planning area
- Weed risk analysis (as required by FSM § 2080)
- Proper functioning condition assessments for riparian areas (Bureau of Land Management 1994; 1995)
- Range health analysis (e.g. National Research Council, 1994)

Management plans resulting from NEPA analysis shall include (see expanded explanations of NEPA components, below):

- Identification of reference areas
- Utilization limits, including browse limits (also see Additional Guidelines below for more information)
- Quantitative and qualitative description of Desired Future Condition
- Identification of photo points for monitoring
- Biologically based season of use determination
- Identification of key areas and benchmarks for utilization and ecological monitoring based on interdisciplinary selection process
- Monitoring plan with timelines

- Adaptive management plan, including timeframes, specifying what actions will be taken if standards are not met

II. Standards and Guidelines Evaluation

All forests must evaluate their forest wide grazing management direction within 2 years for adequacy. The evaluation will include public review and input of current Standards and Guidelines

Criteria for adequacy of Forest Management Plan grazing management direction:

- Must be consistent with FSM direction (FSM § 2211.6)
- Must include a monitoring and reporting program, with timelines (see Monitoring Section below)
- Standards and monitoring protocols must include quantitative as well as qualitative elements (see Components of NEPA Section below)
- Quantitative and qualitative ecological indicators must be identified (see Appendix 1 for examples). These will be used for long term monitoring and for ecological health standards
- Utilization limits must be identified and must vary depending on plant community type and range condition as required by FSM § 2211.6. These must include browse limits for woody species
- Bare soil limits must be identified where appropriate (National Research Council, 1994)
- Quantitative wildlife habitat quality standards must be identified
- Quantitative Riparian habitat quality standards (e.g. bank cover, bank stability, etc.) must be identified.

If current standards and guidelines are found to be inadequate, or if fewer than 4 NEPA analyses are performed in a year, the following Interim Annual Use Standards will apply pending development of new Forest standards and guidelines and/or site specific NEPA analysis. These standards are deliberately conservative in order to protect resources while site specific analyses are performed or Forest Plans are updated to reflect current science and law.

Interim Annual Use Standards

- 40% utilization for upland areas in good condition
- 20% utilization for upland areas in poor condition
- 5" stubble height for meadows and riparian areas in good condition
- 7" stubble height limits for meadows and riparian areas in poor condition
- 5% maximum annual utilization on new growth on riparian browse species and oaks
- 15% maximum annual utilization on new growth on highly palatable upland browse species.
- 5% limit on streambank alteration (USDA Forest Service, 1997)

Interim standards shall apply only on allotments where NEPA analysis is out of date.

The monitoring and adaptive management procedures described in Sections (III) and (IV) below shall be applied as part of the Interim Annual Use Standards.

Also:

- The annual personnel evaluation and personnel record for the responsible line officer will reflect failure to perform the required number of NEPA analyses AND
- Before the following grazing season, the responsible line officer will be required to prepare a detailed explanation as to why NEPA analyses did not occur and a plan to ensure that NEPA review occurs the following season. Both the report and the plan will be available for public review.

III. Monitoring

Short and Long Term Monitoring

Science-based short and long term monitoring protocols for utilization and ecological indicators will be developed by an interdisciplinary team during watershed analysis and/or NEPA analysis.

Monitoring plans shall include both annual use and long term ecosystem health and trend components.

- Annual use monitoring of forage utilization (herbaceous and browse) and short term ecological impacts shall include but not necessarily be limited to bare soil, streambank cover, trampling, water quality, compliance with on- and off-dates, weed cover.

  Annual use monitoring will occur each year on all allotments to determine if standards are being met. If standards are not met willfully or due to repeated negligence, then enforcement action will be taken (See USFS Grazing Permit Administration Suspension and Cancellation Guidelines).

  Utilization monitoring should occur both during and after the grazing season. Monitoring during the grazing season will be used to predict the probable date on which utilization limits will be met and to assist permittees in determining when livestock must be removed from a unit. Monitoring after the grazing season will be used to ascertain whether annual use standards were met.

