LEARNING FROM THE LAND

SUMMER REPORT, 2013

What have we been doing all summer?

tapes on a very steep plot in the Elkhead watershed.

In year 1 of our 3 year project, we've been getting to know the wildlife, vegetation and soils of Moffat County and the Elkhead watershed in Routt County. Jennifer Timmer (PhD student), and our field technician Jake Schas, spent most of June doing songbird surveys and collecting pellet data for sage-grouse. In July and August, Retta Bruegger (Outreach and Research Coordinator) and Crystal Tipton (MS student) joined them in the field to sample vegetation and soils on a subset of the wildlife plots (a plot is randomly selected location in the field were we collect data; a site is a broader and geographically undefined area, such as an ecological site or what we call East Moffat county). When not sampling or camping out in Moffat County, we could be found at Carelli's Pizza in downtown Craig.

What are State-and-Transition Models?

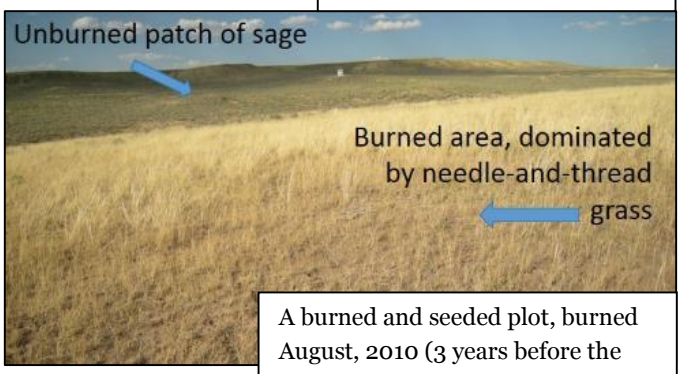
State-and-transition models (STMs) are tools that represent our best available knowledge of how different types of land change over time in response to management (e.g. grazing) and disturbances (e.g. fire). A STM is like a road map that can help guide management of complex rangeland systems, where uncertainty is inherent. Our project is building (or adding to) STMs. By answering specific questions about how types of land change in response to specific disturbances such as fire, we can gain a broader understanding of how, why and when types of land change over time.

Vesper sparrow nest, photo by Jennifer Timmer

What are we hoping to learn from all this work?

The meetings, conversations and workshops we had this spring with participating landowners, Extension staff and agency partners, helped direct our data collection.

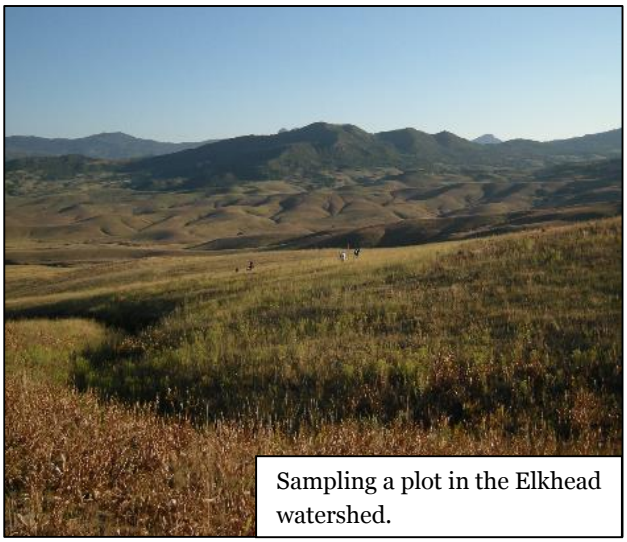
In **Eastern Moffat**, we will learn about the implications of **burns** and **mechanical treatments (drag and mow),** compared to **controls (no burn or other treatment)** on Sandy Land and Rolling Loam ecological sites**.**



A burned and seeded plot, burned August, 2010 (3 years before the photos was taken).

