National Park Service
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San Francisco Bay Area Network
Pacific Coast Science and Learning Center
Research Project Summary January 2009

Managing Park Rangeland to Improve the Health of the Tomales Bay Watershed

Importance: *Ten thousand acres of park rangeland at Point Reyes National Seashore (PRNS) and Golden Gate National Recreation Area (GGNRA) are within the Tomales Bay watershed. The non-point source pollution from these rangelands contributes to the compromised health of this important watershed.*

Dotted with beef and dairy cattle, the rolling hills around PRNS and GGNRA support thriving farming and ranching operations, but this concentration of animals has reduced the quality of the waters that flow into Tomales Bay. The National Park Service grants permits for thousands of acres to 12 ranching families, who share responsibility for maintaining this land and ensuring the quality of the water in cooperation with the park service. What's more, the rivulets and streams that funnel into the bay— including Olema and Lagunitas Creeks—as well as the bay itself, provide a recreation area, support a shellfish industry, and serve as spawning and migration waters for a bevy of federally protected species: coho salmon (*Oncorhynchus kisutch*); steelhead trout (*O. mykiss*); California freshwater shrimp (*Sycharis pacifica*); and the California red-legged frog (*Rana aurora draytonii*). In 2004 the Regional Quality Control Water Board developed an action plan known as the Tomales Bay Pathogen Total Maximum Daily Load (TMDL) after listing the watershed as "impaired" for pathogens, sediment, nutrients, and mercury. This plan called on land owners, including the park service, to identify non-point sources of pollution and set forth time lines, water qualitystandards, and other performance objectives to remedy the problem.

To stem the infusion of sediment and pollutants into the watershed, crews repaired and filled in the Truttman Ranch Headcut.

The rehabilitated area (shown in 2008) is less likely to serve as a highway for pollutants.

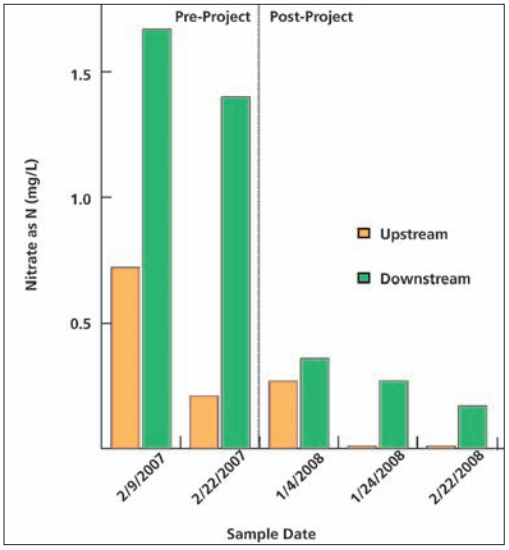
The Project: *This project aims to establish the efficacy of 10 demonstration Best Management Practices (BMPs), based on National Conservation Practice Standards, to reduce non-point source pollution flowing into the Tomales Bay watershed from pastoral lands within PRNS and the GGNRA. It is intended to inform a model for future BMPs to reduce TMDLs.*

Park staff completed an initial assessment of park rangeland in 2006, creating a GIS database of identified pasture features and areas that could contribute to non-point source pollution in the Tomales Bay watershed. These locations were prioritized by their potential to deliver pollutants to adjacent waterways, the type of BMP necessary to address the relevant issue, and the feasibility of repair. Then, rangeland ecologists working with ranchers chose 10 sites at which to implement demonstration BMPs that followed the standards delineated by the National Resource Conservation Service. In 2007, construction began at the source sites in cooperation with ranchers, the Marin Resource Conservation District, and other organizations.

To protect the fragile areas surrounding water sources like springs and streams, which tend to erode quickly when frequented by cattle, the team built troughs and other alternative water supplies away from the sources themselves. This strategy not only limits the impact to the immediate source area, but also improves cattle health by providing cleaner drinking water. Because the earth around water sources often stays wet and is subject to a high volume of cattle traffic,

these areas often degrade and become a polluting source. To address this problem, park staff and volunteers constructed fences to keep cows out of these spaces, allowing plant life to grow back and stabilize the surrounding soil. Riparian exclusion fencing was built to permanently block livestock access to a stretch of Lagunitas Creek and the primary headwater to Olema Creek. They installed fencing that prevented access to Olema Creek tributaries during the winter months when the ground is wetter and more susceptible to erosion, and when runoff from rain storms can carry pollutants into waterways. Lower elevation stream crossings were fenced and relocated, where necessary, to areas upslope that had been historically used as livestock crossings. In addition, park managers worked with ranchers to establish seasonal grazing systems.

The project also aimed to repair erosion features such as headcuts. These gashes in the ground form where there is a sharp break in slope gradient in a drainage or at the top of a gully. As water flows over the cut face, it continues to erode. Consequently, the gully creeps upslope, losing more soil into the watershed. Because this process is accelerated by the movement of livestock through the area, preventing animal access was a first step in addressing the problem.To repair the headcut, staff constructed barriers—called willow walls—made of tightly woven, freshly cut willow branches that trap sediment flowing downhill, dissipate the erosive energy of concentrated water flow, and halt the upward march of the headcut. These bioengineered partitions eventually take root and spawn willow saplings, stabilizing what was once a non-point source pollution hotspot. In order to repair a 250-foot long gully (5 feet deep and eight feet wide in some places) near the olema cemetary, park service road crews installed two rock grade-control structures, filled the gully, and restored the historical (and intermittent) stream channel and floodplain.



Though too early to draw conclusions, nitrate levels were lower in the year after the project decommissioned Lupton Road and restabilized a creek.

In conjunction with the headcut and gully repairs, park staff also rehabilitated existing ranch roads. Lacking the stability provided by vegetation, roads erode quickly, becoming highways for water and delivering sediment, pathogens, and other nefarious particles into the watershed. Along 375 feet of road, teams installed a system of dips and water bars. These structures are constructed by carving out small channels roughly perpendicular to the direction of travel, and they provide a route for the water to diffuse into surrounding vegetation, rather than allowing it to rush down the road and carry polluting runoff with it. Water bars serve as stopgaps to enhance the effectiveness of the dips when storms cause the channels to fill with water. Crews also decommissioned an 800-foot stretch of ranch road and restored 350 feet ofan associated stream channel, which had been routed into a ditch, to its historical location.

Status and Trends: *Construction and implementation of the BMPs is ongoing. To assess the success of the project, scientists are monitoring water quality, vegetation recovery, and cattle usage.*

Park scientists conducted pre- and post-construction water quality monitoring to establish baseline pollutant levels. They undertook site condition assessments, which included the cataloging of native and nonnative plant species present. Park staff tracked the numbers of animals that are able to gain access to water source areas, and photographs were taken over time to measure the recovery of the vegetation in these sensitive areas. Managers have also developed a 10-year monitoring and maintenance plan to assess and ensure the long-term viability of these strategies.

Additional Resources:

DiGregoria, J., and B. Eisenberg. 2008. *Tomales Bay Rangeland Best Management Practices (BMPs) Pathogen Total Maximum Daily Load (TMDL) Implementation Project (Draft Report)*. National Park Service, Point Reyes Station, CA. 81 pp.

Summary written by John C. Cannon. For more information, please contact John DiGregoria, Rangeland Ecologist, John_ DiGregoria@nps.gov, and Beth Eisenberg, Rangeland Technician, Beth_Eisenberg@nps.gov, Point Reyes National Seashore.