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Karen Taylor-Goodrich, Superintendent
Attn: Wilderness Stewardship Plan
Sequoia & Kings Canyon National Parks
47050 Generals Highway
Three Rivers, CA 93271

November 15, 2012

RE: SEKI PROPOSED WILDERNESS STEWARDSHIP PLAN

Dear Superintendent:

We are writing in regard to your preparation of wilderness plans to manage SEKI wilderness. This letter provides important information that should be considered by your planning staff and addressed by your plans, and we also respond here specifically to your published call for public comments.

We strongly disagree with the proposals for stock use in the wilderness, as they do not appropriately address the impact of stock on water quality.

Scientific literature has overwhelmingly demonstrated that horses and mules (hereafter referred to as "stock" and/or "pack animals") have a very negative impact on the natural ecology of wilderness and backcountry areas, especially the degradation of water quality. Our own research documents that stock animal use in SEKI and elsewhere in the Sierra causes shifts in aquatic ecosystems and poses a significant risk to human health by polluting water with bacteria and other pathogens.

In addition to importing microbial pathogens in large quantities into wilderness environments in their manure, the cumulative impact of tons of nutrients, primarily nitrogen and phosphorus, damages lakes and streams, by stimulating excessive growth of algae. Both suspended and attached algae (periphytic algae) growth is greatly stimulated by the fertilizing effect of manure from stock that is often washed into nearby waterways, or directly deposited. This causes the eutrophication or greening of pristine mountain lakes and streams. The trampling of stream and lake banks by stock also contributes to erosion, resulting in increased sediment transport to down-stream areas. Such impacts were recognized by Bob Harris, a USFS supervisor who largely eliminated livestock grazing in much of the Lake Tahoe basin.

Together we have a combined research experience in the High Sierra of more than 65 years. This has often been in collaboration with many researchers including those in the John Muir Institute of the Environment at UC Davis, and the Tahoe Research Group. We have published numerous scientific studies that show the negative impact of stock on water quality in the Sierra. In

addition, other research groups have also shown negative impacts of stock on wilderness, both in the Sierra, and other roadless areas in the US.

A summary of some of these studies is provided below:

1. "Coliform bacteria in Sierra Nevada wilderness lakes and streams: What is the impact of backpackers, pack animals and cattle?" Derlet RW, Carlson JR. Journal of Wilderness and Environmental Medicine. 17(1):15-20. 2006. *Analysis of 60 lakes/streams in the Sierra (including SEKI) showed that in stock use areas 80% of surface water had indicator bacteria above threshold, compared with 7% in wildlife areas. Conclusion: Pack animals significantly degrade water quality by increasing bacteria loads in surface waters.*

2. "Surface Water Quality along the Central John Muir Trail in the Sierra Nevada Mountains: Coliforms and Algae." Carling Ursem, C. Scott Evans, Kemal Ali Ger, John R. Richards, and Robert W. Derlet. High Altitude Medicine and Biology. 10(4):349-355. 2009. *36 sites near the JMT between Yosemite and Kings Canyon were studied on 3 separate occasions during the Summer. Suspended algae levels were higher in stock contaminated areas compared with backpack only areas. In addition, levels of indicator bacteria were higher in stock use areas. Conclusion: Pack animals significantly degrade water quality by increasing eutrophication and bacteria loads in surface waters.*

3. "Do waterborne coliform bacteria increase in Sierra Nevada Mountain Wilderness area lakes and streams during drought periods?" Derlet RW, Richards JR, and Ger KA. Journal of Wilderness and Environmental Medicine. 21(1):70. March 2010: *The study found a 78% prevalence of indicator bacteria in stock areas, compared with 20% in areas trafficked only by wildlife or backpackers. Conclusion: During drought years, wilderness water coliform prevalence was significantly increased compared to non-drought years in those areas used by pack animals.*

4. "Backpacking in Yosemite and Kings Canyon National Parks and Neighboring Wilderness Areas: How Safe Is the Water to Drink?" Derlet, RW. Journal of Travel Medicine 15(4):209-215. July/August 2008. *This analysis of 72 lakes and streams in the High Sierra confirmed earlier work and demonstrated a 70% prevalence of indicator bacteria at stock use sites compared with none in wildlife sites. Conclusion: Pack animals significantly degrade water quality by increasing bacteria loads in surface waters.*

5. "Risk Factors for Coliform bacteria in Sierra Nevada Mountain Wilderness Lakes and Streams." Derlet, RW, Carlson JR, Richards, JR. International Journal of Wilderness. 14(1):28-31. April 2008. *Similar to items # 1, 2, 3, and 4 listed above, this study occurred during a different summer but yielded similar results: 56% of stock areas (66% in Yosemite) had high indictor bacteria levels compared with 18% of wildlife or backpack use areas. Conclusion: Areas used by stock are at significant risk for coliform pollution of lakes and streams.*

6. "Risk Factors for Coliform Bacteria in Backcountry Lakes and Streams in the Sierra Nevada Mountains: A 5-Year Study." Derlet RW, Ger KA, Richards JR, and Carlson JR; Journal of Wilderness and Environmental Medicine. 19(2):82-90. June 2008. *This major paper combined data from 5 years of High Sierra research. In all, 364 samples were analyzed and a multivariate*

analysis applied. Similar to individual years, prevalence of indicator bacteria above threshold was found to be 63% at stock use sites compared with 9% of wild sites. Conclusion: Areas used by stock are at significant risk for coliform pollution of lakes and streams, and most of the microbial contamination in areas used by stock can be attributed to stock animals. This detailed study establishes that stock animals are a source of significant water pollution in the Sierra Nevada, including at Yosemite National Park.

