



# Wetland Ecological Integrity Monitoring at Great Sand Dunes National Park and Preserve

Wetlands are biodiversity hotspots, supporting a rich variety of plants and animals at Great Sand Dunes National Park and Preserve (GRSA). They provide “ecosystem services” by slowing and capturing floodwater, stabilizing the soil, storing carbon out of the atmosphere, improving water quality, and cycling nutrients through ecosystems. They are also prized by park visitors. The ecological integrity of wetlands is their capacity to support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitats of the region.



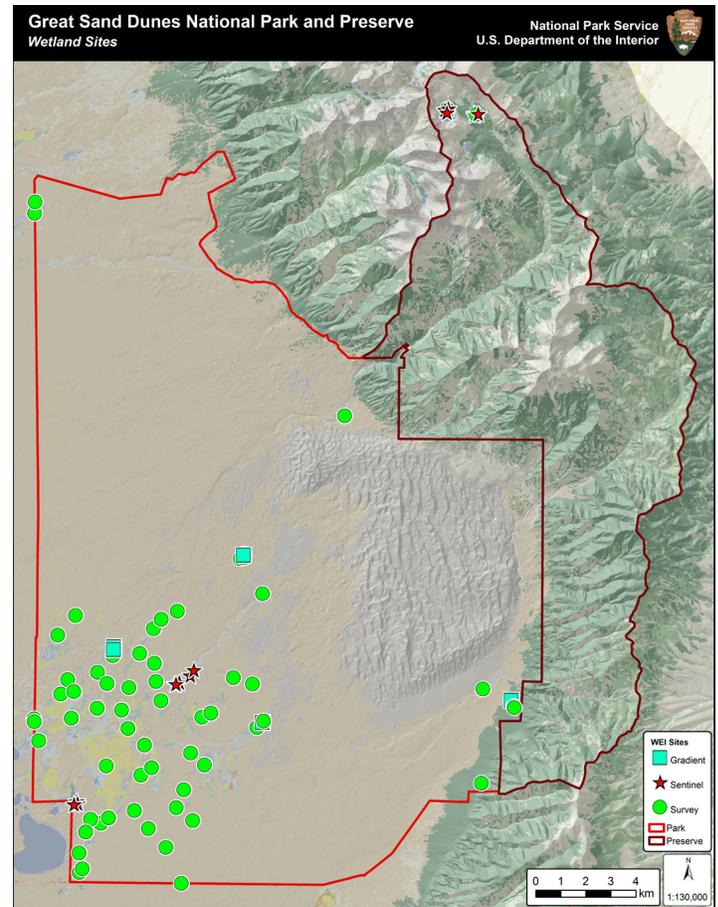
## Long-term Monitoring

The Rocky Mountain Inventory and Monitoring Network (ROMN) began long-term monitoring of wetland ecological integrity (WEI) in Great Sand Dunes National Park and Preserve in 2010. The focus of the monitoring is on estimating the status and trend in the ecological integrity of the park’s important wetlands.

Between 2010 and 2014 the network established 83 permanent wetland monitoring sites in the park and conducted over 175 full sample events at these locations. Crews conduct a complete vegetation characterization at each site, including species level vascular and nonvascular cover, woody stem counts, and estimates of damage to woody stems (i.e., from ungulates and beaver). Depth to ground water is hand-measured during each visit at all sites, and loggers collect continuous ground water data at a subset of the shallow ground water wells. Soil profiles are developed every 10 years, and complete soil chemistry is taken every 5 or 10 years. Finally, extensive site and large scale disturbance data are collected, including anthropogenic and natural stressors, such as ungulate habitat use, that can influence wetland condition.

## Status of Wetlands

Overall, if we assume that ecologically healthy wetlands in a national park should have minimal human disturbance, the ecological integrity of sandsheet wetlands in GRSA during 2010 warrants moderate to significant concern. Only one out of 83 of our wetland monitoring sites was in a reference (or ecologically healthy) condition as measured by our multimetric index of ecological integrity (MMI). This index translates the condition of climate, hydrology, soils, vegetation, and



Wetland monitoring sites at Great Sand Dunes National Park and Preserve.

disturbance at sites into an overall score of wetland health (Figure 1). Human disturbances to GRSA wetlands include impacts from ditches, roads, wells installed for livestock and historical and ongoing human landuse. Excessive ungulate (especially elk and bison) disturbance and impacts to GRSA wetlands are also likely due to overconcentration of these species in park wetlands.

