HIGH
SIERRA
HIKERS
ASSOCIATION

PO Box 8920, South Lake Tahoe, CA 96158

June 6, 2007

Superintendent
Yosemite National Park
Attn: Merced River Plan
P.O. Box 577
Yosemite, CA 95389

Dear Superintendent,

The High Sierra Hikers Association (HSHA) is a nonprofit public-benefit organization that seeks to inform and educate its members, public agencies, and the general public about issues affecting hikers and the Sierra Nevada. Many of the HSHA's members visit the Merced River basin in Yosemite National Park for hiking, camping, backpacking, horse packing, and other recreational pursuits. Following are our scoping comments on the Merced Wild and Scenic River Comprehensive Management Plan. Please place a copy of this letter in the project record.

General Comments

The HSHA is very concerned about the ongoing (and increasing) adverse impacts in the Merced River basin due to commercial stock animal usage, in particular to supply the High Sierra Camps. This planning process should be used to terminate—forever—the impairment of park, wilderness, and wild & scenic river resources and values resulting from these high-impact activities. Following are our specific comments:

The HSHA is especially concerned with the Merced Lake, Vogelsang, May Lake, and Sunrise High Sierra Camps (HSCs). These aged and ugly facilities have a significant negative impact on the Merced River corridor, the trails leading to those camps, and ultimately on Yosemite Valley and beyond. All the by-products of human occupancy are produced at these camps: sewage (human body wastes), "gray water" from showers, grease and detergent from kitchens. But there are no water or sewage treatment plants. Wastewater ends up in the meadows, soils, and waters of Yosemite National Park.

California Wilderness Act

Congress specifically recognized this threat to Yosemite when it passed the California Wilderness Act of 1984 (CWA). The Act, signed by President Reagan, bestowed formal wilderness designation upon the Yosemite backcountry. The Act allowed the HSCs to remain, but stated:

> "If and when it occurs that the continued operation of these facilities . . . results in an increased adverse impact on the adjacent wilderness environment (including increased

> adverse impact on the natural environment within the enclaves themselves), the operation of these facilities shall be promptly terminated, the facilities removed, the sites naturalized, and in the procedure set forth by section 9 of the bill, the areas promptly designated as wilderness."

The four HSCs cited above are classified as "potential wilderness," which, by law, must be treated the same as wilderness.

The HSCs are an anachronism—an out-of-date holdover from the bad old days from 1916 (the Merced Lake camp) through the early 1960s, when more development and more commercialism were considered desirable and beneficial. One way to look at the HSCs today is this: If the NPS were to propose establishing an HSC in the Yosemite backcountry at the present time, the project would never get off the ground. It would violate the Wilderness Act (WA), it would violate the CWA, and it wouldn't have a ghost of a chance of surviving a NEPA process. That being so, why should not the existing HSCs be abolished? Fifty years ago, no one talked about environmentalism. Now we have a federal agency, the EPA, and all and sundry declare themselves to be in favor of environmental protection. It is long past time for the National Park Service at Yosemite to heed the mandate of its Organic Act, adhere to the strictures of the WA, the CWA, and the Wild and Scenic Rivers Act, obey NEPA requirements, and follow the direction of the General Management Plan (GMP) of 1980, by choosing preservation of park resources, scenery, wilderness character, and wild river values over ongoing exploitation and impairment.

Vogelsang HSC

The Vogelsang HSC (capacity 42) is supplied from Tuolumne Meadows, but its very existence has a significant impact on the Merced River corridor. The trail from Tuolumne Meadows to Vogelsang HSC, like all trails traversed by the HSC supply trains, is battered and polluted, featuring flies and stench and dust. One is not out of sight of manure for the entire seven miles.

The same is true of the trails to Merced Lake (capacity 60), May Lake (capacity 36), and Sunrise, (capacity 34). For the sake of those few, dozens of people every day—and during the course of an entire season, thousands—are inconvenienced, offended, and exposed to health hazards by the disgusting condition of the trails.

The 1984 CWA also stated:

> "Because of the importance of continuing monitoring and assessment of this situation, immediately upon enactment of this bill into law, the Secretary of the Interior should document current baseline operational and environmental impact conditions of all of these facilities [HSC camps], and he should also, within one year of the date of enactment, report in writing to the relevant committee of the House and Senate, his findings and recommendations as to this matter. Annual assessments of this situation should thereafter be made by the Secretary to assure continued monitoring of conditions."

Has the Park Service at Yosemite prepared the baseline reports and submitted the annual monitoring reports as requested by Congress? If such reports do exist, they should be made public at once and included in the record for this project.

Illegal Construction

Those HSCs are classified as "potential wilderness additions," which, by law, must be treated and managed essentially the same as wilderness. (See the California Wilderness Act of 1984, Section 9.) However, despite the ongoing and increased impacts of the HSCs, and the clear direction from Congress, we are aware that the NPS has made continuing efforts to hide the impacts of these facilities from Congress and the public, and has illegally continued to use nonconforming methods (i.e., helicopters) to maintain the HSCs and to construct new developments (i.e., sewage mounds, toilets, etc.) at the HSCs. Congress specifically directed that:

> "Helicopter use for routine nonemergency purposes associated with visitor use is a questionable activity in national park system wilderness areas and should be eliminated within designated national park system wilderness." (House Committee Report No. 98-40, at p. 51.)

The 1980 GMP, which preceded the CWA by four years, stated:

> "Potential wilderness classification will prevent any further development of facilities or services; should existing developments be removed, there will be no reconstruction of facilities. Wilderness classification will require the eventual elimination of all improvements that do not conform with wilderness activities. Use of wilderness areas will be restricted to activities that are compatible with wilderness as cited in the Wilderness Recommendation for Yosemite National Park." (National Park Service, 1972).

Vogelsang HSC

After passage of the 1984 CWA it became evident that the meadows and streams around the Vogelsang HSC were being threatened by sewage and wastewater from the camp. Instead of closing the camp, as required by law, the Park Service in 1985 constructed a new "leach mound" system in an effort to contain the wastes. The project involved a great amount of explosives, soil disturbance, and helicopter use. But this fix was short-lived. By 1990 it was obvious to the Yosemite administration and to the Curry Company (the operator of the camp) that the mound system was failing.

> "After several seasons of continuing environmental concerns, NPS maintenance representatives have determined that the mound system for sewage disposal at the Vogelsang High Sierra Camp is inadequate to properly handle solid wastes generated by Camp guests and employees." (Yosemite National Park Project Proposal Form, dated 1/16/91.)

At this point, as in 1985, the only correct, legal action would have been to close the camp, naturalize the site, and designate it as wilderness. Nevertheless, in the summer of 1991, without asking for public comment, the Park Service once again ignored the law and constructed new toilet facilities at Vogelsang HSC.

Sunrise HSC

In 1991 the Park Service admitted that:

> "At Sunrise camp, there are inadequacies in the sewage system and in potable water; work will be required in the near future." (Draft Concession Services Plan Environmental Impact Statement, December 1991.)

Instead of complying with the law by documenting the problems with the Sunrise sewage system (a cesspool), and removing the camp, the Park Service constructed a 604-square-foot building at the Sunrise camp to house toilets and showers. This was done in blatant disregard of the Organic Act, the California Wilderness Act, the Wilderness Act, the Wild & Scenic Rivers Act, and the 1980 General Management Plan.

In sum, all four of the HSCs cited above should be subject to site-specific Environmental Impact Statements (EISs) as part of the Merced River planning process. This has never been done, and is necessary to illuminate the scope and nature of the substantial environmental impacts of those facilities. Significant issues include, but are not limited to: (1) impaired scenery; (2) degraded trails; (3) pollution of surface and ground waters by sewage and wastewater produced at the HSCs; (4) pollution of surface waters by manure (bacteria, etc.) produced by pack animals that service the camps; (5) harm to wildlife that come in contact with sewage, kitchen/bath wastes, and human food sources; (6) harm to native songbirds due to proliferation of brown-headed cowbirds; etc. Given the above, your planning process for the Merced River should include and adopt alternatives that will <u>permanently remove</u> all four of the HSCs discussed above, restore the sites, and propose that the potential wilderness additions at those four HSCs be designated as wilderness as intended by Congress in the California Wilderness Act (see that Act, Section 9; and House Committee Report No. 98-40).

Commercial Packstock Enterprises

The use of stock animals can be legitimate, appropriate, and even necessary for certain recreational and/or administrative purposes. We want to make clear at the beginning that we do not advocate or suggest the complete elimination of recreational or administrative stock use from the Merced River basin. Our primary concern is that <u>the NPS must acknowledge and substantially reduce the many adverse impacts that are occurring due to the currently excessive and poorly controlled activities of commercial stock enterprises</u>.

