8. MONITORING RECOMMENDATIONS

TASK 8: PROVIDE RECOMMENDATIONS INCLUDING METHODOLOGY AND SITES FOR FUTURE MONITORING

In the Elkhorns, where the herbivory by wild ungulates and domestic livestock is recognized to be important, collecting data for production (percent composition by weight) is essential. The crosswalk (regression equations) back and forth between cover and weight are unsatisfactory. Given the fact that wildlife and domestic livestock use pounds of forage rather than coverage, we recommend on-going herbage yield data collection for production.

8.1 FUTURE MONITORING RECOMMENDATIONS

- Increase upland utilization monitoring during cattle grazing season;
- Establish a pre cattle turn-on utilization monitoring program;
- Establish future vegetative data collection programs and methods to better utilize historic data;
- Reestablish all Parker 3-Step transects, even if permanent stakes are gone;
- Updating the USFS rangeland data sets and rethinking Stand Stage ratings;
- Continuing existing riparian utilization standards and monitoring while rethinking monitoring site selection;
- Future adoption of the State and Transition Model to help better understand and manage rangeland habitats.

ERG recommends that data collection methods similar to those used during the Elkhorn Vegetation Study be continued in the Elkhorns. Repeating the similar data collection techniques, every five years or so, would allow the most accurate assessments of rangeland health, function , and trend to be made; successive readings would also allow the EWG to assess future management's effects across the landscape. It is also recommended that the data collection techniques used in the Kimber and North Crow EHUs be applied in other EHUs. The Elkhorns encompass a wide range of habitats; from the Ponderosa pine/Douglas-fir forests on the west side, the ample rangelands on the eastside, to the large areas in succession after the Warm Springs fire in the north. All of these areas have unique habitats and concerns which management needs to address independently. ERG recommends that the west side of the Elkhorns also be further investigated; during Phase I ERG determined that the west side of the Elkhorns potentially had higher rates of encroachment, forest infilling, and more reports of wildlife effects to private land, than did the east side.

Fully utilizing all possible historic data, in other parts of the Elkhorns is also recommended. In order to make use of old data and to help coordinate between agencies; develop methods for future vegetation data collection that can be used as a crosswalk between the several different types of vegetation measurement. Typical vegetation measurements vary among state and the different federal agencies including canopy cover, canopy cover classes, frequency, basal area, leaf area index, Parker 3-Step transects, nested plots etc. This task will be difficult and requires interagency cooperation.

8.1.1 Upland Monitoring

A wide array of quality vegetative information has been collected over the years in the Elkhorn Mountains. A major problem, however, has been that collection techniques have changed numerous times, resulting in older data becoming outmoded because they don't contain comparable data. These diverse vegetative data collection techniques all sought the same goal, i.e., trying to track vegetative change over time and respond to differing management systems, but they provide differing data that ultimately hinders the land manager's goal of tracking the vegetation through time.

ERG recommends that vegetation data collection techniques be standardized and carried out uniformly across jurisdictional boundaries. Historic vegetation data, even though it does not provide the exact same data, needs to be compiled and incorporated into the present monitoring and data collection program. With further development (though not within the scope of this project), regression equations could be used on a species-by-species basis to convert percent composition into percent cover, thus increasing the usefulness of the older Parker 3-Step data.

ERG specifically recommends that the USDA NRCS methods be used to quantify the departure from a historic climax plant community (HCPC) using a Similarity Index. The key measurement regarding wildlife, cattle, and vegetation noted in the Forest Plan (1986) is "range condition." Range condition is the present status of vegetation of a range site (ecological site) in relation to the climax (natural potential) plant community for that site. It is an expression of the relative degree to which the kinds, proportions, and amounts of plants in a plant community resemble that of the climax plant community for the site (SRM, 1999). The similarity index is sometimes considered synonymous to range condition (SRM, 1999). The similarity index is a measure of where the current plant community is in relation to the historic climax plant community, or to a desired plant community, that is one of the site's potential vegetation states. As seen by this definition, the only difference between range condition and the similarity index is that the comparison of the current plant community can be to a desired vegetation state of that ecological site and not necessarily only to the potential natural plant community as was done with range condition. With that said, generally the similarity index is compared with the potential natural plant community (climax), to provide a basis for describing the extent and direction of changes that have taken place from a perceived historic natural community. These evaluations provide the manager with a milepost for establishing objectives and developing management goals. These goals can result in a change in the present plant community toward a community desired by the decision-maker that meets the needs of the soil, water, air, plant, and animal resources, as well as those of the manager.

