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Collaborative Group on Sustainable Grazing for U.S. Forest Service Lands in Southern Utah: Final Report and Consensus Recommendations

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Collaborative Group on Sustainable Grazing for U.S. Forest Service Lands in Southern Utah

Final Report and Consensus Recommendations
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and the Utah Department of Natural Resources

Report compiled by Michele Straube, University of Utah
and Lorien Belton, Utah State University

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Collaborative Group on Sustainable Grazing for
U.S. Forest Service Lands in Southern Utah

Final Report and Consensus Recommendations

I. Executive Summary

In the fall of 2011, the Utah Department of Agriculture and Food and the Utah Department of Natural Resources jointly convened a collaborative group to discuss sustainable grazing on the U.S. Forest Service lands in southern Utah. The Forests under consideration were the Fishlake National Forest, the Manti-La Sal National Forest, and the Dixie National Forest. A diverse array of stakeholders came together to learn from one another, identify current issues, and develop agreement on how Forest Service lands can be sustainably grazed. Representatives from the livestock industry, conservation interests, state and federal agencies, universities, sportsmen's interests, and local government attended ten meetings over the course of a year. Forest Service representatives attended all meetings as technical representatives to ensure that the group had accurate information on policies, current activities, and other topics critical to the discussions, but did not participate in collaborative decision-making. The group worked to achieve consensus to ensure that all participants were comfortable with the documents produced by the collaborative.

The group was tasked with developing consensus agreement on grazing management principles and practices for Forest Service lands in Southern Utah that provide for **ecological** sustainability, are **socially** acceptable, and **economically** viable.

During the year, the group discussed key issues and concerns related to grazing on the three National Forests in southern Utah. They then identified key indicators of ecological, economic, and social conditions related to grazing. An indicator is something we can see or measure that tells us about the state or condition of something else less tangible. For example, one of the ecological indicators identified was the presence and type of macroinvertebrates (e.g. waterbugs). The kinds and numbers of these creatures in a stream or river give an indication of the health of the stream.

The group identified numerous possible ecological indicators, 11 for upland range areas, and 15 for riparian areas (i.e. the areas near water). These indicators include:

- Gross visual indicators of both positive and negative situations (2 in upland, 2 in riparian)
- Soil stability (3 in upland, 1 in riparian)
- Plant species composition (5 in upland, 5 in riparian)
- Structure and Function of the landscape or riparian area (1 in upland, 3 in riparian)
- In-stream condition (2 indicators in riparian only)
- In-stream water conditions (2 indicators in riparian only)

The group also agreed on 12 social and economic indicators – things which, if measured in the areas where grazing occurs on Forest Service land, could help everyone understand the effect that changes in grazing management might have on individual permittees and local ranching culture, as well as local economies and communities. These indicators fell into four categories.

The group identified:

- 4 indicators of investments in grazing practice
- 4 indicators of opportunities to participate in livestock grazing programs on Forest Service lands
- 3 indicators of the diversity of grazing management arrangements and public involvement that reflects a broad range of societal values, and
- 1 indicator of community/county-level economics

Once the ecological, economic and social indicators were identified, each one was evaluated using several criteria. This review helped refine the indicators and provide additional information that would help someone using the indicators identify which ones might be most useful in particular situations. This work was done in the full group for ecological indicators, and by a sub-team for the economic and social indicators. In addition, a separate sub-team identified "simple methods" for measuring the ecological indicators. The resulting reference document identifies potential simple ways to measure these indicators.

The group agreed that it is very important to look at the information from multiple indicators together, not just one indicator at a time. All the indicators – ecological, social, and economic – can be related to changes in livestock grazing management. However, they may also be related to many other things, including external factors beyond the control of livestock operators of the Forest Service. For example, ecological indicators could change in response to livestock grazing, but might also change in response to rainfall or wildlife grazing, such as by elk. Likewise, economic/social indicators could respond to livestock grazing management changes or to other forces unrelated to grazing, like national beef or lamb prices.

In addition to identifying appropriate indicators, the collaborative also focused on grazing management principles and practices. First, grazing experts participating in the collaborative helped the group identify three primary principles of grazing management. Then, they created a list of grazing management practices, based on those principles, which could improve the sustainability of grazing activities on Forest Service lands.

The collaborative identified three fundamental principles of grazing management:

- Time (duration/length of grazing use in an area)
- Timing (when – what season – an area is grazed)
- Intensity (how much gets eaten by livestock while they are in an area)

Used together, these three principles provide the foundation for improving the sustainability of grazing. Indeed, many of the grazing management practices suggested in this final document relate to ways to improve the time, timing, and intensity of grazing on the three forests. Using these three principles, grazing management could be changed to include use of pastures at different times of year, rest of pastures, or other adjustments to grazing patterns that contribute to ecological, social, and economic sustainability.

The group discussed a wide variety of possible grazing management practices and other strategies that could be used by livestock operators, the Forest Service, and others, to increase the sustainability of grazing on Forest Service Allotments. Over 20 specific suggestions include ways to:

- Influence the duration, timing, and intensity of grazing
- Change grazing management decisions
- Improve conditions for the benefit of both livestock and ecology
- Improve monitoring for understanding how to graze most sustainably

The recommendations in this report are simply a menu of possibilities. Some might prove extremely valuable in one area, but impossible to implement or irrelevant in another area. In addition, a wide array of individuals and institutions could help implement monitoring suggestions. Nothing recommended here should be considered the exclusive responsibility of any one party. Most of these recommendations involve communication and shared decision-making among permittees, the Forest Service, and potentially other interested parties. The collaborative also provided recommendations specific to the Forest Service, given that agency's role in administering and managing grazing on the National Forests. In addition, a key focus of many discussions was how to provide appropriate incentives to livestock operators to embrace grazing management principles on the forests, since their full participation is critical to successful, sustainable grazing.

The collaborative understands that not all situations on Forest Service allotments are under the control of the Forest Service or the livestock operators who graze there. Therefore, the group included recommendations for other entities that could also contribute to the goal of increasing the ecological, economic, and social sustainability of grazing on the National Forests. These recommendations acknowledge that livestock grazing and wildlife management decisions should not be made independently and include specific suggestions to improve coordination of such decisions to ensure long-term sustainability of the resource.

This report calls for a continued collaborative effort by all parties involved in activities related to Forest Service grazing. Improved communication, joint learning, trust building, and working together will be critical to achieving the primary goal of this collaborative effort: a system of grazing on the U.S. Forest Service lands of southern Utah that is ecologically sustainable in addition to being broadly socially acceptable and economically viable for the ranchers and communities that depend upon it for their culture and livelihood.

II. Description of Collaborative Process

Conveners and Participants

The Collaborative Group on Sustainable Grazing for Southern Utah Forest Service Lands ("collaboration") was convened in November 2011. Utah Department of Agriculture & Food Commissioner Leonard Blackham and Utah Department of Natural Resources Director Mike Styler acted as co-conveners, issuing an invitation to a cross-section of interests to participate in the collaborative effort.

Thirteen participants accepted the invitation to join the collaboration. They included representatives from the ranching community (sheep and cattle), county government, state government, federal agency range professionals, conservation groups and academia. The Forest Service participated in all collaboration activities as a Technical Advisor. The Forest Service was not an official participant in the collaboration's consensus-building process. However, the Forest Service perspective about opportunities, policy, and possibilities did inform the group's discussions and agreements.

The collaboration process was designed and facilitated by a team of Michele Straube, Director of the Stegner Environmental Dispute Resolution Program (University of Utah S.J. Quinney College of Law); and Lorien Belton, Program Coordinator and Facilitator, Community-Based Conservation Program (Utah State University).

A full listing of the collaboration participants can be found in Appendix 1.

Guiding Document

Co-conveners Utah Department of Agriculture & Food Commissioner Leonard Blackham and Utah Department of Natural Resources Director Mike Styler kicked off the collaboration's conversation with a Guiding Document (charter) outlining the focus for discussion and desired outcomes. The collaboration members made minor changes and approved the Guiding Document found in Appendix 2.

The collaboration's goal was to "develop consensus agreement on grazing management principles and practices for Forest Service lands in Southern Utah that provide for ecological sustainability, are socially acceptable, and economically viable." All participants in the collaboration accepted as a starting point for discussion that livestock grazing is a valid use of National Forest System lands.

In order to identify how the three southern Utah Forests (Dixie, Fishlake and Manti-LaSal) can be sustainably grazed, the Guiding Document assigned the collaboration the following tasks:

- Define and agree on the key indicators of ecological sustainability/watershed health. The Guiding Document acknowledged that ecological sustainability is the "lynchpin that establishes the sideboards within which social and economic sustainability can be achieved." (Objective 1)
- Agree on what "social sustainability" means in the context of domestic livestock grazing. Develop guidelines or indicators for social sustainability, recognizing the importance placed on local customs and culture, and identify opportunities to sustain them. (Objective 2)
- Agree on what "economic sustainability" means in the context of domestic livestock grazing. Identify indicators for economic sustainability, with particular focus on the impact of grazing management practices on livestock producers' economic viability. (Objective 3)
- Agree on affordable methodologies to establish baseline conditions and monitor changes in key indicators of ecological, social and economic sustainability in the context of grazing. (Objective 4)
- Identify grazing management principles and practices, and other strategies that contribute to the ecological, social and economic sustainability of grazing. (Objective 5)

Operating Protocols / Consensus-Based Decision-making

As one of its first orders of business, the collaboration developed Operating Protocols to guide the group's work. In addition to ground rules designed to foster respectful dialogue, the group agreed to share information freely and participate in good faith with the intention of finding common ground where possible.

The group chose consensus decision-making as the process most likely to help them find common ground. Rather than using a vote or veto process, consensus requires that everyone agrees they can accept what has been proposed. As a part of the process to reach consensus, the interests of all participants must be fully explored and understood, and every effort must be made to explore options that meet the interests of all participants. Each collaboration participant shared the responsibility to propose solutions that met everyone else's interests as well as their own, and conversation continued until a mutually acceptable solution was identified. A Forest Service technical representative provided input and ideas at the meetings, but was not included when determining consensus.

The Operating Protocols can be found in Appendix 3.

Seaman Canyon in Dixie National Forest

Key Issues

During the collaboration's first meeting, each participant shared the key issues or problems related to grazing in the three southern Utah Forests this collaborative should address. A summary of the Key Issues can be found in Appendix 4.

While the group acknowledged that some of the key issues extended beyond the sideboards of the Guiding Document, the problem statements informed the group's efforts to identify key indicators of ecological, social and economic sustainability.

Existing Allotments Information

In response to requests from collaboration members, the Forest Service developed a series of maps and charts to provide basic information about allotments on the three Forests. Details such as how many allotments there are, the current permitted stocking, size of the allotments, and major vegetation communities that may exist on allotments were provided to the group. In addition, the Forest Service also developed a preliminary list of "hotspots" or ecological settings where unacceptable resource conditions are found more frequently in the three southern Utah Forests. This preliminary list can be found in Appendix 5.

The background information provided by the Forest Service provided a context for the group's discussions about grazing management principles and practices, and key ecological indicators.

Meetings

All collaboration members met in ten full group meetings, some held in Salt Lake City and some held in Richfield to equalize the travel commitment by individual participants. Appendix 6 is a visual representation of the timing, location and focus of full group meetings and other collaboration activities.

Work groups were established as needed to provide a more detailed review of specific topics. Care was taken to include all who wished to participate in any given work group, and to ensure a cross-section of interests in each work group. The participants in each work group can be found in Appendix 1:

- Ecological Indicators work group (refined the full group's list of possible ecological indicators into suggested *key* ecological indicators).
- Ecological Indicators "Simple Methods" work group (identified suggested "simple methods" to establish baseline conditions and conduct monitoring for the key ecological indicators).
- Economic/Social Indicators work group (refined the full group's list of possible economic and social indicators into suggested *key* economic/social indicators).
- Field Trip Logistics work group (investigated feasibility and logistics for the possible field trip locations identified by the full group).

Work group meetings were primarily conducted via conference call. The work group's recommendations were distributed to the full collaboration before the next full group meeting and were discussed by all participants at that meeting. No significant decisions were made by the work groups.

Field Trips

Collaboration members went on a field trip June 26-27, 2012, to observe on-the-ground conditions in the three southern Utah Forests. They spent one full day on Monroe Mountain, led by Mr. Vince Pace, Rangeland Management Specialist with the Forest Service, who has worked with the ranchers and community members in this area for over 30 years. On the second day, the group visited Dennis Bramble's property near Escalante, to see the effects of a variety of grazing management practices and passive restoration in an area where occasional fall grazing has occurred since 1993.

Recovering native grassland on Bramble property and adjacent Dixie National Forest

Four individuals who participated in a field trip to Bureau of Land Management (BLM) allotments in Nevada shared their impressions with the full collaboration in a virtual field trip at the August 21, 2012 meeting in Richfield. A PowerPoint presentation created by Nevada BLM field staff included before-and-after pictures documenting riparian area ecological improvements due to changes in grazing management practices. Photographs of an example location in Nevada (Susie Creek) are shown below.

Susie Creek, Nevada. Looking upstream, 1992.

Nevada Bureau of Land Management grazing management successes.

This photo time series was taken in an area where grazing management was changed over a period of years.

AUMs remained the same.

Susie Creek, Nevada. Looking upstream, 1999.
Channel has narrowed.

Susie Creek, Nevada. Looking upstream,
Oct 2012 (drought year).
Beaver have returned and created a wetland.

Final Report Drafting and Review

This final report was drafted by the co-facilitators, incorporating consensus language where that already existed and translating consensus concepts from flipchart notes to full sentences. A first draft was circulated to all collaboration participants three weeks before the final meeting. Comments submitted before the final meeting were identified either as editorial suggestions or serious concerns about concept or language. At the final meeting of the collaborative on December 6, 2012, the group reviewed each substantive comment or question received on the draft report, and agreed upon revised language for the final report. The group also developed an outreach strategy by which the final report would be distributed to the public and specific interested constituencies.

III. Grazing Management Principles

[Relates to Objective 5 in Guiding Document]

The group was tasked with agreeing on a few core grazing management principles that could form the foundation upon which grazing practice recommendations would be based. The following three principles, with short examples, are the final concepts that the group agreed on.

Time (Duration)

TIME (or DURATION) is a key principle of grazing management. It refers to how long animals stay in a specific pasture or grazing area. For example, the duration of grazing in one place could be an entire season, just a few days, or not at all for that year (rest). This principle is about creating appropriate rest periods for pastures by having shorter grazing periods, and reducing the frequency at which individual plants are grazed during rapid growth.

Time (Duration) is an important principle because it influences both ecological and social/economic results. How long livestock stay in an area – along with other factors, like stock density – influences what plants they eat, how much of the available forage they eat, and how much time plants have to grow or recover (rest). The time/duration of grazing may also affect how much work a rancher or herder must do to move the animals, and how the use of any one pasture fits together with the other pastures those animals use throughout the year.

Timing (Season of use)

The TIMING of grazing is also a key grazing management principle. This refers to when (what stage of plant growth) livestock graze in a specific area. For example, a change in timing might involve taking livestock to Forest Service allotments earlier or later than the year before. Other examples could include using the same three pastures every year, but just using them in a different order each year, or using four pastures, with one receiving year-long rest each year.

Timing is important for both ecological and social/economic reasons. Managing the timing of grazing so pastures and individual plants have ample time to re-grow can improve plant health and plant community health. In addition, the date that livestock arrive at a pasture can influence what plants the animals eat and may impact recreation or other resource uses in certain areas at specific times.

Intensity (Utilization)

The third principle of grazing management is INTENSITY. This refers to how heavily the area gets grazed, or in other words, how much of the available forage is eaten. Zero intensity would refer to resting a pasture, whereas extremely high intensity would mean almost everything is being eaten.

The intensity of grazing matters for both ecological and social reasons. The ecology of an area can be influenced by what plants get eaten at what level of utilization, especially if the area has no opportunity for growing-season rest.

Using the Principles Together

Optimum benefits are achieved by management of all three principles – time, timing, and intensity – together. For example, implementing the principles of "time" and "timing" simultaneously could mean a greater percent of the management unit (allotment) would receive growing season rest each year, and ideally, at least one pasture totally rested. In addition, it is important to understand that managing intensity alone is unlikely to achieve the results that are possible by managing time and timing. If an allotment or management unit achieves good management of "time" and "timing," then intensity (though valuable) becomes less important from an ecological health standpoint. However, managing the intensity of grazing can be important when managing time and timing is not feasible. Under these circumstances, utilization intensity may influence a plant's chance of going to seed or producing more plants the next year.

These three principles – time (duration), timing (season), and intensity (utilization) – appear in many forms in the grazing management recommendations and suggestions in the "Grazing Practices" section of this document. Many of the suggestions that follow are simply specific suggestions for how to change the time, timing, and intensity of grazing in order to make livestock grazing more ecologically, economically, or socially sustainable. This would typically mean creating longer rest periods for pastures by having fewer herds, more pastures per herd, and shorter grazing periods per pasture.

IV. Grazing Management Practices and Other Strategies

[Relates to Objective 5 in Guiding Document]

The collaborative group spent a large amount of effort discussing specific ideas for how to make grazing of southern Utah Forest Service lands more sustainable. They considered grazing sustainability from many different angles. They worked to understand grazing problems identified by different groups, and the barriers that make solving those problems difficult. Then they talked through numerous possible ways to address unsustainable grazing.

