



CALIFORNIA  
FARM BUREAU  
FEDERATION

August 24, 2011

Mr. Charlie Hoppin  
Chair, State Water Resources Control Board  
1001 I Street  
Sacramento, CA 95814



Dear Chair Hoppin;

The California Cattlemen's Association (CCA) and California Farm Bureau (Farm Bureau) appreciate the opportunity to comment on the Waiver of Waste Discharge Requirements for Nonpoint Source Discharges Related to Certain Activities on National Forest System Lands in California. CCA and Farm Bureau represent ranchers and livestock producers who graze cattle on nearly 34 million acres of public and privately owned rangelands and encompass California's \$1.68 billion beef industry.

Our organizations are very concerned with specific conditions in the waiver and would request the State Water Resources Control Board (State Water Board) effectively address these concerns prior to voting on the adoption of the waiver in October. California ranchers depend on both public and private rangelands to maintain a sustainable and productive beef cattle industry. Similar to other states in the West, the federal government owns over 50 percent of California and many rural counties are almost entirely owned by the United States Forest Service (USFS) or Bureau of Land Management (BLM). Rural residents depend on the responsible and lawful use of federal lands in conjunction with private lands and together serve as the foundation for healthy rural economies.

Bluntly stated, California's cattle industry and California ranchers could not produce food without the availability of federal lands for summer grazing as intended by Congress. California's Mediterranean climate requires that livestock be rotated on winter and summer rangelands or pastures. Federal lands, specifically USFS grazing allotments, account for a large percentage of the summer forage available to livestock producers. Purchasing private lands to offset the use of public lands is also not an option for ranchers due to the rising cost of land and the ever growing pressure to develop productive agricultural lands for urban use.

While ranchers depend on and care for federal grazing allotments, there has been a drastic reduction in Animal Unit Months (AUMs) or forage made available to livestock on USFS and BLM lands. This trend is largely attributed to increasing regulatory pressures, originating from both Washington, D.C. and Sacramento, and the ever growing stack of lawsuits filed solely on procedural matters by well funded groups seeking to end the multiple uses of our nation's public lands. Ranchers not only graze livestock but serve as the care takers for federal grazing allotments such as maintaining the intrusion of invasive species, providing in-kind labor and materials to repair roads and forest infrastructure, serve as an active presence to deter unlawful activities on public lands, etc. Grazing also is a documented land management tool essential to protecting meadows from encroachment woody species, controlling the production of invasive species, spurring plant growth, reducing fuel loads and maintaining the ecological health of wildlife habitat for various endangered and threatened species.

As a result of the general decrease in grazing and other multiple uses, forest and BLM lands throughout the West have experienced more destructive wildfires, unhealthy meadows and watershed functions due to the growing rate of invasive species and a decline in family ranchers who have little option but to sell private lands for other uses.

It is essential that both the state and federal governments work to reverse this trend but at the very least ensure that new regulatory policies like the proposed waiver do not adversely impact ranchers who have been grazing public lands in the West for over 100 years.

It is also important to keep in mind that grazing on National Forests has a minimal impact on water quality. Although grazing has occurred on the National Forests for more than 100 years (before they were National Forests), current permitted livestock numbers are only a fraction of what they were. Additionally, research has shown that even if a water sample "spike" is found, it is diluted to an undetectable amount within less than a mile downstream. This is an important consideration for grazing activities that occur in areas where there is very little, if any, human presence.

Specifically, CCA and Farm Bureau urge the State Water Board to address the following areas of the waiver:

**Waiver Should be Narrowly Tailored**

The waiver should be drafted in a manner so that the only required conditions are those necessary to comply with the California Water Code. The purpose of this narrowing is to minimize regulatory overlap and the inevitable regulatory conflict.

This general concern of regulatory overlap and conflict is based upon those parts of the waiver that make actions not explicitly required by the California Water Code a condition of the waiver. This means that if one of those conditions is violated, even though the "violation" is not contrary to state law, the USFS is in violation of the waiver. A good example of the challenges posed by the kind of interagency relationship proposed in the draft waiver is found in the difficulties associated with timber harvest on

private lands. There, Cal Fire's management of timber harvest has been made much more difficult by its interaction with the Regional Board. Since the Forest Service does not have the same sort of obligatory relationship with the regional board it should make every effort to minimize its obligations under the waiver.