- Long term monitoring of ecosystem health and trend, shall include but not necessarily be limited to riparian ecosystem health and trend, wildlife habitat quality and trend, rare species status and trend, age class distribution of plant communities and trend, ecosystem health indicators and trend (see below). Long term indicators of ecosystem health shall be monitored every three years at minimum (Sierra Nevada Ecosystem Project, Vol. I, p. 122

Quantitative vs. Qualitative Monitoring

Annual use monitoring should be quantitative where possible. Qualitative measures should be used for annual monitoring only if quantitative measures are demonstrated to be unfeasible.

Where qualitative methods, such as the BLM's "proper functioning condition" assessment for riparian areas (California Rivers Assessment, 1996; BLM, 1995; 1994), are used for short or long term monitoring, a quantitative method which measures the same ecosystem component will be used on a random sample of sites (at least 15%) to calibrate monitoring methods and ensure accuracy of data collected.

Quality Control in Monitoring

Permittees are responsible for meeting utilization limits and other annual livestock management requirements. The Forest Service is responsible for the collection and accuracy of all monitoring data and for meeting ecological standards.

Where anyone other than a Forest Service employee performs monitoring, the Forest Service will monitor a random sample of at least 35% of key areas each year, using quantitative methods, to calibrate monitoring methods and ensure accuracy of data.

All monitoring results shall be available for public and permittee review upon demand.

Where monitoring by anyone other than Forest Service staff shows that a standard or guideline is not being met, the Forest Service shall take action to verify and respond to the violations before the next grazing season.

Annual Monitoring photographs

Annual photographs should be used to document ecological condition of key areas, sensitive areas, and damaged areas. Photographs should be carefully standardized following an accepted published protocol (e.g. EPA, 1993; Kinney and Clary, 1994).

Annual Public Monitoring Report

The USFS will produce a statewide monitoring report which will indicate which key areas in which allotments were monitored for annual use or long term trend, which were not, whether monitoring was performed using ocular estimates or quantitative measurement, what, if any, violations of standards or guidelines were observed, and what, if any, enforcement action was taken. This report shall be available to the public and posted on the Forest Service web site.

Monitoring is Mandatory

If annual use monitoring is not performed in any year, then grazing management will be adjusted the following grazing season. Adjustments should include

- reductions in allowable utilization up to 10% each year monitoring is not performed, OR
- reductions in season of use up to 10% for each year monitoring is not performed, OR
- a combination of changes in season of use and utilization.

(Alternatively, grazing use may be suspended altogether until monitoring is performed. The point is to provide a positive incentive to both the agency and to permittees to ensure that monitoring is performed.)

Also,

- The annual personnel evaluation and personnel record for the responsible line officer will reflect monitoring failures AND
- The annual public statewide monitoring report (see above) will show that no monitoring was performed AND
- Before the following grazing season, the responsible line officer will prepare a detailed explanation as to why monitoring did not occur and a detailed plan to ensure that monitoring occurs the following season. Both the report and the plan will be available for public review.

When monitoring is resumed, and if monitoring shows that standards are being met or exceeded, then management adjustments will be reversed.

IV. Adaptive Management

If ecosystem health standards are not met

If in any area or allotment which has been judged to be suitable for livestock grazing by an interdisciplinary team (see suitability and capability analysis in NEPA section, below), short or long term monitoring data indicates that the condition any resource is not meeting ecosystem health standards (see examples in Appendix 1), and if there is evidence that grazing impacts are causing or contributing to this unsatisfactory condition, then grazing management will be adjusted before the following grazing season.

Adjustments shall be determined by an interdisciplinary team including specialists with relevant expertise. Permittees should also be consulted regarding possible management adjustments. Adjustments shall be designed to show rapid, substantive and measurable progress towards desired conditions.

Adjustments should include but need not be limited to:

a. reductions in season of use in the affected area. Season of use changes should be designed to improve ecological condition, OR

b. reductions in allowed utilization in the affected area, OR

c. a combination of changes in season of use and utilization.

If after two years of altered management, resource condition still does not meet standards, and if there is evidence that the problem continues to be related to grazing impacts, then management will be further adjusted as above. If resource condition continues to be unsatisfactory after 6 years of adjustments (or 3 adaptive management attempts, whichever occurs first), the suitability of the allotment for livestock grazing will be re-evaluated by an interdisciplinary team.

If ecosystem health standards are met

If all ecological standards are being met, a permittee may request that an interdisciplinary team determine whether increased grazing use can be allowed. Any increase in grazing use must initially be accompanied by increased monitoring to ensure that the increase does not cause environmental damage. Any increase in grazing use must be subjected to NEPA analysis.

