Soils Specialist Report

Kiowa, Rita Blanca, Black Kettle and McClellan Creek National Grasslands Plan Revision

Environmental Impact Statement Analysis

Submitted by: __/s__
Livia Crowley, Forest Hydrologist

Cibola National Forest and National Grasslands
Specialist Report

Introduction
This report discloses and evaluates the potential environmental consequences on the soil resource that may result with the adoption of a revised land management plan. It examines, in detail, three different alternatives for revising the management direction from the 1985 Cibola National Forest Land Management Plan (only that which is relevant to the National Grasslands).

Relevant Laws, Regulations, and Policy that Apply
- Organic Administration Act of June 4, 1897, as amended. This act contains the first authority for watershed management on National Forest system lands. The purpose for the establishment of National Forest, as stated in the Act, includes securing favorable conditions of water flow.

- National Forest Management Act 1976, which ensures that forest planning and management activities provide for the conservation and sustained yield of soil and water resources.

- Multiple Use Sustained Yield Act of 1960, which states that management of the National Forest must provide “sustained yields in perpetuity without impairment of the productivity of the land.”

- Bankhead Jones Farm Tenant Act of July 22, 1937, as Amended (7 USC 1010-1012), directs Secretary of Agriculture to develop a program of land conservation and land use to assist in controlling soil erosion and other impairments. Lands were acquired through this act and are now largely included in the National Grassland.

Methodology and Analysis Process
The spatial analysis is based on the Forest Service lands within the proclaimed boundary of the Black Kettle, Kiowa, McClellan Creek, and Rita Blanca National Grasslands. The timeframe extends to the next planning period. Current conditions are the result of historic impacts, beginning with the impacts from the Dust Bowl and the practices which led up to it and extending to today with continued improvements of these soils. As a result, existing soil conditions are the result of influences that have occurred at least over the last 100 years. Existing conditions and environmental consequences were evaluated using existing forest data, including Terrestrial Ecosystem Unit Inventory (TEUI), satellite imagery, and data from other sources as cited.

Numerous onsite soil condition assessments were made and existing field notes were analyzed to classify and extrapolate soil condition across the Grasslands (USDA, 2007) as part of the TEUI. Overall accuracy of mapping and information provided by the TEUI and soil condition protocol is considered reliable at the ecological unit or landscape level.
Each alternative was evaluated for its ability to meet the desired condition for soil resources. The desired condition for soil is for it to be in satisfactory condition.

**Assumptions**

In the analysis for this resource, the following assumptions have been made:

- The land management plan provides a programmatic framework for future site-specific actions.
- Land management plans do not have direct effects. They do not authorize or mandate any site-specific projects or activities (including ground-disturbing actions).
- Land management plans may have implications, or environmental consequences, of managing the forests under a programmatic framework.
- The plan decisions (desired conditions, objectives, standards, guidelines, management areas, monitoring) will be followed when planning or implementing site-specific projects and activities.
- Law, policy, and regulations will be followed when planning or implementing site-specific projects and activities.
- Monitoring will occur and the land management plan will be amended, as needed.
- We will be funded similar to past budget levels (past 5 years).
- The planning timeframe is 15 years.
- Soil and Water Conservation Practices will be applied to all management activities as described in FSH 2509.22.

**Revision Topics Addressed in this Analysis**

While there were no issues specific to soil resources, there are some related topics which require attention. Climate change was not addressed in the 1985 Plan for any resource. Information from the Southwest Region Climate Change Trends and Forest Planning (USDA, 2010) was used to consider climate change effects to soil resources. Issues identified in the Notice of Intent (Federal Register, 2010) include the effect of human influences of the grasslands from livestock grazing, energy development, mining reclamation, miscellaneous forest products, mineral materials, and fire management.

**Summary of Alternatives**

Alternative A is the ‘no action’ alternative, meaning there is no change from the current management direction as found in the existing plan (USDA, 1985). For soil resources, emphasis was placed on inventory and monitoring for soils, using Best Management Practices to mitigate adverse effects, incorporating water and soil improvement into projects where watershed condition is unsatisfactory, and specified certain practices to reduce effects to soil resources such as rehabilitation after management activities or wildlife fire and seeding and using control structure to prevent soil loss. The expected future condition is to reduce soil loss by 10%. The goal for soil is to improve and maintain soil productivity. Alternative A does not include specific
direction for climate change, fire, energy development, mining reclamation, miscellaneous forest products, and mineral materials. Currently, each of these activities is managed through existing policies that are not directly part of the Forest Plan or require updating.

