

Recreational Strategies for the High Lakes Off-Highway Vehicle Area

Independent Study Project

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Outline of Suggested Strategies

A. Recreation Use Sites and Sanitation Facilities

- Designate most use sites through regulations or persuasion
- Contain use sites unless use levels are extremely low
- Allow use areas to remain dispersed throughout the High Lakes area
- Concentrate (*i.e.* cluster) use sites at high use areas
- Use least management techniques at use sites in extremely low use areas
- Construct a parking/loading/unloading area at the “T”
- Construct a mix between a Forest Camp and Overflow Camp adjacent to the parking/loading/unloading area located at the “T”
- Construct no more than 15 use sites at the developed camp located at the “T”
- Construct two simply pump-out privies at the developed camp and the parking/loading/unloading area (one facility for the use sites only, and one for use sites and the parking/loading/unloading area)
- Use sites past the “T” should be designated by the use of permanent fire rings only
- Place small wood post barriers in use sites that receive very high use amounts or have the potential to expand beyond acceptable reason
- Develop two backcountry style camps at Spring Valley Lake
- Construct two composting toilets at Spring Valley lake (one for use sites/general OHV travel, and one for use sites only)
- Develop one backcountry style camp at Campbell Lake
- Construct one composting toilet at Campbell Lake (used by both general OHV travel and use sites)
- Develop one backcountry style camp at Long Lake
- Construct one composting toilet at Long Lake (used by both general OHV travel and use sites)
- Contain and designate use sites at Bear Lake, Saddle Lake, Grassy Lake, Morriss Lake, and Mud Lake (do not cluster sites)
- Study other areas for possible need of contained use sites

B. Routes

- Do not upgrade routes
- Do not rate routes
- Close Mud Lake, Saddle Lake, and Bear Lake to motorized travel
- Open new technical OHV route as suggested by Pair-A-Dice 4x4 club
- Study user created routes that access popular locations (*i.e.* use sites, lakes, etc), and determine if acceptable to include in the Forest Service system
- Barrier and/or sign unacceptable user created routes, spurs, and shortcuts
- Maintain popular non-motorized trails
- Do not upgrade/maintain low use non-motorized trails
- Develop no new non-motorized trails until user demand is evaluated
- Install barriers through meadows along re-route designed in July, 2004
- Increase Forest Service staff, signage, and maps to encourage users to stay on routes

C. Signs and Barriers

- Do not use any negative tones in messages
- Ensure proper signs are chosen and are maintained
- Place American Flag stickers on prominent signs
- Do not install external directional signs on routes leading to the High Lakes area
- Construct a large two or three panel kiosk at the “T”
- Construct a directional orientation sign at the Forest Camp/Overflow Camp located at the “T”
- Use “Carsanite” and “Tree-Hugger” signs within the High Lakes area
- Use “White Arrow” emblems to show designated routes
- Place directional signs (*i.e.* tent symbols, restroom symbols) along travel routes when approaching facilities
- Install barriers and signs at motorized and non-motorized intersections

- Construct small kiosk at popular non-motorized trailheads
 - Do not install interpretive signs within the High Lakes area
 - Install site etiquette signs at heritage sites
 - Install barriers and signs along routes adjacent to sensitive areas that attract off-road use
 - Install barriers and signs at undesirable user created routes, short cuts, and spurs
- D. Length of Stay and Group Size Limits
- Impose length of stay limits to mitigate homesteading
 - Impose two night length of stay limit in low use areas
 - Impose a differential group size limit, dependent on use levels
 - Impose a group size limit of no more than “10 bodies” at high use areas
 - Impose a group size limit of no more than “8 bodies” at moderately and low use areas
 - Require permits for groups larger than “10 bodies”
- E. Education, Partnership, and Forest Service Presence
- Maps, signs, and brochures at kiosk located at “T” should be main educational tools
 - Develop partnerships with 4x4 organizations, and provide specific duties
 - Increase Forest Protection Officer and Law Enforcement Officer presence
 - Increase partnership with other local organizations (i.e. BLM, State Parks, NPS, Local Sheriffs) to help mitigate lack of law enforcement presence
- F. Site Containment: Concentrated, Dispersed, and the High Lakes Area
- Explanations
 - Relate to the High Lakes area
 - Past research
- G. Recreation Related Impacts and Mitigation Techniques
- Past research

Introduction

“When impacts are acceptable or even when they are approaching unacceptable levels, an indirect or persuasive strategy is more appropriate than a direct or restrictive strategy. The latter is more appropriate when an impact is clearly unacceptable” (Anderson, Lime, & Wang, 1998, p. 11).

In June 2004 Lassen National Forest sent out a document to Forest Service (FS) staff regarding the High Lakes Off-Highway Vehicle Area (HLOHVA). The document was titled High Lakes Master Plan and included a section titled “Standards and Guidelines”. One section under standards and guidelines is recreation. Within recreation, the document states that a comprehensive recreational plan needs to be developed, that includes sanitation issues. When complete the plan would be designed to help manage use within the High Lakes and Chips Creek basin areas. In order to help fulfill this goal, the author has put together a document for the High Lakes area that suggests specific strategies in order to assist in the development of the comprehensive recreational plan.

The need for educated strategies to assist the FS is great. The author suggests there are three major reasons why the FS may be in need of educated suggestions regarding the HLOHVA. They are: (a) off-highway vehicle (OHV) use is increasing (L. Norton, personal communication, April 17, 2005; M. Reid, personal communications, September, 2004; Fisher, Blahna, & Bahr, 2001), (b) unmanaged recreation is a top priority for resource managers (Chavez & Knap, 2004; General Accounting Office, 1995), and (c) the HLOHVA is being impacted beyond acceptable levels.

First, OHV use throughout the United States has increased by twenty percent from 2003 to 2004 (M. Reid, personal communication, September, 2004). This growth in popularity may be especially focused in California, where OHV sales is by far the highest within the United States, with 130,635 units sold in 2003 (L. Norton, personal communications, April 17, 2005). The closest state that follows California in sales is Texas, with about half the amount, at 61, 134 units sold in 2003 (L. Norton, personal communication, April 17, 2005). The amount of OHV sold in California is magnified even more when looking at the increase of sales over the past years. As

noted by a FS OHV specialist (L. Norton, personal communications, April 17, 2005) OHV sales in California have increase 346% since 1998, when only 29, 255 units were sold. This increase in the numbers of OHV can be a testament to the growing popularity of off road travel.

There are several reasons behind the growing popularity. As stated by Max Reid and Maggie Williams of Fish Lake National Forest (personal communication, 9/2004), and the Bureau of Land Management (as cited by Fisher et al., 2001) one reason is the “coming of age” of the baby boom generation. This means that baby boomers to have more leisure time, and many enjoy the use of OHV in order to recreate. Further, users are growing in number due to their closeness to once remote areas (M. Reid & M. Williams, personal communications, September, 2004; Fisher et al.). What this means is the public is moving to areas that were once considered remote, but have become popular for reasons that once made them undesirable, such as solitude, and distances from large populations.

Second, as recently stated by the Chief of the USDA Forest Service (USFS), unmanaged recreation is a major issue facing National Forest (Chavez & Knap, 2004). The Chief further detailed this by illustrating that current OHV use is a prime example of unmanaged recreation. Backing this up further, executive order’s 11644 and 11989 were issued in 1972 and 1977 respectively; to insure OHV use was managed in a proper manner (General Accounting Office, 1995). These orders suggest that OHV use was already showing signs of creating user conflicts, and natural resource damages, even in the nineteen-seventies (General Accounting Office, 1995). These two examples are instances when top-ranking individuals made direct connection with problems surrounding OHV use, thus suggesting that proper management of this type is of extreme importance.

Third and potentially most importantly, is the suggestion by the author, that the

HLOHVA is being impacted beyond acceptable levels. If this were the case, it would seem in the best interest of the FS to use as many resources as possible in designing a comprehensive recreational plan. To further this thinking, the author suggest that the strategies suggested are of importance, since a majority of them step beyond the realm of indirect management, and into specific, well research, direct management techniques.

To support the use of direct management techniques Anderson et al. (1998) state direct management techniques are appropriate when impacts have passed levels of acceptability. Further, Frost, McCool, Swearingen, and Johnson (as cited by Manning, 1999) state that direct management practices can actually enhance a recreational experience when it appears impacts are becoming unreasonable. In addition, and in further support, Dustin and McAvoy (as cited by Manning, 1999) suggest that in circumstances where impacts are at such a high level, direct management may actually increase user freedom. Following this line of thought, the author suggests that the strategies within this document may be very important to the FS, the HLOHVA, and those who recreate within this area.

Specifically, the strategies suggested by the author are related to seven areas: (a) recreation use sites and sanitation facilities, (b) routes, (c) signs and barriers, (d) length of stay and group size limits, (e) education, partnerships, and Forest Service presence, (f) recreation related impacts and mitigation techniques, and (g) site containment: concentration, dispersal, and the High Lakes area.

In writing this document, the author tried to hit on topics where impacts were the greatest, ways in which to mitigate those impacts, and research that help back up specific strategies. It is the hope of the author, that these selected sections will assist the FS in limiting impacts, while maintaining an acceptable level of user satisfaction and freedom.

Within the section of “Recreation Use Sites and Sanitation”, the author suggests specific type, location, and design of use sites. In addition, the reasons behind particular suggestions are stated, and where applicable, specific research is documented. In regards to sanitation facilities, specific type, amount, and locations are also covered.

Within the section “Routes” the author discusses route condition and route rating. Further, route closure and inclusion of new routes are specifically addressed. Within the section of “Signs and Barriers” the author suggests specific sign and barrier type, location, and message content. Included in this section is research and suggestions from specialist that backs up specific suggestions. Within the “Length of Stay and Group Size Limit” segment the author specifically suggest length of stay limits and group size limits. Again, these suggested are backed by current research.

Within the section, “Education, Partnerships, and FS Presence” the author suggest methods in ways to educate users, the need for partnerships, and increased FS presence. Also, as with the other sections, the author backs suggestions with research and suggestions from specialist within the field. Finally, within the sections of “Site Containment: Concentration, Dispersal, and the High Lakes Area”, and “Recreation Related Impacts and Mitigation Techniques” the author details research and where applicable relates research with the High Lakes area.

Recreation Use Sites and Sanitation Facilities

Use sites within the HLOHVA appear to be mostly user create, and are generally found aside bodies of water, or directly along travel routes (M. Nebel, personal communications, Spring 2005). The sites are generally modified by motorized vehicle travel and day or overnight use. This type of use has resulted in sanitation problems, as well as other potential problems such as site expansion, increased soil exposure, loss of vegetation cover, soil compaction, and increased erosion. Further, with the majority of use sites occurring along side lakes, introduction of nutrients and human caused bacteria to the water is also a concern. If management actions are not taken within a reasonable amount of time, use sites may continue to grow in number, current sites may continue to expand, and the impacts mentioned above may further spread into previously undeveloped locations. Finally, and as a result of these impacts, user satisfaction may potentially decrease.

In order to mitigate the situations mentioned above, the author suggests that use sites within the HLOHVA be contained. Use sites within high use areas should be concentrated or clustered together, while use sites within low use areas should be contained, but not clustered. Further, FS staff should designate, by regulation or persuasion, all use sites throughout the semi-primitive motorized area (SPM) and most within the semi-primitive non-motorized areas (SPNM). Finally, site design at high use areas should resemble those of backcountry camping areas. If these suggestions are taken, it is the opinions of the author that the impacts mentioned above will be mitigated, while acceptable levels of user satisfaction and perceived freedom are maintained.

In addition, it is suggested that the FS develop a use area at the main access point to the HLOHVA, which is generally referred to as the “T”. It is suggested to design a use area consisting of a loading/unloading segment, parking segment, and overnight use segment. The overnight use sites should be a mix between a “forest camp” and a “peak load camp” (Douglas, 2000). Development such as explained will further help mitigate resource damage and maintain user satisfaction, while indirectly managing use within the HLOHVA.

It is the opinion of the author that the steps mentioned above are a necessary component in the mitigation of impacts occurring within the HLOHVA, while maintaining acceptable user satisfaction and perceived freedom. In addition, the use of signs, face-to-face contacts, education, regulations, and other management tools will further enhance the positive affects of designated sites. Finally, the use of designated sites will allow for FS staff to more easily use further management actions if deemed necessary in the future. In the following section information will be covered that explains research within the field of use sites in order to assist FS management. Following, components of each suggestion stated above will be detailed.

Site Selection

Robert Douglas (2000) states that there are three basic questions that must be asked when thinking of site selection: (a) will the site satisfy the users need, (b) is the site convenient for the users, and (c) is the resource adequate to satisfy the user.

Satisfaction of users is one of the major components when thinking of site selection. Criteria's for satisfaction may differ for different type of users. However, three major features need to be thought about regardless if the users are backpackers or RV enthusiast (Douglas, 2000). These three factors are: sanitation, safety, and attractiveness of site (Douglas, 2000). In addition, these factors can be thought of in unison with the primary

objectives of having use sites. These are: (a) to provide a service, (b) protect the user, and (c) protect the resource (Douglas, 2000).

Following this, site selection should be convenient for the users (Douglas, 2000). It could become a major flaw if site selection is based on convenience for the resource manager, instead of the user. Convenience for the user entails sites with relatively easy access (*i.e.* good roads, signage, trails, distance), and sought after amenities (*i.e.* view, location, toilets, privacy, etc) (Douglas, 2000).

Within the HLOHVA designated use sites should be located within formally impacted zones. These areas will generally be found around lakes, and other sought after locations (overlooks, etc.). By keeping sites within these areas, user satisfaction should be maintained, since users created the sites in the first place. Further, satisfaction will be maintained and even increased with sites remaining in very attractive and safe locations, especially if sanitation facilities are installed.

Further, by creating designated sites within previously impacted areas, user convenience will be maintained. This is based on the idea that an attribute of user created sites is user convenience. This idea should generally hold true throughout the HLOHVA since most use sites are located directly off motorized routes. In addition, with designated sites being developed, convenience will be increased with the addition of fire rings, signs, and sanitation facilities.

Finally, site selection must go through the process of thinking if the resource will satisfy the users. In order to satisfy the use, Douglas (2000) states that sites need to have preferred attributes (*i.e.* flat, shaded, and in ideal locations). However, in general it would appear that site could be modified to insure the resource meets the user's need, while mitigating further impacts. Also, this will be eased somewhat given that site location is proven desirable, thus taking away a major obstacle within this realm.

Site Development

A main idea when thinking about site development within the HLOHVA is the idea of maintenance and the idea surrounding uses sites within SPM and SPNM locations. It is generally thought that maintenance within the HLOHVA will remain relatively low because of the location, time, and financial issues that the FS deals with on a daily basis. This may be mitigated with the use of volunteer agreements, and the designation of employees who are specifically trained in OHV management. However, the strategies discussed here will assume that work hours within the HLOHVA will remain minimal.

Second, the development of use sites must remain within the realm of SPM and SPNM specification. Within SPM areas it is stated that "...areas [are] essentially undisturbed except for the presence of four-wheel drive

roads and trails” (FS Management Directions, personal communications, January, 2005). Further, SPM guidelines suggest to “Limit recreation facilities to those of Development Level 2 Primitive toilets, campfire rings....” (FS Management Directions, personal communications, January 2005). In addition, SPM guidelines state that the social setting should be “...low to moderate frequency contact with other parties” (Douglas, 2000, p. 94). Given this, suggestion will be within these guidelines, and within the thought that the HLOHVA is a backcountry area, and should remain under SPM and SPNM management specifications.

Finally, as compared to SPM areas, little attention will be paid to site development within SPNM areas. According to maps, most of these areas appear to be in relatively good shape. However, some locations will be mentioned, and suggestions given (*i.e.* Mud Lake, Bear Lake, etc.). When discussing these areas it will be taken into account the criteria for SPNM specification. This will include the ideas that, “subtle setting modifications are acceptable; little or no evidence of primitive roads or motorized use of trails and roads; structures are rare and isolated”, and use is low, with about “6 to 8 parties encountered on the trail per day....” (Douglas, 2000, p.94). Also, the criteria of “Motorized use is not permitted” (Manning, 1999, p.183) will be addressed.