### **Regional Board Regulatory Jurisdiction**

The Regional Board oversteps their regulatory jurisdiction in many places throughout the document, specifically with regard to land use, management practices, and pesticide application. The Regional Board can only require a water quality objective, not the management practices by which you might achieve that objective. Specific areas of inappropriate jurisdiction include:

- **Land Use:**  
Regulating land use is not within the purview of the Regional Board. The Water Code and the Basin Plan focus on water quality and activities which may impair water quality. While the Regional Board has authority to prohibit an act which may result in a discharge, the Board does not have authority to require an act which is unrelated to discharges to waters of the state (Wat. Code, § 13360).
- **Management Practices:**  
The Regional Board does not have the statutory authority to mandate specific management practices. (Wat. Code, § 13360(a).) The Regional Board has the authority to adopt water quality control plans, water quality objectives to "ensure the reasonable protection of beneficial uses," and waste discharge requirements. (Wat. Code, §§ 13240, 13241, 13242.) However, it cannot dictate the management and business practices undertaken by a landowner to reach the applicable discharge goal. Specifically, Water Code §13360(a) provides:
  - No waste discharge requirement or other order of a regional board or the state board or decree of a court issued under this division shall specify the design, location, type of construction, or particular manner in which compliance may be had with that requirement, order, or decree, and the person so ordered shall be permitted to comply with the order in any lawful manner.
  - Several provisions of the waiver intrude upon the Forest Service's management practices; these are noted in the attached document. Because such provisions relating to management are contrary to the Water Code and will be detrimental to the efficient management of Forest Service lands, they should be removed.
- **Pesticides:**  
Given the need for proper and effective oversight of pesticide use, pesticide regulation is a matter of "statewide concern" that must be regulated from the state level. (Food & Agr. Code, § 11501.5(a).) The Legislature made this unmistakably clear by commencing the section with "this division and Division 7 (commencing with Section 12501) are of statewide concern and occupy the whole field of regulation." The plain meaning of the words within this sentence illustrates the Legislature's intent for state regulation of pesticides and such regulation to be conducted by the

Department of Pesticide Regulation and not the Regional Water Quality Control Boards. Thus, the imposition of pesticide restrictions for ground and aerial application by the Regional Board is improper and exceeds statutory authority.

### **Ongoing Role of USFS & Permittees–**

The USFS maintains a high protection for water quality based on the USFS Water Quality Management Plan (WQMP) that is routinely updated. Likewise, NEPA and individual permits, including grazing permits, prescribe best management practices (BMPs) to protect water quality and are implemented on the ground by ranchers who also depend on healthy watersheds. The USFS already adequately protects water quality through the BMPs that have been in place for years and with or without a waiver. USFS' Best Management Practices Evaluation Program (BMPEP) clearly indicates that the current WQMP and Best Management Practices (BMPs) currently prescribed are successfully monitoring and protecting water quality on California's National Forest lands.

The USFS maintains the sole authority to manage federal lands under their jurisdiction and conditions under the waiver should be consistent with the WQMP; the waiver should not add additional conditions or requirements. Not only was the plan recently updated and more specific measurement tools were added to gauge BMP effectiveness, but it more clearly prescribes on-the-ground activities that protect water quality. Various sections throughout the waiver require the USFS to adopt on-the-ground BMPs inferring that this would be a new procedure; however, this is already being done. Therefore, the best approach is to have the only condition of the waiver be continued implementation of the Forest Service's existing protocols.

Similarly, monitoring requirements should be consistent with ongoing programs already prescribed by NEPA, Allotment Management Plans or a permittees' annual operating instructions provided by USFS range staff. USFS monitoring programs adhere to guidelines and protocols established at the national level and USFS Region 5 should not deviate from these protocols in order to maintain consistency throughout the USFS.

In many places throughout the waiver and Attachment C, the Monitoring and Reporting Program, the State Board requires the USFS to submit various reports and summaries of monitoring data. The USFS should be allowed to submit this information to the Board in any form in which it already exists, rather than being required to reformat or recalculate. The many new requirements will already consume additional USFS staff time which is already limited due to budget shortfalls. The goal should be to minimize unnecessary paperwork and staff time that would be better spent implementing projects on the ground.

### **North Coast Regional Water Board Order R1-2010-0029**

It was the understanding of many of the stakeholders who participated in the initial CEQA review process that upon expiration, national forests within the jurisdiction of the North Coast Regional Water

Quality Board would fall under the statewide waiver. Language in Section 40 of the proposed waiver's general findings indicates that the adoption of the statewide waiver would not supersede the waiver adopted by the North Coast Regional Water Quality Control Board. We ask the State Water Board to clarify this issue in order to ensure consistency throughout the state.