We are aware that commercial packstock activities and impacts have increased <u>substantially</u> in recent years throughout Yosemite National Park. Your planning process should begin by producing a complete disclosure of the increases in stock use, facilities, and impacts that have occurred over the past few decades. Then, your plans should significantly reduce/control commercial stock use to avoid the identified impacts, and incorporate definitive limits to prevent future harmful increases in commercial stock enterprises.

Quotas and Permits for Commercial Stock Outfitters

The Yosemite backcountry, including portions of the Merced Wild & Scenic River corridor, is so popular that quotas on its use have been implemented to prevent unacceptable impacts. We support the implementation of restrictions designed to protect park, wilderness, and wild & scenic river values. However, we remain concerned that commercial outfitters are allowed easy access when the general public is turned away due to use quotas. A fundamental tenet of environmental science that must be acknowledged is that one horse (or mule) can produce at least as much impact as several people (see references below). Your management plans for the Merced River should state clearly that: (1) Commercial stock use of Yosemite National Park is a privilege—not a right, and (2) Commercial stock use shall not be given priority over private foot travel. **Wherever rationing (i.e., a quota system) is necessary, commercial stock use shall be reduced to maximize the number of people allowed to enjoy the area.**

In addition, all commercial outfitters (and/or their clients) should have to wait in line with the rest of the public to obtain wilderness reservations and permits. Commercial packstock enterprises should never be allowed to issue their own wilderness permits to conduct commercial operations in Yosemite National Park. (This is a ridiculous notion, and one that illustrates the unfair special treatment that commercial packers receive from land managers in some areas.)

Impacts of Recreational Stock Use

Parties traveling with stock animals have much greater impact on park, wilderness, and wild & scenic river resources and values than groups traveling on foot. The disproportionate amount of impact created by stock users must be much more limited and much better controlled. Impacts to meadows, stream zones, wetlands, and lake shores. Numerous studies have documented adverse impacts to meadows caused by stock animals used for recreation (Cole 1977, Merkle 1963, Nagy and Scotter 1974, Neuman 1990 & 1991a-b, Strand 1972, Strand 1979a-c, Sumner and Leonard 1947, Weaver and Dale 1978).

Trampling and grazing by livestock are known to increase soil compaction and to contribute to streambank erosion, sedimentation, widening and shallowing of channels, elevated stream temperatures, and physical destruction of vegetation (Behnke and Raliegh 1978, Bohn and Buckhouse 1985, Kauffman and Krueger 1984, Kauffman et al. 1983, Siekert et al. 1985).

Streambanks and lake shores are particularly susceptible to trampling because of their high moisture content (Marlow and Pogacnik 1985). Unstable streambanks lead to accelerated erosion and elevated in-stream sediment loads (Duff 1979, Winegar 1977).

In sum, the impacts of recreational stock animals on meadows, streams, wetlands, and lake shores are substantial, and need to be addressed in this planning process.

Impacts due to invasive weeds.

The role of herbivores in dispersing weeds is now well established. Seeds can be spread from one location to another by attachment to the bodies of animals (epizoochory) or by being ingested and later excreted (endozoochory). (See, for example, Fenner 1985, Hammit and Cole 1987, Harmon and Kiem 1934, Heady 1954, Janzen 1982, Ridley 1930.) Many native herbivores have been shown to be effective seed dispersers. In addition, domestic stock animals such as cattle, sheep, pigs, and horses have all been shown to pass viable seeds through their intestinal tracts. (See, for example, Harmon and Kiem 1934, Harper 1977, Heady 1954, Janzen 1981 and 1982, McCully 1951, Piggin 1978, St John-Sweeting and Morris 1991, Welch 1985.) A detailed review of the scientific literature regarding the spread of weeds by domestic livestock (cattle, sheep, and horses) concluded:

> "Recent research showing that livestock significantly increase invasions by non-indigenous plants in the western U.S. is persuasive. Similar results were found in all western states and for nearly every introduced species that has been studied. Although many of these studies would have benefited from both better replication and more recent research techniques, the pattern of evidence is overwhelming." (Belsky and Gelbard 2000)

Numerous other reports document specifically that recreation livestock (i.e., horses, mules, etc.) can and do spread exotic weeds. (See Benninger 1989, Benninger-Truax et al. 1992, Campbell and Gibson 2001, Hammit and Cole 1987, Harmon and Kiem 1934, Janzen 1981 and 1982, Landsberg et al. 2001, Quinn et al. 2006, Weaver and Adams 1996.) For example, several reports show that horses can excrete viable seeds for many days or even weeks after ingestion. (See, for example, Janzen 1981, and St John-Sweeting and Morris 1991.) Hammit and Cole (1987) state that horse manure is a major source for exotic seeds in wilderness recreation areas. Campbell and Gibson (2001) found that "seeds transported via horse dung can become established on trail systems," and that weed seeds found in horse manure had become established along trails used by horses, but not along trails that weren't used by horses. Weaver and Adams (1996) documented "substantial overlap in the weed species germinated from horse manure and the weeds present along trails used by horses." After reviewing all available scientific evidence, Landsberg et al. (2001) concluded that "concerns about dispersal of weeds by horses are legitimate."

Invasive (i.e., weed) species have been specifically identified—at the national level—as one of the <u>four greatest threats</u> to our national forests.[1] The spread of invasive weeds has also been identified by the Regional Forester as an urgent issue that needs to be addressed in all Forest Service activities in California.[2] Current direction <u>requires</u> Forest Service units adjoining Yosemite to address these issues. For example, specific Standards and Guidelines applicable to neighboring Forest Service lands include:[3]

> 42. Encourage use of certified weed free hay and straw. Cooperate with other agencies and the public in developing a certification program for weed free hay and straw. Phase in the program as certified weed free hay and straw becomes available. **This standard and guideline applies to pack and saddle stock used by the public, livestock permittees, outfitter guide permittees, and local, State, and Federal agencies.**
>
> 43. Include weed prevention measures, as necessary, when amending or re-issuing permits **(including, but not limited to, livestock grazing, special uses, and pack stock operator permits).**

As outlined above, scientists have (in the past five to seven years) documented "overwhelming" evidence that domestic livestock (including horses, mules, etc.) can and do spread harmful weeds. This relatively new issue has never been adequately evaluated by the NPS at Yosemite. Therefore, your plans for the Merced River should address the issues of

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1. *See* http://www.fs.fed.us/projects/four-threats/
2. *See* http://www/fs.fed.us/r5/noxious weeds/
3. *See* http://www.fs.fed.us/r5/snfpa/final-seis/rod/appendix-a/standards-guidelines/forest-wide.html

weeds and plant pathogens that may be spread by domestic stock animals. This would include, at minimum, a range of reasonable alternatives for mitigating the potential for spread of weeds and plant pathogens, such as: (1) prohibiting all grazing by domestic stock (to minimize the free-roaming of stock animals and dispersion of seeds across the landscape via epizoochory and endozoochory); (2) requiring stock users to feed their animals weed-free forage for at least several days before entering the park (in order for stock animals to excrete viable weed seeds before entering Yosemite); and (3) cleaning stock coats and hooves before entering the park (to minimize the potential for epizoochory).

Given the above-described impacts, your management plans for the Merced River should include the following elements to mitigate these impacts:

- No grazing by recreation livestock should be permitted. Stock users should be required to carry feed for their animals, as is required in many other national parks. Certified weed-free feed should be required to minimize the spread of weeds. This is consistent with the biocentric approach described in Hendee and others (1990).

- Lower group size limits for stock parties should be adopted to mitigate the greater impact of stock on park resources and wild & scenic river values (see below for detailed discussion of group size limits).

Trail damage by stock animals.
When compared to hikers, stock parties cause substantially greater impacts to trails (Dale and Weaver 1974, Frissell 1973, Kuss et al. 1986, Laing 1961, McQuaid-Cook 1978, Trottier and Scotter 1975, Weaver and Dale 1978, Weaver et al. 1979, Whitson 1974, Whittaker 1978, Wilson and Seney 1994).

Whitson (1974) provides a good discussion of how horse impact differs from hiker impact. Dale and Weaver (1974) observed that trails used by horses were deeper than trails used by hikers only. Trottier and Scotter (1975) documented deterioration of trails used by large horse parties. Weaver and Dale (1978) found that horses caused significantly greater trail damage than hikers Whittaker (1978) concluded that horses significantly increased the potential for severe erosion by churning soil into dust or mud. Weaver et al. (1979) found that horses caused more trail wear than both hikers and motorcycles. After reviewing the available literature, Kuss et al. (1986) concluded that: "*Pack stock and horse travel is considerably more damaging to trails than hiking.*" Recent research (Wilson and Seney 1994) has confirmed these earlier studies, concluding that "*horses produced significantly larger quantities of sediment compared to hikers, off-road bicycles, and motorcycles.*"

To mitigate these impacts of stock use, your Merced River management plan should include the following elements:

- Groups using stock should be limited to ten or fewer animals per party (as suggested by Cole 1989 & 1990).