Designated Sites at the “T”

To begin with it appears that some users may be displaced with the creation of designated sites within the HLOHVA. This being the case, the creation of a designated use sites at the main access point (the “T”) appears to be a good idea. It is thought that this should be a mix between a “forest camp” and a “peak load camp” (Douglas, 2000). The reasoning behind this line of thought is the potential of an undesired increase in use if a well developed site is engineered, which could be brought about with a traditional forest camp development. Further, by keeping development at a minimum, SPM guidelines will have a greater chance of being met. Also, a risk remains that a highly developed site will not be used frequently, thus causing facilities to be unused for a good part of the season. In addition, it is thought that most overnight users desire to stay within the HLOHVA, thus the developed sites at the access point will be used for mainly overflow camping.

Douglas (2000) states that forest camps have four strong points: (a) site protection, (b) a degree of solitude, (c) convenience, and (d) room for family camping. Strong points of a peak load camp is that they mitigate impacts occurring at high use times by providing use areas for those not able to locate sites within the HLOHVA. Further, peak load camps help maintain users satisfaction (Douglas, 2000). Finally, peak load camps are less costly to build

and maintain.

It is thought that a developed use area at the main access point of the HLOHVA be designed in a loop format, with use sites at least 100' apart. This will ensure that vehicles do not drive through other sites, and a sense of solitude is maintained. As stated in a study, forest camps should have less than 25 camp units within them, and be spread out with connecting loop routes (Douglas, 2000). However, it is suggested that this developed area be limited to the maximum of 15 use sites. By keeping site numbers low, management will be indirectly controlling access, thus not encouraging overuse of the HLOHVA.

Sites should be numbered along a loop route with limited facilities consisting of fire rings, possible picnic table, and a place to park a vehicle. Also, each site should be well defined with barriers such as short wood post to mitigate site expansion. In addition two centralized modified pump- out pit privy toilets should be installed. Research shows that one toilet is needed per 8 camp units, thus if 15 units are designed two facilities will be needed (Douglas, 2000). Further, research shows that the optimum distance between use sites and toilets is 200', with sites 50' or closer deemed undesirable, and 600' or more deemed too far to travel (Douglas, 2000). If possible water pumps should be installed. However, small waste bins should be avoided since maintenance is very limited in this area.

Regarding the parking/unloading zone, it is felt that this area should require the use of minimal facilities, thus be limited to such things as signs, a sanitation facility, and a possible water pump. It is suggested to install one centralized modified pump- out pit privy toilet. This facility should be linked to the use site area (this is one of the two facilities recommended for the forest/overflow camp, thus it will do double duty), making sure the FS dollar is used effectively and efficiently, while providing acceptable conditions for users. This line of thought comes from the idea that peak load camps are not designed to be as aesthetically pleasing as forest camps, but are built to serve the purpose of overflow, and maintain user satisfaction (Douglas, 2000).

Designated Sites within the HLOHVA

As described earlier, use areas within the HLOHVA are mostly user created. Thus, some are in poor locations, and many are in poor condition. Problems occurring consist of, but are not limited to: amount of sites, amount of fire rings, site expansion (spatial and areal), loss of vegetation cover, soil erosion, site location (closeness to water and designated routes), sanitation disposal, litter, and user created damage to surrounding areas (*i.e.* tree damage, site modification).

It is suggested that containment and designation (through regulations or persuasion) of most use sites within the SPM and SPNM zones of the HLOHVA be implemented to help mitigate the issues mentioned above.

By doing so the author feels that user satisfaction and perceived freedom will be greater in the long run, than if dispersed user created sites are allowed to continue. This thought is inconsistent with FS management practices of the past, especially in areas managed as SPM and SPNM (Manning, 1999). As stated by Manning (1999),

First, legislative and management agency policies applied to wilderness and related areas often emphasize provisions of recreation opportunities that are “unconfined”. Thus, direct regulations of visitor behavior may be inconsistent with such management objectives. Second, recreation is a form of leisure activity connoting freedom of choice of thought and actions. Regulations to control visitor behavior can be seen as antithetical to the very nature of recreation. Third, many studies indicate that given a choice, visitors prefer indirect over direct management practices (p. 241-243).

However, the author feels that the HLOHVA has surpassed the point where indirect management practices will work when related to use sites. This thought is well phrased in the paper, *Maintaining the Quality of Park Resources and Visitor Experiences: A Handbook for Managers*. It states, “When impacts are acceptable or even when they are approaching unacceptable levels, an indirect or persuasive strategy is more appropriate than a direct or restrictive strategy. The latter is more appropriate when an impact is clearly unacceptable” (Anderson et al., 1998, p.11).

Further, it is the opinion of the author that direct management in the HLOHVA can do double duty in the sense that impacts will be reduced to acceptable levels, while satisfaction and freedom is maintained, and potentially increased in the long run. This opinion goes along with research conducted by Dustin and McAvoy 1983 & 1984, Cole 1993, Frost and McCool 1988, Swearingen and Johnson 1995, D. Anderson and Manfredo 1986, and Shindler and Shelby 1993 (as cited by Manning, 1999). Dustin and McAvoy (as cited by Manning, 1999) believe that direct management (*i.e.* designated sites) can in fact lead to more freedom in the long run. Further, is the thought that direct management actions actually preserve the diversity of recreation opportunities available to the users (Manning, 1999). Lastly, Frost and McCool (as cited by Manning, 1999) build on this line of thought, with their findings that direct management can enhance the quality of a recreational experience.

Following the lead of these researchers the author feels that designating use sites within the HLOHVA will actually enhance satisfaction and freedom. This line of thought comes from the belief that if direct action is not taken now, then impacts will continue to persist in an unacceptable manner, thus possible making harsher

management actions necessary in the near future. If this is the case, direct management action taken now will actually preserve opportunities sought by the majority of users, which in turn will lead to more satisfaction and perceived freedom. In contradiction, if impacts continue at current rates then opportunities could be taken away to a further extent by future management actions, thus decreasing satisfaction and overall freedom.

In addition to maintaining satisfaction and perceived freedom, further research suggests that the containment of use sites will decrease the total amount of human created impacts (Hendee & Dawson, 2002). Within heavy use areas Hendee and Dawson (2002) suggest, "Containment is a better strategy for minimizing impacts, unless management is willing to reduce use to extremely low levels and actively rehabilitated deteriorated sites" (p.435). In addition Spildie, Cole, and Walker (as cited by Hendee & Dawson, 2002) showed that closing certain sites, restoring those sites, and designating previously impacted use sites decreased disturbed areas by 37% and bare areas by 43 % in five years. Their research further shows (as cited by Hendee & Dawson, 2002) that within a few decades the actions of closing sites, and designating others will reduce disturbed areas to just 36% of what they had been, and bare areas to just 24% of what they previously were.

Following research and personal on the ground experience, it is the opinion of the author that use sites be designated on Spring Valley Lake, Morris Lake, Campbell Lake, Long Lake, Grassy Lake, Saddle Lake, Bear Lake, and Mud Lake. Further, it is suggested that sites be walk-in only at Saddle, Bear, and Mud Lake. Sites modifications will differ with each location, depending on popularity, location, and condition. But in general all designated sites should be numberless, equipped with fire rings, and previously impacted.

The idea around keeping use sites numberless seems to stem from the perception of freedom, or, in other words, the less the feel of designation the more perceived freedom. As with fires rings, two reasons are given. First, the placement of fire rings increases the safety to the user as well as increase user convenience. However, the second reason is thought most important. Research shows that sites with centralized fire rings assist in centralizing impacts. As stated by Hammitt and Cole (1998), "Typically, campers in developed sites spend more than three-quarters of their in-camp time close to the table, tent, pad, and fire grills" (p.116). Hammitt and Cole (1998) go on to state that, "In undeveloped sites, backpackers spend most of their time around the tent and fire areas" (p.116). In fact as stated by Marion (as cited by Hammitt & Cole, 1998), fire gates in the backcountry are actually recommended to concentrate use and centralize impacts. So, it is the opinion of the author that fire rings should be installed in all

designated sites for the main purpose of mitigating impacts.

Finally, use sites should be designated in previously impacted areas. As stated earlier users should prefer these areas, since users initially chose them. Further, the use of previously impacted areas, as opposed to creating new use sites, is broadly supported by outdoor recreation research. Basically, research suggests, that areas are impacted relatively quickly (use of only a few time a year), and recover slowly (as compared to impact rates). Thus, the creation of new use sites will result in the impact of those new sites, plus the previously impacted sites. To mitigate this, managers would have to insure old sites are never used again, and use amounts are reduced dramatically, or remain at very low levels (unrealistic within the HLOHVA).

As far as specific design, it is suggested that Spring Valley Lake, Campbell Lake, and Long Lake be developed in the style of a back-country camp, while Grassy Lake, Morris Lake, Mud Lake, Bear Lake, and Saddle Lake be left in a more primitive condition. Finally, FS staff should study miscellaneous areas, and make decisions on amount and location of use sites.

The back-country camp is a style of camp that generally provides fire rings, safe-drinking water, and sanitation facilities (Douglass, 2000). Douglas (2000), states that Back-Country Camp sites can be used to concentrate use, thus protecting the surrounding areas. Within the HLOHVA site should be modified only slightly (*i.e.* fire rings, barriers), and as explained previously, already impacted sites should be used. By using this technique, little damage should be done to existing vegetation. It will be up to FS staff to determine where each site should be, as well as how many should exist. On this note, not all impacted zones need to be use sites; in fact impact zones should be *dramatically* reduced.

The sites deemed unacceptable should be signed, stringed, re-vegetated and/or made very difficult to use (*i.e.* fallen trees, boulders, etc.). Or, as suggested by Hendee and Dawson (2002) if education and communication is well done, use sites will be those only with fire rings, thus easily identified by users (this seems to be the least obtrusive tactic). Finally, as stated by Hendee and Dawson (2002), “ It is important to...have a few more sites open than the maximum number of parties anticipated at any time” (p. 435).

Further, modification should be made in order to provide for a linear layout of facilities and a centralized trail (non-motorized) that links one site to the other, thus decreasing shortcutting. A sanitation facility would be centrally located adjacent to the connecting trail. Each fire ring should be located at least 100’ off the water thus

centering the use site a safe distance away from the waters edge. Also, it may be appropriate that users be able to drive directly adjacent to sites, since impacts from this already exist, and user may do it anyway if this option is restricted. In addition, high use sites could contain some sort of barriers, such as short wooden stakes.

Spring Valley Lake

Spring Valley Lake (SVL) is one of three areas within the HLOHVA that needs a back-country camp development (the other two being Campbell and Long Lake). As mentioned earlier, a back-country camp is a use zone, laid out in a linear pattern, and consist of use sites, non-motorized connector trails, and a sanitation facility (with a potential water source if applicable) (Douglas, 2000). At the SVL location there are currently 41 user created fire rings, with most located along the southern edge and south western edge of the lake. However, several fire rings are dispersed in surrounding outlying areas, and on the east side of the lake.

It is the recommendation of the author that two back-country style camps be developed at the SVL location. One location could connect use sites along the east side (250522UC-02 & 250522UC-01) of the lake and the locations on the south east side of the lake. The other location could connect use sites along the south (250523UC-01) and south western edge (250223UC-02) of the lake. Use sites dispersed around the outskirts should be dismantled and/or otherwise made very difficult to access. The maximum number of use sites at each camp should be limited to amounts determined by FS staff, and past overnight use amounts or approximations. The author suggest that each backcountry camp include a maximum of six use sites. This would provide a total of twelve overnite use sites at SVL, thus decreasing fire rings by approximatly seventy-five percent. In addition, it is thought that this number of use sites should easily meet the demands of overnight use at SVL, as well as provide areas for day users to access the water for their preferred activity.

As far as sanitation facilities are concerned, SVL should consist of two facilities with one at each backcountry camp location. The facility located within the camp along the east, south-east portion of the lake could also be used by OHV users traveling along route 6E11. This could be done by locating the facility at the southeast corner of SVL (intersection of 6E11 and 250522UC-01). If this is done it appears that only one use site will be over 600' feet from the facility, thus maintaing an acceptable distance (Douglas, 2000). In addition, this facility will be available for day users as well.

The facility located at the south and southwestern back-county camp appears to be best located between the two impact zones. It appears that a connector trail may need to be constructed so these two areas can be joined. If this is done, use sites can be developed on either side of the facility, with few being over 600' from the facility (*i.e.* sites on the western border of the lake). Unlike the facility on the east, this one would be away from day use motorized travel. This being the case, it would seem this facility would get little use as compared with the one located along the south east corner of the lake.

Campbell Lake

It appears that Campbell Lake (CL) has eleven user created fire rings along its eastern banks, which are within five impact zones. In addition, these impact areas are adjescent to motorized route 6E13. This being the case it appears a backcountry style camp could be developed, with a sanitation facility that would allow use by both overnight and day users. Use site amounts along CL should be kept under six, and perferably be limited to three or four. Use areas could be located at the northern most point of the lake (unnumbered user created route), along the east side of the lake, and on the south end of the lake (unnumbered user created route). A sanitaion facility could be centralized and adjacent to route 6E13, thus making no use site over 400' away, and allowing day users to access the facility.

Long Lake

It appears that Long Lake (LL) has eleven fire rings located within five impact zones. Most rings are located on the northern, eastern, and southern edge of the lake, with the western edge being undeveloped (user created trail developing). It may be best to locate permanent fire rings at the northern portion of the lake, with a backcountry style camp developed along the eastern, and southern edge of the lake. Further, it may be necessary to develop a non-motorized connector trail for the easterns and southern camp.

It may be appropriate to locate a sanitation facility within the backcountry style camp, bewteen use sites on the eastern side and southern tip of the lake. The facility could be adjacent to route 6E13 (west side of route) in a previously impacted area. By doing so, eastern and southern use sites will be within 400' of the facility, while allowing OHV day user access as well. The northern use sites could use either the CL or LL facility. Whatever the

outcome, the backcountry camp should keep use sites to a minimum, with a suggested amount of four use sites/developed rings. This would provide five use site/rings along LL (one at northern point of lake).

Bear, Saddle, Grassy, Morriss, and Mud Lake

Previous mapping of these areas appear to indicate lower use levels than SVL, CL, and LL. This being the case, the author suggest that use sites be designated by fire ring only, and no camp style be developed. This being the case, no sanitation facility should be developed. The only additional development suggested may be a connector trail if dealing with more than one use site. Use areas along these lakes should be decided by FS staff, with regards to current impacts, past use and approximated use levels. However, as mentioned previously, use sites should be reduced, with unappropriate sites being dismantled, revegetate, and/or otherwise made very difficult to access.

Miscallanious Areas

It is suggested by the author that all other user created use sites/fire rings within the HLOHVA be either destroyed, revegetated, made difficult to access, or greatly reduced in number. Those that appear to be in well liked locations (*i.e.* around bodies of water, next to overlooks, etc) should be investigated by FS staff. By doing so, FS staff can reduce the amounts of rings, and locate them in acceptable locations (*i.e.* away from water, off slope, etc). Through regulations, education, or persuasion (*i.e.* camp only in sites with pre-developed fire rings) overuse can be mitigated. Those rings/use sites along general routes, and in little used location should be dismantled, revegetated, and/or made very difficult to access.

In contrast, areas that receive extremely low use (*i.e.* Oliver lake) should be left without designated sites. The line behind this thought is areas with very low use can actually see a increase in impacts if sites are concentrated, rather than dispersed (Hendee & Dawson, 2002). Whatever the case, impacted areas and fire rings should be greatly reduced in number.

Sanitation Facilities beyond the "T"

As for sanitation, the author feels that due to water contamination concerns and maintenance concerns, the best alternative is to provide composting toilets in high use areas. If composting toilets are used, water contamination should be minimized, sanitation issues will be mitigated, and user satisfaction should remain at acceptable levels and/or increased. As stated by Brenda Land's (1995) US Forest Service publication on Remote Waste Management,

Maintenance is critical. Compost toilets need a carbon source, preferably wood chips, added regularly to maintain the decomposition process. The fecal cone must be knocked down and mixed with the carbon source regularly. The schedule of maintenance varies from once a month to twice a week, depending on digester tank size, level of use, temperature, and climate. Finished compost must be removed, generally about a bushel every 1 to 2 years, but some units have operated for 10 years without removing any material. A user-maintained composting toilet has been reasonably successful in very remote, low vandal areas, and in huts or cabins. A bin of wood shavings is located next to the toilet riser with a scoop attached. Instructions are posted to add 1 scoop per use. Maintenance personnel must still mix the waste, remove the composted material as needed, and refill the bin with wood shavings.

It is felt by the author that FS staff can indeed meet the demands of a compost toilet. With a use season from

about mid-June to late September, it appears that maintenance would require about six visits a summer (if users help by adding wood chips). This amount hopefully would be doable, especially in the growing presence of the attitude that the HLOHVA needs more attention than it is previously receiving. However, with limited knowledge on FS issues (*i.e.* budgets, staffing, etc.) this type of dedication may not be obtainable. If this is the case other options may be necessary (*i.e.* transportation privies, or simple pit privy if water issue is ok).

