

Lesson Plan 3.

Current Science of Rangeland Watershed and Nutrient Management

Goals/Overview

Provide overview of rangeland water quality science to understand how grazing and livestock management practices can degrade and enhance water quality.

Learning Objectives:

1. Understand the watershed science of working rangelands.
2. Review the potential sources of pollution on a ranch.
3. Learn the sources, fate, and transport of pathogens and nutrient pollutants on grazing lands.
4. Understand water quality risks associated with areas of bare soil and high manure concentrations and their connectivity to waterways.
5. Learn how the science has changed over last 50 years, emphasizing the importance of rangeland water quality science in understanding the fate and transport of water pollutants and practices that can enhance water quality.
6. Compare and contrast pros and cons at sites where livestock grazing has been removed.

Introduction/Hook:

- Since water quality is seldom measured enough to quantify long-term changes, have participants consider how water quality has changed over time and recovered from historic land use. Given the benefits of livestock grazing for preventing wildfire and maintaining grassland diversity, what else can be done to improve water quality and the viability of the local ranching community?
- Discuss previously held assumptions that have resulted in unintended negative consequences to water quality (for example, impacts from channeling streams, draining farm fields, or oak

woodland management on long-term pasture production).

Materials/Speakers:

- Review historical aerial photos of watershed, region, and/or ranch comparing circa 1970s to present. Google Earth often has comparable imagery from the 1990s (15 minutes).
- Invited speaker would be someone with knowledge in rangelands, watersheds, and water quality, potentially from UCCE, the NRCS, or RCDs.
- Educational video: “[Science of Grazing Management and Water Quality](#)” (16 minutes).
- Educational video: “[Nutrient Dynamics and Water Quality on California Rangelands](#)” (16 minutes).
- Consider extending availability of Water Board staff to review and further explain regulations. This can be helpful to attendees who missed previous meetings, while increasing confidence in and support of this extension program.
- Provide example of binder with RWQP from Tomales Bay or Napa/Sonoma watersheds.
- Provide attendees handouts of pertinent resources.
- Food and beverages—snacks and coffee/tea suffice during introductory meetings.

Time Allocated:

Allow 1.5 to 2 hours (45 minutes for presentations and 30 minutes for questions, with time to review regulations).

Procedures/Activities/Strategies/Questions:

- Welcome; attendees introduce themselves.
- Review historical maps and aerial photos for changes over multiple decades of specific ranches or interesting areas of the watershed (for example, well-known landslide or gully formation and recovery).

- Review observations of attendees around their ranches following large rainfall events.
- Present video: “[Science of Grazing Management and Water Quality.](#)”
- Ask participants to give examples of sources of pollution and how they have changed since the 1970s.
- Present video: “[Nutrient Dynamics and Water Quality on California Rangelands.](#)”
- Discuss large changes to specific ranches in watershed over time and contemplate if types of erosion or other pollution sources have changed.
- Compare and contrast fate and transport of pathogens and nutrients in rangeland watersheds (20 minutes).
- Provide sufficient time to go over new and old questions about regulations (10 to 20 minutes).
- Complete the Session Evaluation Form (appendix A).

Conclusion/Self-assessment:

- Have participants consider if and when pollution sources may potentially connect hydrologically. Asking how much rain must fall for a stream to lose clarity and become turbid, or how hydrologic connectivity has changed over the years on the ranch, can be helpful in this discussion.

Resources:

- Barry, S., R. Larson, G. Nader, M. Doran, K. Guenther, and G. Hayes. 2011. Understanding Livestock Grazing Impacts: Strategies for the California Annual Grassland and Oak Woodland Vegetation Series. Oakland: UC Agriculture and Natural Resources Publication 21626. <https://anrcatalog.ucanr.edu/pdf/21626.pdf>
- Bedell, T. 1995. What is a watershed? Fact sheet no. 4. Rangeland Watershed Program, UCCE and Natural Resources Conservation Service. https://ucanr.edu/sites/UCCE_LR/files/180570.pdf
- Bush, L. 2006. Grazing handbook: A guide for resource managers in Coastal California. Santa Rosa, California: Sonoma Resource Conservation District. <https://carangeland.org/images/GrazingHandbook.pdf>
- George, M. 1995. Management measures and practices. Fact sheet no. 9. Rangeland Watershed Program, UCCE and Natural Resources Conservation Service. <http://rangelandarchive.ucdavis.edu/files/244732.pdf>
- George, M., S. Larson, J. Harper, D. Lewis, and M. Lennox. 2011. California's Rangeland Water Quality Management Plan: An Update. Rangelands. February: 20–24. http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/tomalespathogens/Calif.Rng.WQMP.2011.pdf
- Hudson, T. D. 2008. Livestock management and water quality. Pullman: Washington State University Extension. <http://pubs.cahnrs.wsu.edu/publications/wp-content/uploads/sites/2/publications/eb2021e.pdf>
- Rissman, A. R., and N. F. Sayre. 2011. Conservation outcomes and social relations: A comparative study of private ranchland conservation easements. *Society and Natural Resources* 0:1–16. <https://doi.org/10.1080/08941920.2011.580419>

Next Steps/Future Lessons:

- Ask participants to bring old maps of ranch to next meeting.
- Suggest that participants view previews for videos 8, 9, and 10 prior to Lesson Plan 4.