The suggestions below represent many different kinds of changes. Some are straightforward, specific suggestions that a single permittee could act upon without much difficulty. Others would require a more complex reorganization of traditional approaches, and might involve multiple parties. Some suggestions would require institutional involvement, such as by the Forest Service, and might mean changes in monitoring protocols, communication, or other areas. A final category of recommendations specifically addresses how to improve monitoring, which was a frequent topic of discussion: although it is not a grazing practice itself, monitoring is what informs grazing management changes. Therefore, the monitoring recommendations are an important component of the suggestions this group has compiled.

It is important to understand that these suggestions are like a menu of ideas. Not every suggestion would apply, or even be appropriate, in certain situations. The collaborative group chose to provide a longer, more comprehensive list from which someone can chose the best grazing practices for improving (or maintaining) ecological sustainability, while also being economically and socially feasible in their situation. In many cases, these ideas are already in use by innovative grazing managers.

Appendix 7 contains a detailed description of some key barriers that may need to be addressed for some of these recommendations to be implemented. The exercise of identifying barriers and challenges led to many of the consensus recommendations found in subsections C (Forest Service-Specific Strategies) and D (Strategies External to the Forest Service) below, as well as Section V (Additional Recommendations and Observations) of the report.

A. Grazing Management Practices

Ways to influence the duration, timing, and intensity of grazing

- Use riders to actively manage livestock. This provides an active way to move livestock to areas where they can graze more sustainably, and keep them out of areas where/when their presence is less sustainable.
- Move key resources (like water and salt) that livestock need as a way to help manage where livestock spend time, and how long they are there.
- Add or remove fencing to provide opportunities for more flexible, resource-condition-based grazing management decisions.

Ways of changing grazing management decisions

- Consider combining allotments or pastures to provide more flexibility for livestock grazing decisions. This could be done by one operator or by many different operators, depending on the scale of the landscape and the degree of interest in working together.
- Consider multi-season rest in some areas.
- Consider managing riparian areas/pastures differently than upland pastures to ensure that the sustainability of grazing in each area is appropriate to the resources found there.
- Consider ways to have more flexible stocking rates so that grazing can more effectively adapt to the resource conditions. This might involve individual permittees organizing operations to have more flexibility, policy decisions by the Forest Service, or groups of operators working together to provide more flexibility across a larger area.
- Consider changing what kind of livestock grazes each allotment. Not every area is suitable for every type of livestock, due to topography and the type of vegetation needed for browsers or grazers. Managing the kinds of grazers can affect the diversity of vegetation in an area. Evaluating how the different kinds of grazers affect the sustainability of grazing in a given area may help clarify problems and provide innovative opportunities for solutions.
- Consider developing a grass bank or other forage reserve system. This could provide emergency forage in times of hardship, or opportunities to rest other areas following treatments, thus increasing the sustainability of grazing in the area long-term. This would also involve developing a system to administer it.
- Consider how to strategically use supplements (protein, for example, not hay) for livestock on the forest. Done right, this could help increase the benefit that livestock get from forage, especially when forage is dormant.

Ways to directly improve conditions for the benefit of both livestock and ecology

- Utilize native plant seed whenever possible on range improvement projects. Having native plants in an area improves the sustainability of the system since they are better adapted to local conditions.
- Actively manage vegetation for a healthy mix of successional stages (a range of ages in plant communities). This might include many different techniques with the goal of having a variety of different plant communities that provide resilience for the whole system.

Importantly, no one group is exclusively responsible for making positive changes. Most of these recommendations involve communication and shared decision-making between permittees, the Forest Service, and potentially other parties as well.

B. Monitoring Innovations

Ways to improve monitoring for understanding how to graze most sustainably

- Consider how to improve compliance monitoring (i.e. whether permittees and the Forest Service are meeting their contractual obligations).
- Develop monitoring (of ecological indicators, grazing implementation, livestock, etc) that helps improve grazing practice. This means involving permittees and others in designing and interpreting the results of monitoring, so that everyone understands how well different grazing management strategies work at achieving various goals.
- Use the results of monitoring as an opportunity to improve grazing management, whether that be through permittee choices, Forest Service decisions, or other ways. Monitoring is how we understand the changes in range condition created by different grazing management practices, so monitoring results provide a great opportunity to understand how to graze more sustainably.
- Consider using reference areas (ungrazed areas in otherwise similar conditions as grazed areas) to understand the ecological potential of an area and provide an important reference point for understanding which changes are related to livestock grazing and which may be due to other factors.
- Involve a diversity of parties in monitoring. This can bring more expertise, more capacity, and more funding to efforts to understand and increase the sustainability of grazing on Forest Service lands. Involving multiple interests may help ensure that issues of interest to many different public lands users are part of a larger monitoring strategy.

As with the other suggestions above, monitoring suggestions are simply a menu of possibilities. Some may be greatly needed in one area, but impossible or irrelevant in another area. In addition, a wide array of individuals and institutions could help implement monitoring suggestions. Nothing recommended here should be considered exclusively the responsibility of any one party.

C. Forest Service-Specific Strategies

- The Forest Service should explore the extent of flexibility it currently has to adjust grazing time, timing and intensity to on-the-ground conditions, and educate its staff about the full extent and benefits of exercising such flexibility.

- The Forest Service should build in flexibility when authorizing grazing to create opportunities to adjust grazing time, timing and intensity in response to on-the-ground conditions. This may include authorizing the longest possible season or the maximum possible Animal Unit Months (AUMs). This would increase flexibility to adjust the very specific grazing season, or specific number of livestock to meet resource objectives within a wide possible operating season. In creating this flexibility, the system must

build in accountability measures to ensure that flexibility does not undermine ecological sustainability.

- The Forest Service should consider using new or different indicators to make decisions about grazing management. For example, stubble height has been used as a key annual indicator for many years, but other indicators may be more useful in determining whether Forest Service allotments are being sustainably grazed.

- Forest Plan Amendments may include default standards, with an option for permittees to develop an alternate (more flexible) plan through multi-interest collaboration. Any alternate plan should include performance standards (an identification of specific ecological goals that must be met), rather than imposing design standards (specific grazing management tools like utilization). The use of performance standards can encourage flexibility and creativity in grazing management practices.

- The Forest Service should encourage "early adopters" to pilot and experiment with new grazing management practices. This would serve an educational purpose for those involved in the pilot, as well as for others interested in improving grazing management on public lands. Pilots should be closely monitored to determine whether the new grazing management practices are successful in promoting ecological sustainability, recognizing that it may take 3-5 years to see results. Pilot projects should include annual accountability (e.g., monitoring and adaptive management).

- Work to understand how other uses of Forest Service land, such as recreation, impact grazing sustainability, and how to address any related issues (for example, recreationists leaving gates open between pastures).

- The Forest Service should respond to and/or create opportunities for multi-party engagement in grazing management in ways that may lead to changes in:
  - National Environmental Policy Act (NEPA) decisions on grazing systems
  - Allotment Management Plan (AMP) revisions
  - (Timely) Annual Operating Instructions (AOI) development
  - Annual allotment monitoring (data collection and reporting, sharing and discussion of results)

D. Strategies External to the Forest Service

- Ensure that discussions about grazing management include other parties whose decisions influence the sustainability of grazing on Forest Service lands. This includes:
  - Coordination and joint grazing impact assessments with the Division of Wildlife Resources regarding elk and/or deer numbers on Forest Service lands.

- Coordination with the Bureau of Land Management to consider how to jointly increase opportunities for improving grazing management, particularly for permittees with both Forest Service and Bureau of Land Management (BLM) allotments.

- Livestock grazing and wildlife management decisions should not be made independently. Grazing and wildlife management decisions should pay special attention to recommendations and decisions that may lead to unsustainable or unacceptable levels of forage use on Forest Service lands, with particular focus on the cumulative impacts such decisions could make to the resource. All interests (grazing permittees, hunters and anglers, and interested members of the public) should be part of the conversation when grazing decisions are made through Allotment Management Plans (AMPs) and when wildlife management recommendations are made by the Wildlife Board's Regional Advisory Councils (RACs) to ensure that multiple values are integrated. Conversations across agencies, not tied to a specific decision, about how to improve coordination of grazing and wildlife management decisions to ensure long-term sustainability of the resource, are critical.

Tasha Creek, Fishlake National Forest

- Encourage operators to utilize existing programs and resources at Utah State University Extension, the Utah Department of Agriculture and Food, the Utah Small Business Development Centers, and others to identify ways to improve flexibility and sustainability of their operations.

- Encourage communication and collaborative work among all interested parties.

V. Additional Recommendations and Observations

[Relates to Objective 5 in Guiding Document]

The problem statement in the collaboration's Guiding Document suggests that "[b]uilding broad agreement among stakeholders at the principle level will provide context and a framework for addressing conflicts [related to grazing of domestic livestock on the three southern Utah Forests] at smaller geographic scales."

The collaboration members have agreed on recommendations and observations beyond identifying grazing management principles, practices and other strategies (Objective 5 in the Guiding Document, Sections III and IV in this final report) which they feel are necessary to

provide the full context and framework for addressing grazing management on the three southern Utah Forests.

Within this document are multiple recommendations which may be appropriate to incorporate into Forest Plan direction and individual allotment plan direction.

- Forests should be open and flexible to a diversity of grazing arrangements on the three Forests in southern Utah, with no particular percentage designated for any given type. Examples of different grazing arrangements include, but are not limited to:
    - Differences in time, timing and intensity
    - Grass banks
    - Reference areas
    - Multi-season and long-term rest
    - Voluntary non-use
    - Flexibility in species and class of livestock used

- Change in grazing management practices needs to be encouraged and supported by all stakeholders. Successful changes in grazing management practices will depend on people's willingness to change, as well as on policy directions that encourage or support change. The collaboration makes the following observations and suggestions about approaches that can encourage and support beneficial changes in grazing management practices:
    - Change needs a champion within the Forest Service.
    - Change needs a champion from the permittees.
    - Use the existing permit system to try out changes in grazing management practices.
    - Look for permittees and other parties interested in piloting innovations and help them succeed.
    - Success stories with individual permittees (or groups of permittees) can persuade others to make beneficial changes.
    - Workshops can be sponsored by trusted entities to raise awareness of what is possible with grazing management practice changes. There are multiple possible audiences – permittees, range managers, county agents, conservation groups, wildlife decision-makers. Workshop content can include grazing management principles, on-the-ground grazing management practices, and ecological indicators. Training materials can be developed collaboratively across interests, and consideration should be given to offering collaborative presentations.

Monroe Mountain, Fishlake National Forest

- Look for incentives for permittees that will motivate grazing management that results in more forage and improved land health.
    - The collaborative discussed elements of a potential new, valuable incentive program. Under this program, permittees could be certified as having "Blue Sky Allotments" in return for participation in initial training, implementation of experimental grazing management practices, and participation in monitoring to document improved range conditions. The program would have multiple goals: providing permittees with desired opportunities for management flexibility, engagement in and support for innovative grazing improvement practices by diverse entities with increased communication and trust; and an exploration of innovative ways to improve the sustainability of grazing on Forest Service lands in southern Utah.

- Decisions improve with transparency and input from diverse interests. Dialogue – face-to-face conversation in which the participants listen to diverse opinions with respect and an open mind – is an important tool for building trust. Workshops on collaboration and conflict resolution offered to all interests involved in grazing management issues would help build their capacity to work together.

- The collaboration acknowledges the potential limitations of Forest Service resources and capacity to facilitate, implement, maintain, ensure accountability for and monitor the effects of grazing management changes. We encourage the Forest Service, permittees and others to identify creative ways to provide the needed resources to accomplish these functions.

- Studies quantifying the direct and indirect benefits of a range of grazing management practices provide valuable information, especially at a large scale (100,000 acres or more).

- Technical assistance to ranchers should be increased. Ranchers as a group can benefit from education about grazing management principles and practices, as well as ecological indicators. Technical assistance to individual permittees can be helpful in identifying which grazing management practices are most relevant for site-specific conditions.

VI. Key Indicators of Ecological Sustainability, Economic Viability and Social Acceptability

A. General Statements about Indicators

A substantial amount of the collaboration's time was spent in learning together which ecological, economic and social measurements are meaningful and might change as grazing management practices change. The full group also established evaluation criteria to help

determine which indicators would be considered "key" for measuring changes related to grazing management practices on the three southern Utah forests.

Each member of the collaboration suggested possible measurements for each set of indicators (ecological and economic/social). The facilitators compiled the individual suggestions in one list and the full group discussed them until there was mutual understanding about each one. A smaller work group was then created for each set of indicators (one for ecological indicators and one for economic/social indicators). The work groups had intense discussions to narrow the list of potential indicators down to a few select "key" indicators. The work groups' suggestions for "key" indicators were presented to the full group and fully discussed before reaching consensus on the lists of indicators in the next two sections.

Winnowing the list of possible measurements of ecological, economic and social sustainability down to a few "key" relevant indicators was not an easy task. The collaboration members developed these basic principles about indicators to guide their discussions and to provide a context for use of the suggested key indicators by others in the future:

- The group's conceptual approach to developing key indicators (ecological, economic and social) followed these principles:
    - An indicator indicates. An indicator should measure *whether* there is an impact/change in that indicator due to a changed grazing management practice or implementation of some other recommended strategy, and *how much* of an impact/change.
    - The judgment of whether the impact/change is acceptable is a policy decision, which this collaboration consciously did not make.
    - Indicators should be framed in an impartial and neutral way.
    - Indicators need to be independently measurable. One needs to be able to tell objectively, with a repeatable method, whether there is a change in the indicator.
    - The group focused on selecting indicators that are likely to change if you change a grazing management practice or implement some other recommended strategy.

No one indicator alone is sufficient to reach a conclusion about sustainability.

Each set of indicators (ecological, economic and social) should be looked at as a whole. No one indicator is intended to have more significance than any other; but certain ecological indicators may be more relevant in certain settings.

- It is possible an indicator might change due to influences unrelated to grazing management, which reinforces the need to look at a suite of indicators. For example, weaning weights for calves and lambs are important indicators for ranch operations. A

change in breeds or genetics alone could influence weights, which has little connection to National Forest grazing management.

- There are a number of factors that do not change with grazing management practices, but which need to be accounted for when indicators are analyzed. For example, precipitation patterns and temperature can cause a downturn in ecological, economic or social indicators, regardless of grazing management practices.

B. Ecological Indicators

[Relates to Objectives 1 and 4 in Guiding Document]

After extensive research and discussion, the collaboration agreed on the following set of key ecological indicators to measure changes in ecological function and watershed health as related to grazing management principles and practices.

UPLAND
Gross visual indicators of sustainable upland grazing • Positive indicators – at extremes (e.g., a diversity of native flowers and grasses; aspen stands with diverse heights of trees) • Negative indicators – at extremes (e.g., a moist meadow with extensive bare soil; evidence of severe erosion)
Soil stability • Percent soil cover • Evidence of erosion • Soil surface susceptibility to erosion
Plant species composition (compared to rested or reference areas) • Simplified measure of plant diversity (count; species richness) • Significant presence of plant species associated with poor grazing management (e.g. stickseed, tarweed, pepperweed, any noxious species, etc.) • Full range of size classes of woody species present • Evidence of desirable plant recruitment, i.e. new (little) and medium size plants (bunchgrasses/forbs) • Evidence of seed-head maturation
Landscape composition and structure • Change in relative coverage of vegetation types

RIPARIAN
Gross visual indicators of sustainable riparian grazing • Positive indicators (e.g., stream banks with grasses overhanging and shading the creek; dense willow of multiple sizes) • Negative indicators (e.g., scattered old cottonwood and willow, with heavy browse of sprouts)
Percent bare soil (exclusive of rock)
Plant species composition (comparison to rested or reference areas) • Simplified measure of plant diversity (count) (species richness) – accounting for patch diversity • Significant presence of plant species associated with poor grazing management (e.g., Kentucky bluegrass, redtop, noxious) • Evidence of seed-head (including willow catkins) maturation • Full range of size classes of woody species present (site dependent) • Evidence of desirable plant recruitment, i.e. new little, medium, etc. plants
Riparian area structure and function • Percentage of streambank with overhanging vegetation (with channel type as context) • Abundance of deep-rooted vegetation (sedges, rushes, and woody species) • Trampling/shearing associated with hoofprints (depending on channel type and grazing method for restoration)
In-stream conditions • Pool depths • Sedimentation
In-stream water quality • Water quality • Macroinvertebrates

The above ecological indicators were identified as "key" based on the full collaboration's determination that they met the following criteria:

- *Objective* – The indicator can easily be framed in an objective way, without value judgments.
- *Easily observable* – Non-technical people can easily observe this indicator.

- *Measurable* – There is a simple, repeatable measurement method available. The evaluation documented whether the measurement was quantitative or qualitative, and whether the Forest Service currently collects data on this indicator.
- *Tied to ecological sustainability* – The evaluation documented whether the indicator is valuable in the short- and/or long-term, and whether it can be meaningful at different spatial scales (allotment and landscape scale).
- *Tied to Forest Service management* – The indicator responds to on-the-ground changes in grazing management; a change in the indicator could trigger a change in Forest Service management or a Forest Service action.
- *Practical* – The evaluation rated the cost of measuring the indicator (low/medium/high), and noted whether the Forest Service has the capacity to measure the indicator.
- *Can be communicated* – The indicator can be communicated easily from the Forest to the public, including ranchers.