Routes

As the name states, the HLOHVA is a designated area for OHV use. Thus the discussion of routes is a very important one. Routes within the HLOHVA have been mapped and labeled as “System”, “User Created”, “Decommissioned”, and “USFS System Roads” (M. Nebel, personal communication, Spring 2005). System routes and USFS System Roads are roads designed by the FS for designated travel. User Created routes are routes created by users. Decommissioned routes are routes decommissioned by FS officials.

Issues with routes within the HLOHVA are generally location, and condition. Some issues with location are: routes through sensitive areas (*i.e.* meadows, along bodies of water), motorized routes located within SPNM areas, user created routes, and routes through private property. Issues with route condition are generally correlated with route difficulty and erosion. Natural occurring obstacles, amount and type of use, and design and modifications are generally the major players in route difficulty. Erosion concerns are generally due to poorly created routes, route location, route design, lack of maintenance, climate, and type and amount of use.

The FS has inventoried most of the routes that are currently within the HLOHVA. The inventory shows location, status, stream crossing, culvert locations, and what type of condition the route is in (M. Nebel, personal communication, Spring 2005). Out of the routes inventories (6E17 & 6E11 are incomplete) 69% were rated as acceptable, 20% were rated as needing maintenance, and 11% were rated as needing rehabilitation (FS staff, personal communication, Spring 2005).

Route Difficulty

Difficult routes provide a challenging experience for users within the HLOHVA, and are generally sought by FS staff (High Lakes Master Plan, personal communication, July 2004). In addition, difficult routes are an indirect way to control visitor use (Manning, 1999). Further, and possibly most importantly, it is generally thought that the majority of users within the area seek technical OHV travel. Lastly, if routes are upgraded, FS staff will have to evaluate each route since routes within the HLOHVA have significant historical importance, route upgrading within the area may have to be evaluated by specialist to meet the standards set by the 1966 National Historic Preservation Act (J. Pierre, personal communication, January, 2005). Thus, it is suggested that routes not be upgraded, unless rehabilitation is required to meet specific standards.

Route Rating

Route rating is an idea thought about by many resource managers (K. Walton, personal communications, February 17, 2005)). The idea behind it is basically rating routes by difficulty. This could be done by FS staff, and communicated to users through signs and/or brochures. By doing so, users would know before hand the situation they are getting themselves into. However, after talks with a Kevin Walton (personal communications, February 17, 2005), OHV specialist with the FS the author suggests that FS staff refrain from rating route within the HLOHVA. The

reason behind this deals specifically with the issue of liability. For example, routes rated as easy may be seen as difficult by other parties, thus potentially placing the FS at blame for damages occurred.

It is the suggestion of the author that FS use the tool of recommendations when addressing route difficulty. In doing so, FS staff could specifically suggest users not use trails within the HLOHVA in vehicles not designed for off-road travel. This idea could certainly be refined to be more specific, but none-the-less should be used as a recommendation tool only. By doing so the FS would further place it self away from being liable for personal and property damages that occur while traveling within the HLOHVA.

Route Modification

There are three known areas within HLOHVA that are being abused beyond acceptance, or are areas that motorized travel is progressing into SPNM zones. Specific areas of concern are Mud Lake, Bear Lake, and Saddle Lake. It is believed by the author that Mud Lake and Bear Lake are classified as SPNM zones, but contain motorized routes. Saddle Lake is mostly located within a SPM zone, but is being abused beyond acceptance (Impacts detailed in a following section, titled Saddle Lake).

It is the opinion of the author that all three locations need to be closed to all motorized use. This should be apparent for the routes within the SPNM zones, but will still be a difficult task (discussed latter in this section and in regulation, education, and signs). With the Saddle Lake area, the author feels that even though it is within a SPM zone, and contains a FS system OHV route, route conditions and use site abuse are at such a degraded level that harsh restriction are necessary. It is felt that all three locations need to be signed, made very difficult to access, and be made accessible for non-motorized activities only.

Bear and Mud Lake

The HLOHVA consist of approximately 18, 500 acres (High Lakes Master Plan, personal communication, July 2004). 13, 900 of these acres are managed as SPNM (High Lakes Master Plan, personal communication, July 2004). Within this area non-motorized activities exist, such as hiking, bird watching, horseback riding, mountain biking, and hunting. The ability to experience these activities also exists within the SPM zones, but is accompanied with a larger percentage of motorized travel. This being said, it is well documented that much conflict within outdoor recreation is between non-motorized users and motorized users (Ramthun, 1995; Hendee & Dawson, 2002; Hammitt & Cole, 1998; Manning 1999; Gibbons & Ruddell, 1995). In addition, research shows that most of this conflict is asymmetrical, meaning it is coming from one side (Ramthun, 1995). Further, conflict frequently stems from some sort of goal interference (*i.e.* need for solitude, quietness, commune with nature, etc) (Gibbons & Ruddell, 1995). So, in order to mitigate user conflicts, it is suggested SPNM zones need to be segregated from motorized use within the HLOHVA.

Based on the assumptions stated above, the author feels that Bear Lake and Mud Lake need to be modified into walk-in sites only, thus kept within SPNM guidelines. By doing this, FS staff will be better able to meet SPNM guidelines on the amount of contact that are acceptable within a SPNM zone, as well as the guideline stating no motorized use (Douglas, 2000). Further, it is felt that motorized user have enough area to maintain an acceptable experience at a high satisfaction rate. By closing these areas to motorized travel the author feels that conflict will be kept at a minimum, non-motorized recreation will be able to expand, and overall user satisfaction will be maintained at acceptable levels.

Saddle Lake

Saddle Lake is predominately located within a SPM zone; however it borders a SPNM zone, and non-motorized trailhead. The FS system motorized route that accesses the lake is very technical, thus causing a fair amount of off-road travel to occur. In addition, it appears that this route travels beyond the SPM zone, and into the SPNM areas. Further, the use sites around Saddle Lake are in poor condition, and have taken on significant amounts of abuse.

Due to off-road travel in this area, FS staff has tried to curtail off-road use by making it very difficult to maneuver off the designated trail. However, off-road use continues, with noticeable user created trails being created around technical zones, and further up toward the lake. In addition, OHV users have modified the route in order to make the area more easily accessible to motorized travel. Lastly, the immediate surrounding area encompasses wet meadows, and riparian zones that are not adequate to OHV travel.

At the lake itself, use areas have been abused beyond acceptable levels. Examples of impacts are large amount of litter, poor sanitation disposal, and site expansion and modification. Specifically, users have taken it upon themselves to cut down green trees to expand the site. Also, cut trees have been modified into “camp furniture”. In addition, large amounts of garbage have been left behind. Finally, as stated earlier, it appears that OHV use has expanded into SPNM zones.

Specific reasons of why such impacts are caused are unknown. Potentially, users may fall into the categories of unintentional (*i.e.* unaware), releaser-cue (*i.e.* vandalism begets vandalism), uninformed (*i.e.* know rules, but unaware of consequences), responsibility denial (*i.e.* users understand rule, but don't comply because it interferes with their pre set goals), status conforming (*i.e.* go along with violation since those in their group are doing it), or willful violator (*i.e.* fully aware of wrong doing, yet persist because their goals are more important than resource protection) (1987, Gramann & Vander Stoep). Or, it could be due to the lack of FS presence in the area, thus creating a “free for all”. Whatever the case maybe, the conditions of the area are unacceptable. Due to these conditions, and the fear that FS presence will not substantially increase in the future, the author suggest that the area be made non-motorized, and be designated as a walk in site only.

Making this area non-motorized is easier said than done. A major reason behind this is the experience sought when an OHV user enters the route to Saddle Lake. This specific route allows OHV users to experience technical obstacles, something that users seek, and something the USFS wants to provide within the HLOHVA (FS staff, personal communication, Summer, 2003/4; Pair-A-Dice 4x4, personal communications, Summer 2004). Further, as cited by Cindy Calbourn (personal communication, September, 2004) of the Escalante Ranger District on the Dixie National Forest, keeping OHV out of restricted overnight camps is very difficult, since users are uncomfortable leaving expensive equipment unsupervised.

However, as expressed, the impacts that are occurring within this area are not acceptable. To mitigate the loss of experience, and reduction of satisfaction the author suggest that if this area is closed to OHV use, then another technical area should be made available to OHV users (to be discussed later in this section). In regards to Cindy Calbourn’s statement about OHV user being uncomfortable about leaving equipment unsupervised, FS staff on the Lassen may be better off, since OHV use within the High Lakes is generally modified trucks, and not small vehicles that are more easily stolen.

If it is decided to keep this area open, FS staff must take it upon them selves to insure impacts are curtailed. Ways in which to do this will be discussed in latter section, but in general, signage, barriers, regulation, enforcement, and education are suggested. In addition, if route

pioneering is continued within SPNM zones the FS needs to install barriers and/or signing to mitigate this occurrence.

Non-Motorized Routes

As suggested earlier, some motorized routes should be closed, and designated as non-motorized. Reasons behind this are the zones in which they lie (SPNM), and the abuse they have received. However, non-motorized routes that exist in proper zones (SPNM), and are not being abused need to be discussed. Things to consider are maintenance, signage, modification, and the creation of new routes. Specifically, this section will discuss trail creation and maintenance.

When discussing trail creation, use numbers and types of use are key components. Unfortunately little is known about the amount and type of non-motorized use that is occurring in SPNM zones. The author would think that predominant uses are day hiking, backpacking, mountain biking, bird watching, fishing, and hunting. However, the amount of use is unknown. It is thought by the author that non-motorized trails are very lightly used, especially in comparison to motorized use. Given this, the author would suggest that no new routes be created for non-motorized travel until research can validate their necessity.

Maintenance of non-motorized trails should be conducted where it is deemed necessary. What this means is: If a route is being used frequently (amount decided by FS) then it should be maintained to avoid unnecessary impacts (*i.e.* erosion, pack stock impacts, user created shortcuts, etc.). The author would think these trails would be those going to lakes such as Lotts Lake, Murphy's Lake, and areas such as Oliver's Flat. However, it is the opinion of the author that if a non-motorized trail is found to receive little use, then it should be allowed to fall further into disrepair and/or otherwise be allowed to go back to its natural state. The reason behind this line of thought is that the HLOHVA receives little non-motorized use, and non-motorized uses will not significantly increase, especially since the area is a designated OHV area (*i.e.* conflict is high between motorized and non-motorized, thus curtailing non-motorized users entering the area).

User Created Routes, Spurs, and FS Reroute

User created routes and spurs occur throughout the HLOHVA. Reasons behind this seem to be a desire for more technical obstacles, desire to visit other areas (*i.e.* Bear Lake, ridge lines, other areas that have not been used, etc.), and general unawareness or disregard for resource related issues. In relation to the causes for off-route travel are ways in which they can be mitigated. Some key ways are: (a) open new technical routes to fulfill desire and/or modify/don't modify pre-existing routes for more technical travel, (b) create/modify routes to access areas desired by users, (c) create a lengthy/fulfilling trail system, (d) signage/barriers, and (e) enforcement, education, and communication.

Suggestion one, which state to open or modify/don't modify routes to be more technical seems to be a key way to curtail off-route travel (M. Reid & M. Williams, personal communication, September, 2004). Behind this idea, is the thought that if you provide a challenge then the OHV user will not have to seek other areas to satisfy their desires. In addition, this would meet specific agendas sought by the FS, which state that routes within the HLOHVA shall provide a challenge for users (High Lakes Master Plan, personal communication, July, 2004). A specific way to meet this is already in progress. This is the decision to not upgrade travel routes. By doing this routes will remain technical, and hopefully fulfill user desires.

Another method, which is more controversial, is to open or designate new routes. The author suggests that this option be looked at as a valid suggestion. As stated before, if FS staff choose to close the Saddle Lake route (*i.e.* 6E12), then other technical options need to be made

available to OHV users. An option that has been suggested by the Pair-A-Dice 4X4 group (personal communications, July, 2004) and FS LEO Scott Bell (personal communications, January, 2005) is to open a very technical area located near “Oil Pan Alley”, or the “Devils Staircase” (the author is unaware on exact name/location). In the summer of 2004, the author had a chance to walk this area with a Pair-A-Dice group member. It is the opinion of the author and Scott Bell (personal communications, January, 2005) that this area may provide a valid option. However, concerns exist. Specifically, route location and open characteristics may create further off-route travel. If this option is sought, FS staff must be active in communication, education, and signage.

Suggestion two, states routes may be modified/created to access desired attribute. This idea is basically stating user created routes should be analyzed, and asked: Why have these routes been created? If it appears that the user desired to access an attractive area, and mitigation techniques can be adapted to lessen impact to acceptable levels, then FS staff may want to consider the route for a FS system route (*i.e.* routes that currently go to use sites falls under this category). In doing so, the FS will essentially be looking at route creation for the sole purpose of recreation use, something that probably was not considered when the original routes were designed. By going in this direction, the FS can in fact increase user satisfaction, while mitigating impacts through outcropping, installing water bars, and other techniques.

Specifically, the FS should consider designating user created routes that access use sites along lakes within the HLOHVA (the author suggest many designated use sites that are accessed exclusively by user created routes). However, user created routes that cause unacceptable impacts and/or are in poorly chosen locations should be closed.

Suggestion three, states that having a lengthy/fulfilling trail system may mitigate off-road travel (M. Reid, personal communications, September, 2004). It is felt by the author that the HLOHVA already meets this criterion. Suggestion four, which states signage and barriers could be used to mitigate off-route travel, needs to be carefully thought out by FS staff, and implemented in certain areas. These areas include FS routes through meadows (*i.e.* new route placed in 2004), FS routes along side meadows and lakes, short user created spurs (into woods, meadows, and around lakes), and other user created areas (*i.e.* routes used as shortcuts/access around technical areas and as extensions to dead – ends).

Of specific concerns, is the use of barriers and signs along the new route placed in the summer of 2004, and spurs which are popping up to access previously un-trailed sections that are directly adjacent to lakes (See Nate Parks & Jack Johnson).

Specifically, it is suggested that the FS place barriers and signs along the new route designed in the summer of 2004. As of the date this paper was written the only barrier through this meadow is fallen logs. It is the opinion of the author, and those within the 4X4 community (Pair-A-Dice 4x4, personal communication, July, 2004) that this will not be adequate to curtail off-road travel (this is especially true in the wet season, when temptation may be high to recreate in a challenging mud area). This thought is back by research conducted by Bayfield and Bathe 1982 (as cited by Manning, 1999), which found that logs and brushwood kept only 50% of users off undesired areas. To mitigate, the author suggest FS staff install “buck-n-pole” or “split-rail” fencing along the meadow area. This should be accompanied with proper signage (barrier and signage specifics are detailed in the sign/barrier section). Again this type of system is backed by the research of Bayfield and Bathe 1982 (as cited by Manning, 1999), which found that planks and signs kept 90% of users off undesired areas.

As with spurs, the author suggest proper signage and/or barriers where deemed

necessary. It may seem overly obtrusive and/or expensive to place barriers at user created spurs, since they are many in number, and located in natural areas, but in some instances signage has failed to work (J. Johnson, personal communications, Summer 2003/4). Therefore, if serious resource damage is to be mitigated (especially in wet areas around lakes and in meadows) then FS staff may seriously want to consider using a barrier system such as buck-n-pole or split-rail.

Finally, suggestion five, which states the use of enforcement, education, and communication as a way to curtail off-route travel, should be used in unison with the other strategies mentioned above. Education and communication could be in the form of signs, regulations, brochures, and face-to-face contacts. Enforcement should be implemented by an increased presence of Law Enforcement Officers (LEO) and/or FS staff with Forest Protection Officer (FPO) status. This recommendation sounds easy, but finding staff with FPO status who feel confident in their ability to write citation, and who feel it is necessary is a difficult task.

In particular, the author suggests the FS start using tactics that focus enforcement on high use days/times (*i.e.* holidays, weekends, and hunting season). This could be made more effective if FS staff could correlate with other agencies (*i.e.* BLM, State Parks, DNR, etc), in order to increase their presence and authority (K. Walton, personal communication, February 17, 2005). If this is done on several high use days, it is believed that word may spread through the OHV community, thus assisting in getting the message out that the FS is serious in curtailing illegal uses in and around the HLOHVA (K. Walton, personal communication, February 17, 2005).

