



Effects of Human Disturbance and Ungulate Use on Wetland Ecological Integrity at Great Sand Dunes National Park and Preserve



Monitoring Wetland Condition

Because wetlands are biodiversity hot spots and provide important ecosystem services, the Rocky Mountain Network has been monitoring them at Great Sand Dunes National Park and Preserve (GRSA) since 2010¹. We collect data from a widespread, random sample of “survey” sites every 5–10 years to assess the current *status* of wetlands in the park’s sandsheet region. We monitor a small set of important “sentinel” sites annually to assess *trends* in wetland condition over time. We assign levels of ecological condition (reference, intermediate, non-reference) and disturbance (negligible, minor, moderate, and major) based on cutoff, or assessment points established with park staff. We also develop multimetric indices of ecological condition to predict the effect of disturbance on wetland plant communities. These models integrate wetland plant community conditions, environmental factors, human disturbance, and ungulate use, while controlling for other important drivers, such as climate and groundwater depth.

Detailed results from monitoring both status and trend between 2010 and 2014 were published in 2017². This brief summarizes results from that report for wet meadows and salt flats in the national park; lumped together as “salty meadows,” these two habitats comprise the random “survey” sites sampled in 2010, which best show the current status of park wetlands in relation to human disturbance and ungulate use.

Key Findings

Overall, wetland conditions in GRSA warrant moderate to significant concern.

Extent of Wetlands

Based on sampling at GRSA in 2010, around 30% (7–54%) of the sandsheet is salty meadow wetland habitat (Figure 1). Note that this result

uses our randomized survey design and site level evaluation of wetland habitat, which is different from traditional remotely sensed approaches.

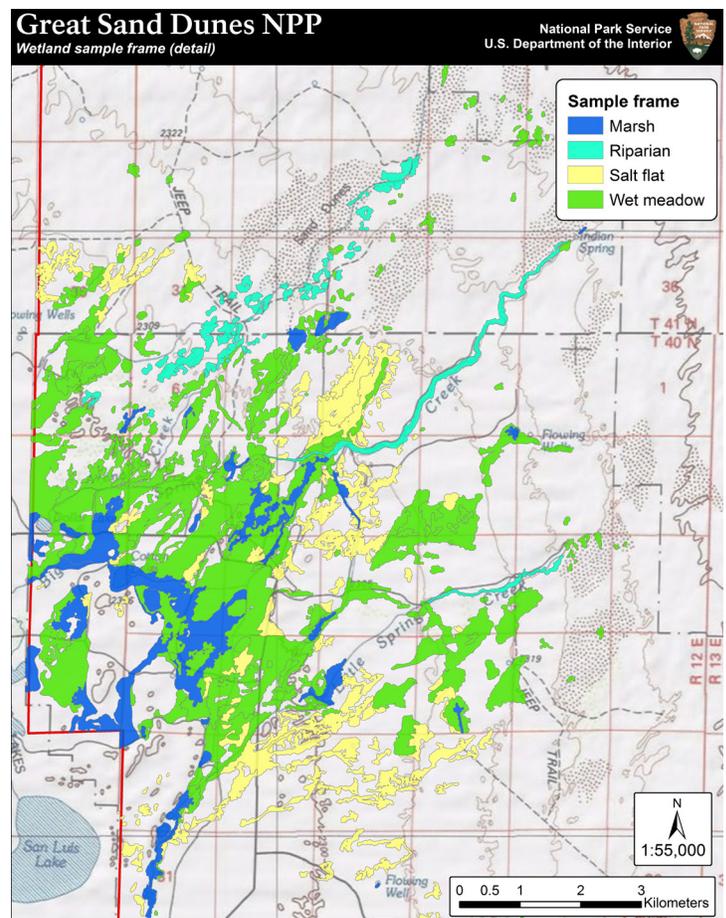


Figure 1. Wetland complex boundaries at Great Sand Dunes National Park and Preserve, 2010.

¹ Schweiger B. 2016. Wetland Ecological Integrity Monitoring at Great Sand Dunes National Park and Preserve. Resource Brief.

² Schweiger, E. William, M. Britten, and J. Jones. 2017. Great Sand Dunes National Park and Preserve wetland ecological integrity: 2010–2014 status and trend report. Natural Resource Report NPS/ROMN/NRR—2017/1569. National Park Service, Fort Collins, Colorado.

Human Disturbance

- 51% of salty meadows had minor human disturbance
- 25% of salty meadows had major human disturbance

Modeling the effect of human disturbance on wetland plant communities, Multimetric Index 1 indicated that

- 1% of salty meadows were in a near-pristine reference condition
- 50% of salty meadows were in reference condition
- 39% of salty meadows were in a non-reference condition

Ungulate Use

- 13% of salty meadows had sustainable ungulate use (Figure 2)
- 27% of salty meadows had minor ungulate overuse
- 26% of salty meadows had major ungulate overuse

Modeling the effect of ungulate use on wetland plant communities (Figures 3, 4), Multimetric Index 2 indicated that

- 8% of salty meadows were in near-pristine condition
- 38% of salty meadows were in reference condition
- 23% of salty meadows were in intermediate condition
- 31% of salty meadows were in a non-reference condition