For the Kimber and North Crow EHUs, ERG recommends the following to ensure maintenance of the vegetative resource of rangeland habitats:

- Annual vigilance of both permittees and range managers to closely monitor and ensure upland use standards are not exceeded;
- Establishing an annual pre cattle turn on utilization monitoring program in allotments, to help identify potential problem areas before the problems occur; and
- Repeating rangeland mapping techniques (SIs), similar to those used by ERG, every five years in order to assess rangeland health and management's effectiveness.

As discussed in Section 7, the USFS has set up upland utilization standards in each allotment's AMP, which, if met, provide more than adequate protection of the vegetative resource. The problem is how, and where, to determine if these standards are being met. ERG found several small sites that exceeded upland utilization standards, but overall all allotments were within standards. With large scale annual monitoring programs unlikely due to the time and money the key to effective monitoring is the selection of key or representative areas. AMPs discuss upland monitoring stating, "Determine key areas and how to do measurements on key areas in riparian and upland key areas in the field", and go on to estimate that it would take one day in the field with permittees and the rangeland management specialist. Next, in the AMPs, it is stated that annual monitoring of the key areas, between the managers and the permittees, will be done to determine cattle move dates. ERG agrees with getting range managers and permittees out in the field together; it is usually much easier for the two sides to reach agreements in the field, rather than at a meeting table. ERG spent several days in the field with USFS range managers, permittees, and MTFWP wildlife biologists; and was always easier to talk about specific management topics, when all sides were looking at the same thing. ERG recommends that all involved parties continue, or preferable increase, the amount of time spent in the field together to monitor and assess conditions.

8.1.2 Riparian Monitoring

In reviewing the management reports for the Elkhorns, we found it striking that riparian conflicts did not appear to be a major problem until the 1990s. All of the AMPs, released in the 1990s, specify riparian standards for livestock grazing including: livestock utilization levels, allowable stubble height, allowable woody utilization, allowable bank disturbance, and allowable soil disturbance. Elsewhere in the West, livestock damage to riparian zones is often controversial (Smith et al., 1992), and any strategy that involves fencing cattle out of riparian areas only increases the controversy. Because the problem is virtually ubiquitous, many different potential solutions have been reported. However, the amount of attention needed in the Elkhorns is not clear. Typical suggestions include:

- Anderson and Scherzinger (1975) suggest development of, and better distribution of, water sources, and distribution of salt to keep cattle away from water;
- Hicks et al. (1996) recommend water developments from troughs to ponds, herding cattle out of riparian areas, and instream structures for gradient control;

- Roberts and Becker (1982) suggest riparian zone management;
- Hicks and Warren (1996) mention "… drift fencing, upland water development, prescribed burning, vegetative plantings, and the use of instream structures"; and
- Knight (1996) notes to fence riparian areas as separate pasture, cross riparian drift fences encourage cattle to use uplands, off site water and fertilized plots.

ERG recommends that agency riparian standards and guidelines be reviewed so that standards are better suited to on-the-ground situations, consistent with dual use. For example, should elk be allowed more leeway with bank disturbance than livestock? We know from work in other riparian areas that wildlife has exceeded disturbance standards.

In general, our analysis of the existing riparian grazing strategy concludes: (1) riparian utilization and bank stability standards need to be reviewed to better reflect on-the-ground situations, consistent with dual use; (2) key areas for monitoring utilization and bank stability are reasonably well identified; (3) permittees are generally alert to situations where cattle use is approaching riparian standards, and are moving cattle to avoid exceeding those standards; and (4) riparian vegetation condition and bank stability are generally improving.

The current riparian management strategy comes at some cost. Grass resources are often under-utilized in upland areas, because riparian standards are met in most cases long before upland grass utilization standards are met. The rate at which riparian utilization approaches acceptable standards can be rapid, particularly late in the season. Consequently, a high level of vigilance by permittees is required so that cattle can be moved and those standards aren't exceeded. Lastly, because riparian zones are dynamic due to seasonal flooding, continual perusal of selected riparian key areas is needed to assure that those key areas actually reflect average conditions.