Signs and Barriers

Signs

“The basic intent of signs is to activate visitor attitudes, visitor awareness of social norms, or visitor fear of the possible consequences of inappropriate behavior” (Anderson et al., p.104).

“The fundamental purpose of signing is to activate visitor attitudes, norms, values, and beliefs, thus influencing visitor decision making” (Anderson et al., p.104).

As a direct and indirect management technique, signs are a key element in the proper management for the HLOHVA. Signs, especially those stating regulations, will assist FS staff in doing the bulk of the work in regards to visitor management (Manning, 1998). In addition, signs will be a key way to educate users on appropriate environmental ethics, and the key source for relevant information regarding the HLOHVA.

Douglas (2000) states that there are five types of signs: (a) directional, (b) regulatory, (c) identification, (d) warning, (e) and interpretive. The meaning of each type is generally self-explanatory. Douglas (2000) goes on to state that signs are generally classified as being administrative, directional, restrictive, or interpretive.

Examples of administrative signs within the HLOHVA are the yellow tags on trees that show longitude and latitude, and generally mark National Forest boundaries. Directional signs are broken into two categories: internal and external (Douglas, 2000). Internal directional signs would be used within the HLOHVA boundaries, while external directional signs would be used to guide users to the HLOHVA from major roads. It is the opinion of the author that internal directional signs will be of most important within the HLOHVA, while external signs should be approached with great caution. In fact, in the opinion of the author, external directional signs may want to be entirely avoided to insure the HLOHVA is not overly used.

Internal signs are broken down into two categories: utility and orientation (Douglas, 2000). Examples of utility signs within the HLOHVA would be signs that show directions to

sanitation facilities or designated camp areas. Example of orientation signs within the HLOHVA would be diagrams showing how camps are laid out, or diagrams of the OHV trail system. Both internal and external directional signs will play a major role as indirect management techniques in controlling visitor use amounts and impacts (Manning, 1999).

Restrictive signs show regulations, control user movements, and install user responsibility (Douglas, 2000). These types of signs are of utmost importance to the HLOHVA, since they do the bulk of the job in controlling visitor impacts (Manning, 1999). Restrictive signs must be well placed, and used in moderation. Further, messages that are commonsense or those that are well known have been shown to reduce user compliance with other regulations that follow after the commonsense ones (Douglas, 2000). Thus, restrictive signs must be well thought out and hit on key messages.

However, in the opinion of the author, and as stated by FS OHV specialist Kevin Walton (personal communication, February 17, 2005) one of the most important concepts in regards to restrictive signing is the minimal use of negative messaging. The use of negative tones can create a battle between users and FS staff (Douglas, 2000). An example of this within the HLOHVA could be signing stating that, "Consumption of alcohol while driving within the HLOHVA will not be tolerated. Violators will be cited." A message in this tone could create a competition of sorts between OHV users and LEO. Instead, a message such as "Please refrain from drinking and driving. Violator's will be cited" gets the point across, but in a more positive manner.

Interpretive signs are signs that tell some sort of story, be it about history or particular attractions. As stated by Douglas (2000), interpretive signs can enrich a visitor's experience by bringing about the areas history and natural interest. However, research has shown interpretive signs are less favored in backcountry areas, as compared to informational signs (Manning, 1999).

Within the HLOHVA, it is believed that most signage will be Internal directional (utility & orientation) and restrictive. No matter what type of signs are chosen, the FS must dedicate itself to making sure signs are kept in good condition, and are replaced when necessary. Without regular upkeep, and general maintenance, signs will deteriorate, and be made useless. Not only does lack of maintenance lead to increased impacts, but it also sends a message to users that the area is unmanaged, and potentially uncared for.

Barriers

Barriers within the HLOHVA are used to channel movement and/or restrict movement. Examples of channeling movement would be those used along routes, to help mitigate off-route use. Examples of barriers to restrict movement are those located at user created spurs, and those within use sites to mitigate site expansion.

Signs at the "T"

Signs located at the "T" of the HLOHVA are of utmost importance. These will be the signs that set the tone for users, and will be major factors in visitor management, use amounts, compliance, and physical and social impacts. Signs at this area will generally be informative, restrictive, and directional. They should include, directional orientation signs located at the forest camp/overflow camp, and informative, directional, and restrictive signage located at a large kiosk at the HLOHVA main entrance point.

The directional orientation sign located at the forest camp/overflow camp should simply greet users and display the layout of use sites (Douglas, 2000). This will allow users to see locations and amounts of use site and sanitation facilities.

The large kiosk, which should be located at the HLOHVA primary entrance, will probably be the principal sign within the entire area. This sign will need to large (potentially 3

panels) since it should display many important messages, well made (to withstand snow amounts), and have a rustic look (to blend in). Messages displayed may include restrictions, HLOHVA mapping (routes and site layouts), FS suggestions (*i.e.* route difficulties), environmental concerns, educational messages, and needed descriptions (walk in sites, reasons for barriers, designated sites, restriction, etc). In addition, FS staff may want to include packets of brochures with relevant information for the HLOHVA.

Specific suggestions of information to display on the main kiosk are descriptions of what signifies a designated route. It is suggested that displays resemble #20-135 (RockArt Inc [RAI], 2001). This type of signage makes users aware that routes marked with white arrows are designated travel routes. Also, as suggested in a memo completed by a Hydrology crew (personal communications, 2003) other messages should target proper waste disposal, litter removal, campfire rules and regulations, OHV rules and regulations, trail etiquette, and private property boundaries.

Further, the author suggests the kiosk include messages on vehicle type recommendations, route information (*i.e.* routes are not maintained, etc), mapping of routes (motorized and non-motorized), location of camp areas and sanitation facilities, general rules and regulations, length of stay, group size limits, and environmental issues thought to be relevant (*i.e.* noxious weeds, wildlife in area, etc).

Finally, the author recommends an idea that is a relatively new concept in visitor management. It is the use of stickers that display the American Flag (K. Walton, personal communications, February 17, 2005). This could simply be a small sticker located in the corner of signs (not just the kiosk) that is highly visible to users. This type of sticker may potentially bring out a sense of patriotic feelings, thus decreasing the amount of sign vandalism. In addition, the author feels that the sticker also has a potential to install a sense of pride in users, thus decreasing impacts.

Trail Signs

It is very difficult to suggest specific sign location from a remote location, even with the use of large maps. However, if able, the author will suggest some specific locations. Sign types should remain inexpensive, while being durable, and able to withstand heavy snow, and potential abuse. The author suggests the use of standard carsanite post (# GFX78) and “tree huggers” (#01-125 through 01-120) along designated routes (RAI, 2001). As stated earlier, designated route markings (*i.e.* white arrows) should be displayed periodically, and at intersections. When routes travel through sensitive areas (*i.e.* along lakes, meadows, heritage sites, private property, etc) signs should state messages reiterating to stay on designated routes. Specific suggestions are sign such as 10-463, 10-490, and 60-137 (RAI, 2001). These signs state an appropriate message, without the negative tone, such as the use of the word “No”, or slashes through travel types.

When routes intersect with non-motorized routes signs should be installed to indicate boldly the type of travel allowed, but need not heavily emphasize the type of travel not allowed (K. Walton, personal communication, February 17, 2005). Specific suggestions are signs such as 10-436, 10-401, 10-402, and 10-403 (RAI, 2001). Again, these get the message across, without overuse of negative texts. Also, it is suggested that barriers be used in these areas as well (discussed later).

Routes that run into user created spurs, or decommissioned routes should at the minimum (barriers discussed later) be posted with signs indicating to stay on designated routes (see recommendations of signs for sensitive areas). These signs should be centrally located on the route, thus being obvious to all users.

Signs at Designated Use Sites and Sanitation Facilities

Signs located at facilities within the HLOHVA, such as designated use areas and sanitation facilities should be well thought out and sparingly used in order to maintain a primitive environment. Specifically, camp orientation signs (*i.e.* map of camp area, illustrating the layout of sites) should not be placed past the “T”. Substitutions for this could be small pamphlets located at the kiosk. In addition, signs should not be placed at each use site, since it is recommended that permanent fire rings will show where a site is designated (this could be communicated in messages at the “T”). However, internal directional signs could be located along designated routes when users are about to approach designated camp areas, and sanitation facilities. Specific signs suggested are decals such as 10-105, 10-131, and signs such as 10-467 (RAI., 2001).

Signs located at Non-Motorized Trail Heads

Some type of small kiosk or panel should be installed at popular non-motorized trailheads. These signs could indicate type of travel allowed, backcountry safety recommendations, rules and regulations, and other natural resource related issues. Also, if available, mapping of non-motorized area could be highlighted.

Interpretive signs

As indicated by the Archeologist specialist (J. Pierre, personal communication, January, 2005), at the Almanor Ranger District, there are four interpretive possibilities within the HLOHVA (see Heritage response). However, the author questions the appropriateness of placing interpretive signs within a backcountry area such as the High Lakes. This concern is reiterated by Manning (1999) who states that interpretive signs are not well received in backcountry areas, when compared to informational signs. In addition, Douglas (2000) states that interpretive signing is recommended for vistas, roadside rest, information sites, and certain forest trails.

The author feels that the installation of interpretive signs may be a step too far in the direction of development, and a step away from a primitive setting. In addition, a concern lies in the fact that interpretive signs may receive little use. However, as stated by FS Archeologist Jamie Pierre (personal communications, January, 2005) human caused impacts are occurring to heritage sites within the HLOHVA. In order to mitigate this, some type of signing is needed. This could be in the form of small “site etiquette” signs or interpretive signs. If interpretive signs are installed, they need to be well thought out, able to blend into the environment, and not be overly obtrusive.

Barriers types and locations

The use of barriers is a direct management technique that is designed to channel movement, discourage access, screen unattractive sites, or increase privacy (Douglas, 2000). As discussed earlier, barriers used within the HLOHVA will serve the purpose of discouraging access, channeling movement, and mitigating site expansion. It is the suggestion of the author that FS staff use “buck-n-pole” barriers, split rail, and small wooden post (for use sites only). However, after a discussion with FS OHV specialist Kevin Walton (personal communication,

February 17th, 2005) the author specifically suggests a buck-n-pole barrier style for the HLOHVA (see illustrations on the following two pages). The buck-n-pole system is described as relatively inexpensive, easy to set up, tough to destroy, and easy to relocate. In addition, the author feels that these specific barriers blend well with the natural surrounding. However, if buck-n-pole is not chosen, then the author feels that split-rail barriers are certainly adequate. In contrasts, and as stated by FS LEO Scott Bell (personal communication, January 2005), the use of small rocks and/or logs is not encouraged since they do not effectively mitigate off-road use.

Specifically, it is suggested that the FS place buck-n-pole barriers along the new route designed in the summer of 2004. In addition, proper signage should accompany barriers, in order to further encourage user compliance. As of the date this paper was written the only barrier through this meadow is fallen logs. It is the opinion of the author, and those within the Northern California 4X4 community (personal communications, August, 2004) that this will not be adequate to curtail off-route travel (this is especially true in the wet season, when temptation may be high to recreate in a challenging mud area).

Further and as previously stated, FS staffs have also expressed concern on this type of barrier. Specifically, FS LEO Scott Bell (personal communication, January, 2005) said that “rocks and trees along the side of routes is not an effective means of deterrence.” This thought is back by research conducted by Bayfield and Bathe 1982 (as cited by Manning, 1999), which found that logs and brushwood kept only 50% of users off undesired areas. “Buck-n-Pole” fencing or “split-rail” should mitigate this, especially when assisted with proper signs. Again this type of system is backed by the research of Bayfield and Bathe 1982 (as cited by Manning, 1999), which found that planks and signs kept 90% of users off undesired areas.

As with spurs, the author suggest proper signage and/or barriers where deemed necessary. It may seem overly obtrusive and/or expensive to place barriers at user created spurs, since they are many in number, and located in natural areas, but in some instances signs have failed to work (J. Johnson, personal communication, Summer 2003/4). The failure of signing has been witnessed within the HLOHVA on several occasions. Specifically, there have been several occasions when carsonite signs have been simply ran over or moved to access easier routes, or to access undeveloped areas around lakes. This being the case, if serious resource damage is to be mitigated (especially in wet areas around lakes and in meadows) then FS staff may seriously want to consider using the barrier system suggested above or other barrier tactics (*i.e.* very large boulders).

Finally, barriers may be needed within use sites that are either to large, located near sensitive areas, have a high chance of expansion, or have a chance to expanding into previously impacted, but undesired locations. Specifically, the author suggests using short wood post (*i.e.* post of this type are used on the west shore of Lake Almanor to discourage motorized use from leaving day use areas) that are periodically driven into the ground to discourage expansion. Although the use of this type of barrier system shouldn't be that common, when used they will hopefully not be overly obtrusive, and blend in well with the surroundings.

Length of Stay and Group Size Limits

Length of Stay

“The purpose of time based regulations is to control the character of visitor use in such a way as to reduce unacceptable impacts to resources and visitor experiences” (Anderson et al., p. 92).

During the summer season, the HLOHVA gets a substantial amount of overnight use. Most of this use appears to be happening at locations such as Spring Valley Lake, Campbell Lake, and Long Lake. Hammitt and Cole (1998) suggest that length of stay will do little to affect impact in high use area. This being the case, limiting the length of stay in areas such as those mentioned will have little affect on impact levels (Hammitt & Cole, 1998; Anderson et al, 1998). It appears that the main function in limiting length of stay would be in keeping “homesteaders” in check (Hammitt & Cole, 1998). The author is unaware of any problem of “homesteading” occurring in the HLOHVA.

However, lengths of stay regulations have been found to limit impacts in low use areas (Hammitt & Cole, 1998). Several areas within the HLOHVA appear to receive little overnight use, such as SPNM zones located well away from motorized routes (both FS & user created routes). If this is the case, then length of stay limits may want to be imposed. If length of stay is imposed, stays should be limited to one or two nights per location (Hammitt & Cole, 1998; Hendee & Dawson, 2002).

Finally, area wide lengths of stay limits are useful when use is at a level that restricts certain user from getting the opportunity to use an area, due to excessive crowding (Hendee & Dawson, 2002). However, this type of regulation does little to mitigate site impacts (Hendee & Dawson, 2002). In the opinion of the author the HLOHVA does not receive enough use to support an area wide length of stay.

Group Size Limits

“The purpose of limiting group size/stock/pet-based regulations is to control the character of use by controlling group size” (Anderson et al. p. 95).

Within the HLOHVA 2004 Masters Plan (personal communication, July, 2004), it is documented that group size limits be regulated to twelve bodies (bodies equals OHV, stock, & users) per use site. This limit was put together by the author and developed from current research on group size amounts, and associated impacts. However, due to further experiences and readings it seems that setting a groups size limit in high use areas, such as Spring Valley Lake, Long Lake, and Campbell Lake may be less important than in low use areas such as Bear Lake, Lotts Lakes, and other SPNM zones (Hammitt & Cole, 1998). Further, as stated by Cole (as cited by Anderson et al.; Hendee & Dawson, 2000), setting party limits higher than ten will probably have little positive benefits toward limiting site impacts. Finally, in the opinion of the author, site impacts will be mostly affected by access and designs

(*i.e.* unimproved routes, designated sites, barriers, & site harding).

However, if a well thought-out group size limit is chosen, the positive benefits may be: (a) potential reduction in camp expansion, (b) potential reduction in user conflicts, and (c) potential reduction in overall site impacts (Anderson et al.; Hammitt & Cole, 1998; Hendee & Dawson, 1998).

First, large groups are associated with site expansion, through the method of creating areas for additional tents, eating areas, and the storage of equipment (Hammitt & Cole, 1998). Second, large groups are associated with user conflict (Anderson et al.). This thought is generally associated with wilderness and backcountry areas, where solitude is a goal by most users. To back this, Stankey (as cited by Manning, 1999) states that user would rather encounter five small groups rather than one large group. Third, large groups are capable of increasing the overall rate of impacts within use sites (Hammitt & Cole, 1998). This type of behavior was documented by Bogucki, Malanchuk, and Schenck (as cited by Hammitt & Cole, 1998), who found that on pristine sites, large groups decreased ground cover by ten to fifteen percent after only two nights of use. Thus, it would seem that large groups could alter relatively unaltered sites within a relatively short time.

Though limiting group size has many benefits, it also comes with cost to the users who desire to travel in large groups. This may be especially true with OHV users who seem to travel with larger parties when compared to non-motorized users. Research by Hammitt and Cole (1998) backs this line of thought by stating that the most significant cost to group size limits are restrictions on access to those who wish to travel with large groups, and decreased satisfaction for those who wish to travel in large groups.