The comparison of the key ecological indicators to the evaluation criteria can be found in Appendix 8.

The collaboration hopes that the key ecological indicators can and will be used by various interests – the Forest Service, permittees and other interested entities – to document ecological conditions on the three southern Utah forests. A separate work group, comprised of scientific experts, identified suggested "simple methods" that can be used to measure each key ecological indicator. A handbook of suggested "simple methods" developed by members of the collaborative can be found in Appendix 9. This provides references and links that can be used to more fully understand and utilize some very specific monitoring techniques.

At the request of the group, the Forest Service participated as a technical expert in the identification of "simple methods." The collaboration understands that the Forest Service may not be able to take administrative actions based solely on data collected by non-Forest Service personnel. However, the Forest Service has stated that key ecological indicator data collected by permittees and other interested entities can encourage problem-solving conversations between the Forest Service, permittees, and other interested parties, and help the agency set priorities for where and how to focus its staff and data collection efforts within the 3.6 million acres of southern Utah forests.

C. Economic/Social Indicators

[Relates to Objectives 2 and 3 in Guiding Document]

The collaboration members acknowledge that livestock grazing on Southern Utah Forest lands represents an important economic and social contribution to rural communities and counties.

The collaboration did not separate economic and social indicators, feeling that they were often inter-related. After extensive discussion, the group agreed on the following set of key

economic/social indicators to measure changes in economic sustainability/ viability (Objective 3 in the Guiding Document) and social sustainability/local customs and culture (Objective 2 in the Guiding Document) as related to grazing management principles and practices.

1. Investment in Grazing Practices
Dollar value of time, capital and other investments (e.g., short and long-term infrastructure, monitoring, land improvement projects) related to grazing management changes on Forest Service land / allotment by • Permittees, • Forest Service, and • Other entities
Total pounds of meat production / acre / allotment (5-10 year average)
2. Opportunities to participate in livestock grazing programs on Forest Service lands
For Permittees • Number of individual permits and Animal Unit Months (AUMs) per permit by district • Permitted AUMS by month by district • Grazing use reported by district by month
For Other Entities • Identification of programs and partners engaged in grazing management arrangements by district, e.g.: o Utah Division of Wildlife Resources (UDWR) o Conservation organizations o Utah Dept. of Agriculture's Grazing Improvement Program (GIP) o Watershed Restoration Initiative (WRI)
3. Diversity of grazing management arrangements and public involvement that reflects a broad range of societal values
Number and acreage by district and year of diverse grazing management arrangements, including but not limited to: • Multiple allotments combined into a single system • Range improvements • Changing kind and class of livestock • Rest-rotation systems • Deferred rotation systems • On-off systems • Non-use • Closed areas • Grass banks

Basis of (NEPA) / administrative appeals / formal objections of Forest Service grazing management decisions
Number of Forest Service decisions made annually that have participation from multiple stakeholder interests (Forest Service, permittee and others). Count to be made by Ranger District, broken down by these four decision types: • National Environmental Policy Act (NEPA) analysis leading to decisions on grazing systems • Allotment Management Plan (AMP) revisions • Annual Operation Instruction (AOI) review • Annual monitoring (collection of data, report out of the findings, and discussions about the results and implications for future management)
4. Community/County-level economic impact of public lands grazing
Average expenditures per "cow unit" (1 cow/year or 5 sheep/year) per county by ranchers who use public land. *[This indicator would likely respond only to large-scale changes in grazing management on the National Forests.]*

The above economic/social indicators were confirmed as "key," based on a sub-group's determination that they met the following criteria:

- *Objective* – The indicator can easily be framed in an objective way, without value judgments.
- *Easily observable* – Non-technical people can easily observe this indicator.
- *Measurable* – Publicly accessible data on this indicator are currently collected by someone, not necessarily the Forest Service. The evaluation rated the cost and ease of measuring the indicator (low/medium/high).
- *Tied to grazing management* – The evaluation documented whether the indicator is valuable in the short- and/or long-term, and the scale at which data are collected (individual operation, county, forest, region, national).
- *Tied to management* – The indicator responds to on-the-ground changes in grazing management; a change in the indicator could trigger a change in Forest Service management or a Forest Service action.

Left Fork Huntington Creek willows, Manti La-Sal National Forest

The comparison of the key economic/social indicators to the evaluation criteria can be found in Appendix 10.

VII. Lessons Learned

Each collaboration participant and the co-facilitators were given the opportunity to submit their reflections on the collaborative effort. These "lessons learned" were not reviewed or altered beyond a spelling and grammar check, and have been included verbatim below.

Ponderosa pine and grasses, Manti-La Sal National Forest

- Anytime a large group representing many diverse interests, backgrounds, training, and experience comes together, the process will be (almost by definition) long and laborious. There always seems to be a period of time at the beginning where each participant is guarded in their participation, skeptical of the outcome, and with little or no trust of their fellow members. However, with skilled, patient facilitation, the group will come together, find ways to build trust and bond into a cohesive unit that gains speed as the process continues. Just about the time that such a group is hitting its productive stride, the mission has been accomplished and it is time to disband. It is my experience that the relationships last far into the future and working friendships and partnering continue to occur.
- All of the information generated by the team is available in any range management textbook, Cooperative Extension Fact Sheets or handbook. Until it has been vetted by a group such as ours, it is sterile and without life. A group such as this can boil the discussion down to simple, straightforward, explanations and identify those "key" issues that drive the discussion and consequent actions. This is truly one of the great strengths of composing a group such as ours.
- The old saying that, "People in leadership positions must take the initiative and lead" was demonstrated here. Commissioner Blackham and Director Styler should be commended for their proactive approach to the issue of sustainable grazing on southern Utah forests, and their willingness to create a broad-based approach to the issues.
- Whenever such a group as ours is convened, there is no substitute for highly skilled, patient, and strong facilitation if consensus is to be the process and a valued, workable product the result.
- The economic activity associated with the livestock industry is critical to rural communities and counties.
- I was encouraged by what appeared to be sincere interest in grazing management principles that can maintain/improve resource health.
- Big game AUMs now exceed livestock AUMs on some USFS lands in Utah—this is important to resource health because it is difficult to control time, timing, and intensity of grazing with wildlife.

- Given the economic condition of the country, we need to create greater economic wealth from our USFS lands while enhancing productive capability and resource health—make the pie bigger.
- The rules, policies, and regulations of the federal land management agencies stifle innovation and creative management—incentive based stewardship with accountability is the preferred alternative.
- The cost and effort required in making management decisions on public land is a barrier to progress.
- Federal land management has become a political football focused on a scarcity mentality and single uses. We can change that if we focus on abundance and multiple use.
- When members of a collaboration group realize the value of actually working as "one" in purpose, then the sideboards start to come down and the opportunity for success is increased.
- Understanding occurs when a person is more interested in the views of others than their own.
- When people are willing to risk their positions for the benefit of collaboration, then progress can be made.
- There is broad support for Forest Service acknowledgment of the validity of
    - independently-gathered, objective field data,
    - reference areas,
    - diverse stakeholder involvement in how livestock (as well as wild ungulates) use these forests, and
    - flexibility (with accountability) for grazing operations.
- A lesson relearned: consensus can be achieved.
- A large amount of collaborative work can be achieved within relatively few meetings with professional, neutral facilitation.
- It is critical for all involved to have a clear understanding of expectations and well-defined sideboards to operate within.
- A third party neutral facilitator was critical in moving beyond positions to understanding interests.
- A third party scribe was critical in recording group discussion, points of concern and agreement, and preparing reports.
- This process helped to better define the problem, which lead to better understanding by all involved, and a means for diverse interests to view the landscape through a common lens.
- I think that it was a good experience where all different kinds of opinion could get together and come to an agreement.
- A successful collaborative process is not an efficient use of time. This does not reflect badly on the process or on our facilitators. On the contrary, it is necessary to take the time needed for all viewpoints to be heard and considered.
- Our popular culture likes to boast of "win-wins." I think that true win-win outcomes, where all parties achieve or receive everything they want, are extremely rare. The best

outcome of a collaborative process among groups with disparate goals is "good enough – good enough."

- Very few things are as simple as they might appear to be at first glance.
- The value of an interactive venue. When one can hear, first-hand, the concerns and wishes of those who are otherwise perceived as "on the other side of the issue," it makes it much harder to reject views when they don't align with your own. The personalization of an issue makes a huge difference. That said, the positive chemistry that can come from collaborative efforts such as this could be easily lost were members of the group not willing to abide the basic rules of conduct, especially that of listening respectfully to others whose ideas are (initially at least) very much at odds with your own. This would suggest that careful consideration of who is to participate is no small matter.
- The power of consensus. The requirement that all substantive decisions be made by consensus seems, in retrospect, a key element in the group's success. This is because consensus frequently requires that some members of the group soften or back off of their original positions on an issue in order for the group as a whole to move ahead. Whether it is openly acknowledged or not, others see this as an important gesture. Each time consensus is reached it is rightfully perceived as a victory for the entire group, not just the individual. It seems to me that these collective victories, made possible only by the good will of individuals, were a vital part of building the confidence and momentum of our group over time.

Tasha Creek, Fishlake National Forest

- The field trip. This event was a key factor in building trust and understanding within this group. It provided greater opportunity for unscripted interactions than was ever possible in our regular meetings. It is one thing to debate the virtues of one type of grazing management strategy over another in a conference room, and quite another when standing in the middle of a FS allotment. The field trip also allowed individuals to demonstrate their personal knowledge of, and attachment to, the rangelands that we were all attempting to find ways to improve and sustain. Once again, this circles back to the value of promoting familiarity and respect among the members, in addition to finding ways to expose shared values.
- The opportunity to make a difference. I'm inclined to believe that most people involved in a collaborative process such as ours would really like an opportunity to be part of a process that, in the end, helps to solve real problems and has a lasting impact. This group exhibited more "creativity" and thinking "outside the box" than I would have predicted in the beginning. Examples include: (1) the idea of promoting better range

management by finding ways to reward permittees for good stewardship, including the opportunity to propose and implement "experimental" grazing strategies of their own design on FS lands or (2) the creation of "Blue Sky Allotments" in which a few willing ranchers would be given special training and technical assistance in order to develop model grazing operations that could demonstrate the benefits of grazing management change to the larger community of livestock producers on FS lands. One critical determinant of the creative effort, I believe, was the willingness (even encouragement) of the FS representative in this collaboration to entertain new ways of approaching old issues. Without that, I suspect that few genuinely new ideas would have come out of this group.

- The essential role of facilitation. This whole endeavor could easily have run off the rails at several points in our deliberations, given the divergent and deeply held belief systems that sometimes separated the committee members. This danger would have existed even if all the individuals were committed to respectful dialogue. The skill of the facilitators in heading off counter-productive exchanges as well as recognizing and encouraging opportunities for productive dialogue was decisive. It made the difference between having a group that produced a fairly pedestrian report and one that actually has the potential to break important new ground.
- It's all about relationships – it's all personal. Each individual participant was open to hearing other perspectives and worked hard to reserve judgment until all information had been presented. This mutual respect and focus on building working relationships across interests is what made the "difficult conversations" possible.

Biological soil crust and native vegetation; Bramble property, Garfield County

- Collaboration requires courage. The co-conveners demonstrated courage by hosting the conversation and ensuring that all perspectives were included. The collaboration participants demonstrated courage by coming to the first meeting, many of them having never participated in this type of process before. The participants continued to demonstrate courage as their constituencies questioned the value of dialogue throughout the year. Co-conveners and participants will continue to demonstrate courage as they educate others about the consensus results and begin to implement them.
- "Love of place" is the basis for finding common ground. Each collaboration participant has a deep connection with the landscape found on the three southern Utah forests and wants to support its long-term ecological health. Confirming this common value, both through discussion and in the field, allowed the group to move beyond impasse.

- Consensus is a magical thing. Consensus is a product – after a year of "frank and open" discussions, the group reached consensus; they reached agreements that everyone can live with and will help to implement. Striving for consensus is a process – everyone commits to keep suggesting potential solutions until an agreement is co-created that satisfies everyone's concerns. Finally, striving for consensus is a way of being – with practice, the skills of active listening, creative thinking and searching for common solutions become habit.
- I was surprised to see that people coming from such diverse backgrounds and fields of expertise would take such interest and show such passion on all aspects of sustainable grazing, and yet work together to come up with ideas to ensure that responsible grazing continues for generations to come on the three forests.
- It was interesting to me to learn the principles of good grazing, Time, timing and intensity. And especially the results that can be achieved by applying these principles.
- The whole collaboration process I found to be very interesting and useful, the brainstorming techniques and all the facilitated discussions helped me to think of new ideas and aspects about grazing.
- Honestly I never thought I would see trust play such a critical factor in building relationships among opposing viewpoints. We talk about it all the time, but until you see an environmentalist and a guy in a big cowboy hat shake hands and call each other friends because they trust each other, you really don't understand the meaning of the word.
- I never thought people could get so passionate about beavers. The funny thing is, that passion changed how I looked at those funny little varmints.
- There is extraordinary value in the opportunity to connect with others as complex, real people. Developing friendships, laughing or commiserating about common experiences, and finding the humanity in everyone, regardless of the viewpoint or issue they represent, contributed greatly to the success of this collaborative.
- Everyone benefited from the chance to learn together, and from one another. Not only did everyone learn new facts, or new ways of thinking about issues, they also learned to respect the experiences and knowledge of others with differing viewpoints. It made a tremendous difference to the outcome of our process that we were given enough time to really learn from one another.
- The willingness of different collaborative members to participate on sub-teams between meetings was critical to our ability to work through the many technical tasks that the group was asked to do.
- My belief in the necessity of good facilitation and sound process was affirmed.
- I will reserve judgment on whether our time was well spent in this effort. So far so good, but the ideas and consensus encapsulated in the collaborative's report will have little meaning unless someone carries the ball further. I want to observe a notable change on the ground that ties back to our efforts. I will be watching.
- In retrospect, I would have liked to spend some time exploring a few more specific examples (allotments, the people involved, the things they do, the controversies and/or triumphs). We got to do this with Dennis Bramble's land and the Nevada field trip to

some extent. Most discussions were about generalities. I understand this was of necessity, but diving into the details with a few case studies may have enabled the group to better focus problems and recommend more meaningful solutions. Perhaps that could be a next step?

- Favorite quote: "If you can tell the truth without blaming someone, you can be a leader" - Allen Rowley
- Favorite quote: "Simplicity, flexibility, accountability" - Mary O'Brien
- Favorite quote: "The best fertilizer on the land is the footprint of the owner" (a south American saying) - Chuck Gay
- The experience reinforced for me how ranchers need to be good caretakers of the land – lots of people are watching.
- The experience was frustrating at times, but it was really interesting, and I learned a lot, especially about quaking aspen.

Upper Valley Creek, Dixie National Forest

Photo credits:
Dennis Bramble, Jeremy Christensen, Chuck Gay, Morgan Heim, and Mary O'Brien

Collaborative Group on Sustainable Grazing
for U.S. Forest Service Lands in Southern Utah

APPENDIX 1

Collaboration Participants:

Val Jo Anderson
Brigham Young University

Byron Bateman[1]
Sportsmen for Fish and Wildlife

Dennis Bramble
Private Landowner
Professor Emeritus, University of Utah

Dave Eliason
Utah Cattlemen's Association

Chuck Gay
Utah State University

Shane Green
Natural Resources Conservation Service

Bill Hopkin
Utah Grazing Improvement Program

Tom Jeffery
Wayne County Commissioner

John Keeler
Utah Farm Bureau

Matt Mickel
Utah Wool Growers Association

Mary O'Brien
Grand Canyon Trust

Rory Reynolds
Utah Department of Natural Resources

Casey Snider
Trout Unlimited

Joel Tuhy
The Nature Conservancy

Conveners:

Leonard Blackham, Commissioner
Utah Department of Agriculture and Food

Mike Styler, Director
Utah Department of Natural Resources

Technical Advisors (not involved in collaboration decision-making):

Allen Rowley
U.S. Forest Service / Fishlake and
Manti-La Sal National Forests

Julia Haggerty
Headwaters Economics, Bozeman, MT

Facilitators:

Michele Straube
Environmental Dispute Resolution Program
Univ. of Utah, S.J. Quinney College of Law

Lorien Belton
Community-Based Conservation Program
Utah State University

[1] Attended first meeting only

Ecological Indicators Work Group:

- Val Anderson
- Dave Eliason
- Shane Green
- Bill Hopkin
- Matt Mickel
- Mary O'Brien
- Allen Rowley
- Joel Tuhy

Field Trip Logistics Work Group:

- Bill Hopkin
- Mary O'Brien
- Allen Rowley

Ecological Indicators "Simple Methods" Work Group:

- Val Anderson
- Chuck Gay
- Shane Green
- Chad Horman (USFS, assigned by Allen Rowley)
- Mary O'Brien

Economic/Social Indicators Work Group:

- Val Anderson
- Julia Haggerty (Headwaters Economics)
- Bill Hopkin
- John Keeler
- Mary O'Brien
- Rory Reynolds

Collaborative Group on Sustainable Grazing
for U.S. Forest Service Lands in Southern Utah

APPENDIX 2

Collaborative Group on Sustainable Grazing for Southern Utah Forest Service Lands

(Approved at 3/16/12 Collaboration Meeting)

Problem Statement:

As specifically named in the Multiple Use and Sustained Yield Act of 1960, grazing of domestic livestock is a valid use of National Forest System lands. It is, however, a permitted activity that has come under increasing scrutiny with some advocating for an end to public land grazing, others seeking major changes in grazing practices, while livestock producers and others have sought to maintain a way of life and economically viable operations. On the national forests of Southern Utah[1] the level of conflict and potential for polarization appears to be building.