Alternative B is the preferred alternative. Alternative B includes guidance for effect of human influences of the grasslands from livestock grazing, energy development, mining reclamation, miscellaneous forest products, mineral materials, and fire management. Livestock grazing would be directed by adaptive management. New recreation areas would be limited with existing site maintained and rehabilitated. The Mills Canyon Management Areas would be designated to preserve its wild, scenic, and recreational qualities. The desired condition for soil resources is that soil is in satisfactory condition.

Alternative C is similar to Alternative B is all ways except that it recommends that part of the Canadian River Inventoried Roadless Area be designated as the Canadian River Wilderness Area.

**Description of Affected Environment (Existing Condition)**

**Soil Resources**

The Terrestrial Ecological Unit Inventory (TEUI) (USDA, 2007) was used throughout this report. TEUI is the result of the systematic analysis, mapping, classification and interpretation of terrestrial ecosystems also known as ecological types delineated and numbered in ecological units. It is the only seamless mapping of vegetation and soils available across the Forest that includes field visited, validated, and correlated sites with a stringent Regional and National protocol. Differences in ecosystem properties including soil and vegetation can occur within short distances. The TEUI was mapped at a scale of 1:24,000 across the landscape. Areas less than 40 acres were not mapped separately at this scale. Overall accuracy of mapping and information provided by the TEUI is considered reliable at the ecological unit or landscape level and is suitable for analysis at the Forest Plan level.

There are 47 different TEUI units on the Grasslands. A map unit is a collection of areas defined and named in terms of their soil, vegetation, and climate components. Each map unit differs in some respect from all others in a survey area and is unique. Ecological Sustainability Report (USDA, 2011) provides a summary of existing soil loss rates and soil condition.

Soil loss is the predicted net average soil loss from a site due to erosion. Conditions on the ground when TEUI was mapped show that 90 percent of the grasslands have current soil loss rate either equal to or below the predicted natural soil loss potential (the predicted soil loss under natural conditions). When soils are not eroding faster than the natural rate, soil is retained onsite, allowing for soil forming processes to occur. Uns suited soils are found on 10 percent of the grasslands. These soils have natural loss rates greater than the tolerance soil loss rate. The tolerance soil loss rate is the rate of soil loss than can occur while sustaining soil productivity (USDA, 2007). This is an unstable state, but a natural one. Since soils loss rates are satisfactory and suited, it appears that current management activities on the Grasslands are not contributing to soil loss greater than natural rates at the scale of the TEUI data.
All of the mixed hardwood riparian, cottonwood-willow riparian, sand sagebrush (*Artemisia filifolia*), and shinnery oak (*Quercus havardii*) potential natural vegetation types (PNVTs) have satisfactory soil loss rates. Unsuited soils occur in the mixed grass prairie, shortgrass prairie, and pinyon-juniper PNVTs. In addition, smaller localized areas may exceed the tolerance soil loss rate, resulting in an unsatisfactory soil loss rate. These areas can occur in any of the PNVTs and are caused by roads, off road vehicles, areas where livestock congregates, recreation, oil and gas developments, and caliche extraction pits.

Soil condition is an evaluation of soil quality based on an interpretation of factors which affect vital soil functions of hydrology, stability, and nutrient cycling (USDA, 1999). The soil condition categories are; satisfactory, impaired, unsatisfactory and inherently unstable. Soils on the grassland units have been rated as 52 percent in satisfactory and 48 percent in impaired condition. Satisfactory soil condition indicates soil function is being sustained and soil is functioning properly and normally. The ability of soil to maintain resource values and sustain outputs is high. Impaired soils have reduced soil functions and the ability to function properly has been reduced and/or there exists and increased vulnerability to degradation. This category is a sign that additional information is needed to determine the causes and degree of the decline in soil function. Changes in management practices may be needed to bring impaired soils to satisfactory condition.

All soils in the mixed hardwood riparian and cottonwood willow riparian PNVTs are in satisfactory condition. Mixed grass prairie is largely in satisfactory condition with 7 percent of the soils in this PNVT in impaired condition. Overall, in these PNVTs, soil functions are sustainable. Conversely, soil conditions in the shinnery oak and sand sagebrush PNVTs are largely impaired. While these two PNVTs account for about 16 percent of the Grassland area, 85 percent of the soils in shinnery oak are impaired while 74 percent of the soils in the sand sagebrush PNVT are impaired. These PNVTs are mostly located on deep sandy soils that depend on these species for stability. Deep plowing removed these species which are an integral part of soil stability for sandy soils in this region. Shinnery oak has a deep root system which keeps soils in place. Sand sagebrush can accumulate nutrients, enabling it to grow on nutrient poor sites such as sandy soils. In the pinyon-juniper PNVT, 24 percent of the soils are also impaired. The pinyon-juniper PNVT occupies 9 percent of the Grasslands. This impaired condition is due to high portions of bare soil resulting in rates of soil loss greater that natural soil loss rates. Soil conditions in the shortgrass prairie PNVT are 54 percent satisfactory and 46 percent impaired. Several of the TEUs in the shortgrass prairie PNVT have a high proportion of bare soil which is erodible and hinders soil hydrology functioning. Much of the current soil condition is an artifact of the Dust Bowl era erosion and deposition. These changes significantly altered soil structure, stability, and texture. Most soils negatively affected during the Dust Bowl have yet to develop into productive grassland soils found prior to the 1930s.