In order to mitigate the problem to the resource and the users, the author suggests setting differential group size limits within the HLOHVA. As stated by Hammitt and Cole (1998), an action such as this may allow for more pristine areas to remain intact, while meeting the needs of both the majority and minority of users. Specifically, the FS may want to intact a higher group size limit at popular areas (already high amounts of impact) such as Spring Valley Lake, Long Lake, and Campbell Lake (drop the number from 12 to 10 bodies. Bodies equal user, OHV, and stock,), while setting a lower group size limit at low use spots such as Bear Lake, Mud lake, Morris Lake, Lotts Lake, and other SPNM zones (8 body limit.). In addition the FS may also want lower group size limits at areas that have been impacted beyond acceptable limits (*i.e.* Saddle Lake). Finally, the FS may want to inform users that special permits are available in order to facilitate very large group parties (*i.e.* church group, OHV group, etc). In

doing so, user will have to contact FS staff who can recommend sites, and LNT techniques.

Education, Partnerships, & Forest Service Presence

Mitigating user created impacts while maintaining an acceptable level of user satisfaction should be one of the goals of the HLOHVA Recreational Plan. In order to accomplish this goal many direct and indirect management techniques will be applied. Some of which should be to implement a strong commitment toward effective education for users, developing partnerships with user groups, and increasing the level of FS presence within the HLOHVA.

Education

User education can be used to mitigate impacts to resources and visitor experiences (Anderson et al.). Ways in which education helps mitigate these impacts is through reducing negative behaviors, reducing user conflicts, distributing use, and promoting proper land ethics (Anderson et al.). As stated by Anderson et al. (1998), the purpose for visitor education is to, ...influence visitor behavior, as well as contribute to positive visitor experiences. Specifically, visitor education is intended: (1) to encourage visitors to practice low impact and other (socially) acceptable behaviors, (2) to reduce human-caused resource problems such as litter, vegetation trampling, improper disposal of human body waste, tree damage, and contamination of lakes and streams, and (3) to alter visitors use patterns spatially and temporally throughout the park areas in an effort to reduce uses as well as help visitors attain desired experiences for encountering other people (p. 111).

Education is a widely publicized way of mitigating impacts; however, as stated by Chavez and Knap (2004) education through specific programs seems to get little use by Region 5 (R5) FS OHV managers when compared to other methods such as personal contacts, volunteer patrols, and partnerships. In research conducted by Chavez and Knap (2004), out of 307 R5 FS OHV managers, only ten used educational programs as a tool to mitigate resource and user created impacts.

With little use among FS OHV managers in R5, it appears that educational programs are thought to be ineffective. However, as stated by Hendee, Vander Stoep and Roggenbuck (as cited by Manning, 1999) research suggest that educational programs have a high success rate in mitigating unskilled actions (*i.e.* selecting improper camping spots) and uniformed actions (selecting lightly used areas, using large snags as firewood). This being said, it may appear an ill-conceived stance that R5 FS OHV managers do not apply these programs to their specific area. However, instead of specific programs (*i.e.* LNT, Ranger Talks, etc), it appears that most R5 FS OHV managers do in fact encourage user education, but use other methods besides specific programs (Chavez & Knapp, 2004). Methods commonly used are signs, brochures, informal communication between staff and visitors, displays, and the creation of partnerships (Anderson et al.; Chavez et al. 2004).

As stated by Anderson et al., no matter what method of education is facilitated, managers must meet two criteria. First, users must perceive the recommendations as desirable for themselves. Second, messages must be sufficiently communicated, in order for the user to understand them. In addition, the content of educational messages needs to come across in a positive manner (Douglas, 2000). This idea was hit on earlier within the “sign” section (major educational tool), but is reiterated here to show its importance. Although, it is also suggested that negative, heavy-handed techniques are sometimes necessary. If a negative approach is taken, FS staff must weigh the benefits against the potential decrease in user satisfaction (Anderson et al.).

Finally, in order to facilitate compliance of messages, the FS must first insure that current problems directly linked to the message are mitigated as best as possible (Anderson et al.). What this means is, if FS staff is educating against human created fire rings, and the HLOHVA is dotted with existing human created fire rings, then the message may likely be ineffective.

HLOHVA Educational Suggestions

It would appear that the most prominent means of education for the general user within the HLOHVA would be messages, maps, and brochures located at the large kiosk at the “T”. This message center will be a key way in which FS staff can communicate its desires and wishes with HLOHVA users. Other measures will surely be used (*i.e.* personal contacts, LEO, public meetings, etc.), but given the current workload, amount of staff, and FS budget, it appears that this display will be the FS best alternative.

The author suggests FS tactics to include a map, which shows preferred use site, sanitation facilities, and motorized and non-motorized routes. By doing so, the FS will influence use patterns, and sanitation issues. Second, the author suggests the FS provide brochures that supply the information stated previously, plus offer key messages that encourage proper behavior. These messages could focus on proper sanitation, off-route travel (especially in sensitive areas), respect of wildlife, respect for other users, and ways to mitigate site impacts (*i.e.* “Please camp only in designated sites.”).

Finally, as stated earlier in the section on “signs” it was expressed that non-motorized use amounts is unknown. If this use is substantial, and if the FS believes user conflicts are on the rise (also could be between hunter/fishermen v/s OHV users), then the author suggests providing material focus on reducing this conflict. Specifically, the author suggests using tactics described in the following paragraph.

Messages focusing on conflicts located on the main kiosk should display a message about similarities and tolerance toward other uses within the HLOHVA. Currently, educational displays generally target the establishments of behavioral norms, such as messages related to trail etiquette (Ramthun, 1995). However, research indicates that user conflict may be further reduced if messages state similarities between user groups, land needs of user groups, and behaviors and motivations of user groups (Ramthun, 1995). Thus, while trail etiquette signing is appropriate, use of messages promoting understanding and acceptance of different user group needs and motives should also be applied. If this is done, then there will be a potential decrease in the biased evaluations of other user groups (Ramthun, 1995).

Partnerships

As stated in the FS Management Directions (personal communications, 2005), the FS should encourage OHV groups to participate in an adopt-a-trail program. If done, the author feels it will become a major tool in maintaining signs, facilities, trails, and other general maintenance issues within the HLOHVA. In addition, contact with users could also be facilitated in this manner, thus extending the FS presence.

The benefit of using other groups as partners has already been realized within the HLOHVA with the design of an OHV reroute in the summer of 2004. The reroute, which would have been a time consuming project for FS personnel, was mostly finished in one day with the help of a local 4x4 group. However, this type of success with partnerships is not confined to the HLOHVA. In fact, Chavez and Knapp (2004) state that out of 307 R5 OHV FS managers, 38 percent use volunteer patrols, 32 percent use Adopt-A-Trail programs, and 31 percent use local groups to maintain trails.

This phenomenon is not just located in California either. Specifically, Kamas Ranger

District (Personal Communications, 2/23/05) located in Kamas, Utah uses a program called “Good Will Riders” developed by FS staff. This program facilitates an experience in which volunteers assist the FS with daily duties several times a week. Duties include making public contact, maintaining facilities and signs, and doing small labor, such as trail maintenance (crews go out by themselves, with FS volunteer vest, and FS radios).

Partnerships have also worked well in non-motorized areas. In fact FS staff on the Lassen National Forest has successfully used partnerships with several user groups. These include hiking clubs, homeowner associations, horsemen, and environmental organization. By creating partnerships the FS helps create relationships between themselves and locals within the community, a very important concept, and one that is widely supported. In addition, by creating partnerships, the FS is able to stretch its already thin budget.

Law Enforcement and FS contact

“ The purpose for using uniformed personnel as a deterrence and enforcement tactic is to control the character of visitor use to maintain acceptable resource and visitor experience conditions” (Anderson et al., p.108).

Throughout this paper the author has suggested several techniques in mitigating user impacts. Some have been direct, and obtrusive (*i.e.* barriers), and some indirect, and non-obtrusive (*i.e.* vehicle recommendations). However, one could suggest that, in most cases the impacts occurring within the HLOHVA are in some ways related to the lack of FS presence, directly or indirectly. This being the case, the author suggests that if any technique is expected to be successful in its mission, then the FS must dedicate itself to becoming a regular presence within the HLOHVA. Specifically, the FS must dedicate itself to insuring that staff with law enforcement ability is a regular presence within the HLOHVA, and that the staff is willing to confront violators.

The use of LEO or FPO within the HLOHVA may seem to contradict the author suggestion to only use positive messages, however, it is felt that the HLOHVA has stepped beyond the realm where education, signing, site designation, and barriers will mitigate all impacts to an acceptable level, thus the use of other direct techniques such as LEO and/or FPO is necessary. By doing so, the author feels that user satisfaction and perceived freedom will actually increase in the long run.

Specifically, the author suggests that FS staff ensure employees exist that have specific job duties that include the patrolling of HLOHVA. In addition, as stated by Kevin Walton (personal Communication, 2/17/05) OHV specialist for the Salt Lake Ranger District (SLRD); LEO, FPO, and the FS in general can be greatly assisted if they coordinate with other local law enforcement agencies (*i.e.* BLM, State Parks, Local Sheriffs, etc). In doing so, the FS and partner agencies can concentrate law enforcement efforts on high use days (*i.e.* holidays, hunting season, etc), thus allowing for more effective use of time, while at the same time showing the FS dedication in mitigating unacceptable behaviors.

As an example of the above suggestion, the SLRD teamed up with the Bureau of Land Management (BLM), State parks, and local law enforcement on a busy weekend, at a popular OHV location. Prior to the gathering, the FS published its intentions in the local paper, thus informing users of their intentions. During the gathering, Kevin Walton (personal communications, February 17, 2005) stated that over 100 citations were written. He went on to state that this type of activity seems very effective, especially in small communities, where word spreads fast (*i.e.* HLOHVA).

Recreation Related Impacts & Mitigation Techniques

Wherever there is use some type of impact will follow. This is true with all types of use, recreational use included. In addition, it matters not what kind of recreational use is occurring, be it non-motorized or motorized, impacts will surely occur. Within this section the author will review impacts associated with recreational use, both motorized and non-motorized. Where applicable, the author will make comparisons with the HLOHVA.

In order to fully understand recreational related impacts, the author will discuss the general patterns in which they may occur. Then impacts will be broke down into two sections, physical and social. Physical impacts (*i.e.* fire, soil compaction, erosion, vegetation loss, etc) will then be broken down into three sections: (1) use sites (impacts are mostly associated with previously impacted sites, since no new sites are recommended within the HLOHVA), (2) travel routes (impacts will be discussed on established routes as well as user created routes), and (3) water bodies. Following, social impacts (*i.e.* crowding, conflict, non-appropriate behavior, etc) will be covered, albeit more briefly than physical impacts. Finally, the author will briefly discuss general ways in which to mitigate impacts.

Impact Patterns

Just as users generally prefer the same use site characteristics, users generally impact areas in similar fashions (Manning, 1999; Hammitt & Cole, 1998). Besides concentrating around certain characteristics (*i.e.* shade, flat ground, etc), other impact patterns are attractive locations such as lakes and overlooks, and the decrease of impacts as one moves further away from the center of a use site (Hammitt & Cole, 1998). With this knowledge, it is assumed that areas with such characteristics may receive unproportional impacts, especially within the center of a use zone.

Impact patterns associated with coveted locations are well documented within the HLOHVA, since most impacts are located around scenic lakes (M. Nebel, personal communication, January, 2005). Further, the occurrence of impacts decreasing as one move away from the center is discussed throughout the paper, specifically when discussing the importance of fire ring placement. If placed in a proper location, such as a sufficient distance away from lakeshores, then impacts should concentrate around the ring, or in the center of the site.

Physical Impacts

Use sites. Hendee and Dawson (2002) state that there are three factors that influence impacts on use sites. They are: (a) the amount and frequency of use, (b) type and behavior of users, and (c) the environment and its durability. As stated by Hammitt and Cole (1998) use site impacts is a function of amount of sites and condition of sites. So, if use sites are increasing overtime (*i.e.* site pioneering) then impact problems will increase even if the original sites stay in the same condition (Hammitt & Cole, 1998). In addition, a new study by Cole and Monz (2003) backed up the much-researched issue (as noted in other sections) that states, impacts on lightly used sites and heavily used sites are somewhat similar, or, in other words, little use can create substantial impacts.

Further, as stated in previous sections users spend about 75% of their time within their use site (Hammitt & Cole, 1998). In addition, wilderness managers cite use site deterioration as their number one problem within wilderness areas (Hammitt & Cole, 1998). This being the case it should be apparent that use site impacts are very common, and can be very dramatic. The notable physical impacts on use sites is the loss of vegetation, amount of bare soil exposed, site

expansion, tree damage, fire associated impacts, and litter. In addition, other less obvious physical impacts also occur. These are soil compaction, increased soil density, reduced infiltration rates, decreased organic levels, changes in soil structure and stability, increase in non-native species, decrease in species richness, greater runoff, and increased erosion (Hammitt and Cole, 1998).

However, as stated earlier, the author will only discuss impacts generally associated with previously impacted sites, since the FS should design no new use sites within the HLOHVA. These impacts are generally site expansion, bare mineral soil exposure, and tree damage (Hammitt & Cole, 1998).

Site Expansion. Site expansion is the increase in disturbed area, generally caused by human activity, which expands from the original central location of a use site. Or as stated by Cole (as cited by Hendee & Dawson, 2002) the expansion of impacts can be referred to as spatial distribution. This distribution can be attributed to a parties' need for more space, attractiveness of adjacent areas, and amount of use received (Hammitt and Cole, 1998). It appears that expansions is most severe where large parties congregate (*i.e.* HLOHVA church group, outfitters, etc) and seek to set up tents somewhat away from others, establish separate eating areas, and seek areas to store equipment (Hammitt and Cole, 1998). In addition, Hammitt and Cole (1998) suggest OHV use leads to greater site expansion, since OHV users can carry in more gear, thus creating a larger use zone. Lastly, as explained by Cole (as cited by Hendee & Dawson, 2002) devegetated areas increase substantially from lightly use site too heavily used sites.

Another concern surrounding site expansion is the eventual lead to newly formed used sites, or satellite sites (Hammitt & Cole, 1998). Hammitt and Cole (1998) go on to say that satellite sites can create entirely new sites, or simply expand the original site. As one can surely see, site expansion can lead to major resource impacts, and possibly instigate the proliferation of impacts throughout a popular area.

However, there may indeed be ways to indirectly and directly control use site expansion. As suggested by researchers (as cited by Manning, 1999), outdoor recreationist generally prefer the same things when it comes to overnight use. These items are amount of shade, flatness, proximity to attractions (*i.e.* water, overlook, etc), proximity to sanitation facilities, and amount of privacy (Manning, 1999). Further the use of natural barriers can be

a used to prevent site expansion (Anderson et al.). Anderson and others (1998) go on to suggest that the direct management method of installing barriers may also work to militate against site expansion.

Within the HLOHVA, it is desired that FS staff take the time to pick the most appropriate use site that will curtail further expansion. Ways in which this can be done is by placing permanent fire rings in appropriate places, and trying to insure natural barriers exist in some manner, either to increase solitude or protect against expansion. Further, FS staff should choose sites with the desired attributes as mentioned above. Lastly, it is suggested by the author that FS staff install small barriers where deemed necessary. This is especially important in sites that are already extremely large, site directly adjacent to water bodies, and areas that have satellite sites in immediately surrounding areas.

Tree Damage. Tree damage within sites is an impact that should concern resource managers. The damage to tree can lead to an undesirable use site, and may increase the desire to create additional use site with more desirable attributes. In addition, it is the opinion of the author that previous tree damage may install the releaser-cue mechanism in some user, thus creating more damage, and the thought that this action is acceptable. To support this Gramann and Vander Stoep (1987) found that carving on picnic tables is encouraged when prior carvings are present.

Further, tree damage occurs in many use sites, and does not take high use to occur (Hendee & Dawson, 2002). David Cole (as cited by Hendee & Dawson, 2002) showed that tree damage occurs in 74 % of sites that receive light-use, and in 97% of sites that receive heavy- use. It would appear that tree damage results from users who are either willful violators, uninformed, or are unaware of the consequences of their actions.

Acts of tree damage include the trampling of seedlings which inhabits trees from establishing themselves, the removal of limbs, driving nails into trees, hacking trees, peeling bark, and felling trees (Hammit & Cole, 1998). In addition, some tree damage occurs inadvertently. These types of damage include scars from hanging lantern, and root exposure (serious concern since this can cause trees to be fell by high wind) caused by tying stock to close to trees (Hammit & Cole, 1998).