Consequently, we recommend the HNF consider a future contingency plan that would either: (1) combine allotments so that rest-rotation grazing systems could be used to provide more protection for riparian systems while extracting more upland forage; or (2) rely more on riparian fencing. The factors that might suggest such a contingency should be considered are:

1. Decreased ability of permittees to meet upland forage standards;
2. Decreased willingness by the permittees to conduct the high level of monitoring and scrutiny needed to move cattle when standards are met; and
3. Declining riparian condition.

Again, we're not recommending any changes in grazing systems or the manner in which riparian grazing is conducted or monitored. Rather, we're suggesting the HNF and permittees be alert to potential changing conditions so that there are no surprises in the future.

8.2 UPDATING USFS RANGELAND HABITATS DATA SET

There is a need for a complete range inventory. ERG, during Phase II, has provided a complete inventory of the rangeland habitats in the Kimber and North Crow EHUs. The current USFS range polygons in GIS does not cover all allotments in the WMU. The BLM lands adjacent to the WMU have no GIS data as to range condition and should also be included in the range inventory.

The primary reason for the recommending a complete range inventory is to reconcile the data used by the USFS to assign forage usage for herbivory. The Crow Creek EA Appendix describes the methods used to calculate stocking rates. ERG reviewed the stocking rate calculations, and found that the USFS stocking rate calculation bases an AUM on 33 lbs/day of forage utilization by an animal unit. This is different than the figure used by the USDA NRCS of 26.3 lbs/day or even that of 20 lbs/day noted by the Society for Range Management (SRM) (Holechek, 1998). This difference between the NRCS, USFS, and SRM animal unit days could account for a 20% to 40% overall change in gross stocking capacities. The calculations used to arrive at stocking rates are derived from the "worksheet - estimate grazing capacity" (reference FSH 2209.21 R1, 740). These worksheets compute production based on vegetation type and condition and trend.

The clipped and extrapolated USFS production values used to calculate stocking rates vary from those shown in the range management section of the Soil Survey of Broadwater County. USFS production values in their database show only the graminoid production and do not have any herbage yield figures for forbs and shrubs. The highest graminoid production figures are attributed to timothy dominated vegetation communities. In contrast to the USFS production values, the Soil Conservation Service (now NRCS) publishes production values for soils and range sites. The range sites show production values which vary significantly compared to USFS values.

A complete range inventory would also identify areas in allotments that have a forage resource but are currently disregarded as an herbage resource. While woodland understory herbage yield is less than that of rangelands, there can be a significant addition to the current AUMs. Presently, the AUMs for the North Crow allotment are based only on primary and secondary range classifications. Primary and secondary range accounts for only 39% of the area. The 43,000 acres un-inventoried should be characterized for forage.

ERG recommends that the HNF's rangeland vegetation data set be updated. The HNF's GIS coverage entitled "pasture_polygon" provides graminoid production and stand stage values for a majority of the rangeland habitats within the allotments in the study area. ERG has found many problems and inconsistencies

with the "pasture_polygon" data set, as described in Sections 1 and 7. Allotment management plans set upland utilization standards according to stand stage. ERG feels that the entire "pasture_polygon" needs to be reworked, especially the stand stage ratings. It is ERG's recommendation that the HNF adopt the final ERG vegetation polygons, in order to update, or serve as, their rangeland habitat data set.

This data set has much variation when compared to the production data collected by ERG. Figures 8.3-1 and 8.3-2 compare just the polygons between the HNF's and ERG's vegetation polygons from a sample area in Weasel Creek in the Kimber EHU. ERG's polygons cover all vegetation types and via large scale digitizing, offer the most accurate representation of the vegetation.

Besides more accurately representing vegetation spatially; the ERG data set offers more accurate, detailed, and up to date data regarding the rangeland habitats in the Elkhorns.

8.3 PARKER 3-STEP PLOTS

Even if permanent transect stakes are missing, the photo sets, at the Parker 3-Step plots offer valuable comparative information. Parker 3-Steps provide the oldest data on the rangeland habitats in the Elkhorns, therefore we recommend that all Parker 3-Step Plots be reestablished. If reestablishment is not possible, ERG recommends that the photo points be resumed in order to capture long term changes across the landscape.