The loss of topsoil and productivity during the dust bowl era was extreme. Restoration management practices on the Grasslands over the past several decades have resulted in tremendous improvement in soil stability and vegetative recovery. A few units on the Black Kettle Grassland that were heavily plowed in the past do not appear capable of recovering to their productivity potential, although the soils are vegetated and stabilized. A few units on Kiowa and Rita Blanca Grasslands adjacent to towns or other private developments are heavily impacted by
invasive plant populations, reducing soil productivity and vegetative diversity. These too are not likely to be restored to full productivity and native grassland vegetation due to continued spread of invasive plants and other impacts from adjacent lands.

**Environmental Consequences**

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carry out any project or activity. Because the land management plan does not authorize or mandate any site-specific activities or ground-disturbing actions there can be no direct effects. However, there may be implications, or longer term environmental consequences, of managing the forests under this programmatic framework.

**Alternative A**

Alternative A is the no action alternative which means there is no change from the current management direction as found in the existing plan.

The expected future condition for soil is a 10 percent reduction in average annual soil loss for all watersheds (USDA, 1985). The goal for soils under Alternative A is to improve and maintain soil productivity. There are some specific practices written into the standards and guidelines to move soil resources toward the future condition while meeting the soil productivity goal. In addition, the use of best management practices (BMPs) is directed to mitigate adverse soil effects and maintain site productivity. The focus is on soil productivity and soil loss rather than soil quality or soil condition. However, soil productivity is analogous to soil condition and soil quality, so this direction also works to improve and maintain soils. This alternative does not set the endpoint for ‘improve and maintain’—as a result, soil conditions may not move all the way to satisfactory soil condition. In addition, reducing soil loss by 10 percent may not be appropriate for all areas. Where soil loss rates are within natural ranges, soil loss may not need to be reduced. Despite this, the overall consequence of Alternative A would be to move soil condition towards satisfactory.

In addition to the goals and expected future condition for soil resources, management activities may also contribute to areas where soil condition is less than satisfactory. While there will always be small, localized areas of bare soil due to natural processes, some management activities create areas where soil is not productive during the time of use, such as oil and gas development and mining of mineral materials such as caliche. Currently, reclamation of oil and gas sites is not part of management direction and occurs inconsistently. This leads to impacts to soil condition where recovery is possible, and the future condition not being met.

Treatment of the sand sagebrush and shinnery oak PNVTs is of interest to soil condition. As mentioned, these two PNVTs have large percentages of impaired soils. This is due, in part, to bare ground in sandy soils as the result of the removal of these species. These two species are known for their ability to stabilize very sandy areas (Gucker 2006, McWilliams 2003). Alternative A includes management direction to reduce shinnery oak without regard for the soil. As a result, in these areas, soil may be impaired when shinnery oak is removed. These two plants are associated with the soils that occur on the eolian sand sheets and sand dune which exist on the Great Plains of North America (Muhs and Holliday 1995), in addition to sand blown deposits that accumulated
during the Dust Bowl era. During times of drought, these soils are particularly susceptible to drying out due to their sandy texture. Mobilization of these sandy deposits has occurred historically during time of great drought, even before the Dust Bowl events (Forman, Oglesby, and Webb 2001). Climate change in this region is expected to result in an increase in drought and wind, which could increase the chance of these areas mobilizing again. There is no direction in Alternative A to address the potential for climate change and this effect.