- To allow reasonable access for stock users, and to reduce the impacts of stock use on trails, some trails should be designated and maintained to withstand stock travel. Proper maintenance of these trails (and reconstruction where necessary) may reduce (but not offset) the impacts of stock travel.

- A network of "foot travel only" trails must be designated so that hikers can enjoy a stock-free experience. These trails should be maintained for foot travel only. Funds saved by designating a network of "foot travel only" trails could be used for intensive maintenance of the stock trails (see Cole [1990], p. 461).

Water quality impacts of stock animals.

Stock urine and manure contribute to eutrophication of streams and lakes (Stanley et al. 1979). Such impacts are a significant concern in the oligotrophic aquatic environments of Yosemite National Park. Livestock manure can also pollute water with harmful bacteria and other organisms such as Giardia and Cryptosporidium, which are pathogenic to humans and other animals. (See, for example, Derlet and Carlson 2002 and 2006).

Some stock users continue to claim that the strains of Giardia and Campylobacter spread by domestic livestock are not infective to humans. This is wishful thinking. For example, their argument that humans cannot contract Giardia from stock animals hinges on a single inconclusive study conducted on domestic cats. The cross-transmission of enteric pathogens from stock animals is certainly not fully understood. However, there is an increasing body of evidence showing that pathogenic bacteria, protozoa such as Giardia and Cryptosporidium, and other harmful pathogens can be spread from stock animals to humans (Bemrick 1968, Blaser et al. 1984, Buret et al. 1990, Capon et al. 1989, Davies and Hibler 1979, Derlet and Carlson 2002, Derlet and Carlson 2006, Faubert 1988, Isaac-Renton 1993, Kasprzak and Pawlowski 1989, Kirkpatrick and Skand 1985, Kirkpatrick 1989, LeChevallier et al. 1991, Manahan 1970, Manser and Dalziel 1985, Meyer 1988, Rosquist 1984, Saeed et al. 1993, Stranden et al. 1990, Suk 1983, Suk et al. 1986, Taylor et al. 1983, Upcroft and Upcroft 1994, Weniger et al. 1983, Xiao et al. 1993).

Specifically, Derlet and Carlson (2002) found pathogenic organisms in 15 of 81 manure samples collected from pack animals along the John Muir Trail. This documents that about twenty percent of the manure piles in the Sierra contain potentially pathogenic organisms (i.e., organisms that may cause disease in humans). Pack animal manure collected in Yosemite contained pathogenic bacteria as well as Giardia. Derlet and Carlson (2006; copy enclosed) also found pathogenic bacteria in surface waters in parts of Yosemite that are used by packstock, and concluded that *"pack animals are most likely the source of coliform* [bacteria] *pollution."*

Your environmental document must evaluate and disclose the effects of domestic animal wastes on the environment, and your management plan(s) should include the following elements to minimize the amount of animal waste that reaches water courses:

- Campsites for stock users should be designated away from water, on level and dry sites. Stock users should be required to camp at these designated sites, and to keep their animals tied at all times when not in use. This will require stock users to carry feed for their animals, as is required in many other national parks. Managers should carefully select and designate campsites and hitching sites for such use (see Cole [1990], pp. 457–62).

• Stock users should be required to use other management tools (i.e., use of portable electric fencing when watering stock, diapers on horses, etc.) to prevent pollution of surface waters by livestock manure. (See enclosed report "Horses in Diapers Help Mexico's Beach Cleanup.") This report documents the feasibility of requiring diapers on horses to prevent the spread of diseases found in horse manure. Horse diapers are commercially available and have been accepted around the world.[4]

In addition, your environmental document must acknowledge not only the State's specific water quality standards, but also the state/federal anti-degradation requirements.[5] Significantly, the waters of Yosemite National Park are high quality waters that are eligible for designation as Outstanding National Resource Waters. The federal and State anti-degradation requirements clearly apply. Specifically, the National Park Service must comply with the California State Water Board's Resolution No. 68–16, which requires that existing high quality waters be fully protected, unless very specific formal findings are made. In this case, neither the Central Valley Regional Water Quality Control Board, the California State Water Resources Control Board, nor the U.S. Environmental Protection Agency has ever made the overriding findings necessary to allow degradation of water quality from the High Sierra Camps or the commercial stock enterprises that operate within Yosemite. Therefore, because the degradation and pollution of water resulting from both the High Sierra Camps and the commercial pack & saddle stock enterprises are *controllable*, that degradation and pollution must be fully prevented (unless the findings required by Res. 68–16 are formally made).

Impacts of brown-headed cowbirds.

The operation of livestock pack stations, stables, and corrals (i.e., stock holding areas) is contributing to the demise of songbird populations in the Sierra Nevada by creating artificial habitat for the parasitic brown-headed cowbird. Cowbirds are obligate brood parasites that can significantly impact native passerine species. One study in the northern Sierra found that up to 78 percent of warbler nests are parasitized by cowbirds, resulting in significant decreases in the reproductive success of those species (Airola 1986). Elsewhere in the Sierra, individual female cowbirds have been reported to lay an average of 30 eggs per season (Fleischer et al. 1987). These high rates of parasitism and fecundity by cowbirds indicate that significant local impacts occur wherever cowbird populations are present. Habitat modifications, pack stations, corrals, and the presence of livestock throughout the Sierra may contribute significantly to regional declines in songbird populations (Graber 1996). A detailed literature review on cowbird impacts is enclosed and incorporated by reference. The impacts of stock holding facilities must be evaluated. An environmental impact statement (EIS) should be prepared that clearly discloses the environmental consequences of, and alternatives to, the continued operation of stock holding facilities in the planning areas.

Your management plan(s) should include the following elements to address the impacts of brown-headed cowbirds:

4. *See* http://www.equisan.com.au/
5. *See* the *Water Quality Control Plan for the Central Valley Region*, the State Water Resource Control Board's Resolution No. 68-16 ("Statement of Policy with Respect to Maintaining High Quality Waters in California"), and 40 CFR § 131.12

- Remove pack stations and stables from national park lands
- Reduce stock use to the minimum amount that is necessary

Aesthetic effects—adverse impacts on visitors' experience.
We are also concerned about the many aesthetic impacts that result from stock use, such as the presence of annoying bells, dust, manure, urine, and flies, and the proliferation of unsightly hoofprints, drift fences, and over-grazed areas (see Absher 1979, Cole 1990, Stankey 1973, Watson et al. 1993). Most of the mitigation measures suggested above would have the added benefit of offsetting these "social" impacts. For instance, designating campsites for stock users would prevent sites used by hikers from being littered with stock manure. Tying stock and supplying feed will eliminate the need for bells and drift fences, prevent overgrazing and trampling of sensitive areas by stock, and reduce the pollution of surface waters by stock animal wastes (i.e., manure and urine). Designation of a network of "foot travel only" trails will provide hikers with a stock-free experience (i.e., no manure or dusty trails churned by stock, etc.). Adoption of group size limits based on science (see below, especially Cole 1989 & 1990, Watson et al. 1993) will reduce the impacts of large stock groups on the experience of hikers.

Group size limits.
The NPS at Yosemite has in the past taken the irresponsible, unsupportable (and illegal) position that limits on group size will only be adjusted in conjunction with surrounding land units. This ignores the mandate of the Wilderness Act and the Wild and Scenic Rivers Act to preserve wilderness and wild & scenic river values regardless of how other surrounding areas might be managed (or mismanaged). The fact that officials in the central and southern Sierra agreed on a consistent number in 1991 for maximum group sizes is no excuse to ignore the mandates of the Wilderness Act, the Wild and Scenic Rivers Act, and the Park Service's Organic Act. This is especially true since the 15-year-old decision to allow 25 stock animals per group throughout the central/southern Sierra was adopted without following any NEPA process, and was implemented over the strong objections of hundreds of citizens and scores of conservation groups.

Further, the current group size limits have been shown to significantly and adversely affect park resources and values. In order to adequately protect Yosemite's environment and wild & scenic river values, the group size limits must be revised downward.

Number of persons per group (on trails).
Dr. David Cole, an internationally recognized research scientist, has written: **"Limits on party size must be quite low (certainly no larger than 10) to be worthwhile"** (Cole 1989). We therefore propose that group size (on trails) be limited to 10 persons, as suggested by Dr. Cole.

Number of persons per group (off trail).
Large groups traveling "cross-country" cause significantly greater impacts to resources and the experience of visitors (Cole 1989 & 1990, Stankey 1973). Dr. Cole (1989) has written: **". . . small parties are critical to avoid the creation of new campsites and trails in little-used places. . . . Once a party exceeds a certain number (perhaps four to six), special care must be taken in**

off-trail travel." As suggested by Dr. Cole, group size should be limited to no more than four to six persons for all off-trail travel.