Components of NEPA Analyses and Range Management Plans

Interdisciplinary teams

NEPA analyses, management adjustments, suitability determinations, reference area identification, benchmark identification, monitoring protocols, and ecological indicator selection will be designed and carried out by an interdisciplinary team including trained specialists in range management, botany, ecology, soil science, fisheries, hydrology, wildlife, and other disciplines as appropriate. This is already required by NFMA (e.g. 36 CFR § 219.1 (b)(10); § 219.5)

Interdisciplinary teams will perform a minimum of one joint visit to the project area during NEPA analysis to exchange resource condition assessments and management recommendations. Other field visits will occur as needed.

Reference areas

Representative ungrazed vegetation reference plots should be placed or identified in appropriate areas to demonstrate the potential ungrazed soil and vegetation conditions and species composition (potential natural condition or undisturbed condition). Information on potential ungrazed ecological structure and species composition may also be gathered by investigating similar plant communities in National Parks or other protected areas, by consulting key researchers, and by inspecting historical records from the last century (Grumbine, 1994; Manley et al., 1995; Bock et al., 1991).

Season of use

Grazing season should be based on ecosystem processes. On-date should be determined by soil (e.g. soil should be dry enough to resist deformation by livestock)

and plant phenology (e.g. growth should be adequate to provide for seed set and carbohydrate storage before grazing begins). Off-date should be set to prevent the dietary "switch" from herbaceous to woody vegetation (Bronson, 1992; Elmore and Kauffman, 1994; Clary and Webster, 1989; Loft et al., 1987). Additional consideration should be given to bird nesting season and wildlife use of site, such as for fawning cover, in setting season of use.

Season of use will be adjusted if an interdisciplinary team determines that failure to meet standards is related to grazing season. For example, if soil compaction is occurring due to early season grazing in wet soils, then on-dates will be adjusted so that livestock do not enter the area until the soil is dry.

Capability and Suitability Analysis

Some plant communities cannot support livestock without permanent damage or irreversible loss of resources or ecological services. Examples of areas that can be particularly susceptible to grazing damage include (a) desert ecosystems (b) high elevation mountain meadows (c) riparian areas, including ephemeral streams and seeps (d) rare species habitat.

Under the NFMA (36 CFR § 219.3), suitability is defined as:

> "The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone."

Capability is defined:

> "The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends on current conditions and site conditions such as climate, slope, land form, soils, and geology, as well as the application of management practices, such as silviculture or protection from fire, insects, and disease."

Evaluations of which allotments and which areas within allotments cannot sustainably be grazed will be made by an interdisciplinary team (see above) during NEPA analyses. Grazing will be excluded from these areas. Criteria to be evaluated during suitability analysis will include productivity, fragility of vegetation or soils, conflicts with other uses (e.g. recreation, water use by communities, etc.), conflicts with any applicable resource protection designations under state or federal law or policy (e.g. heritage trout waters, special interest areas, wilderness), or exorbitant costs of protecting other resources. Analyses should include calculations of the carrying capacity, stocking rate, and expected use, quantitative evaluations of range condition, comparisons of the economic value of grazing with other potential uses forgone, as well as descriptions of resource and use conflicts.

This analysis is already mandated on National Forests. The NFMA (36 CFR § 219.20), the Forest Service Manual (FSM 2212.11) and the Range Analysis Handbook for Region 5 all require suitability analyses for livestock grazing.

All grazing suitability analyses will be substantiated by facts which support the decision to allow or prohibit grazing.

Staffing Analysis

All grazing NEPA analyses shall include staffing analysis. Staffing analyses shall calculate the level of staffing required to meet monitoring, enforcement and mitigation goals, will compare staff availability with those requirements, and will propose mitigation strategies where staffing does not meet workload requirements. Staffing analysis will include all resource specialties relevant to livestock management in the project area, such as botany, range management, fisheries, hydrology, etc.

Allotment Desired Condition

The desired condition is the goal towards which management should be moving the ecosystem. The desired condition for each allotment may include a narrative description but should also include desired ranges of values for some quantitative ecological indicators.

Quantitative desired conditions should be defined for ecological indictors relative to the potential natural condition (undisturbed) of that indicator. Information on potential natural condition can be gathered from reference areas, from experts, or from the scientific literature.