7. "Algae in the Sierra Nevada Wilderness areas." Derlet RW and Ger KA. Sierra Nature Notes, Volume 9, February 2010. *Based on our research studies, we discuss the problem of algae in the Sierra and the potential for secretion of toxins harmful to humans and animals. The most important algae growth stimulant in Yosemite is stock manure, which is deposited or washed into streams and lakes. The high mass of nitrogen and phosphorus stimulate algal growth and provides an opportunity for non-native species to gain foothold.*

8. "Wilderness area streams and lakes: Increased Periphyton and bacteria correlates with stock traffic in National Parks of the Sierra Nevada." 2012. In preparation. *During the summer of 2010 an analysis of periphytic algae was undertaken at multiple lakes and Streams in Yosemite and Sequoia-Kings Canyon national parks. Increased biomass of periphytic algae was found in stock use areas compared with wild areas not used by stock animals. In addition, algae were found to support the growth of tremendous numbers of bacteria, as many as 2 million CFU per gm of algae.*

9. Does Above Normal Precipitation Reduce the Impact of Mountain Cattle Grazing on Watershed Algae and Bacteria? Derlet, Richards and Goldman; Water Qual Expo Health 2012, 4:105-112. This study contains a sub-analysis on Horse-Mule impacts consistent with the above scientific studies.

10 – 18. National Park Service, Investigator's Annual Reports (IARs) for Principal Investigator Robert W. Derlet in SEKI: 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010 and 2011. *It is our understanding that the Park Service possesses, in these IARs and elsewhere in its own files, much of the data we have collected over the years, and this information should be made available to your planning team. Collectively these IARs show data described in some of the above publications.*

Additional research by other investigators also provides data on the impacts of stock:

19-22. National Park Service IARs for Edward Atwill as PI. 2001, 2002, 2003, and 2004. *These studies in the Tuolumne Meadows areas documented a very high mass of stock manure on popular trails and a high number of Giardia in the manure.* Inspection of these trails demonstrates the close proximity to bodies of water and ease at which a rainstorm would carry manure into surface waters.

23. “Influence of Llamas, Horses, and Hikers on Soil Erosion from Established Recreation Trails in Western Montana, USA.” Deluca TH, Patterson WA, Freimund WA, and Cole DN. Environmental Management 22(2):255-262. 1998. *This Forest Service study documents increased erosion and sediment runoff from trails used by stock compared to those used by hikers.*

In summary, considered as a whole, the body of evidence summarized above demonstrates that stock use results in significant adverse effects to water quality in SEKI and elsewhere in the Sierra Nevada. Research has documented pollution of water in stock use areas by bacteria and other pathogens, and has demonstrated a link between stock use and bacterial pollution. It is our considered opinion that this pollution represents a potentially serious health risk to humans.

Further, as noted above, we initiated an analysis and cataloging of algae species in 2010 in SEKI. To complete this work several years of ongoing field investigations will be needed and we urge you to support such work. We are concerned, in part, that the invasive species of algae *Didymosphenia germinata* may take foothold. Preliminary field observations have heightened our concern, and a definitive study should be undertaken. We have found a link between horse manure and water quality degradation. Further continuous research is indicated to explore the potential relationship between nutrient loading and algal growth and pathogens in SEKI. In addition, a related line of research should expand Atwill’s research to determine the amount of manure per trail mile (which he’s calculated on the Yosemite-Glen Aulin trail) then extrapolate to estimate the potential for nutrients and pathogens reaching open water within 200 feet of trails.

We are convinced that SEKI wilderness plan does not address the serious risk for invasive algae. This is not just an academic exercise. The Klamath River in Northern California has received years of excessive algae stimulating nutrients, and has now become prone to late summer algae blooms and large masses of periphyton. California Water Quality Board posted signs along the Klamath River warning persons not to drink or cook with the water, or eat certain parts of a fish catch and a whole run of salmon was lost to degraded water quality. Further, the evidence points to potentially critical effects leading to deterioration of SEKI’s once pristine waters. Californians and visitors from around the world would be saddened to see this occur in the future to SEKI waters.

Thank you for your understanding and consideration of our concerns. Please share this letter with your wilderness planning staff, We would welcome any further contact or communication on this important issue.

Kind regards,

Robert W. Derlet

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