Number of stock animals per group.

Dr. Cole has found that thresholds in group size that result in unacceptable impacts "*. . . would certainly differ between backpackers and parties with stock*" (Cole 1989). He adds that lower limits are necessary for stock parties, since they cause greater social *and* ecological impacts. Dr. Cole has estimated that parties traveling with stock animals often cause ten times more impact than groups traveling without stock. (See enclosed 8/6/99 letter from D. N. Cole to J. E. Bailey). Yosemite National Park must acknowledge the available research findings and conclusions, and regulate hikers and stock users according to their varying degrees of impact. The current group size regulations in effect for Yosemite's backcountry—which employ the same limits for hikers and stock users—were arbitrarily adopted for "ease of management." This scheme does not comply with either the Wilderness Act, the Wild and Scenic Rivers Act, or the Park Service's own Organic Act or wilderness management policies.

Recent research has shed light on the effects of large stock groups on the experience of wilderness users. Watson et al. (1993) documented that the average hiker in the central/southern Sierra is unacceptably affected by encountering stock groups with more than nine animals. Even stock users themselves are negatively affected by encounters with large groups: The average stock user in the central/southern Sierra is unacceptably affected by encountering groups with over fifteen animals (Watson et al. 1993, Table 29 & Table 10). Thus it is very clear that twenty-five animals in a group will degrade the character of the Merced River corridor for the majority of visitors. The Park Service must take action to prevent impairment of these areas by lowering the group size limit for stock parties.

We propose that groups be limited to no more than nine head of stock per party in the Merced River corridor—and indeed throughout the entire park. (see Cole 1989 & 1990, Watson et al. 1993), and that all off-trail travel by stock be prohibited.

Cross-country (off-trail) travel with stock.

One very important element in Yosemite's existing Wilderness Management Plan (WMP) is the prohibition on cross-country travel by groups with stock animals or groups over 8 persons. The plan states:

> "It is Service policy to deemphasize cross-country travel by limiting such travel in Yosemite Wilderness to groups of eight people or fewer. This plan recognizes actual and potential environmental deterioration from off-trail use."

and

> "Stock must travel on designated trails or authorized stock routes and remain within one quarter mile of trails for watering, rest stops, and camping."

This important language must be retained (and strengthened as per our comments above). We recommend against any attempt to weaken this language or to open new areas to off-trail stock use.

Two harmful loopholes in the current WMP must be addressed during this planning process for the Merced River corridor. First, the exceptions in the WMP (Appendix G) for cross-country travel by stock animals must be removed. Secondly, nowhere does the plan list or define "designated" or "established" trails. (Appendix G lists "authorized" exceptions but not the "designated" or "established" trails on which large groups are permitted). Some older maps, still in use, show trails that are no longer maintained, and which are not suitable for travel with stock or by large groups. A list or map clearly defining what trails/routes are open to travel with stock and by large groups in the Merced River corridor should be included in this planning process. This will make clear, to both the public and agency personnel, which routes are open and closed to travel with stock and to large groups. We request the opportunity to review the map or list described above before it is adopted. It should be included in the draft environmental impact statement(s) (DEIS/s) for this planning process.

Summary and Conclusions

As discussed above, the above mentioned four High Sierra Camps and commercial packstock enterprises are having significant, adverse impacts on the environment in the Merced River Wild & Scenic River corridor. Your plans should fully address these impacts by eliminating the HSCs, and adopting effective limits and controls on commercial packstock enterprises.

Thank you for considering the above comments, and incorporating these issues into your plans for the Merced River. Please contact me at the letterhead address if you have any questions about this letter. Please also send full paper copies of all environmental and decision documents for our review.

Sincerely yours,

Peter Browning

Peter Browning
High Sierra Hikers Association

Enclosures (4): (1) "Coliform Bacteria in Sierra Nevada Wilderness Lakes and Streams: What Is the Impact of Backpackers, Pack Animals, and Cattle?" by Derlet and Carlson (2006) (6 pages); (2) "The Brown-headed Cowbird in the Sierra Nevada: Impacts on Native Songbirds and Possible Mitigation Measures," by B.C. Spence (5 pages); (3) "Horses in Diapers Help Mexico's Beach Cleanup," by Reuters, August 2003 (3 pages); and (4) letter dated August 6, 1999, from Dr. David N. Cole, Research Biologist, Aldo Leopold Wilderness Research Institute, to Jeffrey E. Bailey, Forest Supervisor, Inyo National Forest (2 pages).

REFERENCES

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Wilderness and Environmental Medicine, **17,** 15–20 (2006)

ORIGINAL RESEARCH

Coliform Bacteria in Sierra Nevada Wilderness Lakes and Streams: What Is the Impact of Backpackers, Pack Animals, and Cattle?

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Objective.—The presence of coliform bacteria indicates a watershed risk for harboring microbes capable of causing human disease. We hypothesized that water from watersheds that have different human- or animal-use patterns would have differing risks for the presence of coliform bacteria.

Methods.—Water was collected in wilderness areas of the Sierra Nevada range in California. A total of 60 sites from lakes or streams were selected to statistically differentiate the risk categories: 1) high use by backpackers, 2) high use by pack animals, 3) cattle- and sheep-grazing tracts, and 4) natural areas rarely visited by humans or domestic animals. Water was collected in sterile test tubes and Millipore coliform samplers during the summer of 2004. Water was analyzed at the university microbiology lab, where bacteria were harvested and then subjected to analysis by standardized techniques. Confirmation was performed with a Phoenix 100 bacteria analyzer. Statistical analysis to compare site categories was performed with Fisher exact test.

Results.—Only 1 of 15 backpacker sites yielded coliforms. In contrast, 12 of 15 sites with heavy pack-animal traffic yielded coliforms. All 15 sites below the cattle-grazing areas grew coliforms. Differences between backpacker and cattle or pack-animal areas were significant ($P \leq .05$). Only 1 of the 15 wild sites rarely visited by humans grew coliforms. All coliforms were identified as *Escherichia coli.* All samples grew normal aquatic bacteria of the genera *Pseudomonas*, *Ralstonia*, and *Serratia* and nonpathogenic strains of *Yersinia*. No correlation could be made with temperature or elevation. Sites below cattle-grazing tracts and pack-animal usage areas tended to have more total bacteria.

Conclusions.—Alpine wilderness water below cattle-grazing tracts or areas used by pack animals are at risk for containing coliform organisms. Areas exclusively used by backpackers were nearly free of coliforms.

Key words: water, Yosemite National Park, Kings Canyon National Park, Sierra Nevada, *Escherichia coli*

Introduction

The Sierra Nevada range snowpack serves as an important water source for California; its watershed provides nearly 50% of the state's freshwater supply.[1] It is important that this watershed be protected from microbial, chemical, and toxic pollution for users both downstream and upstream.

Within the Sierra Nevada range, over 3 000 000 acres of land have been designated as official wilderness by the National Park Service or United States Department of Agriculture (USDA) Forest Service and protected from development, logging roads, and motor vehicles.[2,3] Some wilderness areas have quotas to limit overnight camping by backpackers and use by pack animals. Most of these protected areas are in high alpine regions between 2000 and 4200 m in elevation. These high alpine lakes and streams are an especially important watershed for California because of presumed purity of water and a large quantity of precipitation in the form of snow. The water is important for not only the distant water users but also the local water users such as backpackers, campers, fishermen, and the USDA Forest Service and

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National Park Service. However, this land is potentially subject to pollution by day hikers, backpackers, horses and pack animals, and also commercial cattle and sheep grazing. Pollution may occur from potential harmful substances that include microbial organisms or toxic substances.[4] Microbial organisms that may cause illness in humans include pathogenic bacteria such as coliforms and protozoa such as *Giardia* or *Cryptosporidium*.[5] Chemicals or toxins may be imported or synthesized by microbes, zooplankton, or phytoplankton from precursors imported by humans. Debate has ensued on the impact of backpackers, cattle grazing, or livestock such as mules and horses polluting the watersheds in wilderness areas. We completed 2 studies in a previous year that surveyed remote Sierra Nevada lakes and streams.[6,7] However, these studies did not provide the statistical power to show significant differences for risk factors. This current study was designed to provide a direct comparison of risk factors.

Coliform bacteria have been established as indicators of fecal pollution or contamination of waterways in the United States.[8,9] Coliforms may originate from a single source or a combination of sources: 1) backpackers, 2) pack animals, 3) grazing animals (cows, sheep), and 4) wild animals. Coliform pollution of wilderness areas by humans occurs through inadequate burial and disposal of fecal material. In addition, bathing or swimming in alpine lakes may also result in microbial pollution.[9] Pack animals may pollute by deposition of manure either directly into lakes and streams or indirectly onto trails or meadows, from which it may be washed into waterways by summer storms and annual snowmelt. The USDA Forest Service "leases" tracts in wilderness areas for cattle grazing.[2] As a result, a high density of cattle manure may be found in certain alpine watersheds, either in meadows or as a result of direct deposit into streams or lakes. Finally, coliform or other bacteria may originate from natural, wild animal zoonotic reservoirs.