### **Protection of Designated Riparian Zones**

Clause 1 of the waiver's general conditions requires the USFS to manage and maintain designated riparian zones as defined by the Northwest Forest Plan and the Sierra Nevada Forest Plan Amendments. The waiver should also include to clarify that manage does not require exclusion or the fencing of riparian areas. In some cases, livestock exclusion is necessary but in most cases BMPs can be employed to disperse cattle over large areas and prevent over grazing in riparian areas or excessive trampling. The notion that allowing cattle access to riparian areas equates to a discharge is also incorrect and unfounded. The ability to access riparian areas is critical to maintaining livestock on allotments to ensure livestock have an available source of fresh water and that riparian areas are properly managed. Likewise, BMPs can be employed to construct specific areas for livestock access to fresh water and stream crossings. The protection of riparian zones under the waiver should also remain consistent with forest regulations and guidelines.

### **Modifications to the USFS Water Quality Management Plan**

We oppose the clause in Section 11(b) of the proposed waiver's general findings that the State Water Board must approve any revisions made by the USFS to the Water Quality Management Plan or USFS guidance related to water quality. Not only is this unnecessary, but USFS regulations and guidance should remain consistent throughout the nation. It would be inappropriate for the state to refuse changes to a federal document that is under the sole discretion of the USFS. While the USFS may consult the State Water Board, the Water Quality Management Plan remains a national USFS document.

### **USFS Authority**

CCA and Farm Bureau strongly support Section 12 of the proposed waiver's general findings that specifies that the USFS have sole authority to determine if permittees are in compliance with permit or NEPA terms and conditions. The USFS remains the agency responsible for managing forest lands to accommodate multiple-uses as directed by Congress.

### **Category B – Moderate Risk Activities & Requirements for Grazing Allotments**

We strongly support Section 11 that specifies that all grazing allotments are covered by the waiver unless specific action is taken by a Regional Board to remove an allotment. A finalized NEPA decision pertaining to a grazing allotment is required to be reviewed every 10 years at the expiration of the permit to determine and mitigate any significant on-the-ground changes that may have occurred over the life of the permit.

Various revisions as allowed by law to the Recessions Act schedule that dictates NEPA completion have been made since the first schedule was adopted in 1995. These revisions reflect the real challenge of completing these NEPA reviews due to a lack of forest staff, inadequate resources provided to complete NEPA for grazing, and a general increase in litigation relative to NEPA.

Many of the lawsuits surrounding NEPA are put forward simply to slow or stall the permitting process by groups wishing to end grazing on federal lands altogether. As an industry, we strongly support the completion of NEPA in a timely fashion, however at this time there are still a large list of allotments that have not received even a first review. The inability to finalize range NEPA according to the Recessions Act schedule is by no means the fault of permittees and likewise permittees should not be harmed because the USFS is unable to complete range NEPA.

We believe providing regulatory coverage to allotments upon adoption of the waiver is critical. Although some have indicated grazing allotments will be “grandfathered” in, this is not true. When an allotment goes through NEPA the first time, that process will officially involve the Regional Board. For those allotments that have already had a NEPA document prepared and finalized, the regional board will be consulted during the NEPA review prior to issuing another 10 year permit. That is to say that any issues that the regional board might believe make the allotment ineligible for coverage can be addressed with the USFS at that time.

Retaining the automatic enrollment of allotments upon adoption of the statewide waiver is important to ensure regulatory certainty for allotments that have not received a NEPA review. Under the waiver, the NEPA process triggers USFS, state and regional water board consultation and we are concerned permittees grazing on these allotments will be left in an ambiguous and dangerous legal and regulatory grey area. We believe it would be unacceptable if permittees do not have regulatory certainty or coverage under the waiver while they are awaiting NEPA review and could be left vulnerable to petty or procedural lawsuits by organizations wishing to end grazing on public lands.

We are also specifically concerned about provision #10 on page 29, regarding USFS responsibility to report “areas...disturbed by grazing that may result in a discharge that threatens to violate water quality.” It is unclear what qualifies as such an area and who makes that determination. Certainly it would not be efficient to apply this responsibility to every alleged violation raised by a third party.

Finally, the Waiver discusses in many places the need for legacy sites to be surveyed and addressed if they exist in a project area. This requirement should also be subject to budgetary constraints, and should not delay the progress of an un-related project (i.e. grazing allotment NEPA).

### **Human Waste**

Although human waste is not covered in the waiver, the waiver does acknowledge that human waste discharges area prohibited. While human waste discharges are prohibited, we remain concerned that this

issue is not being addressed with the same intensity as activities specifically covered under the waiver. The ever-increasing recreational use of National Forest lands is certainly causing human waste discharges to streams, rivers and other waterbodies. Human waste impacts to water quality can be severe, and should be addressed in any comprehensive water quality regulation.