Recreation analysis

This analysis should include a quantitative assessment of recreation use in the project area and should identify areas where livestock and recreation use overlaps. The analysis should also evaluate the cumulative impacts of recreation, livestock and packstock use, if any, in the project area. This review should also include an economic analysis of the impacts of livestock on recreation industries and jobs in the project area (see Loomis et al., 1991 for an example).

Ecosystem Health and Trend Indicators

1. Measurable indicators of ecosystem health (Interagency Ecosystem Management Task Force, 1995; Ecological Society of America, 1995; Williams and Marcot, 1991) will be identified by an interdisciplinary team during allotment NEPA analyses, watershed analysis, and/or during forest plan amendment. Ecological indicators may be defined on the allotment, watershed, Forest, or larger scale as appropriate.

   Indicators should include, as appropriate, measures of riparian structure and function, frequency of disturbance-following invasive non native species, soil

health, rare species vigor, wildlife habitat quality, plant community composition and structure, and water quality (see Appendix 1 for examples).

2. Indicators will be used to define ecosystem health standards which will trigger management changes if not met. Management that meets or exceeds standards should measurably and substantively move the ecosystem towards the desired condition. Indicators will also be used to define desired condition quantitatively.

3. If any standard is not being met, then management will be adjusted before the following grazing season by an interdisciplinary team (see section on Adaptive Management).

4. If all ecosystem health standards are being met, an interdisciplinary team may make a determination as to whether increased grazing use can be allowed (see section on Adaptive Management)

5. Ecosystem health indicators should be monitored every three years at minimum (Sierra Nevada Ecosystem Project, Vol. I, p. 122). Annual use indicators and short term ecological indicators should be monitored annually.

Qualitative vs. quantitative standards and indicators

Standards and indicators may be qualitative (subjective), but should be quantitative (objective) where possible. Qualitative measures should be used for routine annual monitoring only if quantitative measure is demonstrated to be unfeasible.

If a qualitative standard, such as the BLM's definition of "proper functioning condition" for riparian areas (California Rivers Assessment, 1996; BLM, 1995), is used for routine annual monitoring, it shall be supplemented by quantitative standards which will be measured periodically (minimum of every 3 years) to verify and calibrate monitoring results for the standard. Quantitative standards will also be used for more detailed site examinations if qualitative measurements show that a problem exists.

Additional Guidelines for Specific Resources

Riparian

If streambank trampling by livestock exceeds 5% at any time, then an evaluation will be made immediately by a hydrologist and fisheries biologist to determine the ability of the riparian area to adequately capture sediment, maintain water quality, sustain appropriate native plants and animals, and dissipate flood energy. If the riparian area does not meet any single ecological standard, and if it is determined that the problem is being caused or contributed to by livestock, then management will be adjusted following adaptive management procedures (above) until the area meets ecological standards.

A proper functioning condition assessment (Bureau of Land Management, 1995; 1994; California Rivers Assessment, 1996) will be done during NEPA analysis and/or watershed analysis. If a riparian area is found to be functioning "at risk", and if it is determined that the problem is being caused or contributed to by livestock, then management will be adjusted following adaptive management procedures (above) until the area is functioning properly.

If a "no" answer is given to any question in the proper functioning condition checklist (Bureau of Land Management, 1995; 1994; California Rivers Assessment, 1996), then a quantitative measurement of that riparian attribute should be made immediately. If it is determined that the problem is being caused or contributed to by livestock, then management will be adjusted following adaptive management procedures (above).

If a riparian area is in nonfunctional condition due to livestock grazing (Bureau of Land Management, 1995; 1994; California Rivers Assessment, 1996), then grazing will be excluded from the area until it reaches proper functioning condition.

Range Health

A range health assessment (National Research Council, 1994; Appendix 1) will be done during NEPA analysis. If any indicator is found to be in "at risk" condition, and if livestock grazing is contributing to the problem, then management will be adjusted following adaptive management procedures (above).

If any indicator is in "unhealthy" condition due to livestock grazing, then grazing will be excluded from the area until it reaches healthy condition.

Utilization

Livestock will be removed from units or allotments at the time utilization limits are met.

Key areas for utilization monitoring should be set for each allotment. The areas of maximum use are the key areas and it is use in these areas that should determine when utilization limits for each allotment or pasture have been reached. Utilization mapping may be used to help establish use patterns and determine areas of maximum use.