Specifically,

- **Ecological Sites**: How different *are* Sandy Land and Rolling Loam? Do these Ecological sites respond differently to disturbance (fire)? Do they have different plant composition, production, and habitat potential for wildlife?
- **Wildlife:** How does wildlife use compare between burned unburned areas (wildlife such as sage-grouse, songbirds, elk, mule-deer and antelope)?
- **Mechanical Treatments for Wildlife Habitat (and other vegetation characteristics):** What are the long term effects of two different mechanical treatments (drag and mow) on vegetation and wildlife habitat?
- **Recovery after Fire:** Does soil type (sandier versus loamier) influence the kind and amount of vegetation that returns after burns? What happens to areas that were burned and seeded versus burned and not seeded?
- **State-and-Transition Models (STM):** We will use all these data to refine draft STMs we collectively developed at the E. Moffat workshop in May, 2013.

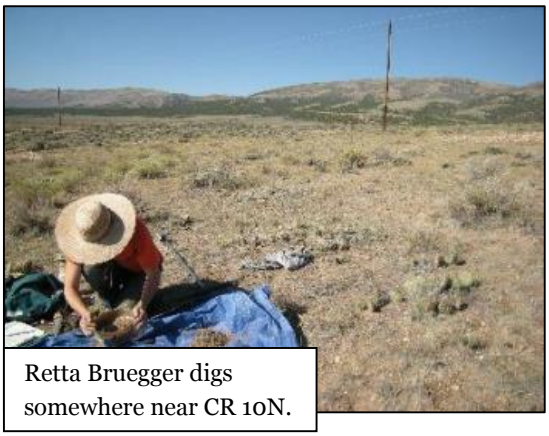

Sampling a plot in the Elkhead watershed.

In the **Elkhead Watershed**, we resampled existing plots established by Emily Kachergis, and established a few new ones. We will evaluate the following:

- **STMs:** Is the "wheatgrass" state a true state or a community within a diverse state on Mountain Loam and Claypan ecological sites?
- **Wildlife:** How do songbird, sage-grouse, and ungulate use compare between different states and communities for Mountain Loam and Claypan, ecological sites?
- **Removal of Grazing:** What effect does the removal of grazing have on the vegetation composition, production and ecosystem services and thus, cascading effects on wildlife occurrence and abundance?
- **Weeds:** We established plots this year to conduct small-scale adaptive management experiments on alternative approaches to weed management. Potential treatments include inter-seeding, seeding following herbicide treatment and goat grazing.

What does it look like to collect data when we don't have defined STMs?

In **West Moffat**, we did not have clearly targeted ecological sites or a draft state-and-transition model to guide our sampling strategy. Thus we used **low-intensity sampling** to survey more plots (versus surveying fewer sites more intensively) to be able to describe the variation in vegetation and soils across the landscape.


Retta Bruegger digs somewhere near CR 10N.

We used existing plots (established by Colorado Parks and Wildlife and the BLM) to integrate existing data with the data we collect. Using newly collected and existing data, we will be able to:

- **Define basic ecological site concepts** by correlating vegetation with soils across the landscape.
- **Draft an STM for a spring workshop,** and
- D**esign a strategy for high-intensity sampling** for next year**.**

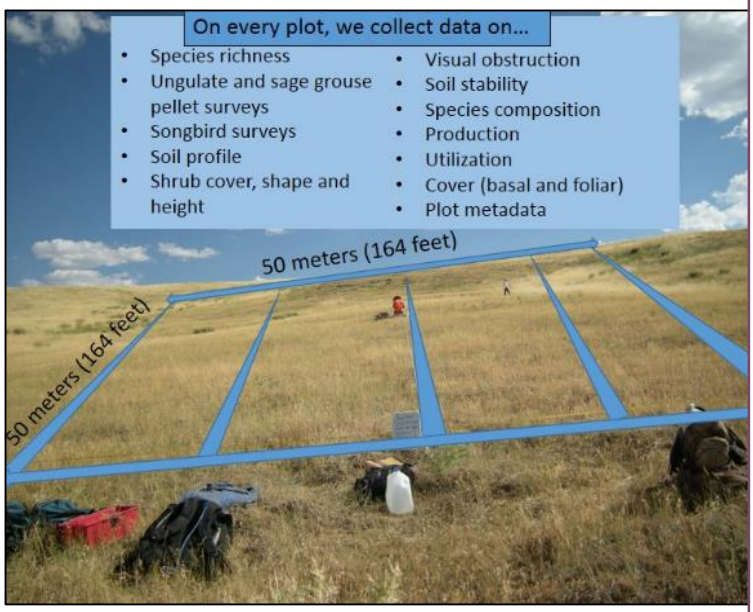
Q. How do we survey wildlife?