### **Regional Board Review**

During the NEPA review, it is important to maintain a requirement in the waiver for the Regional Board to respond to the USFS within 30 days of review. The response should also be limited to approval or non-approval and not delay the USFS from completing action on the NEPA decision. Additionally, we support language in the original draft that considered the allotment enrolled unless the regional board contacted USFS within 30 days. As stated above, there are many challenges that already have slowed down the completion of range NEPA and adding additional burden indirectly through the adoption of a statewide waiver is unacceptable.

Unfortunately, our experience with implementation of the North Coast waiver thus far has confirmed many of our concerns about the regional board's review significantly delaying the NEPA process. While we understand that there is a learning curve to any new program, the basis of this program is the USFS WQMP, which the USFS has been successfully implementing for many years. It is simply unnecessary for the regional board to spend an inordinate amount of time reviewing and proposing revisions to the USFS documents. In fact, we were assured this wouldn't occur since the waiver was essentially a regulatory technicality for water quality protection that USFS was already successfully conducting.

### **Monitoring & Compliance Review Programs**

Generally, we support the inclusion of the ongoing USFS and University of California Cooperative Extension water quality study as the method for monitoring grazing allotments under the waiver. However, the description of "Rangeland Monitoring" on page 4 of Attachment C should be updated to include the research being conducted this summer (2011), which has expanded to study a total of 192 sites on five National Forests. It would also be helpful for the section to more clearly state that the goal of the study is to evaluate the effectiveness of grazing BMPs.

Requiring additional water quality monitoring either by the USFS or permittees would be overly expensive and certainly is not feasible within the limited budget of the USFS or tightening margins facing public lands ranchers. Should the State Water Board seek to deviate from the current research as the mode for monitoring water quality relative to grazing, we wish to be intimately involved with the development of any alternative proposals or monitoring methods. Not only is water quality monitoring extremely expensive but there are also limiting factors associated with sampling and testing waters in remote areas.

### **Inclusion of Recessions Act Schedule**

Attachment F outlines the current Recessions Act schedule and when allotments that have not received a NEPA review are scheduled to begin. While the discussion of NEPA may be appropriate to include in the waiver, defining Attachment F as the firm or final schedule is inappropriate and unlawful. Congress has specifically granted the USFS the ability to revise the Recessions Act schedule based on actual results. It should be made extremely clear that the waiver only describes the current schedule and the schedule listed in the waiver may not be accurate in the future. Also, enrollment in the waiver should not be predicated on Attachment F or the current Recessions Act schedule.

### **Use of Best Available Science**

We remain concerned that both the WQMP update and the development of this waiver have been based primarily on perceived concerns, rather than data and the best available science. The stakeholder group that was formed to provide comments on both the update to the USFS WQMP and the draft of the waiver was allowed to direct USFS and State Water Board staff focus simply on perceived water quality concerns in contrast with the BMPEP. Not only was this inappropriate but it completely disregarded the research that had taken years to complete to gauge BMP effectiveness. We have attached detailed bibliography of the most relevant studies regarding rangeland water quality that should be consulted as the State Board moves forward.

CCA and Farm Bureau again appreciate the opportunity to comment. Should you have any questions, please do not hesitate to contact us directly.

Sincerely,



Justin Oldfield  
Director of Government Relations  
California Cattlemen's Association



Elisa Noble  
Director, National Affairs & Research  
California Farm Bureau Federation

CC: Frances Spivy-Weber, Vice-Chair, State Water Resources Control Board  
Tam Doduc, Board Member, State Water Resources Control Board  
Tom Howard, Executive Director, State Water Resources Control Board  
Gaylon Lee, Forest Activities Program Manager, State Water Resources Control Board  
Randy Moore, Regional Forester, USFS Pacific Southwest Region  
Daniel Jiron, Deputy Regional Forester, USFS Pacific Southwest Region  
Barnie Gyant, Deputy Director Ecosystem Management, USFS Pacific Southwest Region  
Barry Hill, Regional Hydrologist, USFS Pacific Southwest Region  
Anne Yost, Regional Range Program Manager, USFS Pacific Southwest Region