Productively working through this conflict will require an understanding of the interests of livestock producers, environmental and sportsmen's organizations, and county, state and federal government. Solutions must be founded in credible science and be ecologically, socially, and economically sustainable. Building broad agreement among stakeholders at the principle level will provide context and a framework for addressing conflicts at smaller geographic scales.

Goal:

Develop consensus agreement on grazing management principles and practices for Forest Service lands in Southern Utah that provide for **ecological** sustainability, are **socially** acceptable, and **economically** viable. Participants in the collaborative agree that livestock grazing is a valid use of National Forest System lands and the focus of the collaborative is on identifying how these lands can be sustainably grazed.

Objective 1:

Define and agree upon the key indicators of ecological sustainability/watershed health. While the three aspects of sustainability are interconnected and inseparable, we recognize ecological sustainability as the lynch pin that establishes the sideboards within which social and economic sustainability can be achieved.

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[1] The three Southern Utah national forests referred to are the Manti-LaSal, Fishlake, and Dixie.

Objective 2:

Agree on what "social sustainability" means in the context of domestic livestock grazing on the Southern Utah Forests. In meeting this objective the group will recognize the importance placed on local customs and culture and identify opportunities to sustain them. This objective will likely be met in two phases. Initially the collaborative would focus on a qualitative assessment of social values, and develop guidelines for social sustainability and the principle level. Subsequently, if deemed necessary and sufficient resources can be acquired, a scientifically based "values study" may provide information to further inform decisions and practices that support social sustainability.

Objective 3:

Agree on what "economic sustainability" means in the context of domestic livestock grazing on the Southern Utah Forests. The intention of this objective is to recognize grazing practices that provide for ecological sustainability must also be economically viable for the livestock producers. Identification of principles and practices that enhance production and/or reduce management costs are critical to achieving economic sustainability.

Objective 4:

Agree on affordable methodologies to establish baseline conditions and monitor changes in key indicators of ecological, social, and economic sustainability in the context of grazing on the Southern Utah Forests. A key to the success of the collaborative effort is an ability to track change over time in ecological, economic and social conditions and make adjustments where indicated.

Objective 5:

Determine approaches including, but not limited to, grazing management principles and practices that contribute to ecologic, social and economic sustainability of grazing.

Process:

To be successful, this collaborative process must be led and directed by a party or entity trusted by the collaborative participants. It is recommended that Mike Styler, Director of the Utah Department of Natural Resources and Leonard Blackham, Commissioner of the Utah Department of Agriculture and Food co-convene the collaborative.

The collaborative should be of manageable size but include representatives of the key stakeholders with interests in the use and health of public lands. The USFS must be willing to provide information on policy/regulations and provide historical and current data relevant to the resources. The USFS will be asked to serve as a technical resource to the collaborative process, but will not be an official collaborative participant.

Proposed List of Collaborators

While it is important the collaborative include representatives of the key stakeholders with interests in the use and health of the National Forests in Southern Utah, the characteristics of the individual participants is critical to the success of the effort. Each participant must have the interest and time to participate and:

- Have technical expertise to inform the dialogue
- Be viewed as credible by the stakeholder groups they represent and able to clearly articulate their interests
- Open to alternative approaches to meeting their interests and committed to the collaborative process

Collaborative Group on Sustainable Grazing
for U.S. Forest Service Lands in Southern Utah

APPENDIX 3

Operating Protocols
(Approved at 3/16/12 Collaboration Meeting)

Operational Protocols outline the expectations and understandings of the group purpose, products, roles and responsibilities, decision-making and other important process components.

1. **Collaboration Foundation**

   a. **Co-Sponsors:** Utah Department of Natural Resources and Utah Department of Agriculture and Food.

   b. **Facilitation:** A neutral, third-party facilitator with a track record of having successfully facilitated multi-stakeholder collaboratives.

   c. **Scope and focus:** Generate findings and consensus agreement where possible on grazing management and other related principles and practices for Forest Service lands in Southern Utah that provide for ecologic sustainability, are socially acceptable, and economically viable. The focus is on how these lands can be sustainably grazed.

   d. **Legal, policy, and procedural parameters:** The Collaborative process, which seeks to identify and recommend grazing and other principles and practices, is not subject to the National Environmental Policy Act, because the Collaboration's recommendations do not constitute decision documents. The Collaborative process, co-convened by two state agency directors, is not a Federal Advisory Committee Act charter process. The US Forest Service will serve as a technical resource to the collaborative process, but will not be an official collaborative participant. In addition, the Collaboration process does not represent a formal consultation with the U.S. Fish and Wildlife Service and is, therefore, not subject to provisions of the Endangered Species Act.

   e. **End Product:** The Collaboration's Findings may be used in developing grazing management plans and implementing on-the-ground projects that facilitate sustainable grazing. The spectrum of views among Collaborative participants, along with the recommended approaches, will be noted in the Findings Report, including areas of agreement and disagreement.

2. **Collaboration principles.** Collaboration participants agree to the following principles:

    a. **Informed Commitment:** Confirm willingness and availability of appropriate agencies and organizations to participate in good faith with open mindsets to new perspectives. Alternates to Collaborative participants will not be used.

    b. **Group Autonomy:** Engage with all participants in developing and governing process, including choice of consensus-based decision-making; seek assistance as needed from impartial facilitator/mediator accountable to all parties.

    c. **Informed Process:** Agree on how to share information among participants; ensure relevant information is accessible in a timely manner and understandable by all participants.

    d. **Accountability:** Participate in process directly, fully, and in good faith; be accountable to the process, all participants and the public.

    e. **Openness:** Ensure all participants are fully informed in a timely manner of the purposes and objectives of the process; communicate agency authorities, requirements and constraints; uphold confidentiality rules and agreements.

    f. **Implementation:** Ensure recommendations are implementable; ensure parties will take steps and obtain resources necessary to implement agreements.

3. **Methodology and scientific accuracy.** The Collaboration shall insure the professional integrity, including scientific integrity, of the discussions and analyses in its findings. The Collaboration shall identify any relevant methodologies and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the Findings (if any).

4. **Quorum requirement.** There is no quorum requirement. The participants present and active at a given meeting have the authority and permission of the group to continue to work and make decisions and recommendations on behalf of the group. Participants cannot designate replacements to sit in for them if they were unable to attend meetings; however, those who are not present will attempt to provide their input (via documented meeting notes or other electronic mechanisms or through communications with other Collaboration participants) before a given meeting.

5. **Roles and responsibilities**
    a. **Collaboration participants:** The role of Collaboration participants is to bring their unique perspectives to the table, and to work collaboratively with other interests to develop recommendations for sustainable grazing on Southern Utah Forest lands. Participants are responsible for being informed about the issues, contributing useful and accurate information, and serving as an accurate and objective information conduit with others who have similar interests.

b. **Facilitation Team:** The facilitation team consists of Michele Straube, Environmental Dispute Resolution Program (U of Utah, S.J. Quinney College of Law) and Lorien Belton, USU Community-Based Conservation Program. The Facilitation Team supports the participants, maintains the integrity of the collaborative process, and facilitates communication about the process among Collaboration participants.

6. Ground Rules

a. Treat one another with civility, both within and outside the meeting environment
b. Operate with integrity
c. Maintain confidentiality
d. Respect each others' perspectives- consider issues from others' points of view
e. Focus on the future rather than belaboring issues of the past. Recognize and learn from the past, acknowledge the present, and recognize where we want to be in the future
f. Support an open process
g. Be outcome oriented
h. Participate actively
i. Silence cell phones and other electronic devices during meetings

7. **Decision-Making Process:** Decisions will be made by consensus whenever possible. The US Forest Service will not participate in the collaboration's decision-making. Consensus has been reached when everyone agrees they can accept whatever is proposed after every effort has been made to meet the interests of all participants. Participants have both the right to expect that no one will ask them to undermine their interests and the responsibility to propose solutions that meet everyone else's interests as well as their own. If consensus cannot be reached, areas of divergence, along with the reasons for the divergence, will be documented in the Findings.

8. **Communications**

a. **Confidentiality:**

i. **Participants:** Participants will respect the confidential nature of any proprietary information or any other information participants identify as confidential.
ii. **Facilitation Team:** The Facilitation Team will not include confidential/ proprietary information in Collaboration documentation. Conversations/ communications held in caucus with individual participants or participants with similar interests will be considered confidential unless otherwise identified by the participants in those conversations/communications.

b. Describing the Collaboration process to others: Participants agree that if they speak to other people about the Collaboration process, they will share accurate and objective information, relying on meeting summaries and other interim products for factual statements. Any and all opinions will be clearly identified as the speaker's own opinions, and due consideration will be given to the effect that an individual participant's comments

may have on other participants and the process. No individual participant is authorized to speak for the collaborative group.

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APPENDIX 4

Summary of Key Issues from Meeting 1
As Reviewed December 15, 2011 (Meeting 2)

- **Economic:** Some potential ways to improve grazing long-term, like improving fencing, have such high installation and long-term maintenance costs that they are often avoided, resulting in poor long-term return on investments (or no investment, so no return).

- **Economic:** Solutions, especially that include monitoring, are not always affordable for ranchers or others who need to implement them.

- **Economic:** All the costs and benefits of grazing on National Forests are not easily understood and have not been quantified (e.g., ecosystem services, the relative value to local economies of different multiple use options (mining, wildlife viewing/hunting, grazing, camping/recreation, etc.), benefits of livestock-related improvements to other users, etc.).

- **Economic:** Ranchers have a personal financial stake in this process, in a way that puts them more financially at risk from changes to grazing than other stakeholders in the process.

- **Economic:** Any analysis of costs and benefits should look at both use and non-use of Forest Service lands.

- **Economic:** The current situation lacks focus on economic efficiencies and sustainability at the landscape scale.

- **Social:** There is a gap between the role many feel the Forest Service should be playing and what they are currently doing (e.g., not enforcing existing regulations, not incentivizing good grazing management, and not being transparent about management decisions).

- **Social:** The Forest Service currently has inadequate administrative flexibility to address possible changes in rest and timing of grazing.

- **Social:** The public does not fully understand the costs and benefits (positive and negative impacts) of public grazing, but exerts a strong social force on how problems are talked about.

- **Social:** There is a potential conflict between the desires of national and local constituencies re: appropriate uses of public lands.

- **Social:** Ranchers and local community members are concerned that a focus on grazing practices may endanger their livelihoods or way of life that they value.

- **Social:** All Forest Service land that is currently accessible by livestock is scheduled or leased to be grazed – none is conserved long-term or for permanent non-use. This seems unsustainable to environmental interests.

- **Social:** Broader focus on land health is lacking because different causes champion individual components or specific land uses rather than bigger-picture resource potential.

- **Ecological:** Over time, the change from browsers to grazers has changed the vegetation (e.g., resulting in greater impacts on grazed grasses than historically)

- **Ecological:** Riparian areas often have multiple problems related to grazing (e.g., a lack of new willow, cottonwood and aspen shoots that help create future generations or larger plants).

- **Ecological:** Some riparian and upland areas are becoming increasingly simple (not many different species of plants), so are able to support less complex wildlife/ecosystems.

- **Ecological:** Sagebrush and other upland communities are suffering from a lack of healthy native understory and are often invaded by plants like cheatgrass and pinyon/juniper trees.

- **Ecological:** The conditions of forest ecosystems (riparian, sagebrush, etc) vary widely, and it is difficult to understand the differences in site potential, trends, etc.

- **Ecological:** Grazing can alter streams in ways that impact water quality (e.g., increased sediment, temperature (from changing the streams' shape/depth/shade), nutrient loads, dewatering due to diversions).

- **Ecological:** The hydrologic functioning of streams has changed (e.g., problems like eroding banks and the shape of the stream channel make it difficult for streams to naturally flood and contribute to the health of floodplains).

- **Ecological:** Soil erosion in the past has reduced site potential (the ability to completely return to pre-erosion conditions).

- **Ecological:** Accelerated erosion continues in some riparian areas and upland areas due to grazing. This is related to having too much bare ground (lack of ground cover), and in riparian areas it is also related to streambank stability.

- **Ecological:** Wildlife (focus on browsers/grazers) use the same areas as livestock, and it is difficult to differentiate between the impacts of wildlife and livestock.

- **Ecological:** Livestock need adequate forage (quality and quantity) and accessible stock water.

- **Ecological:** Although native plants are preferable for ecosystem balance, the best forage, or the best way to address immediate ecosystem problems, may sometimes involve non-native plants.

- **Ecological:** Solutions may require looking more broadly at landscape-level range health, rather than focusing exclusively allotment-by-allotment as the current system does.

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APPENDIX 5

During the Sustainable Grazing collaboration for the three National Forests in Southern Utah, the group struggled with approaches to define where and what the specific ecological problem areas were. It was suggested we start with an informal survey of local Forest Service staff to define the problems. The table below is a first draft to describe the problem and why we think it is a problem, describe what solution space there may be, and give some sense of priority to the problem.

Hotspot (Plant community or bio-physical setting with re-occurring or frequently observed problems across the respective Forest.)	Natural Resource Conditions Observed	Why the Conditions are an Issue	Are there management changes that may have a high chance of producing better results?	Priority to address based on any negative natural resource impacts	Ease of implementation of mgmt changes
Riparian areas on flatter/not steep streams with fine textured soils. Typically broader valley bottoms with very little large rock to define the stream banks and stream bottom.	Lack of tall sedges, riparian area dominated by Kentucky bluegrass and dandelions instead of sedges	• Lower biomass/forage production • Less capable of trapping sediment during floods • Faster runoff and less ground water recharge • Loss of habitat for birds and insects. • Loss of bio-diversity • Loss of productivity	Yes ✓ Shorter grazing period ✓ Longer rest between grazing ✓ Exclusion fences	High	Moderate if fences are prescribed they can be difficult to implement.
	Lack of vegetation (sedges) overhanging the stream	• Less shade and hotter water temperatures that can kill trout and lead to algae blooms • Less leaf material and insects to feed fish populations • Banks are more susceptible to erosion and general slumping and alteration	Yes ✓ Shorter grazing period ✓ Longer rest between grazing ✓ Exclusion fences		

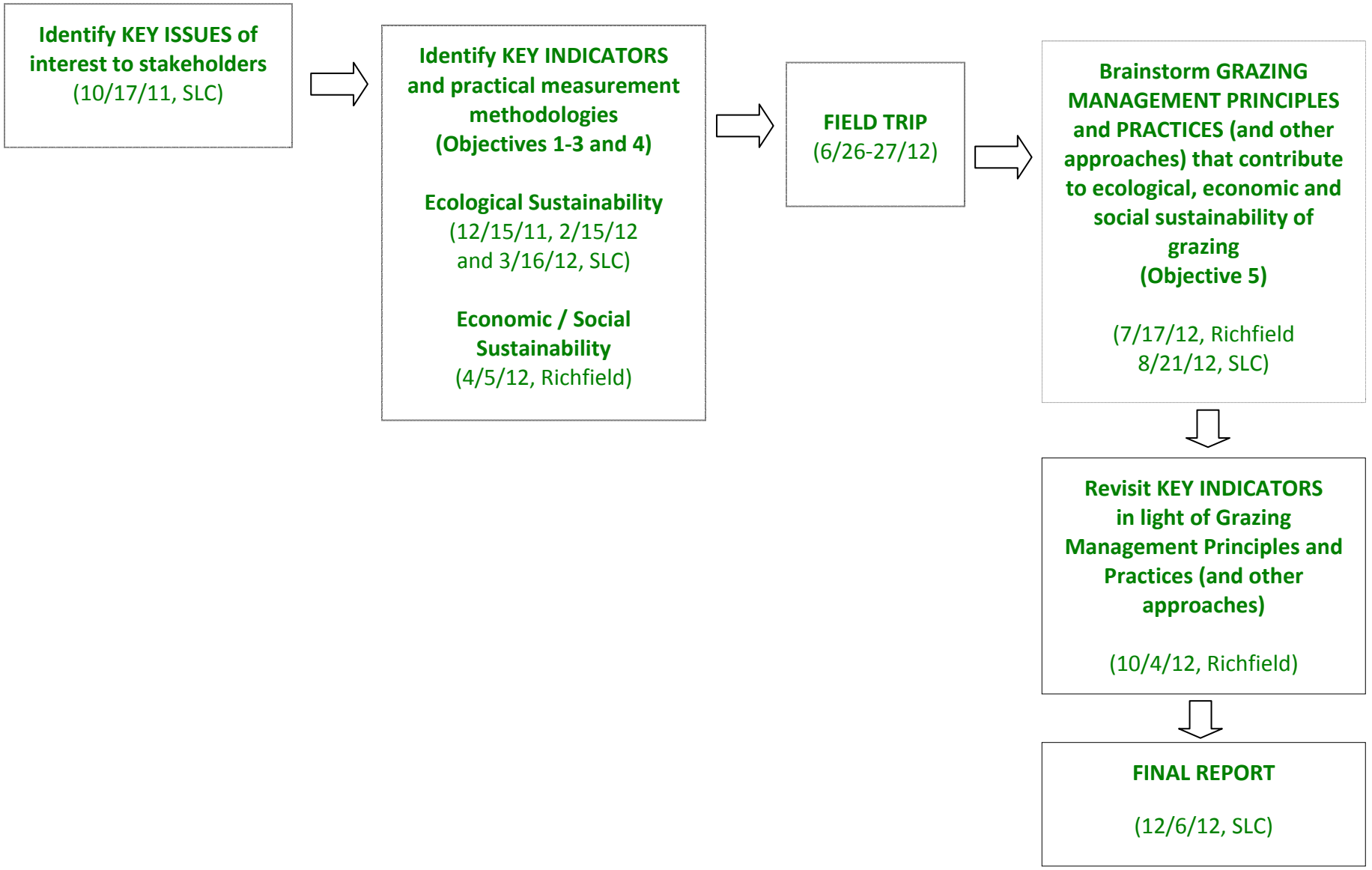
Hotspot (Plant community or bio-physical setting with re-occurring or frequently observed problems across the respective Forest.)	Natural Resource Conditions Observed	Why the Conditions are an Issue	Are there management changes that may have a high chance of producing better results?	Priority to address based on any negative natural resource impacts	Ease of implementation of mgmt changes
		espec. during normal spring high flows.			
	Lack of woody species especially cottonwood willow and to some extent aspen. In some cases a total absence where we expect to see woody species, more frequently older/larger individuals with extensive evidence of browsing are present and there are no new sprouts or new individual plants present in at least the 1-4' size class.	• Less capable of trapping sediment during floods • Faster runoff and less ground water recharge • Loss of habitat for birds and insects. • Loss of bio-diversity • Loss of productivity	Yes ✓ Shorter grazing period ✓ Longer rest between grazing ✓ Exclusion fences ✓ Change the season of use, avoiding August-September		
Riparian areas associated with wet meadows, springs and seeps	Lack of tall sedges, dominated by Kentucky bluegrass and dandelions instead	• Lower biomass/forage production • Faster runoff and less ground water recharge • Loss of habitat for birds and insects. • Loss of bio-diversity • Loss of productivity	Yes ✓ Shorter grazing period ✓ Longer rest between grazing ✓ Exclusion fences	High	Low often these are small locations widely scattered across the landscape which leads to many exclusion fences
	Lack of woody species especially cottonwood willow and to some extent aspen	• Loss of habitat for birds and insects. • Loss of bio-diversity • Loss of productivity			