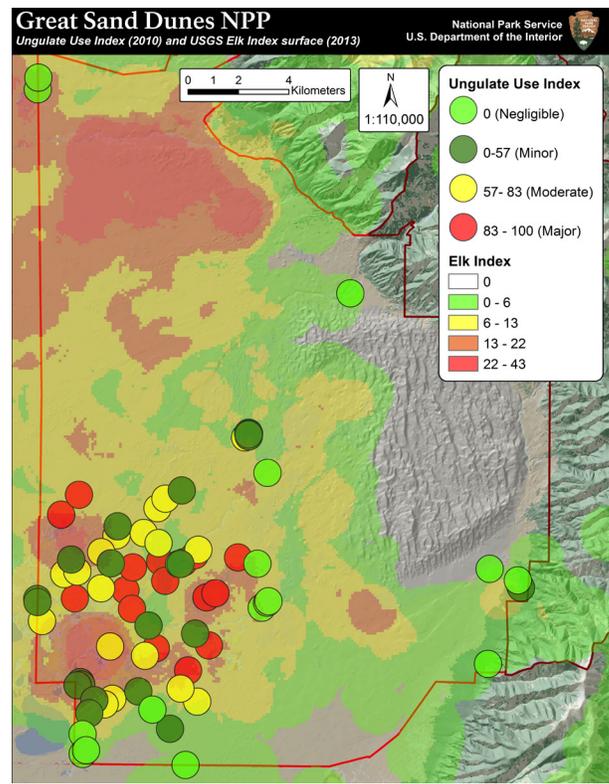


Figure 2. Spatial distribution of disturbance categories at wetland monitoring sites in 2010 as scored by the Ungulate Use Index, overlaid on a contiguous Elk Index surface (higher use in red) from 2013 USGS data.

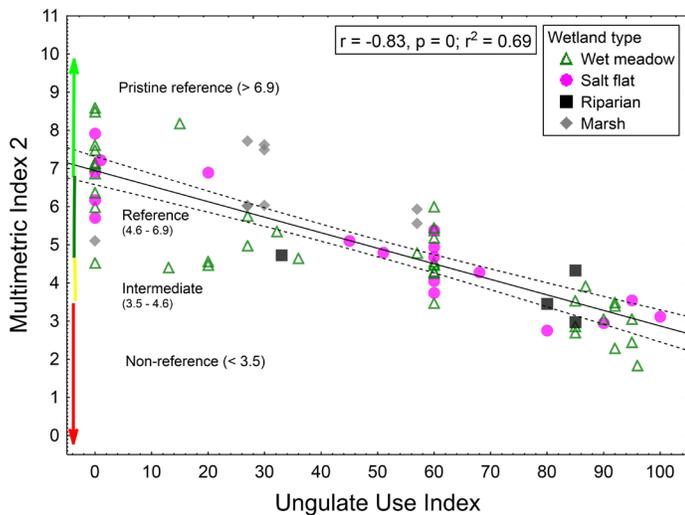


Figure 3. Bivariate relationship between Multimetric Index 2 (MMI 2) and Ungulate Use Index (UUI). Vertical lines along the Y axis partition MMI 2 scores for each site into pristine reference, reference, intermediate and non-reference classes based on predicted response at negligible disturbance (UUI = 0), minor disturbance (UUI < 57), intermediate (UUI: 57–83), and major disturbance (UUI > 83) levels.

Future Monitoring

The network, with support from GRSA, has intensified wetland sampling relative to elk and bison use in the park. We will continue this focus as the park completes its adaptive ungulate management plan.

More Information

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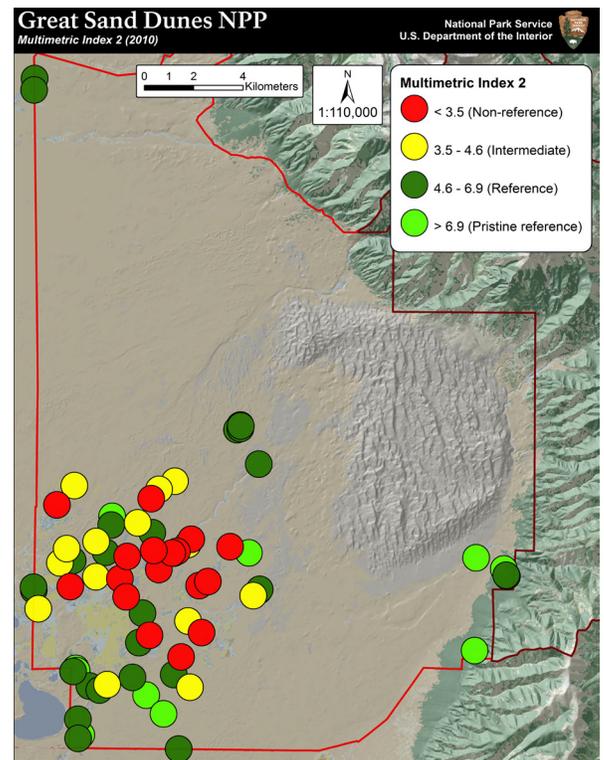


Figure 4. Spatial distribution of ecological condition categories at wetland monitoring sites in 2010 as scored by Multimetric Index 2, which focuses on ungulate use.

About ROMN

The Rocky Mountain Network is one of 32 vital signs monitoring networks across the National Park Service. It monitors status and trends in upland vegetation and soils, wetlands, streams, alpine vegetation, and other systems at six parks throughout Montana and Colorado.