## Published Studies Regarding Grazing and Rangeland Water Quality

1. Agouridis, C.T., Workman, S.R., Warner, R.C., Jennings, G.D. (2005). LIVESTOCK GRAZING MANAGEMENT IMPACTS ON STREAM WATER QUALITY: A REVIEW. *JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION*. 16.
2. Allen-Diaz, B., Jackson, R.D., Bartolome, J.W., Tate, K.W., Oates, L.G. 2004. Long-term grazing study in spring-fed wetlands reveals management tradeoffs. *California Agriculture*. Vol. 58, No. 3: 144-148.
3. Anderson, W.E. 1993. Prescription grazing to enhance rangeland watersheds. *Rangelands*. 15: 31-35.
4. Armour, C., Don Duff, Wayne Elmore. The Effects of Livestock Grazing on Western Riparian and Stream Ecosystem. Pg 9-12.
5. Arnone, R.D., Walling, J.P. (2007). Waterborne pathogens in urban watersheds. *Journal of Water and Health*. 5. 149-162.
6. Atwell, E. R. (1996). Assessing the Link between Rangeland Cattle and Water-Borne *Cryptosporidium parvum* Infection in Humans. *Rangelands*. 18. 48-51.
7. Atwell, R., Six, J. (2009). Wetlands and Vegetative Buffers – filtering pollutants from runoff. *UC Davis Plant Sciences*.
8. Atwill, E.R., K.W. Tate, M. Das Gracias C. Pereira, J.W. Bartolome, and G.A. Nader. 2006. Efficacy of Natural Grass Buffers for Removal of *Cryptosporidium parvum* in Rangeland Runoff. *J. Food Protection*. 69:177-184.
9. Barry, S.J. Managing the Sacramento valley vernal pool landscape to sustain the native flora. *California Vernal Pools*. 236-240.
10. Bekele, A., McFarland, A.M.S., Whisenant, A.J. (2006). IMPACTS OF A MANURE COMPOSTING PROGRAM ON STREAM WATER QUALITY. *Transactions of the American Society of Agricultural Engineers*. 49. 389-400.
11. Belsky, A. J., A. Matzke, and S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. *Journal of Soil and Water Conservation*. First Quarter 1999 vol. 54 no. 1.
12. Brown, L. (2006). Offstream Watering to Reduce Livestock Use of Watercourses and Riparian Areas. *British Columbia Ministry of Agriculture Lands*. 6.
13. Buckhouse, J.C., Gifford, G.F. Water Quality Implications of Cattle Grazing on a Semiarid Watershed in Southeastern Utah. 1976.
14. Buckhouse, JC, Skovlin, JM, Knight, RW. Streambank Erosion and Ungulate Grazing Relationships. *Journal of Range Management [J. RANGE MANAGE.]*. Vol. 34, no. 4, pp. 339-340. 1981.
15. Butler, G.B., Srivastava, P. (2007). AN ALABAMA BMP DATABASE FOR EVALUATING WATER QUALITY IMPACTS OF ALTERNATIVE MANAGEMENT PRACTICES. *American Society of Agricultural and Biological Engineers*. 23. 727-736.
16. Chaubey, I., Chiang, L., Gitau, M.W., Mohamed, S. (2010). Effectiveness of best management practices in improving water quality in a pasture-dominated watershed. *Journal of Soil and Water Conservation*. 65. 424-437.
17. Chen, I.C. (2005). Effects of Manure Application upon Water Quality of Surface Runoff from Rainfall Simulation Tests. *Division of Environmental Engineering*. Master of Science. 153.
18. Chin, D.A., Sakura-Lemessy, D., Bosch, D.D., Gay, P.A. (2009). WATERSHED-SCALE FATE AND TRANSPORT OF BACTERIA. *Transactions of the ASAE*. 52. 145-154.