Hotspot (Plant community or bio-physical setting with re-occurring or frequently observed problems across the respective Forest.)	Natural Resource Conditions Observed	Why the Conditions are an Issue	Are there management changes that may have a high chance of producing better results?	Priority to address based on any negative natural resource impacts	Ease of implementation of mgmt changes
Grasslands and Sagebrush grasslands on less than 20% slopes (Steeper slopes do not seem to have the same conditions observed.)	Lack of diversity in the grasses and forbs. Lack of cool season bunchgrasses	• Loss of biomass production/forage • Loss of habitat for birds, insects, and small mammals. • Loss of bio-diversity • Loss of productivity	Yes ✓ Shorter grazing period ✓ Longer rest between grazing ✓ Avoid early season (May - July) grazing ✓ Changes to stocking rates	Moderate Important when areas of over 2 acres are identified, or the area is next to another high value area.	High – existing fences and infra structure can work. Adjustments in the timing and rest may be adequate for change.
	Abundance of bare ground	• Long term loss of productivity			
	Abundance on invasive and noxious weeds and grasses	• Long term loss of productivity • Loss of habitat of birds, insects, small mammals			
	Over abundance of sagebrush	• Loss of biomass production/forage • Loss of bio-diversity • Loss of productivity	Yes ✓ Shorter grazing period ✓ Longer rest between grazing ✓ Some evidence fall-winter grazing by some classes of livestock can reduce sagebrush coverage.		

Hotspot (Plant community or bio-physical setting with re-occurring or frequently observed problems across the respective Forest.)	Natural Resource Conditions Observed	Why the Conditions are an Issue	Are there management changes that may have a high chance of producing better results?	Priority to address based on any negative natural resource impacts	Ease of implementation of mgmt changes
Aspen communities without conifers present on 20% or less slopes (Steeper slopes do not seem to have the same conditions observed.)	Lack of aspen sprouts growing above the 2-4' height Lack multiple age classes of aspen trees in the stand	• Loss of habitat for birds, insects, and small mammals. • Loss of bio-diversity • Loss of productivity	Yes ✓ Shorter grazing period ✓ Longer rest between grazing ✓ Changes to stocking rates ✓ Change the season of use, avoiding August-October	High	Low - these locations are widely scattered across the landscape and changes to grazing systems may be complicated
	Lack of diversity in the grasses and forbs under the stand	• Loss of habitat for birds, insects, and small mammals. • Loss of bio-diversity • Loss of productivity			
	Abundance of bare ground	• Loss of ground water infiltration • Loss of bio-diversity • Loss of productivity			
Historic salting areas, old bed grounds, and trail/driveways	Abundance of bare ground	• High soil compaction • Loss of water infiltration • Loss of bio-diversity • Lower biomass/forage production	✓ Treat/address compaction layer if present ✓ If salts present, add high amounts of water to drive salts below the root zone ✓ Protect areas from ungulate use	Low to moderate	Low
		• Potential for invasive species to increase in the area	✓ Monitor areas periodically for presence of noxious	Moderate	Moderate

APPENDIX 6

Collaborative Process Diagram



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APPENDIX 7

Challenges and Barriers to Implementing Grazing Management and Other Strategies

The collaborative group acknowledges that many of the suggestions in Sections IV and V of the Final Report are difficult to achieve without first removing some of the barriers which impede their implementation. Some of these barriers are economic or financial; others are social, institutional, political, or technical. Some of the key challenges – those which influence the feasibility of implementing many of the strategies above – are listed below.

Financial/Economic Barriers

- Direct costs of infrastructure to ranchers, USFS, and others:
    - Adding or changing infrastructure, such as fences or troughs, involves direct costs for both materials and labor. Ranchers, the Forest Service, and other public and private funders all incur these costs.
    - Maintaining infrastructure costs money. Permittees and the Forest Service have limited funds to maintain existing fences and water systems, and adding new infrastructure adds to the future burden of maintaining it.
    - NEPA assessments cost the Forest Service money, even before any project benefits are realized
- Direct costs of hiring new people or paying existing employees to do new tasks
    - Range riders cost ranchers or grazing associations money
    - NEPA assessments, collaborative efforts, training efforts for new monitoring techniques, and increased communication and outreach to permittees and others all requires staff time from existing or new Forest Service employees.
- Indirect costs to ranchers
    - Grazing management changes can cost ranchers indirectly; for example, by increasing the time needed to monitor new grazing arrangements or taking on additional risks by using new, unfamiliar pastures. Although benefits may outweigh those risks, permittees may not be willing to deal with that uncertainty.
- Lack of clear financial incentives to balance out the costs to permittees
    - Permittees need an incentive to make some grazing management changes, particularly those that may require taking financial risks. Even if the incentives are not financial, permittees need to be able to easily see a benefit to their operation in order to make changes or take risks.

Social/Political Barriers

- Lack of Forest Service flexibility (real and perceived)
    - Current Forest Service policies and regulations restrict opportunities for change when they are not flexible enough to accommodate innovative grazing management ideas.
    - Forest Service employees may be unwilling to change current systems, even when the regulatory flexibility to do so exists.
    - NEPA analyses are time-intensive and not much fun for Forest Service employees, so a NEPA requirement for a potential grazing management change could discourage or postpone innovative thinking or projects.
    - The frequent statement from permittees, about new grazing arrangements, is that "the Forest Service would have to approve that." The implication is that it may not be worth the hassle to pursue an idea for change.
- Permittee discomfort with potential changes
    - Change is psychologically difficult, particularly when it also accompanies financial uncertainty. Ranchers are by necessity fiscally conservative, and proposed changes may be difficult to become comfortable about.
    - The success of strategies that involve changing social arrangements (such as allotment consolidation) may require greater levels of social cohesion, collaboration, or motivated leadership than currently exists in a particular community of permittees.
    - Making grazing management changes may have social ramifications for ranchers that involve risks they are uncomfortable taking. A lack of clear benefits of making challenging choices contributes to this problem.
- Perceptions and mistrust
    - Grazing on public lands has a long history of mistrust between groups with different points of view. Overcoming this issue takes considerable time, patience, and good communication from all viewpoints.
    - The environmental community often has concerns about the conditions of the range and is doubtful of current management systems.
    - The environmental community feels left out of the decision-making process for decisions about Forest Service grazing management.
    - Permittees and the Forest Service may be unwilling to make changes they feel may be litigated by environmentalists.
    - NEPA is sometimes regarded by the environmental community as the only, and therefore essential, avenue by which the Forest Service is legally required to consider information, concerns and alternatives proposed by the environmental community.
    - Current public opinion supports high levels of doubt from many sides about whether the Forest Service is being transparent, accountable to the public, and is adequately meeting its multiple-use mandate.
    - Other groups sometimes view ranchers as resistant to all change, and overly entrenched in specific grazing management practices.

  - Other groups sometimes view Forest Service employees as entrenched in certain ways of managing grazing, and unwilling to change, based as much or more in local agency culture as in actual policies.
  - Other groups sometimes question the expenditure of Forest Service funds to support grazing practices that they feel may be causing environmental harm.
  - The general lack of trust between parties makes collaborative efforts more challenging, and more critical.

Technical Barriers

- Many parties, including Forest Service employees, lack a thorough understanding about what USFS regulations actually require/restrict, compared to status quo procedures and historical management systems.
- Specific information on how to graze an area most sustainably is usually not exactly known, and changes year to year. This level of uncertainty can make improving grazing plans daunting, especially for permittees who value certainty.
- Some suggestions from the previous section, such as seeding native grasses, or providing water for livestock in new areas, may be limited by logistical factors such as availability of seed, or the availability of water rights for purchase.

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APPENDIX 8

Ecological Indicators Evaluation Chart

		Evaluation Criteria	Objective		Easily Observable			Measurable		
Indicator			Can it easily be framed in an objective way?		Can non-technical people easily observe this indicator?	Does the FS currently collect data on this indicator?		Does it require a quantitative measurement?	Is there a simple, repeatable method available?	Does the FS currently use a simple, repeatable method?
			Yes or No		*Yes or No*	*Yes or No*		*Yes/No/Maybe*	*Yes or No*	*Yes or No*
UPLAND										
Gross visual indicators of sustainable upland grazing										
	Positive indicators -- at extremes		Yes - only at the extremes		Yes	Yes- rarely		No	Yes	Yes- rarely, not systematically
	Negative indicators - at extremes		Yes - only at the extremes		Yes	Yes- rarely		No	Yes	Yes- rarely, not systematically
Soil stability										
	Percent soil cover		Yes, if quantitative		No	Yes. More than rarely		Yes	Yes	No, but measured in more complex ways
	Evidence of erosion		Yes, at extremes		Yes	No (maybe the Manti?)		No	Yes with training	perhaps on Manti
	Soil surface susceptibility to erosion		Yes		No	No		Yes	Yes	No
Plant species composition (compared to rested areas)										
	Simplified measure of plant diversity (count) (spp richness)		Yes		Yes	Yes but more complicated		Yes	Yes	Not simple
	Significant presence of plant species associated with poor grazing management (e.g., stickseed, tarweed, pepperweed, noxious weeds)		Yes		Yes	Yes		No (presence/ absence)	Yes	For noxious weeds only
	Full range of size classes of woody species present		Yes		Yes	No		No	Yes	No
	Evidence of desirable plant recruitment, i.e. new little, medium, etc. plants (bunchgrasses/forbs)		Yes		Yes	No		No	Yes	No
	Evidence of seed-head maturation		Yes through management		Yes	No		No	Yes	No
Landscape composition and structure										
	Change in relative coverage of vegetation types		Yes		Yes, depends on if using visuals	Yes		No	Yes	Yes (photos and imagery)

Indicator	Evaluation Criteria	Tied to Ecological Sustainability			
		Can this indicator be valuable on different time scales?		Can this indicator be meaningful at different spatial scales?	
		Short-term	Long-term	Allotment scale	Landscape scale (aggregated to forest scale)?
		Yes or No	*Yes or No*	*Yes or No*	*Yes or No*
UPLAND					
Gross visual indicators of sustainable upland grazing					
Positive indicators -- at extremes		Yes	Yes	Yes	Yes
Negative indicators - at extremes		Yes	Yes	Yes	Yes
Soil stability					
Percent soil cover		Yes	Yes	Yes	Yes
Evidence of erosion		Yes	Yes	Yes	Yes
Soil surface susceptibility to erosion		No	Yes	Yes	Yes
Plant species composition (compared to rested areas)					
Simplified measure of plant diversity (count) (spp richness)		Yes	Yes	Yes	Yes
Significant presence of plant species associated with poor grazing management (e.g., stickseed, tarweed, pepperweed, noxious weeds)		Yes	Yes	Yes	Yes
Full range of size classes of woody species present		Yes	Yes	Yes	Yes
Evidence of desirable plant recruitment, i.e. new little, medium, etc. plants (bunchgrasses/forbs)		Yes	Yes	Yes	Yes
Evidence of seed-head maturation		Yes	N/A	Yes	Yes
Landscape composition and structure					
Change in relative coverage of vegetation types		No	Yes	Yes	Yes

Indicator	Evaluation Criteria	Tied to FS Management			Practical		Can be Communicated
		Ecological	Political			Staffing	
		Does the indicator respond to on-the-ground changes in grazing management?	Could a change in this indicator trigger a change in FS management or FS action?	Ease of data collection (effort, bureaucracy, politics, etc)	Rate the cost of measuring this indicator	Does the FS have capacity to get this indicator measured?	Is this indicator easily communicated (from the FS to the public incl. ranchers)
		Yes or No	*Yes or No*		*low/medium/high*	*low/medium/high*	*Yes or No*
UPLAND							
Gross visual indicators of sustainable upland grazing							
Positive indicators -- at extremes		Yes - it depends	currently, yes rarely. In the future, potentially	Easy	Low	Yes	Yes - but requires on site training
Negative indicators - at extremes		Yes - it depends	currently, yes rarely. In the future, potentially	Easy	Low	Yes	Yes - but requires on site training
Soil stability							
Percent soil cover		Yes	Yes	Easy	Currently high. Could be lower	Yes	No
Evidence of erosion		Yes	Yes	Easy	low	Yes	Yes
Soil surface susceptibility to erosion		Yes - 10 year time frame	Yes	Yes	low	Yes	Yes
Plant species composition (compared to rested areas)							
Simplified measure of plant diversity (count) (spp richness)		Yes	Yes	Easy	Moderate	Yes	Yes
Significant presence of plant species associated with poor grazing management (e.g., stickseed, tarweed, pepperweed, noxious weeds)		Yes	Yes	Easy	Low	Yes	Yes
Full range of size classes of woody species present		Yes	Yes	Easy	Low	Yes	Yes
Evidence of desirable plant recruitment, i.e. new little, medium, etc. plants (bunchgrasses/forbs)		Yes	Yes	Easy	Low	Yes	Yes
Evidence of seed-head maturation		Yes	Yes	Easy	Low	Yes	Yes
Landscape composition and structure							
Change in relative coverage of vegetation types		Only in long-term; site dependent	Yes-- depending on the change	Potentially easy, depending on technique	Potentially low	Yes	Yes

Indicator	Evaluation Criteria	Objective	Easily Observable		Measurable		
		Can it easily be framed in an objective way?	Can non-technical people easily observe this indicator?	Does the FS currently collect data on this indicator?	Does it require a quantitative measurement?	Is there a simple, repeatable method available?	Does the FS currently use a simple, repeatable method?
		Yes or No	*Yes or No*	*Yes or No*	*Yes/No/Maybe*	*Yes or No*	*Yes or No*
RIPARIAN							
Gross, visual indicators of sustainable riparian grazing							
Positive indicators		Yes - only at extremes	Yes	Yes - rarely, forest specific	No	Yes	Yes, a method. Depends. Forest specific.
Negative indicators		Yes - only at extremes	Yes	Yes - rarely, forest specific	No	Yes	Yes, a method. Depends. Forest specific.
Percent bare soil (exclusive of rock)		Yes	Yes	Rarely	Yes	Yes	No
Plant species composition (comparison to reference area)							
Simplified measure of plant diversity (count) (spp richness) -- accounting for patch diversity		Yes	At a gross level	Yes, but in a more complicated way	Yes	Yes	No
Significant presence of plant species associated with poor grazing management (e.g Kentucky bluegrass, redtop, noxious weeds)		Yes	Yes	Yes	No (presence/ absence)	Yes	Only for noxious weeds. For others, more complicated
Evidence of seed-head (including willow catkins) maturation		Yes, through management	Yes	No	No (presence/ absence)	Yes	No
Full range of size classes of woody species present (site dependent)		Yes	Yes	No	No	Yes	No
Evidence of desirable plant recruitment, i.e. new little, medium, etc. plants		Yes	Yes but with training	Yes, but in a more	No	Yes	No