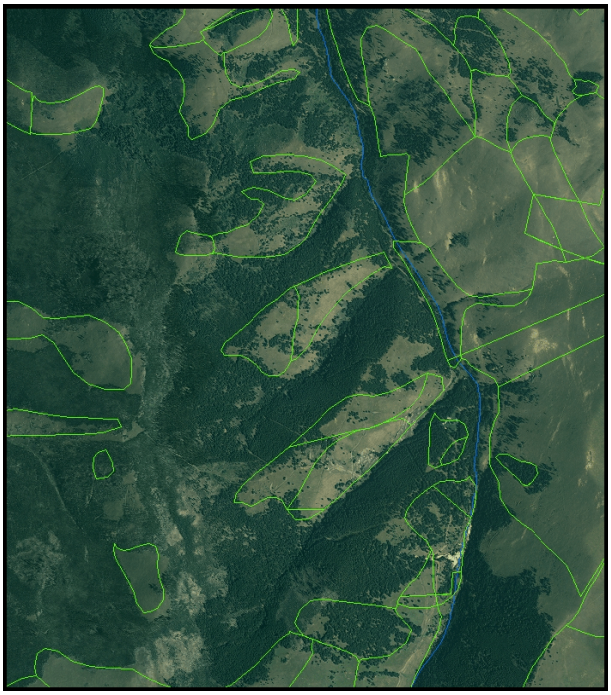

Figure 8.3-1 USFS pasture polygons

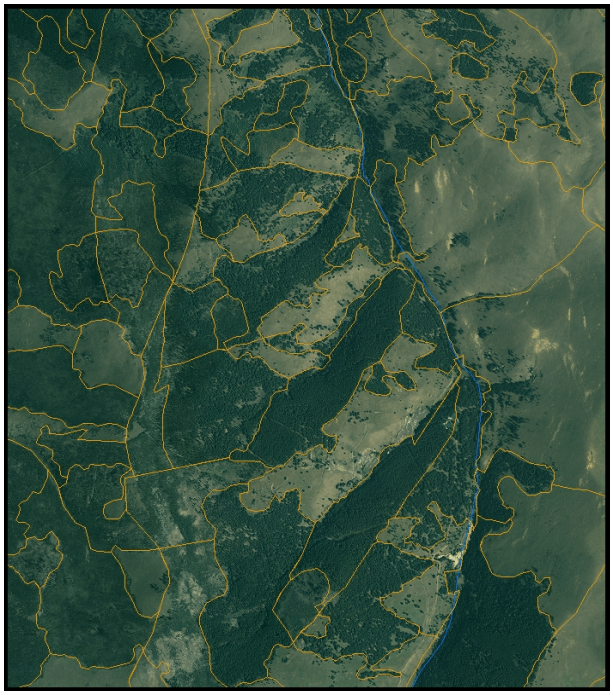

Figure 8.3-2 ERG's final vegetation polygons

8.4 STATE AND TRANSITION MODELING

Ecosystem planning, assessment, and monitoring of vegetation resources are improved with a prediction of vegetation spatial pattern at the landscape scale. Understanding vegetation factors and processes is a necessary prerequisite to predict future patterns of vegetation in landscapes. Toward that end, there is renewed interest in implementing models of vegetation dynamics to assess the effect of human activities on ecosystems and help manage landscapes. In range science, traditional approaches have proven inadequate for certain types of rangeland. Traditional range management was based on the hypothesis that the replacement of one type of plant cover by another was the most rational and reliable way to detect overgrazing, and grazing value of a range site was determined by the stage of succession represented.