19. Clary, W.P., Webster, B.F. Managing Grazing of Riparian Areas in the Intermountain Region. May 1989.
20. Clawson, J.E. (1993). The use of off-stream water developments and various water gap configurations to modify the watering behavior of grazing cattle.. *Rangeland Resources*. Master of Science. 90.
21. Collins, R. , McLeod, M., Hedley, M., Donnison, A., Close, M., Hanly, J., Horne, D., Ross, C., Davies-Colley, R., Bagshaw, C.S., Matthews, L. (2007). Best management practices to mitigate faecal contamination by livestock of New Zealand waters. *New Zealand Journal of Agricultural Research*. 50. 267-278.
22. Dahlgren, R.A., K.W. Tate, D.J. Lewis, E.R. Atwill, J.M. Harper, and B.H. Allen-Diaz. 2001. Watershed Research Examines Rangeland Management Effects on Water Quality. *California Agriculture*. 55:64-71.
23. Deng, Z.-Q., Chowdhary, H. (2008). Statistical Evaluation of BMP Effectiveness in Reducing Fecal Coliform Impairment in Mermentau River Basin. *World Environmental and Water Resources Congress*.
24. Dillaha, T.A., Simpson, T., Weammert, S. (2008). Off-stream Watering with Fencing and Off-stream Watering without Fencing Practices: Definitions and Nutrient and Sediment Reduction Efficiencies. 1-57.
25. Dolev, A., Carmel, Y., Yehuda, Y., Henkin, Z. (2010). Optimizing the location of water and feeding sites to decrease cattle contamination of natural streams. *Options Mediterraneennes*. 92. 55-58.
26. Doran, J.W., Linn, D.M. Bacteriological Quality of Runoff Water from Pastureland. *Appl Environ Microbiol*. 1979 May; 37(5): 985-991.
27. Douglas A. Frank, Samuel J. Tracy McNaughton & F. Benjamin The Ecology of the Earth's Grazing Ecosystems. *Bioscience* v. 48 no 7, July 1998.
28. Eck, B., Barrett, M., McFarland, A.M.S., Hauck, L. (2010). Hydrologic and Water Quality Aspects of Using a Compost/Mulch Blend for Erosion Control. *JOURNAL OF IRRIGATION AND DRAINAGE ENGINEERING*. 136. 646-655.
29. EPA (2010). Implementing Agricultural Best Management Practices Improves Water Quality. *Nonpoint Source Program Success Story*.
30. Fahnestock J.T., Knapp, A.K., Water Relations and Growth of Tall Grass Forbs in Response to Selective Grass Herbivory by Bison.
31. Fitch, L., Adams, B.W. Can cows and fish co-exist? *Canadian Journal of Plant Science*, 1998, 78:(2) 191-198, 10.4141/P97-141.
32. Galeone, D.G., Brightbill, R.A., Low, D.J., O'Brien, D.L. (2006). Effects of streambank fencing of pasture land on benthic macroinvertebrates and the quality of surface water and shallow ground water in the Big Spring Run Basin of Mill Creek Watershed, Lancaster County, Pennsylvania, 1993-2001. *Scientific Investigations*.
33. Gary, H.L., Johnson, S.R., Ponce, S.L., Cattle grazing impact on surface water quality in a Colorado front range stream. 1983 vol. 38 no. 2 124-128.
34. George, M.R., Larsen, R.E., McDougald, N.K., Tate, K.W., Gerlach, J.D., Fulham, K.O. Cattle grazing has varying impacts on stream-channel erosion in oak woodlands. 2004. *California Agriculture*. Vol. 58, No. 3: 138-143.
35. Gifford, G. F., and R. H. Hawkins. 1978. Hydrologic impact of grazing on infiltration – critical review.

36. Gitau, M.W., Gburek, W.J., Bishop, P.L. (2008). USE OF THE SWAT MODEL TO QUANTIFY WATER QUALITY EFFECTS OF AGRICULTURAL BMPS AT THE FARM-SCALE LEVEL. *Transactions of the ASAE*. 51. 1925-1936.
37. Gold, A., Addy, K., Vinhateiro, B., Esten, M. , University of Rhode Island (2010). Evaluation of Site Suitability for Enhanced Infiltration Practices in Heavy use livestock areas: Project Report.
38. Guzman, J.A., Fox, G.A., Payne, J.B. (2010). Surface Runoff Transport of Escherichia coli after Poultry Litter Application on Pastureland. *ASABE Annual International Meeting*. 1008728.
39. Heady, H.F., Child, R.D. Rangeland ecology and management. Rangeland ecology and management. 1994 pp. xvi + 519 pp.
40. Hooda, P.S., Edwards, A.C., Anderson, H.A., Miller, A. A review of water quality concerns in livestock farming areas. Volume 250, Issues 1-3, 24 April 2000, Pages 143-167.
41. Hughes, A.H., Benfield, E.F. (2008). The effects of cattle exclusion on stream structure and function. *Biological Sciences*. Master of Science. 74.
42. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. pp. 1-15. American Fisheries Society Special Publication [Am. Fish. Soc. Special Pub.]. no.
43. Jackson, R.D., B. Allen-Diaz, L.G. Oates, and K.W. Tate. 2006. Spring-Water Nitrate Increased by Grazing Removal in a Californian Oak Savanna. *Ecosystems*. 9:1-15.
44. Johnson, K.I. Management for water quality on rangelands through best management practices; the Idaho approach. 1992 Pgs 415-441.
45. Knock, A.K., Tate, K. W., Dahlgren, R.A., Atwell, E. R. (2007). Management reduces E. coli in irrigated pasture runoff. *California Agriculture*. 61. 159-165.
46. Larsen, R.E. (1996). Survival and transport of fecal pathogens in grazed watershed. Livestock management in grazed watersheds: A review of practices that protect water quality. 59-71.
47. Larson, S., K. Smith, D. Lewis, J. Harper, and M. George. 2005. Evaluation of California's rangeland water quality education program. *Rangeland Ecology and Management* 58:514-522.
48. Lennox, M.S., Lewis, D.J., Gustafson, J., Tate, K. W., Atwell, E. R. (2007). Water quality treatment for livestock feeding and exercise areas on California coastal dairy farms and ranches. *University of California Agriculture and Natural Resources*.
49. Lewis, D. J., M. J. Singer, R. A. Dahlgren, and K. W. Tate. 2006. Nitrate and sediment fluxes from a California rangeland watershed. *Journal of Environmental Quality* 35:2202-2211.
50. Lewis, D.J., Atwill, E. R., Lennox, M.S., Pereira, M.D.G., Miller, W.A., Conrad, P.A., Tate, K. W. (2010). Management of Microbial Contamination in Storm Runoff from California Coastal Dairy Pastures. *Journal of Environmental Quality*. 39. 1782-1789.
51. Lewis, D.J., Atwill, E. R., Lennox, M.S., Pereira, M.D.G., Miller, W.A., Conrad, P.A., Tate, K. W. (2009). Reducing microbial contamination in storm runoff from high use areas on California coastal dairies. *Water Science and Technology*. 60. 1731-1743.
52. Lewis, D.J., Tate, K.W., Harper, J.M. Sediment Delivery Inventory and Monitoring: A Method for Water Quality Management in Rangeland Watersheds. UC-DANR Publication 8014.
53. Lewis, D.J., Tate, K.W., Harper, J.M., Price, J. 2001. Survey identifies sediment sources in North Coast rangelands. *California Agriculture*. Vol. 55, Number 4, pp. 32-38.
54. Ling, T.Y., Jong, H.J., Apun, K., Wan Sulaiman, W.H. (2009). QUANTIFYING ESCHERICHIA COLI RELEASE FROM SOIL UNDER HIGH-INTENSITY RAINFALL. *Transactions of the ASAE*. 52. 785-792.
55. Long, J.W., Medina, A.L. Consequences of Ignoring Geologic Variation in Evaluating Grazing Impacts. Consequences of Ignoring Geologic Variation--July, 2006 pdf size: 0.36mb.