We hypothesized that wilderness freshwater from watersheds that have different human- or animal-use patterns would have differing risks for the presence of coliform bacteria. Therefore, the purpose of the study was to analyze wilderness freshwater samples for coliforms and compare results from watersheds that have different use patterns among the following groups: 1) backpackers, 2) horses and mules (pack animals), 3) cattle grazing, and 4) isolated areas affected only by natural wild animals.

Methods

FIELD SITE COLLECTION

Sixty sites were prospectively selected to differentiate among environmental risks for different types of bacterial contamination in wilderness areas of Kings Canyon National Park, Sequoia National Park, and Yosemite National Park as well as the following USDA Forest Service wilderness areas: Mokelumne, Carson-Iceberg, Emigrant, Hoover Wilderness, Adams, John Muir, and Golden Trout. The Hall Natural Research Area, adjacent to the eastern boundary of Yosemite National Park and the southern boundary of Hoover Wilderness, was also included. No overnight camping or motor vehicles are allowed in the Hall area, and the remote areas have minimal visits by humans.

Risk classifications included 1) high use by backpackers, 2) high use of pack animals, 3) cattle-grazing tracts, and 4) natural sites (wild ecologies) not likely contaminated by humans or domesticated animals. Sites were risk stratified with the assistance of the National Park Service and USDA Forest Service on the basis of user nights by backpackers, pack animals, and cattle allotments in grazing tracts. Cattle grazing is not permitted in national parks, so all samples in cattle-grazing tracts were taken from within USDA Forest Service wilderness areas.

FIELD WATER COLLECTION

Water samples were collected from May through September in 2004. Water was collected in sterile test tubes and Millipore total coliform count samplers (Millipore Corporation, Bedford, MA). All samples were collected in duplicate, cooled according to standardized procedures, and transported to the University of California, Davis.[10] Sample devices measured bacteria for 1 mL of sample. This was multiplied by 100 as per standardized procedure of reporting colony-forming units per 100 mL in the water literature. Water temperature was measured at each site with a stream thermometer (Cortland Line Company Inc, Cortland, NY).

BACTERIAL ANALYSIS OF WATER SAMPLES

Details of analysis for bacteria have been described elsewhere.[6,7] The analysis for coliform counts and total bacterial counts required incubating Millipore counting plate paddles at 35°C for 24 hours. Bacterial colonies were counted and then harvested for further analysis. Colonies were initially plated onto sheep blood and MacConkey agars (Remel Inc, Lenexa, KS). Lactose fermenting colonies from MacConkey plates were presumed to be coliform bacteria and were subject to further testing. Further screening and initial identification was performed by subplating onto C.I.N. (*Yersinia*) agar, Sorbitol-MacConkey agar, L.I.A., and T.S.I. tubes. Precise identification of bacteria genera and species analysis

Table 1. Sites with heavy backpacking*

Wilderness area	*Place*	*Elevation (m)*	*Temperature (°C)*	*Escherichia coli CFU/100 mL*	*Other bacteria CFU/100 mL*
Yosemite	Yosemite Creek	2278	11.1	None	200
Yosemite	Budd Creek	2701	7.8	None	600
Yosemite	Townsley Lake	3154	13.3	None	5200
Emigrant	Wire Lakes	2694	19.4	None	3800
Emigrant	Blue Lake	3048	17.8	None	1100
Mokelumne	Round Top Lake	2834	17.2	None	800
Kings Canyon	East Lake	2493	13.9	None	6400
Kings Canyon	North Fork Woods Creek	2621	11.1	None	1900
Kings Canyon	South Fork Kings River (Upper Basin)	3078	12.2	None	4400
John Muir	Chicken Foot Lake (Little Lakes Valley)	3288	11.6	200	2900
John Muir	Ruwau Lake	3366	12.2	None	4100
Golden Trout	Chicken Spring Lake	3429	15.6	None	4600
Sequoia	Upper Rattlesnake Creek	3169	14.4	None	1100
Sequoia	Kern River	2031	16.7	None	3800
Desolation	Meeks Creek	2133	17.8	None	8900

*CFU indicates colony-forming units.

were performed by standardized automated laboratory procedures. In addition, analysis was also performed with a Phoenix 100 bacteria autoanalyzer. Strains were grown on Colombia agar with 5% sheep red blood cells for 16 to 24 hours at 37°C, replated, and grown again for 16 to 24 hours at 37°C just before testing. A suspension of 0.5 McFarland (accepted range, 0.5–0.6) was prepared in the identification (ID) broth (Becton Dickinson, Erembodegem, Belgium) and poured within 30 minutes into the panel, which was then loaded into the instrument within 30 minutes. Four quality-control strains (*Escherichia coli* ATCC 25922, *Klebsiella pneumonia* ATCC 13883, *Klebsiella pneumoniae* ATCC 700603, and *Pseudomonas aeruginosa* ATCC 27853) were loaded with each study batch, which always met quality-control criteria. The Phoenix instrument gives an ID result when a species or group of species is identified with more than 90% confidence. The confidence value is a measure of the likelihood that the issued ID is the only correct ID. The average time required to reach an ID result ranged from 3 to 12 hours. The autoanalyzer provided a computer printout identifying the bacteria. *E coli* colonies were also subjected to analysis to determine the presence of *E coli* O157 by using latex agglutination methodology.

Statistical significance among groups was calculated with Fisher exact test by STATA 8 Software (STATA Corporation, College Station, TX).

Results

The results are summarized in Tables 1 through 4. Significant differences were found among sample groups. All 15 samples that were taken below areas in which cattle grazed or had recently grazed were positive for coliform growth. From areas frequented by pack animals, 12 of 15 samples had coliforms. In contrast, coliforms were found in only 1 of 15 areas of heavy backpacking. Only 1 of 15 sites rarely visited by humans or pack animals contained coliforms. Backpacker and natural-site groups had significantly fewer sites with coliforms when compared with the cattle-grazing group ($P \geq .01$). Likewise, the pack-animal group had significantly more sites with coliforms when compared with the backpacker and natural areas ($P \geq .05$). No statistical differences were found in numbers of coliform bacteria according to water temperature or elevation.

Noncoliform aquatic bacteria were also identified from the samples. The most common bacteria found included *Achromabacter* species, *Pasteurella haemolytica, Rahnella aquatilis, Ralstonia paucula, Serratia odorifera, Serratia plymthica, Yersinia intermedia, Yersinia kristensenii, Yersinia frederiksenii, Pseudomonas putida,* and *Pseudomonas fluorescens*. No correlation could be made between site use and types of noncoliform bacteria or total bacteria counts, except for the Hall Natural Research Area, where the total bacteria range was the lowest of any group of samples. Total bacteria in the Hall

Table 2. Sites with stock (horses and pack animals)*

Wilderness area	*Place*	*Elevation (m)*	*Temperature (°C)*	*Escherichia coli CFU/100 mL*	*Other bacteria CFU/100 mL*
Hoover	W. Walker River	2262	11.1	250	3100
Emigrant	Horse/Cow Meadow Stream	2686	10.0	200	3000
Emigrant	Grouse Lake inlet stream	2179	5.0	550	2500
Emigrant	Piute Creek—Groundhog Meadows	2286	7.8	300	2000
Emigrant	Spring Meadow Creek	2590	23.3	900	10 000
Kings Canyon	Arrow Lake	3154	17.2	350	2100
Kings Canyon	Kings River—Paradise Valley	1981	14.4	500	1500
Yosemite	Fletcher Lake	3095	15.0	None	5800
John Muir	Long Lake (Bishop Pass Trail)	3277	12.2	150	5000
John Muir	Rock Creek at Wilderness Boundary	3154	11.1	300	8200
Yosemite	Tuolumne River (Lyell Canyon)	2804	16.1	200	3000
Kings Canyon	Dollar Lake	3115	17.2	None	1800
Kings Canyon	Rae Lake (middle)	3211	16.7	None	3100
Golden Trout	Horseshoe meadow	3017	10.0	300	1500
John Muir	Cottonwood lakes	3383	8.9	200	10 000

*CFU indicates colony-forming units.

Natural Research Area ranged from 200 to 500 per 100 mL. Temperature or elevation was not a factor, as other sites with similar temperature and elevation had higher baseline levels of aquatic bacteria. The marked absence of human impact distinguished this area.