In the opinion of the author, it would appear that thy best way in which to mitigate this issue is through education, and communication. Within the HLOHVA this could be done through signing (*i.e.* Main Kiosk) and

face-to-face contacts with FS staff. In addition, FS staff may want to insure fire pits are well away from trees, and when damaged is noticed, such as nails in trees, some task is performed to remove this impact. In doing so, FS staff could potentially reduce future tree vandalism by minimizing the current amount present.

Bare Soil Exposure. Exposure of bare mineral soil comes from use within sites that depletes the area of duff and organic material (Hendee & Dawson 2002; Hammitt & Cole, 1998). It is the assumption of the author that within the HLOHVA this problem has already occurred in most of the use zones. However, it is also presumed that this will continue to occur with site expansion.

Soil exposure within use sites generally comes from foot, stock, or OHV travel. As diagramed by Manning (as cited by Hammitt & Cole, 1998) the beginning of this process is the removal of vegetation and duff, followed by the removal of the organic materials. Following, trampling leads to the compaction of the soil. This results in lower water infiltration rates, and increased bulk densities. This then creates a situation where water does not penetrate the soil in a natural manner, thus increasing the rate of erosion. Thus as one can see, bare soil exposure is created by some sort of trampling, and does more damage than simply expose soil.

Route Impacts

Unlike use sites, this section will briefly discuss impacts associated with designated travel routes, as well as user created routes, since this appears to be a more uncontrollable problem than the continued creation of users sites in designated areas (M. Reid & M. Williams, personal communication, September, 2004). In addition, this section will focus mainly on motorized travel routes. However, impacts associated with OHV can also be crossed over to non-motorized travel in some instances.

The greatest concern of impacts on designated travel routes is erosion. As with use sites, erosion is the effect of trampling, which in turn leads to devegetation, soil compaction, and decreased water permeability. However, unlike use sites, where non-motorized travel is the primary use and the ground is generally level, motorized routes receive their impact by knobby tires in combination with periodic steep inclines (Weaver & Dale, 1978; Hammitt & Cole, 1998). In addition, OHV tires act like cleats, which dislodge soil and vegetation rapidly,

thus creating an environment susceptible to erosion. The damage is compounded when OHV travel up steep or unstable slopes (Hammitt & Cole, 1998).

On travel routes, especially those associated with OHV use; there is also the issue of erosion becoming significantly worse, even with decreased use amounts (Hammitt & Cole, 1998). The reason behind this is that spinning tires create gullies, which act as waterways during periods of run-off. These waterways may continue to increase in depth and width, especially on steep slopes, and can even lead to decreased water quality (Weaver & Dale, 1978; Hammitt & Cole, 1998). In addition, as stated by Wilshire, Shipley, and Nakata (1978), OHV use can lead to erosion off travel routes as well. This occurs in two ways. First, channels can funnel water off trails, thus undercutting root systems. Second, wind erosion is accelerated due to the destabilization of soil, created by OHV use. Wilshire et al. (1978) go on to say that this type of impact can also lead to trail width expansion.

As with engineered routes, user created routes also have the same problem when discussing erosion (Erosion may be at accelerated rates, due to trail placement in poorly chosen locations). However, the other major concern with user created routes is damage done to vegetation (Wilshire et al.). One can see that both engineered routes and user created routes both damage vegetation, however, user created route damage is done without conscious thought of potential impacts to the area characteristics, soil, wildlife, water quality, and others users (*i.e.* visual and noise pollution). In addition, this damage is caused illegally.

Wilshire et al. state that the vegetation damage is both direct and indirect. Direct damage is the crushing and uprooting of plants (Wilshire et al.). Indirect effects are modification made to the soil, which in turn can lead to further damage, even off the travel route (Wilshire et al.). As noted earlier, devegateaion is just the beginning of the cycle. Following impacts can result in soil compaction, increased erosion, and introductions of exotic species (Hammitt & Cole, 1998; Hendee & Dawson, 2002; C. Calbourn, personal communication, September, 2004).

Water Bodies

Within the HLOHVA there are many lakes, meadows, and streams. Unfortunately, most users have established use sites directly adjacent to water bodies. Further, OHV travel on routes (both FS system & user created) are very close to water bodies, pass directly through meadows, and have many stream crossings (both dry & live). In addition, many culverts are in poor

working conditions, thus placing water in direct contact with OHV and users. Given this,

recreational use may have an inverse relationship with high water quality within the HLOHVA.

Hammitt and Cole (1998) state that there are four impacts generally associated with recreation and water impacts. These are: (a) bacterial contamination by fecal matter, (b) increased nutrients within water, (c) reduced dissolved oxygen, and (d) suspended solids (Hammitt & Cole, 1998). The first three will be discussed, but since suspended solids (*i.e.* litter, oil, etc) do not appear to be an issue within the HLOHVA, it will be omitted from discussion. As cited by Hammitt and Cole (1998) the presence of bacterial pollutants appears to be related to five phenomenon: (a) the number of users, (b) location of concentrated use, (c) number of use sites within watershed, (d) the frequency of use, and (e) the condition of facilities. By reviewing GIS maps (M. Nebel, personal communications, January, 2005), it would appear that many locations within the HLOHVA, such as Long Lake, Spring Valley Lake, and Campbell Lake (*i.e.* areas with high use, lots of sites, no sanitation facilities, and close to water bodies) may have potential sanitation issues during the summer months. This would be especially true for high use times such as holiday weekends, and hunting season. In addition, lower use areas may also be of concern (*i.e.* Saddle Lake, etc) since user sanitation disposal methods are sometimes inadequate (*i.e.* disposal of human feces and toilet paper to close to water, & not properly buried).

As noted sanitation practices within the HLOHVA leave much to be desired, thus leading the author to believe that bacterial contamination could become a problem. Currently, improper methods used with waste disposal within the HLOHVA, is allowing feces and toilet paper to simply remain above ground and/or close to bodies of water. Further, even if feces are properly disposed research suggest (as cited by Hendee and Dawson, 2002) that disposal of waste within cat-holes can also harbor active pathogens for over a year, no matter the environment. They go on to suggest that the proper disposal (*i.e.* cat-holes) can lead to disease transmission if too close to humans and/or water sources. Given this, the disposal of waste is a major concern to the FS when discussing impacts to water bodies within the HLOHVA. In support of these concerns, research states (as stated by Hammitt & Cole, 1998) that water contamination from human waste generally comes from indirect causes (*i.e.* erosion of contaminated soils), rather than direct causes (*i.e.* flushing directly into water).

In unison with the above statements, it is the author's opinion that water quality impacts from bacteria within the HLOHVA are generally indirect, meaning actions that effect water quality are generally on the shore or somewhere within the water shed, and not directly on or in the water itself. This thought is backed up by data provided by FS staff (personal communication, 2005) that documents feces and toilet paper lying on the ground, near water bodies, and in popular locations.

With no designated sanitation facilities within the HLOHVA users defecate wherever they please. This means that contaminated soil is not centralized, thus contaminating a potential larger amount of water (in relation to a pit privy which leaches in a specific spot). To add injury to insult, this problem is increased when user recreate, wash, clean fish, or launch small boats within water bodies, since these activities stir bottom sediment, the place where fecal matter potentially concentrates, thus allowing the sediment to spread (Hammitt & Cole, 1998).

Further, the HLOHVA is not just used by humans, but livestock as well. The author is not specifically aware of their travel and grazing area, but notes this also could be a potential source of bacterial contamination of water bodies (Hendee & Dawson, 2002; Hammitt & Cole, 1998).

In contrast to the above statements, research does suggest that bacterial contamination of water bodies doesn't seem to hang around for long, is insignificant even at high use areas, and may even decrease with the presence of humans since they scare away wildlife (Hammit & Cole, 1998). Further, it should be stated that research has little evidence to suggest recreational use is a major concern when discussing the contamination of water bodies by human produced bacteria's (Hammit & Cole, 1998). Although, the bulk of research has only studied surface water, thus, little is known about bacterial contamination within bottom sediment (Hammit & Cole, 1998). This may leave one to believe that the findings are incomplete, since many think that the concentration of organism's and nutrients are found within the bottom sediment.

When discussing nutrients levels within water bodies, Hammit and Cole (1998) suggest lakes within environments such as the HLOHVA are generally oligotrophic (young and clear) and very susceptible to even small amounts of added nutrients. They go on to say, "...campsite erosion and water contamination by campers are potential sources of nutrients in these systems" (p.97). Further, research conducted by Dickman and Dorais (as cited by Hammit & Cole, 1998) states that over a 20-year period, recreational use increased dramatically around high mountain lakes within a semi-wilderness area located in Gatineau Park, Quebec, Canada. Now the lakes in that area are some of the most eutrophic (old & murky) water bodies in North America, and this is directly linked to recreational use (*i.e.* trampling within use sites).

So, in unison with the above research, recreational use is believed to increase the nutrients level within water through erosion (Hammit & Cole, 1998). The main nutrients, which seem to enter the water, are nitrogen and phosphorus (Hammit & Cole, 1998). When these nutrients enter a water body, productivity of the water body is accelerated, leading to an increase in weed growth, and possibly algae blooms, and a potential change in the fish populations (Hammit & Cole). Essentially, what happens is the water body goes from being a young clear lake (*i.e.* oligotrophic), to an older, murkier lake (*i.e.* eutrophic).

As with erosion caused by trampling, it would appear that OHV use might lead to increased levels of nutrients entering water bodies as well. This would seem to be supported by research that indicates OHV use actually accelerates erosion, when compared to non-motorized travel modes (Hammit & Cole, 1998). Further, as stated earlier, streams pass through OHV routes and many culverts are in poor condition, thus potentially increasing pathways for nutrients to find their way into water bodies. Finally, it would appear that the channels created by OHV on travel routes would also lead to nutrients entering water bodies.

In the opinion of the author, the addition of added nutrients to lakes within the HLOHVA should be a major concern, one that matches that of sanitation, and off-road travel. This is especially true since current use sites are located directly adjacent to water bodies and OHV use occurs directly adjacent to water bodies. If not curtailed, impacts could potentially lower productivity of sport fish and create murkier waters, both of which could potentially impact user satisfaction, and the areas naturalness.

Since reduced dissolved oxygen levels are essentially related to the addition of nutrients they will be briefly discussed. If in fact lakes within the HLOHVA are receiving additional nutrients, then dissolved oxygen levels may begin to deplete (Hammit & Cole, 1998). This can have a dramatic effect on aquatic life, which is a major draw for users within HLOHVA. It is noted by Hammit and Cole (1998) that cold water fish like trout, which live in lakes within the HLOHVA, need a minimum of 6 to 7 parts per million of dissolved oxygen to survive. If dissolved oxygen levels are sufficiently depleted then species composition can change in insect, fish, and plant life (Hammit

& Cole, 1998).

Social Impacts

Social impacts are different than physical impacts in that they do not focus specifically on the resource, but on both the user and how the user effects and interprets the resource, and how users affect one another. A focus on users is a reoccurring theme throughout natural resource management (*i.e.* crowding, conflict management, user satisfaction, etc). In fact, the author would argue that the majority of recreation management falls under user management. This being the case, impacts to the user needs to be understood, in order to insure an acceptable management plan is designed.

Within the HLOHVA, it appears that social impacts are due to conflicts between users (both direct & indirect), and conflict with FS management techniques. In regards to crowding it appears that at this time little impact has arisen, thus it will not be discussed. Conflict between users is commonly between motorized and non-motorized groups, but could stem between different motorized user groups, or within exact user groups. In addition, this type of conflict is generally thought to be asymmetrical in nature, meaning it arises from one side only (Ramthun, 1995).

Luckily (in the case of conflict), use within the HLOHVA appears to be mainly motorized, thus mitigating conflicts between non-motorized use and motorized use. However, some conflicts may arise between mountain bikers, and OHV users. In addition, conflicts may also arise between non-motorized users within SPNM zones and motorized users who intrude into those areas (Public Scoping, personal communications, Spring 2005). Further, and as stated earlier, user conflict could also arise between similar users who are engaging in different activities, such as hunting, fishing, technical OHV use, bird watching, etc (Public Scoping, personal communications, Spring 2005).

Indirect conflict between users can be a little trickier in understanding. This is when a conflict arises when unacceptable behaviors are identified. This could be noise from OHV use, sightings of user created routes within sensitive areas, overly abundant fire rings, resource degradation, loud noises from other users, discharging of fire arms, and the presence of litter and/or human waste. When items such as those explained are experienced a user may feel negatively toward those deemed responsible, thus potentially generating a level of conflict. As Jacob and Schreyer suggest (as cited by Ramthun, 1995) this level of conflict could generate from a sense of goal interference, such as a desire for solitude, or a pristine setting.

Finally, conflict within the HLOHVA may stem from FS management practices. As experienced by the author, some user groups experience conflicts due to travel restrictions caused by technical routes (*i.e.* hunters). Others may feel conflict due to route expansion or closure (Public Scoping, personal communications, Spring 2005). Lastly, user may feel conflict with the FS due to the allowance of cattle, and/or specific regulations put in place to mitigate physical and/or social impacts.

Impact Mitigation Techniques

Impact mitigation techniques have been discussed throughout the paper, so they will only be briefly reviewed here. The techniques will fall in two categories, direct and indirect. Indirect techniques are those that "...attempt to influence the decision factors upon which visitors base their behavior" (Manning, 1999, p. 240). "Direct management tactics operate directly on visitor behavior and restrict behavior in some way" (Anderson et al., p.14).

Indirect techniques applied within the HLOHVA will generally be educational signage, improving camp areas (*i.e.* fire rings, sanitation facilities), development of non-motorized travel routes in backcountry camps, decrease of use sites within the HLOHVA, installment of use sites at the main access point ("T"), and limited route improvements. Further, other indirect techniques may be an attempt to build understanding of needs and motives between user groups, and the cleanup of unacceptable impacts.

The installment of fire rings, installment of sanitation facilities, and the development of trails within back-country camps can be classified as site harding (Hammit & Cole, 1998). By installing these types of facilities, FS staff is essentially concentrating impacts, thus decreasing overall impacts. Indirect management techniques deployed through signs is a way in which FS staff can educate users. Examples of this are proper trail etiquette, explanations of wildlife, proper sanitation disposal, mapping of camp areas and travel routes and possible attempts to bridge the understanding between different user groups.

Limiting back-country camp areas, designing overflow sites at the "T", not maintaining routes, and not increasing route mileage is an indirect way in which to limit access. By doing so the FS is limiting impacts, both physical and social. Further, by removing previous impacts (*i.e.* nails, site closure) FS staff will take away the potential they have in instigating further impacts. Finally, the FS may indirectly limit impacts by designating a new technical trail in a hardened area, thus decreasing impacts in areas suggested to be closed because of high impact levels (*i.e.* motorized access to Saddle Lake).

Direct management techniques used to mitigate impacts within the HLOHVA will be the use of rules and regulations, designated use sites, limits on groups size, limits on length of stay, travel restrictions, use of barriers and regulatory signs, presence of FS staff and LEO, and maintenance of routes as proposed by the FS in 2003 (*i.e.* route outslipping, stream crossing armoring, water barring, etc.). Many of these techniques are generally thought to be obtrusive (as cited by Anderson, et al.) and are specifically in place to reduce physical and social impacts.

Site Containment: Concentration, Dispersal, and the HLOHVA

“The containment strategy is an attempt to keep the number of sites relatively small” (Hendee & Dawson, 2002, p. 435).

“Over the years many techniques have been implemented to control impacts. ...the only successful approach has been a use concentration strategy-the “Designated Camp-site” system” (Hammit & Cole, 1998, p. 274)

“Containment can be accomplished either through regulation-by allowing camping only on designated sites-or through educations-by encouraging the use of existing campsites. Sites can either be clustered or dispersed” (Hendee & Dawson, 2002, p. 435).

The HLOHVA has experienced a growth in use as OHV popularity has risen. Combining this aspect with limited management creates an increase in the number of use sites. Use sites within the HLOHVA are mostly user created, vast in number, generally heavily impacted, and located in less than desirable locations. To mitigate this, the author suggests that FS staff develop a strategy to contain sites within the HLOHVA. This strategy should contain use to specified locations, reduce the total number of sites, minimize distance between sites in high use areas, and allow dispersal to continue throughout the entire area in previously impacted zones.