56. Makarewicz, J.C. (2009). Nonpoint source reduction to the nearshore zone via watershed management practices: Nutrient fluxes, fate, transport and biotic responses - Background and objectives. *Journal of Great Lakes Research*. 35. 3-9.
57. Makarewicz, J.C., Lewis, T.W., Bosch, I., Noll, M.R., Herendeen, N., Simon, R.D., Zollweg, J., Vodacek, A. (2009). The impact of agricultural best management practices on downstream systems: Soil loss and nutrient chemistry and flux to Conesus Lake, New York, USA. *Journal of Great Lakes Research*. 35. 23-36.
58. Marty, J. 2004. Vernal pools are at home on the range. *National Wetlands Newsletter*. Vol. 26, No. 4: 12-14.
59. Marty, J. T. 2005. Effects of cattle grazing on diversity in ephemeral wetlands. *Grazing for Biological Conservation*.
60. Meals, D.W., Dressing, S.A. (2010). Lag Time in Water Quality Response to Best Management Practices: A Review. *Journal of Environmental Quality*. 39. 85-96.
61. Meehan, W.R. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. pp. 389-423. American Fisheries Society Special Publication [Am. Fish. Soc. Special Pub.]. no. 19.
62. Miller, J., Chanasyk, D., Curtis, T., Entz, T., Willms, W. (2010). Influence of streambank fencing with a cattle crossing on riparian health and water quality of the Lower Little Bow River in Southern Alberta, Canada. *Agricultural Water Management*. 97. 247-258.
63. Miner, J.R., Buckhouse, J.C., Moore, J.A. (1992). Will a Water Trough Reduce the Amount of Time Hay-Fed Livestock Spend in the Stream (And Therefore Improve Water Quality)? *Rangelands*. 14. 35-38.
64. Minnesota Pollution Control Agency (2008). Bacteria: Sources, Types, Impact on Water Quality - A General Overview. *Water Quality/Impaired Waters*. 1-2.
65. Mishra, A., Benham, B.L., Mostaghimi, S. (2008). Bacterial Transport from Agricultural Lands Fertilized with Animal Manure. *Water, Air, and Soil Pollution*. 189. 127-134.
66. Moechnig, H. (2007). Managing Grazing in Stream Corridors. *Minnesota Department of Agriculture*. 1-33.
67. Muenz, T.K., Golladay, S.W., Vellidis, G., Smith, L.L. (2006). Stream Buffer Effectiveness in an Agriculturally Influenced Area, Southwestern Georgia: Responses of Water Quality, Macroinvertebrates, and Amphibians. *Journal of Environmental Quality*. 35. 1924-1938.
68. Nader, G., Tate, K.W., Atwell, R., Bushnell, J. Water Quality Effect of Rangeland Beef Excrement. 1998.
69. Platts, W.S. Livestock grazing and riparian/stream ecosystems – an overview. 39-45.
70. Pyke, C.R., Marty, J. 2005. Cattle grazing mediates climate change impacts on ephemeral wetlands. *Conservation Biology*. Vol. 19, No. 5: 1619-1625.
71. Rao, N.S., Easton, Z.M., Schneiderman, E.M., Zion, M.S., Lee, D. R., Steenhuis, T.S. (2009). Modeling watershed-scale effectiveness of agricultural best management practices to reduce phosphorus loading. *Journal of Environmental Management*. 90. 1385-1395.
72. Reema, Padia, Israel David, Parker, Bailey, Sullivan, R. Karthikeyan, Saqib, Mukhtar (2009). Fate and Transport of E. coli in Cedar Creek Watershed, Texas. *2009 Reno, Nevada, June 21 - June 24, 2009*.
73. Reicks, G.W., Clay, D.E., Carlson, C.G., Clay, S. A. (2009). Better Management Practices for Improved Profitability and Water Quality. *South Dakota Cooperative Extension Service*. FS944.