**Alternative B**

Alternative B provides clear direction for moving soils to a satisfactory condition through a stated goal and related guidelines. In Alternative B, the desired condition for soils is satisfactory with areas above natural levels of soil loss stabilized or occurring rarely. There are guidelines which address moving soil towards this condition for all management activities. Two guidelines are particularly helpful in meeting the desired condition. These are management activities which occur on unsatisfactory or impaired soils should incorporate practical opportunities for restoration to recover soil functions and the use of BMPs as found in FSH 2509.22 (USDA, 1990). The use of BMPs applies to all management activities. Monitoring BMPs to assess their effectiveness is an important part of the BMP process. When BMPs are found to need improvement through monitoring, improved practices are put into place. In this way, soil resources are protected. In addition, there are guidelines which address the issues identified in the NOI. Climate, oil and gas development, livestock grazing, energy development, mining reclamation, miscellaneous forest products, mineral materials, and fire management are also part of this alternative. The Mills Canyon Management Areas would be designated to preserve its wild, scenic, and recreational qualities. Impaired soils in this area would be improved as the Management Area guidelines and objectives are implemented. Climate change is also considered under this alternative. By considering climate change, management can be more prepared for future droughts and other changes. This is especially for soils which are susceptible to drought, such as the sandy soils.

Overall, Alternative B moves soil resource more quickly to satisfactory conditions, through clarification of the desired condition, comprehensive guidelines which include improving unsatisfactory and impaired soils during management activities and the adaptive use of BMPs.

**Alternative C**

Alternative C is very similar to Alternative B in its consequences to soil resources. This is because the only difference between the two alternatives is that part of the Canadian River Inventoried Roadless Area would be recommended as the Canadian River Potential Wilderness Area. This area is about the same as the Mills Canyon Management Area, which would be implemented as part of Alternative B. Management activities which would be allowed under Alternative C are also the same since the management area proposed in Alternative B would be managed in a similar way.
Cumulative Environmental Consequences

The cumulative effects area for soil resources are the soils on Forest Service lands within the project boundary on the grassland ranger districts. The effect is soil condition. Current soil conditions, where impaired, are the largely the result of impacts related to intensive agriculture coupled with drought during the Dust Bowl era. Many of the lands located within the grassland units were acquired after the dust storms to assist farmers and restore soils. As mentioned in the soil condition discussion, many of these soils have been restored to satisfactory condition, however on some sites, especially where sandy soils occur; bare areas contribute to soil loss. Restoration of these sites will be slow as processes destroyed by deep plowing need to be reestablished before soil condition is restored. All of the alternatives are expected to continue the restoration process, although some soils may take a long time before they are restored. Alternatives B and C may work to improve more soils since these alternative include direction effect of human influences of the grasslands from livestock grazing, energy development, mining reclamation, miscellaneous forest products, mineral materials, and fire management.

The Environmental Quality Incentives Program (EQIP) administered by the USDA Natural Resources Conservation Service provides a voluntary conservation program for farmers and ranchers. EQIP offers financial and technical help to assist eligible producers reduce soil erosion and sedimentation from unacceptable levels on agricultural lands.

The Conservation Reserve Program (CRP) provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The CRP reduces soil erosion by encouraging farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover.

Unavoidable Adverse Impacts

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Before any ground-disturbing actions take place, they must be authorized in a subsequent environmental analysis. Therefore, none of the alternatives cause unavoidable adverse impacts.

Irreversible and Irretrievable Commitment of Resources

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Because the land management plan does not authorize or mandate any ground-disturbing actions, none of the alternatives cause an irreversible or irretrievable commitment of resources.

Adaptive Management

All alternatives assume the use of adaptive management principles. Forest Service decisions are made as part of an on-going process, including planning, implementing projects, and monitoring
and evaluation. The land management plan identifies a monitoring program. Monitoring the results of actions will provide a flow of information that may indicate the need to change a course of action or the land management plan. Scientific findings and the needs of society may also indicate the need to adapt resource management to new information. The Forest Supervisor annually evaluates the monitoring information displayed in the evaluation reports through a management review and determines if any changes are needed in management actions or the plan itself. In general, annual evaluations of the monitoring information consider the following questions:

- What are the effects of resource management activities on the productivity of the land?
- To what degree are resource management activities maintaining or making progress toward the desired conditions and objectives for the plan?
- What changes are needed to account for unanticipated changes in conditions?

In addition to annual monitoring and evaluation, the Forest Supervisor reviews the conditions on the land covered by the plan at least every 5 years to determine whether conditions or demands of the public have changed significantly. The forest plan is ordinarily revised on a 10-year cycle and the Forest Supervisor may amend the plan at any time.

**Consistency with Law, Regulation, and Policy**

All alternatives are designed to guide the Kiowa, Rita Blanca, Black Kettle and McClellan Creek National Grasslands’ management activities in meeting federal law, regulations, and policy.

**List of Preparers**

Livia Crowley – BA Geology, Hartwick College. 23 years professional experience. Cibola National Forest Hydrologist, 2009 - present.

**References**


USDA. 2010. Southwest Region Climate Change Trends and Forest Planning. USDA Forest Service, Southwestern Region, Albuquerque, NM.