Discussion

In this study, areas frequented by cattle or pack animals had the greatest degree of fecal contamination into the wilderness watershed. We are not surprised at the finding of coliforms below cattle-grazing areas. In most of these areas, moderate amounts of cattle manure were observed during field collections. We identified all coliforms in our study as *E coli*. In some respects, finding coliforms below grazing areas serves as a positive control for the study. One might expect coliforms in watersheds with high densities of cattle.[11] However, we are surprised at the finding of coliforms in areas frequented by pack animals. National parks and the USDA Forest Service have strict requirements on management of livestock in wilderness areas. It is not possible to exclude a human contribution to this finding, as high-volume pack-animal areas are also used by humans. In previous years we have examined Sierra Nevada water for coliform bacteria.[6,7] However, those studies were from water taken primarily from watersheds polluted by both pack animals and humans, and we were unable to fully determine associated risks for coliform pollution. This current study identified and included sampled sites used exclusively by backpackers and not pack animals. In addition, this current study added sites that were unused by humans, pack animals, or cattle. The absence of coliforms in most of those areas used exclusively by humans and the absence of pack animals would suggest that pack animals are most likely the source of coliform pollution. Pack animals produce high volumes of manure, which is deposited directly onto the surface of trails, soil, or meadows.[12,13] Manure deposited on the ground may be swept into streams during summer rains or spring snow runoff. During the field operations of the study, pack animals were observed on several occasions to be defecating directly into bodies of freshwater. Fecal contamination as indicated by the finding of coliforms would place the watershed at risk for harboring microbes capable of causing human disease. Some of these infections are a potential threat to humans. This includes certain pathogenic strains of *E coli*, *Salmonella*, *Campylobacter*, and *Aeromonas* and protozoa such as *Giardia*, all of which have animal reservoirs. The organism *Yersinia enterocolitica* has been previously cultured in high alpine areas of the Sierra Nevada range and may have a natural reservoir in small mammals and birds.[14] Pack animals entering the High Sierra have been subject to analysis, and *Giardia* samples were found in their manure.[15]

E coli and other pathogenic bacteria can survive in aquatic environments for long periods depending on the nutriment availability, pH, and water temperature. The number of years that *E coli* can survive in aquatic environments has been debated.[16] A study of Lake Michigan shore water showed that *E coli* may sustain itself indefinitely in appropriate environmental situations.[17]

Table 3. Cattle-grazing sites*

Wilderness area	*Place*	*Elevation (m)*	*Temperature (°C)*	*Escherichia coli CFU/100 mL*	*Other bacteria CFU/100 mL*
Carson	Upper Clark Fork River	2072	11.2	250	10 000
Carson	Lower Clark Fork River	2316	8.9	300	2600
Carson	Disaster Creek—north fork	2366	10	350	1300
Carson	Disaster Creek—east fork	2438	10.6	200	5700
Carson	Arnot Creek	2000	11.1	100	4600
Carson	Woods Gulch	1976	11.7	100	5200
Hoover	Buckeye Creek (Big Meadows)	2274	12.8	500	3800
Hoover	Buckeye Creek side creek	2377	8.9	450	4700
Hoover	Molydunite Creek	2773	11.1	400	3400
Hoover	South Fork Walker River (Burt Canyon)	2719	11.1	250	2800
Golden Trout	Mulkey Meadows	2840	15.6	100	3500
Golden Trout	Little Whitney Meadow	2560	16.7	100	3500
Emigrant	Borland Lake	2264	8.9	250	8400
Adams	East Fork Chiquito Creek	2212	14.5	100	5200
Adams	Cold Creek	2503	14	150	4600

*CFU indicates colony-forming units.

Open-range cattle are noted to carry *E coli* strain O157: H7 at a rate of 1%, placing humans who drink untreated water below established cow pastures at risk for a very serious disease.[13] Studies on this strain have also shown it to survive in cold water.[18] In addition, many non-O157 *E coli* are capable of inducing serious disease in humans.[10] Although it is possible to genetically differentiate human from animal and ecologic *E coli*, these techniques are very expensive and available only in limited laboratories in the United States.

Finally, we wish to comment on the noncoliform bacteria found in the study. Aquatic bacteria are part of a normal ecosystem of lakes and streams.[19] Indeed, if bacteria were absent, the normal food chain from frogs to fish, as well as the ecological balance, would be in jeopardy. The most common bacteria we found was *R aqua-*

Table 4. Low-impact sites: rare visits by humans*

Wilderness area	*Place*	*Elevation (m)*	*Temperature (°C)*	*Escherichia coli CFU/100 mL*	*Other bacteria CFU/100 mL*
Hall area	Green Treble Lake—lower	3115	10	None	300
Hall area	Green Treble Lake—upper	3116	10	None	400
Hall area	Maul Lake	3117	10.6	None	200
Hall area	Spuller Lake	3132	11.1	None	500
Kings Canyon	Avalanche Creek	1554	8.9	None	5000
Yosemite	Middle Dana Fork Creek	3016	12.8	None	1200
Yosemite	Parker Pass Creek	2971	13.9	None	1500
Yosemite	Granite Lake	3167	14.5	None	1200
Kings Canyon	Cunningham Creek	2621	14.0	None	2300
Sequoia	Upper Buck Creek	2209	16.7	None	3400
John Muir	Little Cottonwood Creek	2996	14.5	None	1900
Kings Canyon	North Guard Creek	2895	14.0	None	2600
Sequoia	Side Spring Creek Franklin Pass Trail	3078	5	None	1200
Sequoia	Laurel Creek	2063	13.9	None	4700
Yosemite	Miguel Creek—upper north fork	1503	12.8	100	1800

*CFU indicates colony-forming units.

tilis. Several nonpathogenic species of *Yersinia* were also cultured. Many bird species can be carriers of nonpathogenic species of *Yersinia* and *Y enterocolitica*.[20] Previous studies of wilderness water suggest a correlation between total bacterial counts and usage by backpackers.[6,7] Freshwater from remote alpine areas has been shown to be a source of *Campylobacter*, *Salmonella*, and *Y enterocolitica*, although these were not found in the current study.[21,22,23]

Conclusion

The risk for finding coliform bacteria in alpine wilderness water was determined by the use of the adjacent watershed. Water in areas used extensively by pack animals or for cattle grazing was routinely contaminated, whereas water in those areas used exclusively by backpackers or rarely visited by humans was rarely contaminated.

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The Brown-headed Cowbird in the Sierra Nevada: Impacts on Native Songbirds and Possible Mitigation Measures

Brian C. Spence

Sierra Songbirds on the Decline

In May and June, thousands of songbirds arrive at their breeding sites in the Sierra Nevada, culminating migratory journeys of fifteen hundred miles or more from winter homes in Central and South America. This return *should* be a welcome respite for many. In recent years, the wanton clearing of land in the tropics has rendered inhospitable millions of acres of wintering habitats annually. Yet once back in the Sierra Nevada, songbirds face additional and significant threats to their survival. Among these is the brown-headed cowbird.

Cowbirds are "brood parasites" that lay their eggs in the nests of other birds, often resulting in reduced reproductive success or complete reproductive failure for the host species. Their expanding geographic range and high fecundity have led scientists to implicate them in the regional decline of songbird populations in eastern North America (Brittingham and Temple 1983). Now, biologists are equally concerned about the role cowbirds are playing in the recent and dramatic decline of Sierra songbird populations (Graber 1990).

Cowbirds in the Sierra Nevada

Cowbirds are not native to the High Sierra. Historical records indicate that cowbirds were absent from the entire Sierra Nevada prior to 1930 (Rothstein et al. 1980). They were first recorded in Yosemite Valley in 1934, and have been expanding their Sierran range ever since (Airola 1986, Gaines 1977, Rothstein et al. 1980, Rothstein et al. 1987). Now, cowbirds are frequently seen in mid-to-high elevation areas around human developments, and sightings deep in the Sierra wilderness are not uncommon (Beedy and Granholm, 1985; D. Graber, NPS, pers. comm.).

The cowbirds' habitation of the middle elevations of the Sierra Nevada has resulted from human alteration of natural ecosystems. Logging and other land clearing activities have increased the amount of open habitat, which cowbirds prefer. In the higher elevations of the Sierra Nevada, the invasion of cowbirds has been made possible by the presence of stock, both livestock and recreational (Rothstein et al 1980, Verner and Ritter 1983, Rothstein et al. 1987). Insects and waste grain associated with manure provide a rich food base that allows cowbirds to survive and breed successfully in harsh mountain environments. The cowbird's attraction to pack stations in the Sierra is well documented (Fleischer et al. 1988, Keys et al. 1986, Rothstein et al. 1980, Rothstein et al. 1987, Verner and Ritter 1983, Yokel 1989, and others). On the east side of the Sierra, large aggregations of cowbirds are found primarily near pack stations (since cattle are less common), while in the western Sierra they are abundant at both pack stations and among herds of grazing cattle (Rothstein et al. 1980, Verner and Ritter 1983, Rothstein et al. 1987). Other human-based food resources, such as bird feeders and campgrounds (where unwitting campers feed cowbirds), may compound the problem. Nevertheless, when researchers wish to study or collect cowbirds in the Sierra, they invariably target pack stations and other aggregations of livestock because they are assured of finding birds there.

