



Vegetation Composition, Structure, and Soils

Introduction

The structure and composition of vegetation are among the primary characteristics used to define grassland and shrubland ecosystems. Vegetation structure and composition are fundamental components of wildlife habitat, visitor experiences, cultural and historic landscapes, and basic ecosystem functions. Vegetation contributes to ecosystem functions through primary production, nutrient cycling (e.g., carbon, nitrogen), and micro-climate controls. In addition to providing information about the condition of vegetation, data from the Rocky Mountain Network's (ROMN) Vegetation Composition, Structure, and Soils (VCSS) protocol will help characterize park ecosystem responses to at least five other high priority vital signs: Weather and Climate, Wet and Dry Deposition, Landscape Dynamics, Invasive/Exotic Plants, and habitat conditions for Focal Species (i.e., elk, grizzly bear, and endemic insects).

Objectives

The goals of the ROMN VCSS protocol are to determine the status and trends of the conditions and dynamics of upland vegetation and soil as well as to develop reference conditions for each network park. The core monitoring objectives include the following:

1. Determine the status and trend in vegetation structure (i.e., relative cover of shrubs, grasses, herbs, trees, and bare ground) and composition within classes and at the species level
2. Determine the status and trend in soil structure based on texture and stability, water infiltration rates, evidence of erosion, and extent of bare or non-vegetated soils
3. Determine and track the correlation between trends in vegetation and soil conditions and potential drivers of change, including climate, atmospheric deposition, management, landscape patterns, and biological drivers (e.g., herbivory, exotic invasion, pests)
4. Report the status and trends of vegetation and soils in the presence of invasive or introduced species

Protocol Development and Status

The ROMN began developing the VCSS protocol in 2006. Staff continued to refine and implement the protocol in 2007 and 2008. The protocol is derived from existing designs and recommendations by the U.S. Department of Agriculture–Agricultural Research Service and the USDA Forest Service's Forest Inventory and Assessment program. The design in-

LONG-TERM MONITORING PROJECT SUMMARY



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Student Conservation Association interns lay out the first transect of a vegetation and soils monitoring site at Little Bighorn Battlefield NHS, 2008.

cludes both transect- and plot-based sampling organized in a “spoked-wheel” pattern covering 0.5 ha (1.2 acre) at each site. The ROMN is using relatively simple, repeatable measures of vegetation and soil conditions. Field crews will collect samples across each “small” park: Florissant Fossil Beds National Monument, Grant-Kohrs Ranch National Historic Site, Little Bighorn Battlefield National Monument. Samples will be collected from a subset of grasslands and shrublands in each larger park: Glacier National Park, Great Sand Dunes National Park and Preserve, and Rocky Mountain National Park.

ROMN and cooperators conducted sampling in Little Bighorn Battlefield and Grant-Kohrs Ranch from 2006 to 2008. Efforts expanded to Florissant Fossil Beds and Glacier in 2008.

Network park units with ongoing VCSS monitoring

Florissant Fossil Beds NM	Great Sand Dunes NP and Pr
Glacier NP	Little Bighorn Battlefield NM
Grant-Kohrs Ranch NHS	Rocky Mountain NP

bold indicates current monitoring; gray indicates future monitoring plans
NHS = National Historic Site; NM = National Monument;
NP = National Park; Pr = Preserve

ROMN staff are revising the protocol based on sampling efforts and will submit the final draft for formal review at the end of 2008 as designs and analyses are completed.

Preliminary Results

In 2008, field crews consisting of ROMN staff, Student Conservation Association (SCA) interns, park staff, and volunteers sampled 38 sites at four network parks. The intern crew revisited two of these sites to capture inter-seasonal variability. New ROMN ecologists and interns conducted the majority of the sampling, which provided a good opportunity to test whether the draft protocol is clear and detailed enough to allow an entirely new crew to continue the protocol. The 2008 field season concluded the three-year pilot data collection period for Little Bighorn Battlefield and Grant-Kohrs Ranch.

ROMN and Glacier staff sampled park grasslands and shrublands in 2008 to compare methods and time required to collect data. Results from this effort will help guide future collection methods and will be identified in the final version of the VCSS protocol. This collaborative effort between network and park staff using local expertise for data collection may be repeated in an effort to maximize efficiency and lower sampling costs.

ROMN conducted its first vegetation inventory and monitoring effort in Florissant Fossil Beds during 2008. This effort provided an initial test of the VCSS protocol's suitability to open woodland and forested habitats. A new field crew conducted this work using only the written standard operating procedures. In addition to conducting soil tests, staff collected soil samples to assess the suitability of adding a long-term soil chemistry segment to the VCSS protocol. These samples will likely be processed in the winter of 2008–09.



Student Conservation Association intern Tiffany Starnes assists with photo documentation of a long-term vegetation and soils monitoring site at Glacier NP, 2008.



Florissant Fossil Beds NM Chief Ranger Rick Wilson takes time out to dig dirt as part of the ROMN soil infiltration protocol, 2008.

Future Plans

The ROMN expects to expand implementation of the VCSS protocol to Rocky Mountain and Great Sand Dunes in 2009. Sampling will continue in Little Bighorn Battlefield, Florissant Fossil Beds, and possibly Glacier in 2010.

In 2010, the ROMN will continue to expand VCSS sampling efforts to new survey sites at Florissant Fossil Beds and revisit some sites in the park and Little Bighorn Battlefield. Site revisits will eventually include areas impacted by fires or other disturbances (e.g., pine beetles). ROMN ecologists will also continue analysis of pilot study data to evaluate the effectiveness of the sampling efforts, determine panel sizes, and guide future sampling efforts. The ROMN will also develop a research plan for sampling in large parks, such as Glacier, where access to sites may be costly and challenging. It is possible that vegetation monitoring crews based in Glacier may be an efficient solution for sampling and re-sampling.

In 2011, the ROMN will likely sample new sites and resample the three-year pilot data collection sites at Little Bighorn Battlefield and Grant-Kohrs Ranch. The ROMN will continue to collect pilot study data in Glacier NP during 2011.

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