Where no utilization limits exist and ecological standards are not being met, initial utilization limits will be set by plant community type and adjusted through adaptive management as monitoring results warrant. See Appendix 2 for examples of starting points for utilization limits.

Woody species (Browse limits)

Woody species are not part of the forage base. Woody species generally are not used by cattle until available herbaceous forage has been consumed, dried to unpalatability, or has otherwise become unavailable (Bronson, 1992; Elmore and Kauffman, 1994; Clary and Webster, 1989; Loft et al., 1987). Because browsing occurs after other forage sources are exhausted, overuse and severe damage of browse species (willows, oaks,

shrubs, etc.) can occur very rapidly after browsing has commenced. Therefore use of woody species should be minimized as follows.

Allowed use for woody species:

- 10% livestock maximum annual utilization on new growth riparian browse species and oaks
- 20% maximum annual utilization on new growth on highly palatable upland browse species.

Carrying Capacity and Stocking Rate

Allowed stocking rates should be set somewhat below (e.g. 80%) the calculated carrying capacity for moderate use (e.g. moderate forage utilization as defined by Holecheck et al., 1998; Appendix 2). Conservative stocking can provide stability in livestock production and protection from intense adverse environmental impacts in years of low productivity due to drought or other causes.

Rare species

Grazing management will ensure the recovery of threatened and endangered species and will prevent future listings.

If a rare or sensitive species is present, but inadequate information is available on grazing impacts, species, a scientifically sound (peer reviewed) monitoring and evaluation program (conservation strategy) will be developed and initiated immediately. Possible mitigations will also be developed and will be included, on a conditional basis, in the management plan.

If after an appropriate monitoring period (1-4 years), grazing is found to be detrimental to the species OR if monitoring is not performed, then mitigations will be implemented. Conditional mitigations to be considered will include (1) adjusting season of use, (2) reductions in allowed use in sensitive plant habitat, or (3) closing affected pastures to grazing.

Where an approved ecosystem management plan, habitat management plan, recovery plan, conservation strategy or other management plan exists for one or more rare species, an evaluation and report will be made of whether the plan is being implemented and monitored.

Noxious weeds

Populations and trends of noxious weeds and other invasive non native plants and animals shall be monitored each year.

Specific actions will be built into standards and guidelines and management plans to discourage the spread and infestation of weeds (e.g. use of weed free hay, livestock

purging periods) (Sheley, 1995). Weed infestations >= 2% plant cover will trigger implementation of weed control measures.

Forest Service Manual guidance (FSM § 2080) will be followed.

See CNPS scoping comments on the Sierra Nevada Framework for more discussion of weed management.

Restoration

Only locally-collected native species will be used for restoration or revegetation projects.

Water quality

Grazing management practices should ensure the attainment of water quality which is necessary to meet or exceed State and Federal standards. Water quality indices shall be monitored and reported annually. Adjustments in stocking rate and/or season of use will be made the following season if standards are not met in any year.

Opportunistic management

Opportunistic management will be employed. After exceptionally wet or dry years, or following fire, flood or other extraordinary events, livestock grazing may be reduced or eliminated in order to avoid interfering with recruitment of species which germinate or sprout in response to events such as fire, or are unusually sensitive to damage following events such as flood or drought. Temporary (1-3 year) changes in management, including rest, should be evaluated by an interdisciplinary team following fire, flood, etc.

Scientific and Public Review

Ecological indicators, monitoring protocols, standards and desired future condition definitions will be reviewed by specialists from agencies, universities, or other appropriate institutions for scientific and biological soundness using the peer review process. The specialists will represent a range of disciplines including soil science, botany, fisheries, hydrology, range management, wildlife ecology, and plant ecology.

Indicators, monitoring protocols, and standards shall also be reviewed by the public through allotment level NEPA process or through plan amendment level public review.

Permits

Monitoring plans, standards and guidelines will be incorporated into each grazing permit immediately upon completion. Grazing permits, Allotment Management Plans and Range Management Decisions shall state

- what indicators will be used to determine whether standards are being met
- how, when, where and by whom the indicators will be measured
- what records will be kept of the monitoring results and when and where will they be available
- what actions (management, enforcement) will be taken if standards are not being met after a specified time period usually 2 years).

