Lesson Plan 5.
The Good, the Bad, and the Ugly—Pathogens and Practices for Water Quality Management

Goals/Overview:

Understand which pathogens are important in rangeland systems, the prevalence of pathogens in livestock and wildlife, and management practices to reduce pathogen pollutants in water bodies. Provide a specific emphasis on science-based management practices that are relatively easy to understand and implement.

Learning Objectives:

1. Know the primary waterborne pathogens attributed to livestock grazing activities and how they move across the landscape.
2. Understand the water quality risks associated with livestock densities, especially in areas with direct hydrologic connectivity to water bodies.
3. Understand the benefits of common ranch management practices that improve water quality and forage utilization (for example, locating water and supplement sites).
4. Gain ability to consider multiple conservation practices as alternative options to treat a particular site or pasture.
5. Encourage participants to remember that no single conservation practice fixes water quality. For example, exclusionary fencing is not required for all waterways and should be used only where problems exist that cannot be alleviated with other practices.
6. Review common management techniques and conservation practices that increase range production and improve water quality.
7. Compare and contrast water quality improvement practices that treat surface runoff downstream, such as buffers and filter strips, versus practices that work on the pasture itself, such as grazing management, supplement and water trough locations , and cross-fencing.

Introduction/Hook:

- Discuss practical maintenance issues of previously completed conservation practices and general ranch maintenance practices that improve water quality and economic returns. Discuss how practices have been documented in an RWQP.
- Provide sources of funds (NRCS, grants through RCDs, and so on) for implementing conservation practices.

Materials/Speakers:

- Invited speaker to cover the fate and transport of pathogens, such as UCD Veterinary Medicine Specialist or UCCE Watershed Management Advisor, Rangeland Hydrology Specialist, and/or Livestock Range Advisor.
- Educational video: "Rangeland Management of Waterborne Pathogens from Livestock and Wildlife" (31 minutes).
- Educational video: "Public Lands Grazing and Water Quality" (13 minutes, depending on local issues).
- Educational video: "Management Options to Reduce Pollutants in Runoff from Irrigated Pastures" (30 minutes, depending on local issues).
- Invited speaker covering historical ranch photos of sites or pastures that improved vegetation cover or structure and discuss why. This could be an engineer, ecologist or hydrologist working on local ranches—UCCE Watershed Management Advisor, Rangeland Hydrology Specialist, and/or Livestock Range Advisor.
- Invite NRCS and/or RCD staff to discuss technical and cost-share assistance programs that are available.
- Water Board staff invited to continue learning about program and building relationships with landowners.
- 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 may still suffice; however, as tension over regulation subsides and relationships strengthen, consider starting to provide a lunch or dinner to attendees, agency staff, and conservation partners, depending on resources.

Time Allocated:

Allow 1 to 2 hours (30 to 75 minutes for presentations and 20 to 40 minutes for discussions/questions).

Procedures/Activities/Strategies/Questions:

- Welcome; attendees introduce themselves.
- Review information from prior topics and provide time for discussion and questions.
- Present video: "Rangeland Management of Waterborne Pathogens from Livestock and Wildlife."
- Present video: "Public Lands Grazing and Water Quality" (depending on local issues).
- Present video: "Management Options to Reduce Pollutants in Runoff from Irrigated Pastures" (depending on local issues).
- Discuss lessons learned from previously completed projects and practices. Consider what conservation practices or stewardship efforts have been successful on your ranch or on others to improve water quality. Also consider **whether the site needs more work.**
- What types of projects on your ranch would you like assistance to fix and which do you prefer to do yourself? Are there certain sites needing technical and/or monetary help?
- Ask for examples of water quality fixes of ranch sources of pollution from the watershed.
- Review historical maps and aerial photos of watershed that depict changes in vegetation resulting from specific projects or practices.
- Discuss large changes in ranch productivity over time and contemplate if treating types of erosion or other pollution sources also improved or impacted ranch viability.
- Complete the Session Evaluation Form (appendix A).

Conclusion/Self-assessment:

- Have participants reflect upon both successes and failures to find lessons learned from previously completed restoration projects or conservation and water quality practices.
- Ask participants if and how treating types of erosion or other pollution sources also improves or impacts ranch viability.

Resources:

Briske, D. D., ed. 2011. Conservation Benefits of Rangeland Practices: Assessment, Recommendations, and Knowledge Gaps. Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/ceap/?cid=stelprdb1045811

George, M., D. Bailey, M. Borman, D. Ganskopp, G. Surber, and N. Harris. 2007. Factors and Practices that Influence Livestock Distribution. Oakland: UC Agriculture and Natural Resources Publication 8217. https://anrcatalog.ucanr.edu/pdf/8217.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

Lewis, D., M. Lennox, N. Scolari, L. Prunuske, and C. Epifanio. 2011. A half century of stewardship: A programmatic review of conservation by Marin RCD & partner organizations (1959–2009). Prepared for Marin Resource Conservation District by UC Cooperative Extension. http://ucanr.org/sites/Grown_in_Marin/files/138393.pdf

Macon, D. 2002. Grazing for change: Range and watershed management success stories in California. Sacramento: California Cattlemen's Association. http://www.carangeland.org/images/Grazing_for_Change.pdf

Napa County Resource Conservation District. n.d. Slow it. Spread it. Sink it! A landowner's guide to beneficial stormwater management. https://naparcd.org/wp-content/uploads/2014/06/Slowit_Spreadit_Sinkit.pdf

Natural Resources Conservation Service. 2012. Introduction to waterborne pathogens in agricultural watersheds. Nutrient management technical note no. 9. https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=32935.wba

Prunuske, L., C. Choo, M. Jensen, and H. Appleton. 2007. Groundwork: A handbook for small-scale erosion control in coastal California. 2nd ed. Marin Resource Conservation District and Marin County Stormwater Pollution Prevention Program. http://www.marinrcd.org/wp/wp-content/uploads/2014/01/Groundwork-A-Handbook-for-Small-Scale-Erosion-Control-in-Coastal-California.pdf

Roche, L. M., L. Kromschroeder, E. R. Atwill, R. A. Dahlgren, and K. W. Tate. Water quality conditions associated with cattle grazing and recreation on national forest lands. PLOS One 8(6):e68127. https://doi.org/10.1371/journal.pone.0068127

Next Steps/Future Lessons:

- Ask participants to consider the future project sites or pastures they previously intended to improve and brainstorm current potential objectives given the information discussed.