Sites located in areas that receive high use (*i.e.* Spring Valley Lake, Long Lake, and Campbell Lake) should be concentrated and contained, while lower use sites (*i.e.* Saddle Lake, etc.) should be contained yet somewhat spread out. By doing so, site numbers could be reduced, while allowing for solitude in low use areas. However, the above strategy may be unnecessary in very low use areas (SPNM zones). If the containment strategy is implemented in these areas, it could actually increase impacts (Hammit & Cole, 1998). The philosophy behind this thought is only relevant if use is so low that uncontained use will actually decrease impacts when compared to contained use (Hendee & Dawson, 2002).

Containment

Containment is a popular method used by resource managers to mitigate impacts where recreation use is occurring in high volume areas, or sensitive areas (Hendee & Dawson, 2002). Some suggest that containment is akin to “sacrificing” an area, but this presumption is false, especially in high use zones. The philosophy behind this is; any kind of use will create impacts, and without some containment the impacts may be far worse if allowed to disperse over an entire area (Hendee & Dawson, 2002). By containing sites, FS staff would essentially select desirable locations that can best handle use, while having characteristics similar to those sought by users. In doing so, FS staff will mitigate impacts by regulating or persuading users to use only specific sites, thus mitigating impacts caused by site pioneering, something that occurs with use dispersal.

As mentioned in an earlier quote, containment is done through regulations or education, and can be either concentrated or dispersed. In high use, non-wilderness areas, it appears that concentrated containment may be the best at mitigating impact. Although this method may decrease solitude, and potentially increase problems such as bear encounters, and waste disposal (Hendee & Dawson, 2002). Concentrated containment is the style suggested for high use areas within the HLOHVA. This method would concentrate sites within currently impacted areas, thus hopefully containing further impacts. However, in lower use areas, it appears that dispersed

containment is the method of choice (Hendee & Dawson, 2002). Dispersed containment is the allowing of use sites throughout an area, while designating or recommending exactly where the use occurs.

Concentrated use

When use levels reach a point that is considered heavy by resource managers, and it appears impacts are becoming or are unacceptable, then use sites need to be concentrated to mitigate impacts (Douglas, 2000). As stated by Hammitt and Cole (1998), there are three ways in which use sites can be concentrated: (a) distance between parties can be reduced without reducing the number of sites, (b) use can be concentrated on fewer sites (*i.e.* HLOHVA), and (c) use can be more concentrated in time. Out of the three, concentrating use on fewer sites is the most popular (Hammitt & Cole, 1998). By implementing this strategy impacts can be limited to selected areas, thus mitigating impacts to surrounding zones.

As stated the concentration of sites, especially in heavy use zones, is very important in mitigating impacts. This is especially true since users generally spend up to seventy-five percent of their time within campsites (Hammitt & Cole, 1998). Further, by pairing site harding (*i.e.* fire rings) with concentrated use; FS staff can mitigate the spread of impacts even further (Hammitt & Cole, 1998).

In addition, by selecting appropriate sites, impacts will not continue at an ever-increasing rate. This is true for two reasons. First, FS staff will have the chance to select appropriate site locations that are most resistant to further impacts. And second, as stated by Hammitt and Cole (1998), and Hendee and Dawson (2002), sites receiving relatively low use generally receive impacts quickly, with impacts tapering off after a relatively short period of time, even as use continues. Or, in other words, impacts usually level off after a relatively short time.

However, with all the benefits that comes with use concentration, comes the negative affect of a potential decrease in solitude. This should come as no surprise, since use sites will be concentrated together. In order to mitigate this, site characteristics and location must be very well thought out (Douglas, 2000). If not, the concentration of sites may not work, since users may continue to camp in undesignated sites, build a negative attitude toward management, and potentially form a disregard for regulations and suggestions (Douglas, 2000). However, another mitigation tool is also available, and this is the option to use other areas, something that the HLOHVA provides.

Dispersed use

Like concentration, dispersal of use can occur in three ways (Hammitt & Cole, 1998). First, use sites can be spread out with the same number of sites. Second, use sites can be increased in amount. And third, use can be spread out over time. Of the three mentioned, none are suggested in high use areas, such as the HLOHVA (Douglas, 2000; Hammitt & Cole, 1998). Further, the first two types of dispersal mentioned are generally considered to increase impact in most areas except those that receive very low use (Douglas, 2000; Hammitt & Cole, 1998; Hendee & Dawson, 2002).

However, dispersal is acceptable and even desired through another approach. This is spreading of use sites throughout an entire area, while maintaining a containment strategy (*i.e.* reduced number of sites, but designated) (Hendee & Dawson, 2002). This type of dispersal includes both clustered sites at high use areas and individual sites at low use areas. The reader must be aware that this type of suggestion does not encourage that any new site be designed, just that the current dispersal of previously impacted sites be maintained throughout the HLOHVA. Thus the only modification will be that some sites will be dismantled, and specific areas will be

designed with permanent fire rings. This type of dispersal will simultaneously disperse use, concentrate use, and contain impacts (Douglas, 2000).

Research by Spildie and others (as cited by Hendee & Dawson, 2002) studied this type of site dispersal within the Selway-Bitterroot Wilderness. In this area resource managers closed certain sites, required overnight use to stay in designated areas, and restored close sites and portions of open sites. By doing so, Spildie and others (as cited by Hendee & Dawson, 2002) found that disturbed areas decreased by 37% and bare areas were reduced by 43% in just five years. In addition, they expect that within two decades bare areas will be only 24 % and disturbed areas 36 % of what they had previously been. Further, it is felt by the author that this type of management will not only mitigate unacceptable impacts, but also maintain perceived freedom and user satisfaction.

Conclusion

Whether or not the author's strategies are taken, it is felt that the FS staff must take it upon themselves to set specific objectives for the HLOHVA which can guide future decisions after the Master Plan is complete, and after modifications to the area are made. As stated by Hammitt and Cole (1998), "...it is critical to set some objective limit on the types and amounts of change that are either desirable or acceptable" (p. 208). Such objectives could be designed in a style such as Limits of Acceptable Change (LAC).

Cole (as cited by Hammitt & Cole, 1998), states the LAC process begins with setting objectives, inventorying conditions (already done within the HLOHVA), and monitoring. Within the LAC concept, objectives can be measured with the use of indicators, or specific criteria (*i.e.* bare soil area) set by managers. The indicators could be analyzed through future monitoring, thus determining if current management action are working or if additional techniques are necessary.

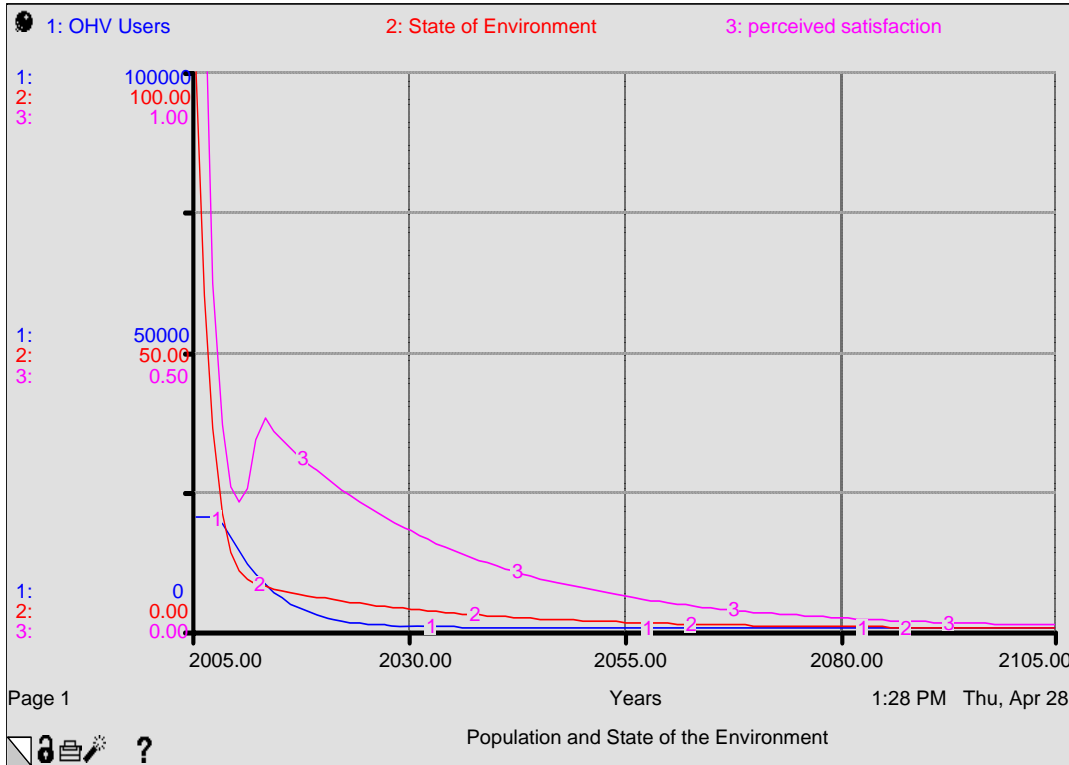
In addition, statements within the High Lakes Master Plan (personal communications, July, 2004) show SPNM areas may need to be considered for uses beyond SPNM guidelines. Although the author realizes some modifications may be necessary, it is suggested that FS staff try to mitigate changes to current zoning, specifically those designated as SPNM. This line of thought comes from the belief that through only slight modifications, such as suggested within this paper, FS staff can maintain and/or increase user satisfaction, and meet user demand with the current route and site system. If techniques are taken to minimize SPNM zones, FS staff must face the potential consequence of further motorized intrusion, increased user conflicts, and the further deterioration to the resource, all of which may negatively affect the majority of users and the resources associated with the HLOHVA.

Finally, and in review, the specific areas concentrated on within "Recreational Strategies for the High Lakes Off-Highway Vehicle Area" were: (a) recreation use sites and sanitation facilities, (b) routes, (c) signs and barriers, (d) length of stay and group size limits, (e) education, partnerships, and Forest Service presence, (f) recreation related impacts and mitigation techniques, and (g) site containment: concentration, dispersal, and the High Lakes area. Section one through five, detailed specific strategies, and focused mainly on direct management, while section six and seven documented research that specifically related to the HLOHVA, and/or supported strategies within the paper.

As stated in the first quote of the paper, direct management is necessary if impacts have reached an unacceptable level. In the opinion of the author, the HLOHVA has reached this point, thus strategies included are generally thought of as direct management techniques. By implementing these techniques, the author feels that resource conditions can be improved to acceptable levels, user satisfaction can be maintained and/or improved, and the diverse array of recreational opportunities can be preserved.

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Run

Run Specs.

Range Spec

erosion management

0.0 — 5.0

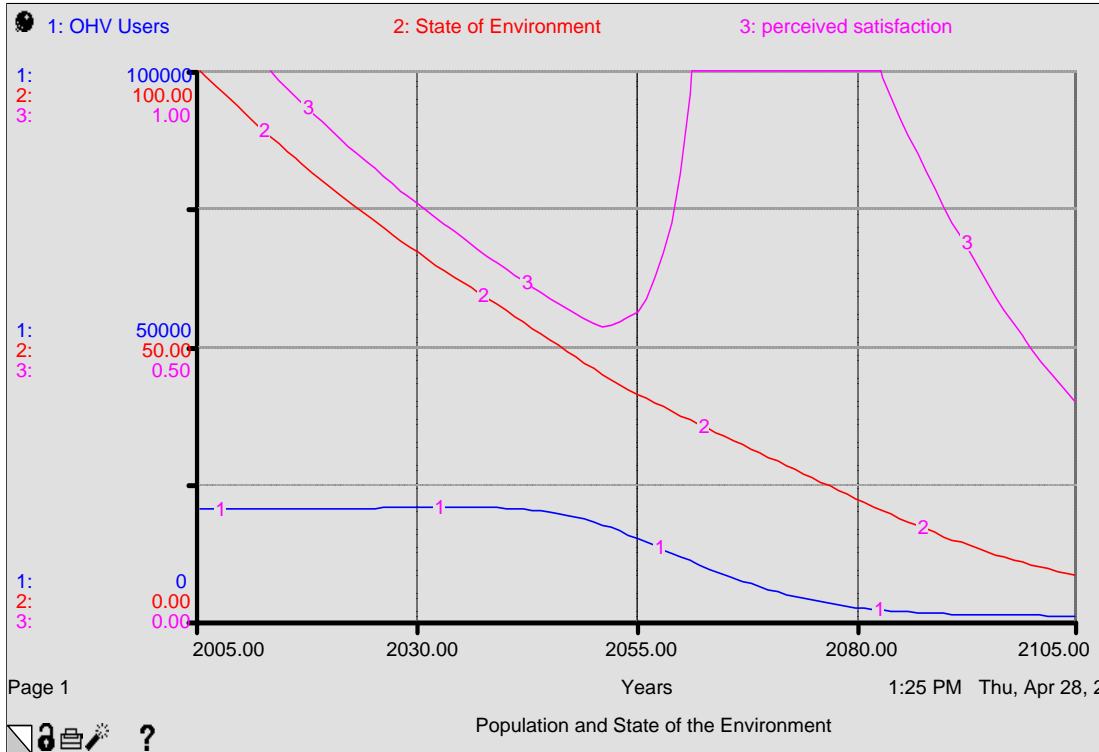
U ? 1.0

waste management

0.0 — 5.0

U ? 1.0

Jump to Model



Run

Run Specs.

Range Spec.

erosion management

0.0 ————— 5.0

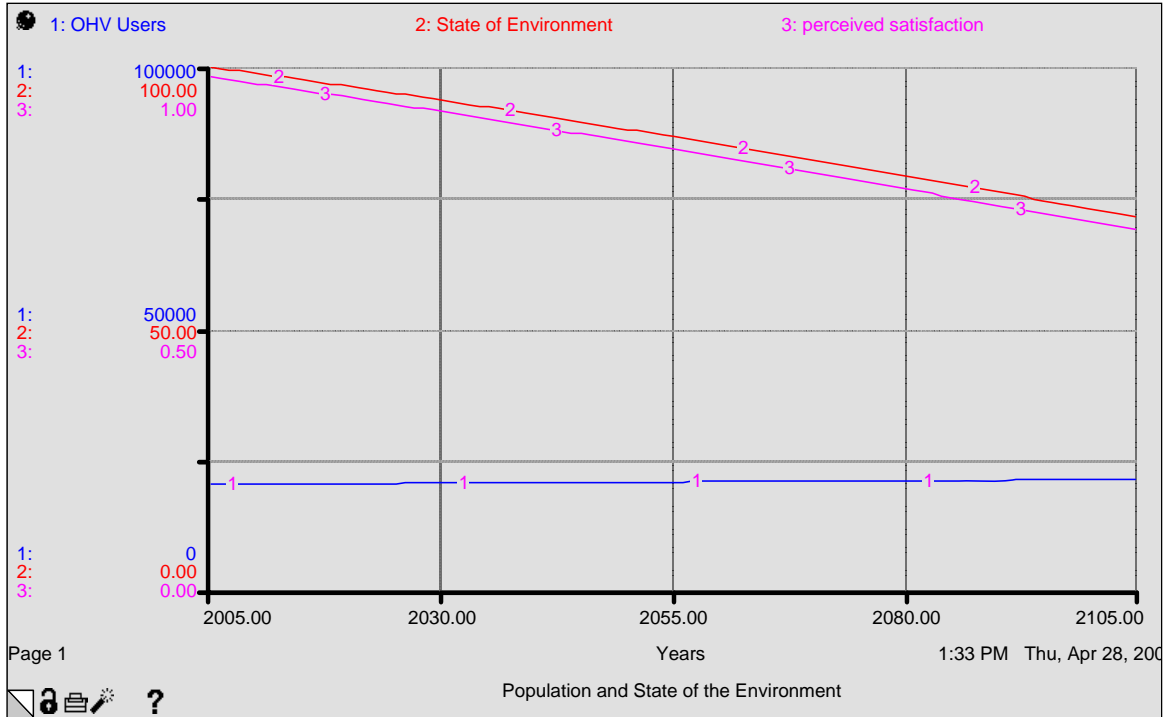
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waste management

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U ? 2.3

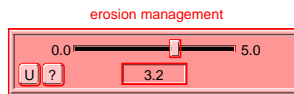
Jump to Model



Run

Run Specs...

Range Specs.