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Appendix 1 - Examples of Indicators and Standards

Ecosystem Health Indicators are measures of the health of the components of an ecosystem.

Ecosystem Health Standards are specific values or descriptions of indicators which, if not exhibited in the field, will trigger immediate changes in management to improve ecosystem health. Standards should be set so that where standards are being met or exceeded, the ecosystem should be meeting or measurably moving towards desired condition.

This section presents some examples of possible indicators and standards. *The list is not meant to be exhaustive.* It is meant to act as a guide to the interdisclipinary teams who will be developing actual site specific indicators and standards.

Site specific indicators and standards will be developed on the allotment, resource area, watershed, or other appropriate scale.

Indicators and standards may be qualitative, but should be quantitative where possible. Qualitative measures should be used for routine annual monitoring only if quantitative measure is demonstrated to be unfeasible.

If a qualitative method, such as the BLM's definition of "proper functioning condition" for riparian areas (California Rivers Assessment, 1996; BLM, 1995), is used for routine annual monitoring, it shall be supplemented by quantitative measurements which will be measured periodically (minimum of every 3 years) to verify and calibrate monitoring results. Quantitative standards will also be used for more detailed site examinations if qualitative measurements show that a problem exists.

Annual photographs should be used to document progress towards standards. Photographs should be carefully standardized following an accepted published protocol (e.g. EPA, 1993; Kinney and Clary, 1994).

General Rangeland Health

Indicator: Rangeland Health Evaluation Matrix (National Research Council, 1994).

Standard: Rangeland health indicators will be in healthy condition.

INDICATOR	HEALTHY	AT RISK	UNHEALTHY
Soil stability and watershed function			
Soil A horizon	Present and unfragmented	Present but fragmented distribution developing	Absent or present only in association with prominent plants or other obstructions.

Pedestalling	None	Pedestals present, but on mature plants only; no roots exposed	Most plants and rocks pedestaled, roots exposed
Rills and gullies	Absent or with blunted or muted features	Small, embryonic, and not connected into a dendritic pattern	Well defined, actively expanding, dendritic pattern established
Scouring or sheet erosion	None visible	Patches of bare soil or scours developing	Bare areas and scours well developed and contiguous
Sedimentation or dunes	No visible soil deposition	Soil accumulating around plants or small obstructions	Soil accumulating in large barren deposits or dunes or behind large obstructions
<u>Distribution of nutrient cycling and energy flow</u>			
Distribution of plants	Plants well distributed across site	Plant distribution becoming fragmented	Plants clumped, often in association with prominent individuals, large bare areas between clumps.
Litter distribution and incorporation	Uniform across site	Becoming associated with prominent plants or other obstructions	Litter largely absent
Root distribution	Community structure results in rooting throughout available soil profile	Roots are absent from portions of the available soil profile	Roots only present in one portion of the available soil profile
Distribution of photosynthesis	Photosynthetic activity occurs throughout the period suitable for plant growth	Most photosynthetic activity occurs during one portion of plant growth period	Little or no photosynthetic activity on location during most of the period suitable for plant growth

Recovery mechanisms			
Age-class distribution	Distribution reflects all species and age classes	Seedlings and young plants missing	Primarily old or deteriorating plants present
Plant Vigor	Plants display normal growth form	Plants developing abnormal growth form	Most plants in abnormal growth form
Germination	Microsites suitable for germination present and well distributed	Developing crusts, soil movement, or other factors degrading microsites; crusts are fragile	Soil movement of crusting sufficient to inhibit most germination and seedling establishment

Soils

Indicator: stability of soil surface aggregates compared to ungrazed or undisturbed site.

Standard: Soil surface aggregate stability should be equivalent to similar ungrazed reference sites.

Indicator: % cover by bare soil

Standard: bare soil should cover less than 3% of key areas (see utilization guidelines below for definition of key area).

Indicator: Rooting Depth

Standard: Depth to common roots. This is the depth at which root density is found to meet the definition of "common" of the Natural Resources Conservation Service (personal commun., Desi Zamudio, Soil Scientist, Toiyabe NF Sparks, NV). This depth should be equivalent for grazed sites and reference areas.

Riparian

Indicator: Streambank stability

Standard: Streambank trampling by livestock should not exceed 5% of any reach at any time.