Cowbird Reproductive Biology

Cowbirds are obligate brood parasites—they lay their eggs exclusively in the nests of other birds—usually laying only a single egg (but sometimes two) in any host nest. Frequently, cowbirds expel the host egg from the nest before laying their own. The cowbird eggs typically hatch a day or two before the host eggs, and the larger, more vociferous cowbird young frequently receive a disproportionate share of food that is brought to the nest by the host adults. As a result, the host young may become weakened or die from starvation (Beedy and Granholm 1985, pp. 197-198). In the eastern Sierra, individual females have been reported to lay an average of 30.5 eggs per season (Fleischer et al. 1987); some individuals may lay twice that number. Laying rates are likely equally high in other parts of the Sierra..

In the Sierra Nevada, cowbirds typically spend their mornings dispersed on breeding grounds, usually riparian areas and the edges of meadows. In midmorning, they gather into feeding flocks (20-30 birds or more) and move to areas of greater food abundance—usually pack stations or meadows with cattle (Rothstein et al, 1980; Verner and Ritter 1983). In late afternoon, some birds form roosting aggregations, while others return to their breeding areas where they roost alone. Cowbirds will travel 7 kilometers or more between breeding and feeding sites (Rothstein et al. 1984); thus, songbirds nesting in a 154 square kilometer (55 square miles) area surrounding a pack station or grazed meadow are potentially vulnerable to cowbird parasitism. Nest parasitism by cowbirds generally decreases with increasing distance from feeding sites (Verner and Ritter, 1983).

Parasitism by cowbirds has been recorded for at least 25 Sierran bird species (Rothstein et al. 1980, Verner and Ritter 1983, Airola 1986). Some host species have evolved defensive mechanisms and will remove cowbird eggs from their nests. Unfortunately, most Sierran birds are quite vulnerable to parasitism since they evolved in the absence of the cowbird threat (Airola 1986). The fact that many Sierra birds nest in small localized groups (Verner and Ritter 1983) makes them even more susceptible to cowbird parasitism.

Impacts of Cowbirds on Native Songbirds

Rates of parasitism and nest failure among host species are variable, depending on the species and the density of the cowbird population. Of the 25 known host species in the Sierra, warblers, vireos, flycatchers, and tanagers appear to be most vulnerable (Brittingham and Temple 1983). Airola (1986) reported that 16 to 78 percent of warbler nests (depending on species) were parasitized by cowbirds at study sites in the northern Sierra Nevada. He also found that among susceptible species, parasitized nests produced only 0.33 young per family group, compared to 1.59 young per group for non-parasitized nests. Rothstein et al. (1980) found that parasitized nests of warbling vireos produced no host young. Verner and Ritter (1983) reported that 23 percent of family groups of yellow-rumped warblers were parasitized by cowbirds at sites in the Sierra National Forest.

Cowbirds are without question having a negative impact on native songbirds, at least at the local level. The only remaining uncertainty is to the magnitude of this impact. While it is difficult to know the exact degree of cowbird impacts throughout the Sierra Nevada, logical inferences about local impacts can be made with the available published data. For example, Yokel (1989) captured and tagged 87 and 90 individual female cowbirds in 1983 and 1984, respectively, in the vicinity of the Sierra Meadows Pack Station at Mammoth Lakes, California. Assuming that females laid eggs at the average rate for this site (30.5 per female; Fleischer et al. 1987), the potential reproductive output for marked birds alone was over 2700 eggs per year during each year of the study. This represents a conservative estimate of the total cowbird egg potential since the authors only captured a portion of the total females present. Yokel (1989) also determined the population density of cowbirds in nearby breeding areas and found it to be 18 females per square kilometer. This indicates that about 550 cowbird eggs were laid *per square kilometer of breeding habitat*.

In some areas, cowbirds may be limited by the availability of host nests, so not all of these eggs necessarily end up resulting in cowbird young or reduced host success. Still, even these conservative estimates illustrate the considerable threat that cowbirds pose to native songbirds, particularly since songbird populations in those areas with limited host-nest availability may be those that are most susceptible to cowbird parasitism (i.e. they are small, localized populations).

Solutions to the Cowbird Problem

There are several potential solutions to the cowbird problem in the High Sierra. Clearly pack stations and herds of cattle within and adjacent to wilderness areas are the primary contributors to the problem in alpine and subalpine areas, as well as many mid-to-high elevation coniferous forests. Trapping of cowbirds has been suggested as one alternative; however, attempts to remove cowbirds by trapping has proven futile elsewhere in the Sierra Nevada. Removal of 125 birds from the Wishon Lakes Pack Station had little effect on the total cowbird population in the area, partly because nearby meadows with cattle provided additional feeding sites (Rothstein et al. 1987). Additionally, conventional traps usually are more successful at catching male cowbirds, rather than females (A. O'Loghlen, UCSB, pers. comm.).

Others have suggested that tape-recorded calls of cowbirds could be used to draw females out of cover, where they could then be shot. This option, though more efficient since it targets female birds, is obviously not viable in national parks, where guns are prohibited. Moreover, such a program would undoubtedly encounter significant public opposition no matter where it was practiced, both because of the public's inherent dislike of such methods, and because it would disrupt the solitude that many visitors come in search of when they visit the Sierra.

Successful elimination of the cowbird problem will only be achieved by removing the unnatural food sources that have allowed these birds to expand their range. This means removing pack stations, cattle, and sheep from areas within and adjacent to wilderness areas. Most cowbirds leave the Sierra Nevada following the peak breeding season of native birds (from May through July). A potential alternative to complete elimination of pack stations and cattle grazing would be to delay these activities until *after* the conclusion of the cowbird breeding season in early August. Neither of these options would necessarily limit recreational stock use by private individuals; problems are most critical where stock density is sufficiently high to attract the birds.

Conclusions

National park and forest lands within and adjacent to wilderness areas offer critical refugia for many songbird species whose lowland and wintering habitats have been irrevocably altered by human activities. By allowing large numbers of livestock into designated and *de facto* wilderness areas, land managers may be inadvertently eliminating the best chance of survival for many sensitive species and populations. While cowbirds are certainly not the only cause of songbird declines in the Sierra Nevada, they may be the final nail in the coffin for many populations that have been adversely impacted by large-scale land disturbance outside of wilderness boundaries.

Clearly, there is a pressing need for land managers to address the issue of cowbirds in the Sierra Nevada. Sufficient scientific documentation of cowbird impacts exists to warrant serious consideration of a complete ban on livestock grazing, as well as pack station operations near or in wilderness areas. Cowbird trapping programs, in addition to being of questionable efficacy, merely treat the symptom of the problem, rather than addressing the root cause—excessive numbers of livestock and the food source that they provide. Indirect impacts of stock use, i.e. cowbird parasitism, are no less damaging to songbirds than direct impacts of other activities. The result on birds is the same whether the agent of death is cowbird parasitism or habitat loss.

Land managers have sometimes argued that before "extreme" measures (e.g. banning livestock from wilderness) are taken, more data on rates of parasitism for specific host species and localities must be gathered. Such a position ignores the reality that managers are unlikely to *ever* have the degree of certainty required to appease the user groups that will be adversely affected by strong mitigation measures. Jack Ward Thomas (1992) said it best:

> *"When land use decisions are to be made . . . individuals who stand to lose from those decisions typically demand unreasonable degrees of certainty in the information on which those decisions are based. All concerned need to recognize that the provision of a degree of certainty adequate to satisfy those whose welfare is threatened by the result is not likely to be attained. This problem is exacerbated when the decision criteria involve biological systems that are dynamic and highly variable."*

The "wait and see" strategy has repeatedly been a recipe for institutional failure and embarrassment, and has contributed greatly to the marked decrease in public confidence regarding the ability of federal agencies to wisely manage our public lands. Moreover, even if federal agencies were to embark on a major monitoring effort to conclusively document local effects, definitive results—definitive in the minds of interests that would be adversely affected by strict mitigation measures—may not be available for decades. In the meantime, the songbirds continue to suffer. In all likelihood, an extensive monitoring program would achieve, at best, a well-documented chronology of species extinctions and local extirpations.

Managers must base decisions on the best available science, and current scientific evidence clearly points to the need for substantive action to be taken to mitigate the impacts of cowbirds on native songbirds. Successful resource management depends on the willingness of managers to respond decisively, *even in the face of strong political opposition*, when the best available information indicates that a significant resource problem exists. Unfortunately, proactive management of wilderness resources historically has been the exception rather than the rule. And as with most resource crises, the options for dealing with the cowbird problem will become fewer (or moot) the longer meaningful action is postponed.