A: We survey wildlife in May-June in the same plots where vegetation data is collected later in the summer. Songbird surveys tell us how abundant different species are in the control and treatment areas and in the different vegetation communities. Similarly, pellet surveys indicate how much relative use by wildlife there is in a particular area. From these two types of information, we can make predictions about how a burn or mechanical treatment for example, could change habitat use by wildlife.

Brewer's sparrow, photo by Jake Schas

Q: How do we sample vegetation and why does it take 3 - 4 hours per plot?

A: Sampling takes a long time because we measure many different indicators (shrub canopy, species richness, production, etc.) all in the same 50 by 50 meter square (see the figure below). We know from research that just one indicator doesn't give the full picture of what might be occurring on the plot. For example, if we only looked at species richness, we would know how many different kinds of plants there are in a given area, but two plots with the same number of different kinds of plants could have vastly different amounts of vegetation on the soil surface. Thus, plots that are the *same* in terms of species richness might be very *different* in their susceptibility to erosion and invasives.



Using multiple indicators, helps us be sure that we don't overlook differences that are ecologically significant, or misinterpret what is occurring on the landscape.

Q. How do we tell if something we see on the land is due to management, disturbance, or inherent properties of the site, like soils, topography, or microclimate?

1. Collecting soil data and recording topography, slope shape, and location, ensures that we **don't confuse differences due to management with differences due to site potential**.
2. Sampling at **multiple locations** that have similar soils and management history, but are spread out across the landscape ensures that our conclusions apply to sites with similar soils across a large area, and are not specific to a single location.
3. Having **control plots** that haven't had a recent history of fire or mechanical treatments enables us to distinguish management- and disturbance-driven change from climate- and weather-driven variations.
4. Knowing (to the extent possible) about the **management history** of the area helps us interpret the patterns we see in vegetation.
5. Using **statistical analysis** to interpret the data and identify patterns (next page) helps us know which observed changes and differences are likely due to management or disturbance or soil differences and which ones could be the result of chance alone, or are too small to be meaningful for management.

Q: We collected data…….Now what?

Entering and storing data in safe, and widely used database called DIMA (Database for Inventory, Monitoring and Assessment) means that all the data we collect will be in a compatible and comparable format to that used by other agencies. This will allow us to incorporate agency data into our analyses more easily. It also means that our results will include the same key indicators reported in the same format that management agencies use to assess and monitoring rangelands. Data entry will take most of the fall. DIMA was developed by the USDA Agricultural Research Service at the Jornada Experimental Range, and is used by the Bureau of Land Management and the Natural Resource Conservation Service, as well as other agencies and researchers.

Analysis – what's in a number?

An artist might describe a landscape using paint. We use data analysis to describe what we observed on the ground, and to carry out specific comparisons that are of interest to managers.
We use 3 different kinds of statistics: ***descriptive, inferential*** and ***multivariate***.

- ***Descriptive* statistics** (for example, **average** shrub cover) to characterize the vegetation on a given plot or on several plots on similar soils.
- ***Inferential* statistics** to test **management hypothesis**. Are differences we see in how wildlife species use areas that were seeded following a wildfire, compared with unburned areas due to random chance? Or are they due to the effect of the burn, or other environmental factors of interest?
- ***Multivariate* statistics** to **group plots together** based on multiple variables (species richness **and** production **and** shrub cover **and…**) while identifying potential **environmental** and **management factors that are associated with that group**. Multivariate statistics are the main tool we use to create an initial draft state-and-transition model from our field data. For example, plots that have sage-brush and bunch grasses might be grouped together in one potential state, and plots that have sagebrush and sod-forming grasses into another. We could then see whether these group are associated with the amount of clay or sand, or management factors like fire or vegetation treatments or other. These data-driven models will later be modified based on local knowledge and other research studies.

Interpretation – what does it all mean?

Statisticians call unimportant (but inherent) variation "noise." Analyses will help us pull out the melody (i.e., important patterns in the data) instead of hearing noise. We expect to have results about what we've learned by the spring. However, results are not an endpoint, but rather something we will continue to revise as we move forward.

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