Indicator		Evaluation Criteria	Tied to Ecological Sustainability			
			Can this indicator be valuable on different time scales?		Can this indicator be meaningful at different spatial scales?	
			Short-term	Long-term	Allotment scale	Landscape scale (aggregated to forest scale)?
			Yes or No	*Yes or No*	*Yes or No*	*Yes or No*
RIPARIAN						
Gross, visual indicators of sustainable riparian grazing						
	Positive indicators		Yes	Yes	Yes	Yes
	Negative indicators		Yes	Yes	Yes	Yes
Percent bare soil (exclusive of rock)			Yes	Yes	Yes	Yes
Plant species composition (comparison to reference area)						
	Simplified measure of plant diversity (count) (species richness) -- accounting for patch diversity		No	Yes	Yes	Yes
	Significant presence of plant species associated with poor grazing management (e.g Kentucky bluegrass, redtop, noxious weeds)		yes, especially for noxious weeds	Yes	Yes	Yes
	Evidence of seed-head (including willow catkins) maturation		Yes	N/A	Yes	Yes
	Full range of size classes of woody species present (site dependent)		Yes	Yes	Yes	Yes
	Evidence of desirable plant recruitment, i.e. new little, medium, etc. plants		Yes	Yes	Yes	Yes

Indicator	Evaluation Criteria	Tied to FS Management			Practical		Can be Communicated
		Ecological	Political			Staffing	
		Does the indicator respond to on-the-ground changes in grazing management?	Could a change in this indicator trigger a change in FS management or FS action?	Ease of data collection (effort, bureaucracy, politics, etc)	Rate the cost of measuring this indicator	Does the FS have capacity to get this indicator measured?	Is this indicator easily communicated (from the FS to the public incl. ranchers)
		Yes or No	*Yes or No*		*low/medium/high*	*low/medium/high*	*Yes or No*
RIPARIAN							
Gross, visual indicators of sustainable riparian grazing							
Positive indicators		Yes - it depends	Yes	Easy	Low	Yes	Yes
Negative indicators		Yes - it depends	Yes	Easy	Low	Yes	Yes
Percent bare soil (exclusive of rock)		Yes, if related to grazing	Yes	Easy	Low	Yes	Yes
Plant species composition (comparison to reference area)							
Simplified measure of plant diversity (count) (spp richness) -- accounting for patch diversity		Yes	Yes	medium	Medium	Yes	Yes
Significant presence of plant species associated with poor grazing management (e.g Kentucky bluegrass, redtop, noxious weeds)		Yes but long term	Yes	Easy, once trained	Low	Yes	Yes
Evidence of seed-head (including willow catkins) maturation		Yes	Yes	Easy	Low	Yes	Yes
Full range of size classes of woody species present (site dependent)		Yes	Yes	Easy	Low	Yes	Yes
Evidence of desirable plant recruitment, i.e. new little, medium, etc. plants		Yes	Yes	Medium	Medium	Yes	Yes

Indicator	Evaluation Criteria	Objective	Easily Observable		Measurable		
		Can it easily be framed in an objective way?	Can non-technical people easily observe this indicator?	Does the FS currently collect data on this indicator?	Does it require a quantitative measurement?	Is there a simple, repeatable method available?	Does the FS currently use a simple, repeatable method?
		Yes or No	*Yes or No*	*Yes or No*	*Yes/No/Maybe*	*Yes or No*	*Yes or No*
RIPARIAN							
Riparian area structure and function							
Percentage of streambank with overhanging vegetation (with channel type as context)		Yes	Yes	No	Yes	Yes	No
Abundance of deep-rooted vegetation (sedges, rushes, and woody species)		Yes	Yes	Yes	Yes	Yes	No
Trampling/shearing associated with hoofprints (depending on channel type)		Usually	Yes with training	no (not as written)	Yes	Yes	Rarely
In-stream conditions							
Pool depths		Yes	Some	Rarely	Yes	Yes	MIM (see Appendix 9) measures this and is beginning to be implemented on the forests.
Sedimentation		Yes	Yes at the extremes	Yes but rarely (cobble embededness)	ocular estimation at extremes; quantitative when precision needed	Yes	MIM (see Appendix 9) measures this and is beginning to be implemented on the forests.
In-stream water quality							
Water quality		Yes	Some aspects (algae, manure)	Yes but rarely (water samples)	Yes	Yes	No
Macroinvertebrates		Yes	Yes	Yes but infrequently	No at a qualitative level; Yes if quantitative	Yes	No

Indicator		Evaluation Criteria	Tied to Ecological Sustainability			
			Can this indicator be valuable on different time scales?		Can this indicator be meaningful at different spatial scales?	
			Short-term	Long-term	Allotment scale	Landscape scale (aggregated to forest scale)?
			Yes or No	*Yes or No*	*Yes or No*	*Yes or No*
RIPARIAN						
Riparian area structure and function						
	Percentage of streambank with overhanging vegetation (with channel type as context)		Yes	Yes	Yes	Yes
	Abundance of deep-rooted vegetation (sedges, rushes, and woody species)		Yes	Yes	Yes	Yes
	Trampling/shearing associated with hoofprints (depending on channel type)		Yes	Yes	Yes	Yes
In-stream conditions						
	Pool depths		No	Yes	Yes	No
	Sedimentation		Yes at extremes	Yes	Yes	At a watershed scale
In-stream water quality						
	Water quality		Different aspects have different time scales	yes	Yes	Not as much
	Macroinvertebrates		Yes	Yes	Yes	No

Indicator	Evaluation Criteria	Tied to FS Management			Practical		Can be Communicated
		Ecological	Political			Staffing	
		Does the indicator respond to on-the-ground changes in grazing management?	Could a change in this indicator trigger a change in FS management or FS action?	Ease of data collection (effort, bureaucracy, politics, etc)	Rate the cost of measuring this indicator	Does the FS have capacity to get this indicator measured?	Is this indicator easily communicated (from the FS to the public incl. ranchers)
		Yes or No	*Yes or No*		*low/medium/high*	*low/medium/high*	*Yes or No*
RIPARIAN							
Riparian area structure and function							
Percentage of streambank with overhanging vegetation (with channel type as context)		Yes	Yes	Easy	Low	Yes	Yes
Abundance of deep-rooted vegetation (sedges, rushes, and woody species)		Yes, but only long-term	Yes	Easy	Low	Yes	Yes
Trampling/shearing associated with hoofprints (depending on channel type)		yes	Yes	Easy	Moderate	Yes	Yes
In-stream conditions							
Pool depths		Yes but only long term	In conjunction with other data	Low or Medium (CH)	Medium	Some but low	Not easily. Would require onsite training. It is an indirect indicator, primarily an indication of positive conditions
Sedimentation		Yes	In conjunction with other data	Medium	Low-Medium	Some but low	Yes at extremes
In-stream water quality							
Water quality		Possibly, to the degree caused by grazing (assigning proportional response difficult)	In conjunction with other data	Low-Medium depending on aspect measured	Low-Medium	Some but low	Some aspects
Macroinvertebrates		Yes, if related to grazing	In conjunction with other data (not as sensitive as other indicators)	Medium	Low-Medium	Yes	Yes

Collaborative Group on Sustainable Grazing
for U.S. Forest Service Lands in Southern Utah

APPENDIX 9

Simple Methods for Measuring Indicators of Ecologically Sustainable Grazing

Simple Methods for Measuring Indicators of Ecologically Sustainable Grazing

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Collaborative Group on Sustainable Grazing for Southern Utah Forest Service Lands

December 28, 2012

Introduction

This compilation of simple and formal methods of assessing key ecological indicators of sustainable/unsustainable grazing management was compiled by a subgroup of the Collaborative Group on Sustainable Grazing for Southern Utah Forest Service Lands ("Collaboration"). This multi-stakeholder, multi-agency collaboration was co-convened in 2012 by the Utah Department of Agriculture and Food and Utah Department of Natural Resources. The collaboration's goal was to "develop consensus agreement on grazing management principles and practices for Forest Service lands in Southern Utah that provide for ecological sustainability, are socially acceptable, and economically viable."

The Collaboration developed a set of ecological indicators (see pp. 1-4). A subgroup of the Collaborative, including a range specialist with the Dixie and Fishlake National Forests, subsequently compiled some suggested "simple" methods of formally assessing these indicators on Forest Service lands. This handbook presents those methods.

Our intent is to encourage the gathering of valuable, objective, repeatable data on sustainable and unsustainable grazing management on the Dixie, Fishlake, and Manti-La Sal NFs by not only the Forest Service but also permittees and other interested parties. We hope that data indicating grazing management could be improved will be used positively and collaboratively to generate management improvements These same methods can indicate that current grazing management is ecologically sound, or that recent grazing management changes are increasing the ecological sustainability of livestock grazing in a particular allotment, district, or forest.

Some notes on using this handbook:

Where a method is described in detail in another monitoring handbook, a website link is provided to the document. This handbook qualitatively/subjectively indicates considerations regarding use of each method. For each method, certain questions are answered regarding:

- Overall difficulty (High, medium, low, as a subjective judgment by the Ecological Indicators Subgroup, based on the sum of the elements immediately below)
- Whether more than minimal training (defined as more than two hours) is required to allow a person to be proficient in the use of the method
- Whether plant species will need to be identified while using the method, and if so, whether the needed plant species identification will be minimal.
- Whether a permanent transect needs to be established when using the method
- Whether analysis of the data that has been gathered will require offsite expertise
- Whether statistical analysis beyond the calculation of percentages or averages is needed

Some methods are identified by an abbreviation, as noted below:

IIRCv4	**Interpreting indicators of Rangeland Health version 4 (qualitative),** **http://www.blm.gov/nstc/library/pdf/1734-6rev05.pdf**
MIM	**Multiple Indicator Monitoring (quantitative),** **http://www.blm.gov/nstc/library/pdf/MIM.pdf**
MM	**Monitoring Manual for Grassland, Shrubland and Savanna (quantitative),** **http://jornada.nmsu.edu/monit-assess/manuals/monitoring**

MVRRA	**Monitoring Vegetation Resources in Riparian Areas (Winward greenline) (quantitative), http://www.fs.fed.us/rm/pubs/rmrs_gtr047.pdf**
NRI	**National Resources Inventory (quantitative), http://www.nrisurvey.org/nrcs/Grazingland/2011/instructions/instruction.htm**
PFC	**Proper Functioning Condition (qualitative) ftp://ftp.blm.gov/pub/nstc/techrefs/Final%20TR%201737-9.pdf**
SVA	**Sampling Vegetation Attributes (quantitative), http://www.blm.gov/nstc/library/pdf/samplveg.pdf**
SVAP2	**Stream Visual Assessment Protocol v2 (qualitative), ftp://ftp-fc.sc.egov.usda.gov/NDCSMC/Stream/pubs/NBH_Part_614_Subpart_B_10_Dec_09.pdf**
US&RM	**Utilization Studies and Residual Measurements (mostly quantitative), http://www.blm.gov/nstc/library/pdf/utilstudies.pdf**

Two assumptions underlie all the methods in this handbook:

(1) Georeferenced photos will assist with all methods; and

(2) All indicators benefit from a reference area both for knowledge of potential conditions and potential rate of change/restoration.

As noted in Appendix A, estimating the potential role of current grazing management in causing, sustaining, or exacerbating any indicators associated with unsustainable grazing, additional information may be useful or essential. Such additional information may include site-specific information, assessment of small and large reference areas (e.g., exclosures, inaccessible areas, closed or vacant allotments), historic photos, collateral signs of unsustainable grazing management, signs of use by wild ungulates (deer, elk), actual use information, and/or relevant scientific literature.

We hope this handbook is useful for gathering information that can be shared for collaborative problem solving as well as appreciation of good grazing practices.

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Table of Contents

List of Ecological Indicators

I. UPLAND

1	**Gross, visual indicators of sustainable upland grazing** (qualitative assessment at landscape scale)
1a	**Positive indicators –** examples: • Aspen stands of mixed heights • Diverse grass and forb understory between sagebrush • Biological soil crust • Tall flowering native forbs • Absence of plant pedestaling • Ponderosa pine spacing
1b	**Negative indicators (indicators of grazing management needing change) –** examples: • Lack of aspen recruitment • Bare trampled soil between sagebrush • Pedestaled plants
2	**Soil stability**
2a	**Percent soil cover by ecosystem** (compared to rested areas) Breakdown of: • % plant litter • % plant basal cover • % plant canopy cover • % bare ground
2b	**Evidence of erosion –** examples: • Bare trampled soil between sagebrush • Pedestaled plants • Gullying • Evidence of patterns of water movement
2c	**Soil surface susceptibility to erosion**

3	**Plant species composition** (compared to rested areas)
3a	**Desired plants (see Appendix A)** • Key decreaser species • High value species for soil protection • Native species of high value / structure for wildlife and livestock use
3b	**Desirable plant reproduction / vigor** • **Plant diversity** • **Lack of significant presence of species associated with poor grazing management** • **Full range of size classes of woody species present** o Woody plants continue leader growth upward after grazing • **Evidence of seedhead maturation**
3c	**Presence of invasive plants (yes/no)**
4	**Landscape composition and structure** • **Existing vegetation compared to reference area or historic conditions**

II. RIPARIAN

1	**Gross, visual indicators of sustainable riparian grazing** (qualitative assessment at landscape scale)
1a	**Positive indicators – examples:** • Mixed height and dense willow • Mixed height cottonwood • Palatable woody riparian plants • Deep-rooted native riparian plants • Graminoids overhanging banks • Overhanging and vegetated banks • Lack of hummocking in wet meadows
1b	**Negative indicators (indicators of grazing management needing change) – examples:** • Riparian areas dominated by shallow-rooted species • Riparian areas lacking in graminoid diversity

	• Sheared / trampled banks • Significant hummocking of wet meadows
2	**Plant species composition (comparison to reference area)**
2a	**Desired plants (see Appendix A)** • Short list of palatable or decreaser woody riparian plants • Short list of native graminoids that would decrease or disappear with excessive grazing

2b	**Desirable plant reproduction / vigor**
	
	• **Simplified measure of plant diversity**
	• **Evidence of seedhead maturation**
	  o Significant number of seed heads or willow catkins left after grazing
	• **Full range of size classes of woody species present**
	  o Woody plants continue leader growth upward after grazing
	• **Percentage of streambank with overhanging vegetation**

2c	**Presence of invasive plants** • Detect first invasive plants
3	**Riparian area structure and function**
3a	**Presence and abundance of deep-rooted vegetation overhanging stream banks** • Identify short list of key palatable woody species, high value species for soil protection, and decreaser key species • Identify short list of unpalatable species
3b	**Presence and abundance of stable stream banks – examples of instability:** • Active cutting (headcutting, ongoing incision) • **Bank trampling and shearing**

4	**In-stream conditions**
	• **Pool depths** • **Sedimentation**
5	**In-stream water quality**
	• **Water quality** • **Macroinvertebrates (at landscape scale)**
6	**Biodiversity**
	• **Potential reproduction/pollination** • **Restoration/reproduction/pollination**

I. Simple Methods For Measuring Upland Indicators

Assumptions:

(1) Georeferenced photos will assist with all methods listed below

(2) All indicators benefit from a reference area both for knowledge of potential conditions and potential rate of change/restoration

Indicator:	**Gross, visual indicators**
Method:	**Georeferenced photos**
	The greater and more systematic the coverage the better
Equipment needed:	**GPS & Camera (georeferencing software is helpful)**
Overall difficulty:	**Low**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Gross, visual indicators**
Method:	**Field tours for obvious cases everyone agrees on**
Overall difficulty:	**Low**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**No**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

SOIL STABILITY

Indicator:	**Percent soil cover**
Method:	Error! Reference source not found. **bare ground and litter indicators**
Equipment needed:	**Tape, pointer, pin flag**
Overall difficulty:	**Medium**
More than minimal training?	**Yes/No**
Plant i.d. needed?	**No**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Percent soil cover**
Method:	Error! Bookmark not defined.Error! Reference source not found.**, Volume I p.9 step point or line point cover, or SVA, p. 70 step point method**
Equipment needed:	**Tape, stakes, pin flag**
Overall difficulty:	**Medium**
More than minimal training?	**Yes**
Plant i.d. needed?	**No, if the purpose is just measuring effective ground cover. Yes, if want species composition information.**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Percent soil cover**

Method:	**Remote sensing**
Equipment needed:	**Computer, software, satellite data, field verification**
Overall difficulty:	**High expertise, but likely low cost per acre**
More than minimal training?	**Yes**
Plant i.d. needed?	**Only as far as being sufficiently familiar with the area to have an idea of the vegetation type one is looking at.**
Require permanent transect?	**No**
Offsite technical analysis?	**Yes**
Statistical analysis?	**Yes**

Indicator:	**Percent soil cover**
Method:	**SVA p. 64 and p. 31; or paced or line intercept transect and photo points**
Equipment needed:	**Camera, GPS, stakes**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Depends on what is being measured: No if ground cover, Yes if ground cover plus species composition**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Percent soil cover**
Method:	**SVA p. 55 - Daubenmire quadrat**
Equipment needed:	**Camera, tape, GPS, frame**
Overall difficulty:	**High**
More than minimal training?	**Yes**
Plant i.d. needed?	**Depends on what is being measured, ground cover no, ground cover plus species composition yes.**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**

Statistical analysis?	**No**

Indicator: Evidence of erosion

Method: Georeferenced photos

Equipment needed:	**Camera, GPS, stakes**
Overall difficulty:	**Low**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Evidence of erosion

Method: IIRCv4, indicators 1,3,5,6 and 9

Equipment needed:	**Depends on what is being measured and whether quantified.**
Overall difficulty:	**Varies with indicator and whether quantifying.**
More than minimal training?	**Less than a day**
Plant i.d. needed?	**No**
Require permanent transect?	**Depends on indicator and whether quantified**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Evidence of erosion

Method: Visual review during paced transect

Equipment needed:	**Paper, clipboard**
Overall difficulty:	**Low**
More than minimal training?	**No**
Plant i.d. needed?	**No**

Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Soil surface susceptibility to erosion

Method:	**IIRCv4 Indicator 8**
Equipment needed:	**Bottle caps (qualitative) or soil stability kit (quantitative)**
Overall difficulty:	**Low/Medium**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**No**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Soil surface susceptibility to erosion

Method:	**MM Volume I soil stability test**
Equipment needed:	**Soil stability kit**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**No**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

PLANT SPECIES COMPOSITION *(compared to rested areas)*

Indicator: **Plant diversity**

Method: **Transect plant surveys**

(1) For those unfamiliar with individual species, first walk the transect area and compile list of species or collect one distinctive example or leaf or reproductive structure of each type of plant species seen and tape onto board and/or photograph. (2a) Record plant species intercepted along point-intercept transect, coupled with presence within 3' of the transect; or (2b) Count/list species present within hoops/frames at set distances along the transect.