Range ecologists and managers realized the need for determining range condition (rangeland health) on factors other than growing season conditions early in the 20th Century. Smith (1989) reports that both Sampson (1917) and Clements (1920) described changes in vegetation as a result of grazing in terms of successional stages; however, the concept of range condition based on secondary succession was not fully elaborated and put into widespread use until the 1940s (Parker and Woodhead 1944, Humphrey 1945; Renner 1948, Dyksterhuis 1949). Thus, by the 1950's range condition was based on succession stage and defined as the present status of vegetation of a range site in relation to the climax (natural potential) plant community for that site. As such, it was an expression of the relative degree to which the kinds, proportions, and amounts of plants in a plant community resemble that of the climax plant community for the site (SRM, 1999). Using the secondary succession model as the theoretical basis, range condition has generally been classified into 4 classes (excellent, good, fair and poor) based on percentage of the current plant composition with the perceived climax community. This was the general procedure of the U.S. Forest Service ECODATA and Parker 3-Step Condition and Trend transects. As disturbance (i.e., livestock grazing) increases the percentage of climax species would decrease (decreasers) and the amount of intermediate species (increasers) and disturbance species (invaders) would increase. Likewise, as disturbance (i.e., livestock grazing) was decreased the dominant climax species would increase and thus condition improved. By the late 1980', the theoretical basis of the secondary succession model was being questioned as being overly simplistic and not representative of natural events (Laycock, 1989; Smith, 1989; Friedel, 1991). A different theoretical approach is being developed using state-and-transition models and a determination of ecosystem functions as a measure of range condition or health. In 1994, the National Research Council defined rangeland health (condition) as "the degree to which the integrity of the soil and ecological processes of rangeland ecosystems are maintained" and the Task Group on Unity in Concept and Terminology (1995) refined the definition to "the degree to which the integrity of the soil, vegetation, water, and air, as well as the ecological processes of the rangeland ecosystem, are balanced and sustained." Thus, current range condition methodology may consider the current plant composition to a reference plant condition (possibly the historic natural plant community), but also considers a number of other factors (soils, hydrology, energy flow).

For the Elkhorns, a change in range condition methodology could be significant. For example, on some sites where range condition is declining because of increases in Rocky Mountain juniper or Mountain big sagebrush removal of grazing will not improve range condition. The increase in these species is more associated with a reduction in the fire regime rather than with overgrazing; although, overgrazing by livestock may increase the rate of encroachment. For these sites the state-transition-model would show that a lack a fire would result in a relatively stable state with high coverage of mountain big sagebrush and will not "transition" to a "grassland" without fire (livestock grazing is not the driving factor). Stringham et al. (2001) believe that "state-and-transition models hold great potential to aid in understanding rangeland ecosystems' response to natural and/or management-induced disturbances by providing a framework for organizing and understanding potential ecosystem dynamics." We believe the development of state-and-transition models for ecological sites for the Elkhorn study area would improve the ability of land managers to assess changes and possibly determine treatments to alter states to more desirable communities for area objectives.

Current theory on rangeland ecosystems implies a need for state-and-transition models to predict vegetation changes. ERG recommends that state-and-transition models be developed for key ecological sites on the study area. The NRCS is developing state-and-transition models for rangelands and some of the information may be available. We do not imply that past condition and trend measures are not usable, but the information needs to be carefully reviewed to determine how vegetation conditions are related to current ecological theory. As stated previously, there are numerous photographs from the old Parker 3-Step files and ECODATA plots that could be used to determine vegetation changes on some important sites and would help in the development of state-and-transition models. We also recommend that rangeland condition not be based on "climax plant communities" or the historic natural plant community, but on ecological processes and integrity of the biotic community (Pellant et al, 2000). A similarity index, a comparison of the current plant community with a desired reference community should be computed. For example, the reference community may be with a historic natural plant community (fescue grassland), a potential plant community (mountain big sagebrush/fescue grassland), or other desired plant community for the site.

Rangeland trend has been defined as the change in range condition (SRM, 1999). Significant changes in plant communities are generally slow, except for intensive treatments (i.e., fire, mechanical treatment, intensive grazing). The adoption of state-and-transition models will help determine "treatments" needed to direct change toward the desired plant community. We recommend that careful attention be given to methods for determining changes. Nested frequency methods have been adopted in some areas and provide for statistically reliable data for determining changes.

Once finalized, the state and transition modeling for rangeland ecosystems is recommended for adoption in the Elkhorns. These models hold great potential to aid in understanding rangeland ecosystems' response to natural and/or management-induced disturbances by providing a framework for organizing current understanding of potential ecosystem dynamics.

All SI plot data, collected during the two field seasons of the Elkhorn vegetation Study, can be updated to calculate percent similarity once ESDs have been developed for the Elkhorns. These can serve as baseline data for future data collection programs.