Indicator: bank vegetation cover

Standard: native vegetation cover >= 95%

Indicator: Rosgen channel characteristics (Rosgen,1985)

Standard: Stream channels should conform to the characteristics (width:depth, sediment load, etc.) of the potential (undisturbed) Rosgen channel type.

Indicator: Other riparian characteristics

Standard: Bank angle (e.g., > 90o for > 80% of stream reach), bank stability, percent overhanging banks (e.g., overhanging banks should be present where appropriate) (US Environmental Protection Agency, 1993).

Indicator: Riparian condition by Proper Functioning Condition assessment

Standard: Stream channels should be in proper functioning condition (BLM, 1995; California Rivers Assessment, 1995)

Plant community

Indicator: plant community demography

Standard: % cover, proportion of native species, distribution of seral stages and age classes should be equivalent to ungrazed reference sites.

Indicator: species composition

Standard: native indicator species (e.g. Menke, 1996) which reflect ecosystem health, should be used to compare condition of grazed and ungrazed reference sites.

Indicator: non-native species cover, particularly of disturbance-following plant species.

Standard: disturbance-following non-native species will make up less than 5% of plant species stem frequency at the soil level. Proportion should stay constant or decline over time.

Rare species

Indicators of the health and vigor of rare species populations include numbers, area covered by populations, recruitment, vigor. Standards must be set for each species individually and should provide for the recovery of sensitive, threatened and endangered species and prevent future listings.

Water quality

Indicators: Water quality indicators will include specific limits for temperature, sediment, nutrient (N and P) and fecal coliform following the direction of the Regional Water Quality Control Board Basin Management Plans.

Standard: Surface and ground water must meet Regional water quality standards.\

Appendix 2 - Examples of Utilization Limits

Clary and Webster (1989) recommend 4-6 inch minimum stubble height remain at the end of the grazing season in most healthy intermountain riparian areas. They recommended setting minimum stubble heights greater than six inches for critical fisheries, easily eroded streambanks, or unhealthy riparian areas (such as those not meeting standards, or those "functioning at risk"). They also note that degraded riparian areas (such as those in nonfunctional condition) should be rested.

Holecheck and coworkers presented some moderate utilization limits that may also provide starting points for management. For rangelands not meeting standards, the lower of the range of utilization limits should be used.

Utilization recommendations from Holecheck et al., 1998 (p. 207).

These recommendations are for "moderate" utilization of key herbaceous species in rangelands in "moderate" ecological condition. Lower utilization limits are recommended for poorer condition rangelands.

Community type	Percent use of key herbaceous species
Semi-desert grass and shrubland	30-40
Sagebrush grassland	30-40
Calif. annual grassland	50-60
Coniferous forest	30-40
Mountain shrubland	30-40
Oak woodland	30-40
Pinon-juniper woodland	30-40
Alpine tundra	20-30

Note: % utilization can be converted to approximate minimum allowed stubble heights or residual dry matter by using average values for height and dry weight of key species (see Kinney and Clary, 1994 or Clary and Webster, 1989 for example).

Things that I think should trigger a review of grazing management:

- PFC below proper functioning condition
- Rangeland health matrix below healthy
- Listing of any species
- No monitoring of allotment for 2 years
- Non compliance with standards for 2 years
- Weeds above 5% of key area stem density – key area defined as average, weeds above 10% key area if key area is heaviest use area.
- Any weed density increases for 3 consecutive years
- Bare soil above 5% key area – key area defined as average
  Bare soil above 7.5% key area – key area defined as heaviest use area
- Any bare soil percentage increases for 2 consecutive years.

First step –

- Prioritize based on resource condition – do worst condition allotments first
- Then do NEPA with PFC, rangeland health matrix, suitability evaluation, capability evaluation, weed risk assessment, etc. and set utilization limits and season of use (biological) at that time. ID key area selection, with photopoints
- Then start adjustments based on adaptive management system below
- Do 4 allotments per year

1. get them first to prioritize allotments for NEPA based on resource damage and start analyzing most damaged allotments first

2. do suitability analysis

3. where they determine that grazing can continue, develop site specific S&Gs following the protocol described in the BLM alternative within one or 2 years.

4. Get them to commit to doing NEPA on 4 allotments per year

5. For allotments in good condition, analyze them last and continue current management if appropriate.