Equipment needed:	**Camera, GPS, stakes**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes, but can be minimal with species taped on board.**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: **Plant diversity**

Method: **MM, Chapter 10 - Plant species richness**

Equipment needed:	**Plots, tapes**
Overall difficulty:	**High**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Plant diversity**
Method:	**NRI, Chapter 16 – Plant census**
Equipment needed:	**GPS**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Plant diversity**
Method:	**SVA p. 64 - Paced transect or line intercept transect**
Equipment needed:	**Paper, clipboard**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Significant presence of species associated with poor grazing management *(See Appendix A)***
Method:	**IIRCv4, Indicators 10, 12, and 16**
Equipment needed:	**Evaluation sheet**
Overall difficulty:	**Medium**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes, for major species**
Require permanent transect?	**NA**

Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Significant presence of species associated with poor grazing management *(See Appendix A)***
Method:	**Abridged techniques from MM, SVA, NRI**

For any frequency, density, cover, or production method that is species specific, but only consider the indicator species rather than the entire plant community.

Equipment needed:	**Depends on technique**
Overall difficulty:	**Medium**
More than minimal training?	**Perhaps a half day.**
Plant i.d. needed?	**Minimal, just indicator species to identify**
Require permanent transect?	**Yes if recording change at a specific spot.**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Significant presence of species associated with poor grazing management *(See Appendix A)***
Method:	**SVA p. 64 and p. 31 Paced or line intercept transect and photo points**
Equipment needed:	**Camera, paper, clipboard**
Overall difficulty:	**LowMedium**
More than minimal training?	**No**
Plant i.d. needed?	**Minimal, with few increasers/weeds to identify**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Significant presence of species associated with poor grazing management *(See Appendix A)***
Method:	**SVA p. 37 - Nested frequency transect**
Equipment needed:	**Nested frequency frame, tape, clipboard**
Overall difficulty:	**Medium-High**
More than minimal training?	**Half day**
Plant i.d. needed?	**Minimal - identifying specific species**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No for site description, but yes if want to compare statistical changes between sample years.**

Indicator: Full range of size classes of woody species present

Method:	**SVA; or any photo, density or frequency technique but with species and size class distinction**
Equipment needed:	**Plots and tapes**
Overall difficulty:	**Low/Medium**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes; minimal if few woody species to identify**
Require permanent transect?	**Yes; if tracking over time**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Full range of size classes of woody species present**
Method:	**MM, Vol. 1 belt transect p. 30**
Equipment needed:	**Stick and tape**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes**

Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Full range of size classes of woody species present

Method: Photos

Georeferenced photos may suffice; the greater and more systematic coverage (e.g., a photo with range pole every 10' along a 500' transect) the better.

Equipment needed:	**Camera, GPS, paper and clipboard**
Overall difficulty:	**Low/Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes –for a few woody species.**
Require permanent transect?	**Depends**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Full range of size classes of woody species present

Method: SVA p. 64 and p. 31 photographs - Paced or line intercept transect and photo points

Equipment needed:	**Camera, paper, clipboard**
Overall difficulty:	**Low/Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes, but few woody species to identify**
Require permanent transect?	**Yes if recording change at specific spot; No if getting general condition.**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Evidence of seedhead maturation

Method: Transect plant surveys

Representative transect(s) with hoops/ frames at set distances, counting plants with and without flowers/seedheads within the hoop/frame. A subset of the most dominant species could be selected for counting. Photos of plants within the hoops/frames may add to assessment.

Equipment needed:	**Camera, GPS, frames, stakes**
Overall difficulty:	**Low/Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes, but minimal if selecting dominant species.**
Require permanent transect?	**Yes if recording change at specific spot. No if getting general condition**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Evidence of seedhead maturation

Method: IIRCv4, indicator 17 – Reproductive capability of perennial plants

Equipment needed:	**None**
Overall difficulty:	**Low**
More than minimal training?	**No**
Plant i.d. needed?	**Yes**
Require permanent transect?	**NA**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Evidence of seedhead maturation

Method: SVA p. 64 and p. 31 Paced or line intercept transect and photo points

Equipment needed:	**Camera, paper, clipboard**

Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Evidence of seedhead maturation**
Method:	**Georeferenced photos**
Equipment needed:	**Camera, GPS, paper and clipboard**
Overall difficulty:	**Medium/Low**
More than minimal training?	**No**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

LANDSCAPE COMPOSITION AND STRUCTURE

Indicator:	**Change in relative coverage of vegetation types**
Method:	**Remote sensing/Google Earth/ satellite imagery over time**
Equipment needed:	**Google Earth (free) for various dates; any other existing aerial images**
Overall difficulty:	**Low if using existing imagery**
More than minimal training?	**No, if trained by an expert**
Plant i.d. needed?	**Yes, but minimal to identify veg types**
Require permanent transect?	**No – just same location**
Offsite technical analysis?	**No, unless attempting to quantify w/ GIS**

Statistical analysis?	**No**

Indicator:	**Change in relative coverage of vegetation types**
Method:	**SVA p. 31 Repeat photos**
Equipment needed:	**Camera, GPS**
Overall difficulty:	**Low**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes: minimal – to identify veg types**
Require permanent transect?	**No; just same location**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Change in relative coverage of vegetation types**
Method:	**SVA p. 64 and p. 31 Photographs - Paced or line intercept transects and photo points in the same location over time**
Equipment needed:	**Camera, GPS, paper and clipboard, tape**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes: minimal – to identify veg types**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

II. Simple Methods for Measuring Riparian Indicators

Assumptions:

(1) Georeferenced photos will assist with all methods listed below

(2) All indicators benefit from a reference area both for knowledge of potential conditions and potential rate of change/restoration

Indicator:	**Gross visual indicators of sustainable riparian grazing**
Method:	**Georeferenced photos; the greater and more systematic the coverage the better**
Equipment needed:	**Camera, GPS, stakes**
Overall difficulty:	**Low**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**Merely need reach location and length formerly photographed.**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Gross visual indicators of sustainable riparian grazing**
Method:	**Photos and field tours for obvious cases everyone agrees on**
Equipment needed:	**Camera**
Overall difficulty:	**Low**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**No**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Gross visual indicators of sustainable riparian grazing**
Method:	**Proper Functioning Condition (PFC) protocol**
Equipment needed:	**Camera, GPS**
Overall difficulty:	**Medium**
More than minimal training?	**Yes, usually a 2-3 day class**
Plant i.d. needed?	**Yes, primarily dominant species**
Require permanent transect?	**N/A, this is an assessment tool and not a trend tool**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Percent bare soil (exclusive of rock)**
Method:	**SVA p. 64 and p. 31 - Paced or line intercept transect and photo points**
Equipment needed:	**Camera, GPS, stakes**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**Yes**
Statistical analysis?	**No**

Indicator:	**Percent bare soil (exclusive of rock)**
Method:	**MIM, streambank stability and cover p. 47**
Equipment needed:	**Plot frame, tape**
Overall difficulty:	**Medium/High**
More than minimal training?	**Yes**

Plant i.d. needed?	**No**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

PLANT SPECIES COMPOSITION (comparison to reference area)

Indicator:	**Simplified measure of plant diversity (count) (species richness) -- accounting for patch diversity**
Method:	**Transect plant surveys**

(1) For those unfamiliar with individual species, first walk the transect area and compile list of species or collect one example or leaf or reproductive structure of each type of plant species seen and tape onto board and/or photograph. (2a) Record plant species intercepted along point-intercept transect, coupled with presence within 3' of the transect; or (2b) count/list species present within hoops/frames at set distances along the transect

Equipment needed:	**Camera, GPS, stakes**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes: minimal – e.g., with species taped on a board**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Simplified measure of plant diversity (count) (species richness) -- accounting for patch diversity**
Method:	**MM, Chapter 10 - Plant species richness**
Equipment needed:	**Plots, tapes**
Overall difficulty:	**High**
More than minimal training?	**Yes**

Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Simplified measure of plant diversity (count) (species richness) -- accounting for patch diversity**
Method:	**NRI, Chapter 16 – Plant census**
Equipment needed:	**GPS**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Simplified measure of plant diversity (count) (species richness) -- accounting for patch diversity**
Method:	**MVRRA, cross sections, p. 9**
Equipment needed:	**None**
Overall difficulty:	**Medium**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes, dominants only**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Simplified measure of plant diversity (count; species richness) -- accounting for patch diversity**
Method:	**SVA p. 64 and p. 31 - Paced or line intercept transect and photo points**
Equipment needed:	**Paper, clipboard**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Simplified measure of plant diversity (count; species richness) -- accounting for patch diversity**
Method:	**MVRRA - Greenline**
Equipment needed:	**Stake, camera, GPS, tape**
Overall difficulty:	**Medium**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Simplified measure of plant diversity (count; species richness) -- accounting for patch diversity**
Method:	**MIM – Greenline composition p.39**
Equipment needed:	**Stake, camera, GPS, tape**

Overall difficulty:	**Medium**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Significant presence of plant species associated with poor grazing management *(See Appendix A)*

Method: Transect plant surveys

Transect with hoops/frames at set intervals,, recording presence and approximate dominance (e.g., 0-25%; 26-50%; >50% of the "increasers" or noxious weeds within the hoop/frame. Use list or photo-annotated list of plant species that become common/dominate with poor grazing management. Depending on extremes or visibility, systematic georeferenced photos may assist.

Equipment needed:	**Camera, GPS, frame, stakes**
Overall difficulty:	**Medium/High**
More than minimal training?	**Half day**
Plant i.d. needed?	**Yes, minimal for the few increasers/weeds to identify**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Significant presence of plant species associated with poor grazing management *(See Appendix A)*

Method: Abridged techniques from MVRRA, MIM, MM, SVA, NRI

Abridged techniques from MM, SVA, NRI for any frequency, density, cover, or production method that is species specific, but only consider the indicator species rather than the entire plant community.

Equipment needed: **Plots**

Overall difficulty:	**Medium**
More than minimal training?	**Low**
Plant i.d. needed?	**Yes, some**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Evidence of seedhead maturation (including willow catkins)

Method: Representative transect(s)

Representative transect(s) with hoops/ frames at set distances, counting plants with and without reproductive structures/seedheads within the hoop/frame. A subset of the most dominant species could be selected for counting. Photos of plants within the hoops/frames may add to assessment.

Equipment needed:	**Camera, GPS, frame, stakes**
Overall difficulty:	**Low Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes, but minimal if selecting dominant species., e.g., willow**
Require permanent transect?	**Yes if recording change at a specific spot.** **No if getting general conditions**
Offsite technical analysis?	**No**
Statistical analysis?	**Yes**

Indicator: Evidence of seedhead (including willow catkins) maturation

Method: SVA p. 64 and p. 31 - Paced transect or line intercept transect and photo points

Equipment needed:	**Camera, GPS, frames, stakes**
Overall difficulty:	**Low/Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes, but minimal if selecting dominant species, e.g. willow**

Require permanent transect?	**Yes only if recording change at a specific spot. No if getting general conditions**
Offsite technical analysis?	**No**
Statistical analysis?	**Yes**

Indicator: Full range of size classes of woody species present (site dependent)

Method: Photos

Georeferenced photos may suffice; the greater and more systematic coverage (e.g., a photo with range pole every 10' along a 500' transect) the better.

Equipment needed:	**Camera, GPS, paper, clipboard**
Overall difficulty:	**Low**
More than minimal training?	**No**
Plant i.d. needed?	**Minimal – few woody species to identify**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Full range of size classes of woody species present (site dependent)

Method: A 6' wide belt transect

A 6' wide belt transect recording height of woody species within a foot increment (e.g., using a range pole) or height classes that will be reported, by woody plant species (if identification not certain, include photos of plant, leaf, reproductive structure)

Equipment needed:	**Camera, GPS, paper, clipboard, tape**
Overall difficulty:	**Low Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Minimal, with few woody species to identify**
Require permanent transect?	**Yes if recording change at a specific spot. No if getting general conditions**
Offsite technical analysis?	**No**

Statistical analysis?	**No**

Indicator:	**Full range of size classes of woody species present (site dependent)**
Method:	**MIM, woody species age class p. 51**
Equipment needed:	**Plot frame, tape**
Overall difficulty:	**Medium**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Full range of size classes of woody species present (site dependent)**
Method:	**SVA p. 64 and p. 31 - Paced or line intercept transect and photo points**
Equipment needed:	**Camera, paper, clipboard**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Minimal – few woody species to identify**
Require permanent transect?	**Perhaps; or may merely need reach location and length formerly measured.**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Percentage of streambank with overhanging vegetation (with channel type as context)**
Method:	**Continuous or set interval measurements**

Measure continuously or within frames at set intervals along the length of streambank with vegetation hanging a set distance (e.g., at least 2") horizontally beyond edge of bank. Record length of rocks or cliff faces separately as N/A.

Equipment needed:	**Camera, GPS, tape or frame, stakes**
Overall difficulty:	**Medium**
More than minimal training?	**Half day**
Plant i.d. needed?	**Minimal**
Require permanent transect?	**May merely need reach location and length formerly measured.**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Percentage of streambank with overhanging vegetation (with channel type as context)**
Method:	**Paced distances parallel to the stream bank or ocular estimates**
Equipment needed:	**Camera or clipboard**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**No or very minimal**
Require permanent transect?	**No – merely need reach location and length formerly measured**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

RIPARIAN AREA STRUCTURE AND FUNCTION

Indicator:	**Extent of riparian vegetation**
Method:	**Remote sensing**
Equipment needed:	**Computer, software, satellite data**
Overall difficulty:	**High expertise, but may be low cost/acre**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes – Only some species can be detected w/ remote sensing**
Require permanent transect?	**No**
Offsite technical analysis?	**Yes**
Statistical analysis?	**Yes**

Indicator:	**Abundance of deep-rooted vegetation (sedges, rushes, and woody species)**
Method:	**Transect plant surveys**

Objectively-set transects perpendicular to the stream/water body, with hoops/frames at set distances, recording presence and approximate dominance (e.g., 0-25%; 26-50%; >50% of common, deep-rooted woody species and riparian sedges/rushes and grasses within the hoop/frame. Use list or photo-annotated list of common woody species., sedges, rushes

Equipment needed:	**Camera, GPS, frames, stakes**
Overall difficulty:	**Medium/High,but captures riparian, not just greenline.**
More than minimal training?	**Yes**
Plant i.d. needed?	**Minimal**
Require permanent transect?	**Yes if recording change at a specific spot. No if getting general conditions**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Abundance of deep-rooted vegetation (sedges, rushes, and woody species)**
Method:	**PFC, item 11**
Equipment needed:	**None**
Overall difficulty:	**Medium (high expertise)**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes**
Require permanent transect?	**NA**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Abundance of deep-rooted vegetation (sedges, rushes, and woody species.)**
Method:	**MIM, greenline composition**
Equipment needed:	**Plot frame, tape**
Overall difficulty:	**Medium**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Abundance of deep-rooted vegetation (sedges, rushes, and woody species.)**
Method:	**MVRRA, greenline**
Equipment needed:	**Plot frame, tape**
Overall difficulty:	**Medium**
More than minimal training?	**Yes**

Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Abundance of deep-rooted vegetation (sedges, rushes, and woody species.)

Method:	**SVA p. 31 - Ocular estimates and photo points**
Equipment needed:	**Camera, GPS, paper and clipboard**
Overall difficulty:	**Low Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Minimal**
Require permanent transect?	**Depends**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Trampling/shearing associated with hoofprints (depending on channel type and grazing method for restoration)

Method: Georeferenced photos; and/or instream transect

Estimate percent of banks both sides of the transect where banks are trampled and/or sheared, with evidence of ungulate hoofprints.