## Management Applications

A fundamental goal of ROMN long-term inventory and monitoring is to provide park managers with data and information useful for protecting and managing park resources. Our estimates of wetland ecological integrity can serve as baselines for understanding the current status and future changes in wetlands in GRSA. This information can help GRSA management report on and meet basic regulatory requirements

and assist with management in new areas of the park. Our models can be used to document the condition of individual wetlands and thus help park managers prioritize wetlands for restoration (e.g., a highly degraded wetland) or protection (e.g., fencing a wetland that has very high ecological integrity and/or significance). Our data can be used to quantify the importance of various “stressors” and “drivers” of wetland health (e.g., ungulate use, groundwater hydrology, etc.). Specific metrics, when interpreted in the context of the larger WEI dataset, can also enhance general understanding of wetland ecology. Monitoring results will allow interpretation of specific wetlands in the context of the broader resource as well as provide a unique perspective across the park as a whole. Finally, WEI results should also help park staff understand the important wetland resources in GRSA and communicate about them to the public.

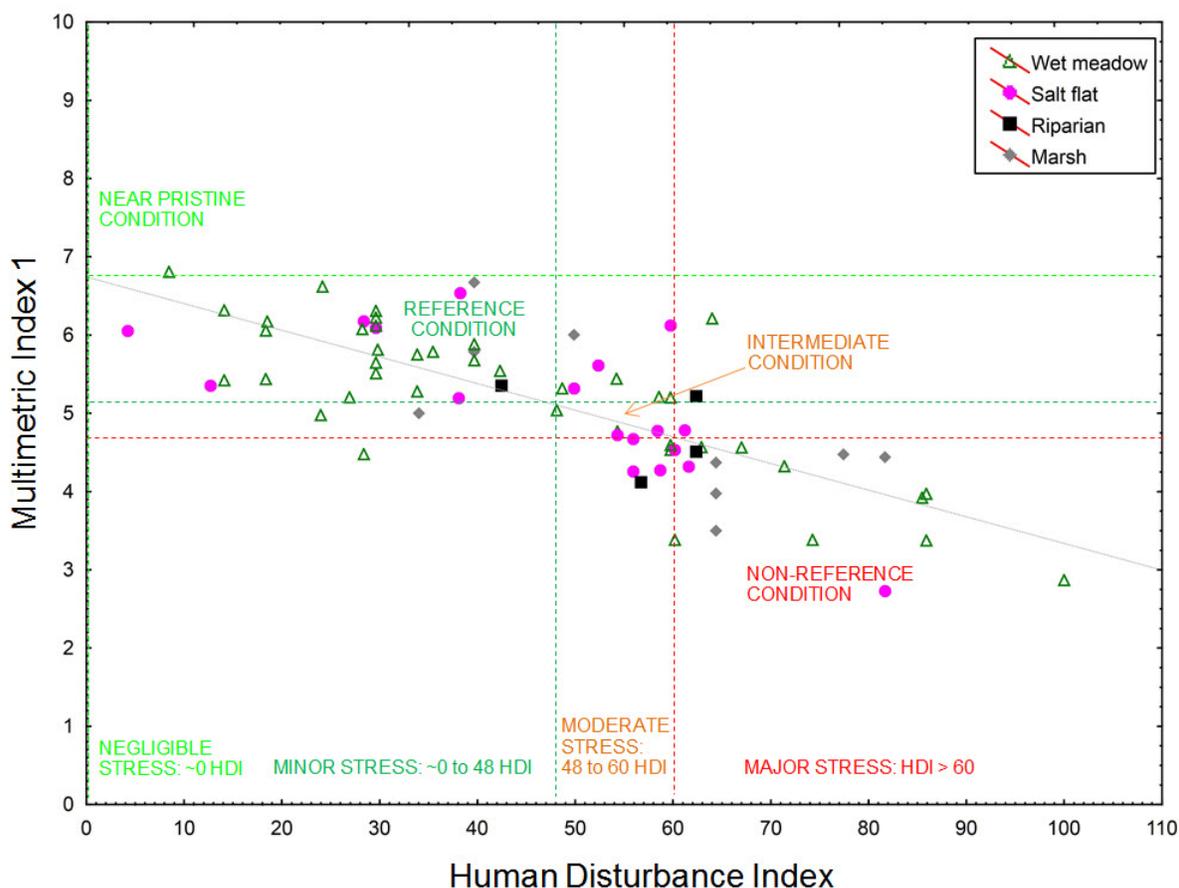


Figure 1. Plot of disturbance and ecological integrity scores for GRSA wetlands in 2010. This multimetric index model—one of two such indexes developed by ROMN—estimates the overall ecological condition of wetlands on the sandsheet based on the response of multiple vegetation metrics to human disturbance and ungulate overuse of wetlands. It integrates aspects of wetlands, like generalist species cover, bare ground, and grass cover (mostly weedy annuals) and shows that these increase with human disturbance and ungulate overuse. Conversely, woody cover, aster cover, and endemic richness decrease. The model accounts for natural drivers like precipitation and ground water depth to isolate the effect of disturbance. Red and green lines show the assessment points that distinguish different levels of stress and ecological condition. These scores provide both useful baselines for future assessments and alert the park that a “near pristine” reference condition, corresponding to “negligible stress” was very rare in 2010.

## More Information

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## 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.