74. Reinoso, R. , Torres, L.A., Becares, E. (2008). Efficiency of natural systems for removal of bacteria and pathogenic parasites from wastewater. *Science of the Total Environment*. 395. 80-86.
75. Simon, R.D., Makarewicz, J.C. (2009). Impacts of manure management practices on stream microbial loading into Conesus Lake, NY. *Journal of Great Lakes Research*. 35. 66-75.
76. Soupir, M.L., McDaniel, R.L., Rehmann, C.R. (2010). Resuspension of E. coli from Direct Fecal Deposits in Streams. *21st Century Watershed Technology: Improving Water Quality and Environment*.
77. Soupir, M.L., Mostaghimi, S. (2010). Escherichia coli and Enterococci Attachment to Particles in Runoff from Highly and Sparsely Vegetated Grassland. *Water, Air, and Soil Pollution*.
78. Strauch, A.M., Kapust, A.R., Jost, C.C. (2009). Impact of livestock management on water quality and streambank structure in a semi-arid, African ecosystem. *Journal of Arid Environments*. 73. 795-803.
79. Struck, S.D., Selvakumar, A., Borst, M. (2007). Performance of Retention Ponds and Constructed Wetlands for Attenuating Bacterial Stressors. *World Environment and Water Resources Congress*.
80. Surbeck, C.Q., Jiang, S.C., Grant, S.B. (2010). Ecological Control of Fecal Indicator Bacteria in an urban stream. *Environmental Science and Technology*. 44. 631-637.
81. Tate, K. W., Atwell, E. R., McDougald, N.K., George, M.R., Witt, D. (2000). A method for estimating cattle fecal loading on rangeland watersheds. *Journal of Range Management*. 53. 506-540.
82. Tate, K.W., D.L. Lancaster, J. Morrison, and D.F. Lile. 2005. Monitoring Helps Reduce Water Quality Impacts in Flood Irrigated Pasture. *California Agriculture*. 59:168-175.
83. Tate, K.W., EDWARD R. ATWILL, NEIL K. MCDUGALD, AND MELVIN R. GEORGE. Spatial and temporal patterns of cattle feces deposition on Rangeland.
84. Tate, K.W., L.M. Roche, J.D. Derner, V. Eviner, M.N. Lubell, , A.T. O'Geen, M.R. George, B. Cutts, A. Robertson, D.J. Eastburn. Prescribed Grazing to Restore Rangeland Soil Quality, Plant Diversity, Water Quality, and Agricultural Productivity. Funded by USDA Range Research Program and USDA Western Sustainable Agriculture Research and Extension Program.
85. Thompson, L.C., L. Forero, Y. Sado, and K.W. Tate. 2006. Impact of environmental factors on fish distribution assessed in rangeland streams. *California Agriculture*. Vol. 60, No. 4: 200-206.
86. Vidon, P., Campbell, M.A., Gray, M. (2008). Unrestricted cattle access to streams and water quality in till landscape of the Midwest. *Agricultural Water Management*. 95. 322-330.
87. Woerner, B., Lorimor, J. (2006). Alternative Treatments to Minimize Water Pollution From Open Animal Feedlots. *Iowa State University Extension*.
88. Wolfson, L., Harrigan, T. (2010). Cows, Streams, and E. Coli: What everyone needs to know. *Michigan State University Extension*.
89. Zeckoski, R.W., Benham, B., Lunsford, C. (2007). STREAMSIDE LIVESTOCK EXCLUSION: A tool for increasing farm income and improving water quality. *Virginia Department of Conservation and Recreation; Virginia Cooperative Extension*. 20.