Equipment needed:	**Camera, GPS, paper and clipboard**
Overall difficulty:	**High-Medium. Can be difficult to estimate percent alteration.**
More than minimal training?	**No, but time must be spent doing actual measurements to get a person's eye calibrated.**
Plant i.d. needed?	**No**
Require permanent transect?	**No, because this is an annual indicator, not measuring trend.**

Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Trampling/shearing associated with hoofprints (depending on channel type and grazing method for restoration)**
Method:	**MIM, streambank alteration**
Equipment needed:	**Plot frame, tape**
Overall difficulty:	**Medium**
More than minimal training?	**Half day**
Plant i.d. needed?	**No**
Require permanent transect?	**No, because this is an annual indicator, not measuring trend.**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

IN-STREAM CONDITION

Indicator:	**Pool depths**
Method:	**Number of riffle/pool units and pool depths within a given length of low-gradient stream**
Equipment needed:	**BPS, clipboard**
Overall difficulty:	**Low/Medium**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**No – merely need reach location and length formerly measured**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

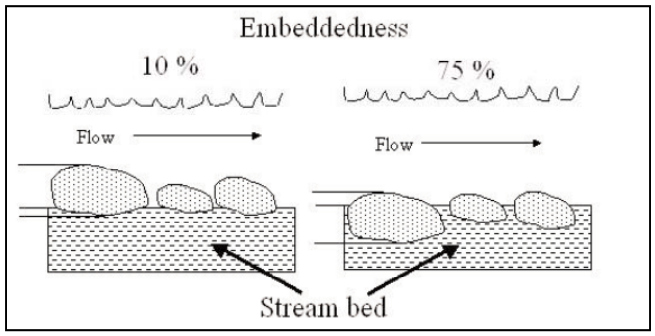
Indicator:	**Pool depths**
Method:	**MIM, pool depth and frequency**
Equipment needed:	**Plot frame, tape**
Overall difficulty:	**Medium**
More than minimal training?	**Yes**
Plant i.d. needed?	**No**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Pool depths**
Method:	**SVAP2, element 10**
Equipment needed:	**None**
Overall difficulty:	**Low**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**NA**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Sedimentation**
Method:	**Embeddedness, per** *User's Guide for the Rapid Assessment of the Functional Condition of Stream-Riparian Ecosystems in the American Southwest*

Randomly select three riffle areas along the reach. Within each area, stand in the middle of the channel and randomly pick up from the bottom six rocks that are 3-8 inches in diameter and note the degree to which each rock was embedded within the substrate. A "sediment\ line" should be readily visible on the rock, separating that portion of the rock which was resting below the streambed and that above the bed in the flowing water zone (Figure below). If the sediment line separates the rock

halfway between top and bottom, the rating is 50% embedded;25% of the rock below the line would be 25% embedded.)



Equipment needed:	**GPS, clipboard**
Overall difficulty:	**Low-Medium**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**No – merely need reach location and length formerly measured**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Sedimentation

Method: PFC, item 17

Equipment needed:	**None**
Overall difficulty:	**Medium (high expertise)**
More than minimal training?	**Yes**
Plant i.d. needed?	**No**
Require permanent transect?	**NA**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Sedimentation**
Method:	**Ocular estimates and photo points**
Equipment needed:	**Camera, GPS, paper and clipboard**
Overall difficulty:	**Low, Medium**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**Merely need reach location and length formerly measured.**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Sedimentation**
Method:	**Substrate Composition in MIM**
Equipment needed:	**Ruler or rock gauge frame**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

IN-STREAM WATER QUALITY

Indicator:	**Water quality**
Method:	**SVAP2, elements 7, 8, 9**
Equipment needed:	**Data form**
Overall difficulty:	**Low**
More than minimal training?	**No**

Plant i.d. needed?	**No**
Require permanent transect?	**Merely need reach location and length formerly measured.**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: Water quality

Method: Sampling along stream for laboratory analysis

Equipment needed: Sampling equipment, GPS, camera, clipboard

Overall difficulty:	**Medium - Low**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**Merely need reach location and langrth formerly measured.**
Offsite technical analysis?	**Yes**
Statistical analysis?	**Yes**

Indicator: Water quality

Method: On-site sampling for turbidity and sediment load

Equipment needed: Sampling equipment, GPS, camera, clipboard

Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator: **Macroinvertebrates (at landscape scale)**

Method: **Sampling per *User's Guide for the Rapid Assessment of the Functional Condition of Stream-Riparian Ecosystems in the American Southwest***

Sampling for aquatic invertebrates should be done at the same locations in riffle areas where embeddedness is recorded. Pick up and, using a hand lens, observe the organisms on six rocks greater than 6 inches in diameter in each of the three riffle areas. Identify (to the Order only: e.g., stonefly larvae, mayfly larvae, caddisfly larvae, beetles) using the illustrations in Appendix 1[See pp. 39-40 in Stacey, et al.; link in references below] or a suitable field guide. List the Orders found on the worksheet. Note the presence of crawfish, but for this protocol, do not include them in the final tally of the total number of orders found in the samples to determine the final score. This is because crayfish are often introduced (non-native) in many streams, and their presence in such situations can be an indicator of other conditions in the stream that are problematic.

Equipment needed: **Data form**

Overall difficulty: **Medium**

More than minimal training? **Half day**

Plant i.d. needed? **No**

Require permanent transect? **Yes**

Offsite technical analysis? **No**

Statistical analysis? **No**

Equipment needed: **Screen/net**

Overall difficulty: **Medium**

Indicator: **Macroinvertebrates** (at landscape scale)

Method: **SVAP2, element 14**

More than minimal training? **No**

Plant i.d. needed? **No**

Require permanent transect? **NA**

Offsite technical analysis? **No**

Statistical analysis? **No**

Indicator:	**Macroinvertebrates** (at landscape scale)
Method:	**Stream collection at various locations for analysis in the Joint Agency Laboratory at USU**
Equipment needed:	**Sampling equipment, GPS, camera, clipboard and paper**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**Yes**
Offsite technical analysis?	**Yes**
Statistical analysis?	**Yes**

BIODIVERSITY

Indicator:	**Potential reproduction/pollination**
Method:	**Transect plant surveys**

Representative transect(s) with hoops/ frames at set distances, counting plants with and without reproductive structures/seedheads within the hoop/frame. A subset of the most dominant species could be selected for counting. Photos of plants within the hoops/frames may add to assessment.

Equipment needed:	**Camera, GPS, frames, stakes**
Overall difficulty:	**High**
More than minimal training?	**Yes**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**Yes**
Statistical analysis?	**Yes**

Indicator:	**Potential reproduction/pollination**
Method:	**US&RM- indirectly through the key species method**
Equipment needed:	**None**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**No**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Potential Reproduction/pollination**
Method:	**Paced transect or line intercept transect and photo points**
Equipment needed:	**Camera, GPS, paper and clipboard**
Overall difficulty:	**Medium**
More than minimal training?	**No**
Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

Indicator:	**Potential Reproduction/pollination**
Method:	**Georeferenced photos**
Equipment needed:	**Camera, GPS, frames, stakes**
Overall difficulty:	**Medium/Low**
More than minimal training?	**No**

Plant i.d. needed?	**Yes**
Require permanent transect?	**Yes**
Offsite technical analysis?	**Yes**
Statistical analysis?	**No**

Indicator: Restoration/reproduction/ pollination

Method: On-site review during the grazing season

Equipment needed: Camera, GPS, maps, clipboard

Overall difficulty:	**Low**
More than minimal training?	**No**
Plant i.d. needed?	**Yes**
Require permanent transect?	**No**
Offsite technical analysis?	**No**
Statistical analysis?	**No**

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Appendix A

PLANT SPECIES INDICATORS ASSOCIATED

WITH POOR AND SUSTAINABLE LIVESTOCK GRAZING

Purpose of this vegetation chart: Provide vegetation indicators or flags that further assessment might be in order regarding livestock management.

Caveat: The "plant species indicators associated with poor grazing management" identified in this chart may have been wholly or partially caused by other disturbances, e.g., historic rather than (or in addition to) current grazing management, dispersed recreation, fire, flooding, wild ungulate grazing/browsing.

In estimating the potential role of current grazing management in causing, sustaining, or exacerbating these conditions, the following may all be useful or essential: site-specific information (e.g., both long and short term monitoring of compliance, condition and trend transects); small and large reference areas (e.g., exclosures, inaccessible areas, closed or vacant allotments); historic photos; collateral signs of unsustainable grazing management (e.g., trampled banks, bare soil, lack of willow recruitment, erosion); and relevant scientific literature.

Similarly, both short- and long-term reference areas can be useful or essential in estimating the potential of a site to attain conditions associated with sustainable grazing management (column 3 below)

Habitat	**Plant species indicators associated with poor grazing management**	**Plant species indicators of sustainable grazing management**
Riparian	**Dominance of Kentucky bluegrass *Poa pratensis***	**A diversity of sedges/rushes**
	Dominance of dandelion *Taraxacum officinale*	
	***A lack of diversity of sedges/rushes where diversity is expected**	
	Dense stand of Baltic rush *Juncus balticus* and lack of graminoid diversity	
	Dominance of Redtop *Agrostis gigantea*	
	Near-dominance of water birch *Betula* and/or alder *Alnus* or rose where greater contribution of willows would be expected	**A diversity of native riparian woody species, including palatable woody species**
	Mullein *Verbascum* species.	

Uplands	**Lack of diversity of forbs**	**A diversity of native palatable forbs that are taller than a few inches**
	Near-monoculture of exotic pasture grasses, e.g., intermediate wheatgrass, crested wheatgrass in environments where native grasses could be re-established	**A diversity of native grasses**
	Blue grama *Bouteloua gracilis* when a diversity of native grasses is lacking	
	Cheatgrass *Bromus tectorum* – Note: there is a particular need to determine whether or the degree to which it's related to grazing	
	More than insignificant presence of certain species, e.g., • **Stickseed *Hackelia floribunda, Lappula occidentalis*** • **Tarweed *Madia glomerata*** • **Pepperweed, *Lepidium* species.** • **Bur buttercup *Ranunculus testiculatus***	
	Dense broom snakeweed *Gutierrizia sarothrae*	
	Presence of exotic invasive species, e.g., yellow sweet clover, houndstongue, non-native thistles *Cirsium* species.	
	Near monoculture of • **Mule's ear *Wyethia ampexicaulus*** • **Arrowleaf balsamroot *Balsamorhiza sagittata*** • **Western coneflower *Rudbeckia occidentalis* specially when associated with other signs of poor grazing management**	
Meadows/ grasslands	**Essentially only "belly flowers"; the only flowers are those within an inch or two of the soil, e.g,:** • **Pussytoes *Antennaria* species.** • **Dandelion *Taraxacum officinale***	**A diversity of native forbs that are taller than a few inches**

	When tall forbs are present, the only ones dominating, and/or common are unpalatable or toxic, e.g., • **Rydberg's penstemon *Penstemon rydbergii*** • **Groundsel *Senecio integerrimus*** • **Death camas *Zigadenus* species.** • **Lupine *Lupinus* species.** • **Yarrow *Achillea millefolium*** • **Larkspur *Delphinium* species.**	
	Near monoculture of Letterman's needlegrass *Stipa lettermanii*	
	Prostrate knotweed, *Polygonum aviculare;* Douglas' knotweed, *P.douglasii*	
Moist/wet meadows	**Dominance of certain species, e.g.,** • **Iris *Iris missouriensis*** • **Goldenpea *Thermopsis montana*** • **Cinquefoil *Potentilla gracilis*** • **Clover *Trifolium repens*** • **Kentucky bluegrass *Poa pratensis*** • **Baltic rush *Juncus balticus***	**Diverse native graminoids, forbs**

Collaborative Group on Sustainable Grazing
for U.S. Forest Service Lands in Southern Utah

APPENDIX 10

Social and Economic Indicators Evaluation Chart

Collaborative Group on Sustainable Grazing
for U.S. Forest Service Lands in Southern Utah

Appendix 10

Indicator	Evaluation Criteria	Objective	Easily Observable			Practicality of Measurement	
		Can it easily be framed in an objective way?	Can non-technical people easily understand this indicator?	Are publicly accessible data collected on this indicator?	Does the FS currently collect data on this indicator?	Cost of measuring this indicator	Difficulty of data collection?
		Yes or No	*Yes or No*	*Yes or No*	*Yes or No*	*Low/Med/High*	*Low/Med/High*
1. Investment in Grazing Practices							
Dollar value of time and capital related to grazing management changes on FS land / allotment by **permittee**		yes	yes	partially	partially	med/high	high
Dollar value of time and capital related to grazing management changes on FS land / allotment by **FS**		yes	yes	partially -- more for capital, less for time	partially	med	med
Dollar value of time and capital related to grazing management changes on FS land / allotment by **other entities**		yes	yes	depends on the entity (gov't or private)	no, although it is available	med	med
Total pounds of meat production / acre / allotment (5-10 year average)		yes	yes	no	no	high for cattle, med for sheep	high for cattle, med for sheep
2. Opportunities to participate in livestock grazing programs on FS lands							
Permittees: No. of individual permits and AUMs per permit by district		yes	yes	yes	yes	low	low
Permittees: Permitted AUMs by month by district (i.e. season of availability)		yes	yes	yes	yes	low	low
Permittees: Grazing use by district by month (from permittees reports to the USFS)		yes (note: this is different than level of trust in accuracy)	yes	yes	yes	low	low
Other Entities: Identification of programs and partners engaged in grazing management arrangements by district		yes	yes	Yes if there is a formal process or arrangement	sometimes	low in formal engagement	low in formal engagement

Indicator	Evaluation Criteria	Scale			Tied to Management			
		Meaningful in the short-term? (1 year or less)	Meaningful in the long-term	At what scale(s) is this indicator meaningful (operator scale? Community/county? Larger public)	Would the indicator respond to on-the-ground changes in grazing management?	Does the FS have any management control over this indicator?	Does the FS currently consider this indicator when making management decisions?	Could a change in this indicator trigger a change in FS management or FS action?
		Yes or No	*Yes or No*	*Note scale*	*Yes or No*	*Yes or No*	*Yes or No*	*Yes or No*
1. Investment in Grazing Practices								
Dollar value of time and capital related to grazing management changes on FS land / allotment by **permittee**		yes	yes	always at operator scale; depends at other scales	yes	yes (influence in operating insturctions, not total control)	yes	yes, along with other factors
Dollar value of time and capital related to grazing management changes on FS land / allotment by **FS**		yes	yes	all	yes	yes	yes	yes
Dollar value of time and capital related to grazing management changes on FS land / allotment by **other entities**		yes	yes	more at community/larger public scales	no (something else controls it)	no	yes, potentially	yes
Total pounds of meat production / acre / allotment (5-10 year average)		no	yes	operator and community; maybe public	yes, could respond either way	yes (via AOI)	no	yes
2. Opportunities to participate in livestock grazing programs on FS lands								
Permittees: No. of individual permits and AUMs per permit by district		yes	yes	all	could, yes	yes	yes	reverse is true
Permittees: Permitted AUMs by month by district (i.e. season of availability)		yes	yes	all	yes	yes	not as phrased; FS doesn't look at balance across seasons	reverse is true
Permittees: Grazing use by district by month (from permittees reports to the USFS)		yes, to the degree accurate	yes	all	could, yes	yes	yes	yes
Other Entities: Identification of programs and partners engaged in grazing management arrangements by district		yes	yes	all	could, yes	no	no	yes

Indicator	Evaluation Criteria	Objective	Easily Observable			Practicality of Measurement	
		Can it easily be framed in an objective way?	Can non-technical people easily understand this indicator?	Are publicly accessible data collected on this indicator?	Does the FS currently collect data on this indicator?	Cost of measuring this indicator	Difficulty of data collection?
		Yes or No	*Yes or No*	*Yes or No*	*Yes or No*	*Low/Med/High*	*Low/Med/High*
3. Diversity of grazing management arrangements and public involvement that reflects a broad range of societal values							
Number and acreage by district and year of diverse grazing management arrangements		yes	yes	yes	yes	low	low
Number of FS decisions made annually that have participation from multiple stakeholder interests (FS, permittee and others); count to be made by Ranger District, broken down by 4 decision types		yes	yes	no	no	low	low
Basis of NEPA / administrative appeals / formal objections of FS grazing management decisions		sort of	sort of	yes	yes	low	low
4. Community/county level economic indicator							
Average expenditures per "cow unit" (1 cow/year or 5 sheep/year) per county by ranchers who use public land		yes	maybe	at a coarse scale	no	low	low

Indicator	Evaluation Criteria	Scale			Tied to Management			
		Meaningful in the short-term? (1 year or less)	Meaningful in the long-term	At what scale(s) is this indicator meaningful (operator scale? Community/county? Larger public)	Would the indicator respond to on-the-ground changes in grazing management?	Does the FS have any management control over this indicator?	Does the FS currently consider this indicator when making management decisions?	Could a change in this indicator trigger a change in FS management or FS action?
		Yes or No	*Yes or No*	*Note scale*	*Yes or No*	*Yes or No*	*Yes or No*	*Yes or No*
3. Diversity of grazing management arrangements and public involvement that reflects a broad range of societal values								
Number and acreage by district and year of diverse grazing management arrangements		yes	yes	community and public	could, yes	yes	no - project or single allotment decisions are focused on the single allotment, and do not typically consider the entire landscape.	reverse is true
Number of FS decisions made annually that have participation from multiple stakeholder interests (FS, permittee and others); count to be made by Ranger District, broken down by 4 decision types		yes	yes	community and public	yes	yes	yes	yes
Basis of NEPA / administrative appeals / formal objections of FS grazing management decisions		yes	yes	all	yes	indirectly	yes	yes
4. Community/county level economic indicator								
Average expenditures per "cow unit" (1 cow/year or 5 sheep/year) per county by ranchers who use public land		yes	yes	county and up	yes, depending on scale	indirectly	no	no