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Horses in Diapers Help Mexico's Beach Clean-up

August, 2003

ROSARITO, Mexico — See-through and peek-a-boo are always in style on Mexico's beaches, but this summer, horses are making a fashion splash on the Pacific coast. Beachside entrepreneurs who rent horses for jaunts on Rosarito beach in the Pacific state of Baja California are dressing the animals in diapers as part of a countrywide effort to cut down on pollution along Mexico's nearly 7,000 miles of coastline.

Roberto Machado, who has rented horses in Rosarito beach for 23 years, estimates that one horse produces about 57 pounds of manure each day. When the town was small, it wasn't a serious problem. But the horse rental business boomed along with the tourist industry. Now, 20 corrals rent about 150 horses each day during the peak summer season. Not every horse owner uses the diapers, fabric and leather sacks which have to be emptied every three to five hours. Manure as well as trash from overflowing garbage cans gathers on parts of the beach.

The horse diapers were invented by Martha Nevarez, a Rosarito resident who became concerned a year ago when her daughter developed a rash after an afternoon of fun in the sand. Nevarez had seen large clumps of horse manure and wondered if they could have been the cause. After talking to her doctor and a local veterinarian, Nevarez learned that people can contract a range of diseases from exposure to manure and feces from animals. After months of trial and error, Nevarez came up with a fabric and leather sack that wraps around the horse's chest and rear end. There is a hole for the tail and a heavy bag that collects the manure.

For about $53, local businesses buy the sacks with the business name, address and phone number splashed across the horse's rear, then donate them to the corrals that rent horses. That way, they get some advertising and help keep the beaches clean, Nevarez said.

Source: ENN, Reuters

By Enrique García Sánchez

March 17, 2003

ROSARITO BEACH – Martha Nevárez began to worry on a summer afternoon when her 6-year-old daughter developed bumps on her abdomen after spending a couple of hours in the sand.

After looking into probable causes, including talking to local veterinarians, Nevárez discovered something that showed her worry was justified.

Her daughter, along with thousands of other visitors to the beach, unknowingly faced the risk of contracting diseases – ranging from minor skin infections to tetanus – because of the tons of manure deposited on beaches each year by the hundreds of horses rented by tourists.

That will change by the end of this month, when some of these horses begin wearing a type of diaper, which Nevárez calls a "talaquilla." She developed it to curb the pollution problem. The device, sponsored by the local hotels, is designed to reduce manure on the beaches, thus helping to prevent health problems.

"It's excellent. I believe this product will be used around the world because it's a solution," said Fidelfa Marchesini, the representative in Rosarito of the state tourism department.

Marchesini has firsthand knowledge of Nevárez's persistence with the local, state and federal authorities to solve this contamination problem, and of her efforts to perfect the device, a kind of portable sack that collects the horse waste.

"I had to do something. People just don't know what horrible diseases you can get by being in contact with this waste," said Nevárez, who has lived in Rosarito for four years with her two children and her husband, a pharmaceutical distributor.

Before starting the project, Nevárez researched how people in other parts of the world handled the problem. Something similar to her solution is used in Australia. In urban settings, including San Diego's Gaslamp Quarter, horses pulling carriages are seen wearing devices to catch manure.

And people in other Mexican cities had their own alternatives, though nothing seemed to work very well.

Now, after nearly two years in development, she has a final version. The device is made from fabric and leather, with a plastic lining, and has an opening for the tail. Just below the tail is a cylindrical depository, which closes with a string.

There are two versions of the talaquilla. A 470-pesos version (about $47) ties to the saddle, while a more expensive model, which costs 530 pesos, includes adjustable straps that wrap around the horse's chest.

Nevárez resists calling her creation a diaper. She spent time finding an appropriate name and decided on talaquilla. In Caesar's Rome, this was the name given to a type of sack draped over the shoulder and used to carry things.

Elia Campillo Osnaya could care less about the name. An environmental activist and adviser to the state, she has become an enthusiastic promoter of the device. She believes it can help reduce one of the main sources of beach contamination.

Besides manure, other major sources of beach contamination are runoff of dirty water from housing developments and businesses, broken bottles, beer and soda cans, discarded food and contaminants from motorcycle traffic.

All this – plus a general lack of education about the importance of protecting the environment – combine to produce serious problems.

Osnaya said there is not enough effort being made to keep beaches clean and healthy, considering it is essential to Rosarito's economic and cultural development.

"The beach is alive, but it's dying," she said. "Many species have disappeared."

Hugo Torres Chabert, general manager of the Hotel Rosarito, is another enthusiastic supporter of the device.

"It's always a good time to safeguard the environment, this is why the talaquilla is a great idea," Chabert said.

Torres became the first mayor of Rosarito Beach in 1995, when the community became a city. Currently, he is president of Rosarito's Coordinated Business Council, which he said would give away 15 to 20 talaquillas to owners of horse rental businesses who promise to use them.

Some horse owners have reacted with disbelief over the device, and others were outright rude.

Roberto Machado is one owner who has agreed to try one of the devices after Nevárez worked hard to persuade him.

Machado and other owners manage about 35 horses, which are rented for $7 per half-hour in the heart of Rosarito, the main tourist area.

He does acknowledge the health problems associated with horse manure on the beach, but believes the problems are not as serious as those faced by people and animals in the stables, where the waste is concentrated.

During a workday, a horse can leave about 33 pounds of manure on the beach.

On average, 250 horses are rented by tourists, though the state tourism representative believes that number doubles in the summer.

"We want to use the talaquilla, but once we are all ready, so we can all start at once, and everyone commits to using it," Machado said.

Los Angeles resident Leonardo Carmona Contreras thinks the diaper is a fine idea. Contreras and his family can ride horses for less money in a small area of Griffith Park, but prefer to do it in Rosarito.

"It seems to work, and it's good that they use it. I only wish someone would worry more about these horses," said Contreras, who was visiting Rosarito Beach with his family.

Nevárez has patented the device in Mexico, the United States, Canada, Spain and Portugal, but does not want to market it anywhere else until it proves to be a success in Rosarito, her home.

"This thing is now personal."

Place to purchase

http://www.equisan.com.au/

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USDA - Forest Service and USDI - Bureau of Land Management, Fish and Wildlife Service, Geological Survey, and National Park Service

August 6, 1999

Mr. Jeffrey E. Bailey
Forest Supervisor
Inyo National Forest
873 N. Main Street
Bishop, CA 93514

Dear Jeff:

I wanted to write a brief note and thank you for your invitation to visit the wilderness in your forest. It has always been one of my favorite places in the world--feelings that strongly reemerged on my recent trip. I imagine it must be exciting and a bit intimidating to have the responsibility to maintain or enhance the long-term value of such a place.

I learned a lot in my time there and hopefully was able to share some ideas, knowledge and management philosophy that will be of use there. The backpack trip was quite useful to observe the variation in conditions (particularly trails, campsites and numbers of people) in the different upper tributaries of Mono Creek. Those provided a good sense for what the recreation management strategy could more formally and effectively provide. I remain convinced that the future value of those wildernesses will be highest if it is possible to protect any large areas with low use that remain.

The specifics of what I learned and shared are too numerous to include here. I also choose here--as I did on my visit--not to make specific recommendations. The right thing to do is not science-based--rather it is a reflection of societal values which remain vague and challenging to assess. I continue to suggest collaborative processes within an LAC-type format as the best way to access and plan based on broad societal values. I also believe that the recreation management strategy can be usefully applied in your wilderness and was happy to hear that it will be addressed in the plan. I also suggest that when you consider the array of available actions, that you include legitimate possibilities even if they are politically unfeasible. This will better illustrate how much things have been compromised when a compromise is reached. An example might be my idea about management being an attempt to reduce and ration impact. This implies the need to incorporate the difference in impact potential between a horse group and a hiker group (which often is as much as 10 to 1, given the same party size). You will ultimately not use this information (probably), but not using this is already a concession to horse groups.

Finally, let me tell you how impressed I was with your staff. I do a lot of similar consultations around the U.S., but your group was the best example of a team full of enthusiasm, experience and willingness to think and learn that I have ever met. I am not sure how or why that is the case. Certainly many years of commitment to such an important place is a key. But there also is the appearance of information sharing, experience sharing and working together to generate, criticize and evaluate ideas that seems important and missing most other places. I hope you can continue to maintain that attitude within that team in the future. I am certain it will result in better wilderness management and reflection on you, your team and the Forest Service in general.

I am invested in your issues and efforts. Please do not hesitate to let me know how I can be of further help. And thanks again for the invitation.

Sincerely,

David Cole

DAVID N. COLE
Research Biologist