Jump to Model

OHV_Users(t) = OHV_Users(t - dt) + (change_in_users) * dt
 INIT OHV_Users = 20000

INFLOWS:

change_in_users = (change_rate*OHV_Users)+outside_impacts_on_user_changes
 State_of_Environment(t) = State_of_Environment(t - dt) + (environment_regeneration - damage_to_environment) * dt
 INIT State_of_Environment = 100

INFLOWS:

environment_regeneration = State_of_Environment/regeneration_time

OUTFLOWS:

damage_to_environment = (State_of_Environment*damage_fraction)*waste*erosion
 damage_fraction = normal_damage_fraction*effect_of_density_on_damage_fraction
 density = OHV_Users/land_area
 erosion_management = 1
 expected_satisfaction = 20
 initial_state_of_the_environment = 100
 land_area = 6000
 normal_damage_fraction = 1
 normal_density = 3
 normal_number_of_users = 15000
 normal_regeneration_time = 1
 outside_impacts_on_user_changes = recruitment_factor/user_management
 perceived_satisfaction = satisfaction/expected_satisfaction
 regeneration_time = normal_regeneration_time*effect_of_environment_on_regeneration_time
 satisfaction = State_of_Environment/(1+crowding*total_managerial_environment)
 total_managerial_environment = user_management+erosion_management
 waste_management = 1
 change_rate = GRAPH(State_of_Environment/initial_state_of_the_environment)
 (0.00, -0.2), (0.1, -0.166), (0.2, -0.126), (0.3, -0.086), (0.4, -0.05), (0.5, -0.014), (0.6, 0.00), (0.7, 0.00), (0.8, 0.00),
 (0.9, 0.00), (1, 0.00)
 crowding = GRAPH(density/normal_density)
 (0.5, 0.00), (0.65, 0.47), (0.8, 0.79), (0.95, 0.95), (1.10, 1.00), (1.25, 1.05), (1.40, 1.13), (1.55, 1.29), (1.70, 1.48),
 (1.85, 1.77), (2.00, 1.98)
 effect_of_density_on_damage_fraction = GRAPH(density/normal_density)
 (1.00, 1.00), (1.90, 1.00), (2.80, 1.00), (3.70, 1.00), (4.60, 1.00), (5.50, 1.00), (6.40, 1.00), (7.30, 1.00), (8.20, 1.00),
 (9.10, 1.00), (10.0, 1.00)
 effect_of_environment_on_regeneration_time = GRAPH(State_of_Environment/initial_state_of_the_environment)
 (0.00, 1.04), (0.1, 1.04), (0.2, 1.04), (0.3, 1.02), (0.4, 1.02), (0.5, 1.01), (0.6, 1.00), (0.7, 1.00), (0.8, 1.00), (0.9,
 1.00), (1, 1.00)
 erosion = GRAPH((OHV_Users/normal_number_of_users)/erosion_management)
 (0.00, 1.00), (0.2, 1.00), (0.4, 1.00), (0.6, 1.01), (0.8, 1.03), (1.00, 1.06), (1.20, 1.12), (1.40, 1.21), (1.60, 1.41),
 (1.80, 1.77), (2.00, 2.99)
 recruitment_factor = GRAPH(perceived_satisfaction)
 (0.00, 0.00), (0.1, 1.20), (0.2, 2.10), (0.3, 3.15), (0.4, 4.35), (0.5, 5.25), (0.6, 6.15), (0.7, 7.10), (0.8, 8.00), (0.9,
 8.55), (1, 9.70)
 user_management = GRAPH(density/normal_density)
 (0.00, 0.005), (0.2, 0.32), (0.4, 0.545), (0.6, 0.695), (0.8, 0.795), (1.00, 0.865), (1.20, 0.9), (1.40, 0.945), (1.60, 0.98),
 (1.80, 0.995), (2.00, 1.00)
 waste = GRAPH((OHV_Users/normal_number_of_users)/waste_management)
 (0.00, 1.00), (0.2, 1.00), (0.4, 1.00), (0.6, 1.01), (0.8, 1.03), (1.00, 1.06), (1.20, 1.12), (1.40, 1.22), (1.60, 1.41),
 (1.80, 1.77), (2.00, 2.99)

USFS Questionnaire Response
(All USFS staff responses are italicized)

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VII. Rangeland.....p. 97

VIII. Wildlife.....p. 101

Archeology

1. What are the current monitoring protocols for this area, and what are the findings?

Currently archaeological sites located within the High Lakes area are only monitored if there is a forest project that is occurring in the area. There currently is no money to do monitoring in this area that is not associated with forest projects. Monitoring that has occurred in the past has shown that the large petroglyph site (CA-PLU-35) is being damaged due to vandalism in the form of spray paint or new pounding on top of the glyphs to add a persons name or date. There is also garbage being left on the site such as broken beer bottles. The monitoring has also shown that there is natural degradation of the glyphs due to weather. Recent monitoring has also shown similar problems occurring on historic sites in High Lakes. Historic dams have been vandalized and there appears to have been recent efforts to fix some of the dams by pilling brush, logs and tarps over holes in the dams. Other sites have modern garbage dumped on them.

2. Are there any concerns related to arch management and the High Lakes?

A major concern of Heritage in relation to the High Lakes area is that most of the area has not been surveyed. The fear is that off road vehicles will leave the designated paths and in doing so damage undocumented archaeological sites. There is as high potential for more petroglyph sites and these sites are very fragile, if vehicles were to drive over them they would be destroyed. Other types of site would also be heavily impacted by vehicle traffic.

There is also the concern that any sites near routs or use areas will have a high likely hood of being looted or damaged since they are close to public access and are easy targets. Other damage could include camping on the sites that creates damage by building fire rings, digging latrines etc.

Since the majority of High Lakes has not been surveyed it is unknown how many sites are currently unrecorded. There is a concern that these sites may be receiving damage from human or natural causes.

The main roads into the High Lakes area are historic, some dating as far back as pre 1874. These have never been recorded. Prior to any road work the road must be evaluated for the National Register of Historic Places Register under the National Historic Preservation Act (NHPA) of 1966.

3. Are there issues with routes and/or use sites as they deal with arch sites?

See above answers

4. Where would archaeology like to introduce interpretive sites within the High Lakes area?

There are currently four interpretive possibilities in the High Lakes area.

The first is the road system itself. The main road going out past Morris Lake was built prior to 1874. It was built to access the Lott Mine that was located above Morris Lake. This gold mine was quite productive during the 1880's. The owner Judge Lott was a prominent figure in local history during the nineteenth century in Butte and Plumas counties. In fact his house in Oroville is currently a museum. It is believed that most of the other roads were constructed prior to 1920's. They were built for continued mining operations along with grazing and recreation.

The second possibility is the large well constructed ditch systems of the Lott Mine. These were built to collect snow run off for the mining operations, they were built in the 1870's-1880's. They are quite large several being around 1 mile long.

The third interpretive possibility is the numerous small rock and mortar / earthen dams in the High Lakes area. These dams were built in the 1930's by the state to improve fish stocks.

The last interpretive site is CA-PLU-35. This petroglyph site is a style 7 site, only 92 of sites with this style petroglyph have been recorded in California. Style 7 petroglyphs are thought to be contemporary with the Martis tradition of the Sierra Nevada. CA-PLU-35 is the most northern of the 92 sites within California. The age of the site is thought to range between 1300 and 5000 years before present

5. What approaches could be taken to mitigate arch site damage?

Site monitoring and public education are thought to be the best approaches to try and curtail site damage. Whenever there is a project in the area, sites will be monitored, however this is infrequent at best. The heritage shop would like to develop a site stewardship program to monitor CA-PLU-35 with the OHV clubs that use High Lakes. That would provide public outreach and the site would be monitored more frequently.

Any site damage that could be assigned to a particular person or group would have to be mitigated using ARPA. This would lead to the evaluation of the site for the National Register, or if the site has already been evaluated and is eligible for the register then it would mean data recovery.

Botany

Kirk,

Thanks, for sending me the questionnaire. As I told Liz earlier in the year, there has only been one day of surveying in the High Lakes area, ever, for TES plant species. This was a small OHV trail near Saddle Lake. Normally there have been past surveys in an area that will give me some idea of the conditions in an area, even if they are out of date. The High Lakes area is unusual in that there have never been any surveys to pull this information from and I'm not even sure I can give you an idea of what might be found in this area. I'm not sure what a recreation plan entails, but I personally know very little about this area, and plant surveys will have to be conducted especially if ground-disturbing activities come out of this plan. Until that time, I'm not sure how much information I will be able to provide to you about mitigations, currently conditions, etc.

Please feel free to phone with any questions.

Allison

Hydrology

I have listed below the points made in the High Lakes Master Plan (June, 2004) as they relate to the respected disciplines. Below each set of points I have posed questions in order to increase my knowledge of each disciplines issues, concerns, and mitigation approaches. If you are able, please answer the applicable questions in specific detail. If further information is needed, but not asked, please include it. In addition, if you feel the questions are not applicable, or repetitive, then do not answer them.

Hydrology & Soils:

The High Lakes Master Plan shows:

- There is a desire to develop water sources
- OHV use occurring in sensitive watersheds
- Stream diversion (trails turning into streams) have developed
- Approximately 17 stream crossings on established routes
- Plugged coverts throughout area
- Water on road potentially creating pollutants in water
- Impact in water quality due to OHV use
- Lack of adequate water dispersal systems on routes
- Lack of sanitation facilities within area
- Lack of proper signs for dispersed recreation sites to communicate proper waste removal, etc
- Monitor and take necessary actions to prevent damage to meadows and soils in the High Lakes Area
- Rehab areas with significant degradation caused by OHV use
- Close areas if necessary

Suggestions by hydrology w/in plan:

- Improvements (outsloping, armoring, signs, water bars, etc) on 6E11; 5E19 to intersection with 6E11 near Spring Valley Lk to Bear Lk; 6E05 to intersection of 6E11 up to Lott Mine; 6E08 from its intersection with 6E11 up to Morris Lake; 6E14, 6E16, 6E10 (loop)

Questions:

1. What are the current monitoring protocols for this area, and what are the findings?

The protocols that I'm aware of would be the OHV monitoring as mandated by the State OHV Commission and BMP monitoring through the Region 5 BMPEP (Best Management Practices Evaluation Program)

2. Are there any other concerns (not listed above) related to hydro/soil management and the High Lakes?

How do we deal/plan for increasing use in the area beyond existing. Is there a carrying capacity that should be established? What kinds of procedures need to be established to ensure on-going maintenance of facilities, including roads/trails? How can we provide for on-going education and enforcement? Need to educate people through signing and active management of the area.

3. Are there specific concerns with route location (i.e. to close to water, meadow, etc)?

Yes, especially the one route that parallels the lakeshore through a wet meadow. I'm sure there are others as well.

4. Should some routes be opened only seasonally?

Yes, the entire area should be open seasonally to prevent resource and road/trail damage during marginal periods. This is a common practice, but often difficult to enforce.

5. Should some routes be closed due to water issues?

If they can't be mitigated through improvements then they should be closed.

6. Does hydrology have concerns with use site locations?

Yes, both dispersed campsites and routes.

7. Does Hydrology have suggestions about area and location for sanitation facilities, and how many?

Yes, we have major concerns related to sanitation and pollution of surface waters and would be happy to work with all parties to improve facilities.

8. What are the specific soil related impacts that are occurring in the High Lakes area?

From what I've seen and heard we are getting areas of accelerated erosion, which is increasing sediment into surface waters and degrading aquatic resources and habitat. There are also impacts to sensitive wet meadows and lakeshore environments.

9. What specific areas (routes/sites), if any, should be closed or closely monitored due to soil degradation?

It seems the whole area should be monitored for resource impacts resulting from OHV and other uses. If impacts cannot be mitigated, then the route or dispersed site should be closed.

10. What specific approaches could be taken to mitigate future soil impacts?

Establish dispersed camping areas away from lakeshores. Close, improve or re-route problematic areas. Improve education and enforcement through signing and maintaining a presence in the area. Install and maintain sanitation facilities. Ensure proper trail/road maintenance.

11. Are we meeting S&G 103 in the Sierra Nevada Framework Project Amendment #2 Record of Decision (p. 63) to prevent disturbance from exceeding 20 percent of natural lake shorelines?

From what I've experienced, it's highly unlikely.

Lands

I have listed below the points made in the High Lakes Master Plan (June, 2004) as they relate to the respected disciplines. Below each set of points I have posed questions in order to increase my knowledge of each disciplines issues, concerns, and mitigation approaches. If you are able, please answer the applicable questions in specific detail. If further information is needed, but not asked, please include it. In addition, if you feel the questions are not applicable, or repetitive, then do not answer them.

The High Lakes Master Plan shows:

- Exchange lands with Plumas NF that are better accessed from Lassen National forest

Questions:

1. Any other issues with regard to the High Lakes and it management?

The Forest Service does not exchange lands with another national forest. We have changed the administration of parcels of lands because it makes sense due to distance or contiguous lands to a FS unit. We do have Lassen NF lands administered by the Plumas and the Shasta-Trinity NF has lands that are administered by the Lassen NF. We did not do an exchange to have that happen. Are there lands on the Plumas that would be more efficient for the Lassen to administer? Maybe you can make that determination in your analysis.

The private parcel at Spring Valley is owned by Sierra Pacific. I have this parcel slated to be acquired by the FS. It has a road going through this parcel that the FS has no legal access rights. If we acquire the parcel, I will not have to acquire a right-of-way.

The Lotts Lake parcel is owned by eight individuals as an undivided interest. The FS has not road right-of-way across this parcel by way of the existing road. The district is reestablishing the existing road that went around this parcel. The landowners do not want the public going across their property.

*Thanks Lois Charlton
Lands Officer
Lassen NF*

Law Enforcement

I have listed below the points made in the High Lakes Master Plan (June, 2004) as they relate to the respected disciplines. Below each set of points I have posed questions in order to increase my knowledge of each disciplines issues, concerns, and mitigation approaches. If you are able, please answer the applicable questions in specific detail. If further information is needed, but not asked, please include it. In addition, if you feel the questions are not applicable, or repetitive, then do not answer them.

Law Enforcement: (issues that may effect LE)

- Route may be closed seasonally/year round, or to certain travel types
- Routes may be converted to trails
- Possible introduction of certain use quotas, limited group size, etc.
- Motorized use in non- motorized zones
- Lack of signage
- Resource damage (user created spurs, off-road travel, down trees, etc)
- Recreation conflict
- Arch site protection
- Drinking and driving
- Hunting violations
- Safety issues
- Non- compliance with USFS and California state law
- Lack of FS presence in area

Questions:

1. What are the current monitoring protocols for this area, and what are the findings?
2. What thoughts, if any, do LEO have about instituting a new forest order to implement vehicle class/size restrictions, seasonal closures, and only using posted open routes for access?
3. What thoughts does LEO have on enforcing or controlling access, and keeping users on designated routes?
4. Are there any other concerns (not listed above) related to LE and the High Lakes?
5. What are the specific or most troubling/problematic concerns LE have within the High lakes area?
6. What specifically could be done to mitigate major issues that are affecting the High Lakes area?

The following responses reflect the experience of the ALRD LEO's in the High Lakes area. They were written by Scott Bell and reviewed by Patrol Captain Mike Zunino.

Question #1

LEO's make an assumption that "monitoring" is meant to mean "patrolling." If this assumption is correct, then there are no current protocols for monitoring the High Lakes. LEO's patrol the area as time permits. Usually, patrols occur on weekends, because higher use/activity has traditionally been observed on weekends. LEO's try to vary schedules, but most of the time spent in the area is during the day on Saturdays. It appears that many visitors recognize that most FS presence (LEO's and other FS employees) occurs during the day on Saturdays. This

recognition has lead to a belief that, at any other time, illicit activity is acceptable because violators will not be caught.

During the 2004 season, LEO's patrolled the High Lakes area on ATV's on only 2 or 3 days. LEO's drove (in their patrol vehicles) to the entry point to the High Lakes, generally thought to be the High Lakes "T" area, approximately a dozen times during the season. This method of patrol is not nearly as effective, due to the lack of contact with visitors within the High Lakes area.

Due to needs elsewhere on the district (i.e., higher use or problem areas where more of a presence is necessary) and the amount of time involved traveling to the High Lakes, LEO's are simply not able to spend a lot of time in the area. LEO's must triage the needs on the district, spending time in areas that have traditionally produced problems. Additionally, LEO's must react to other incidents and commitments as they arise on the district, forest, or even off forest. In these times of dwindling budgets, LE is not immune. The number of LEO's is not increasing, but decreasing at an alarming rate. The prospect is not good for the near future either.

LEO's realize that there are a growing number of LE issues in the High Lakes and there is a need to spend more time in the area. There seems to be a growing sense of anarchy, for lack of a better word, in the High Lakes. LEO's will continue to patrol the High Lakes area as time permits, but the use of aggressive FPO's will become more necessary.

"Findings" will be discussed in responses to other questions, mostly question #5.

Question #2

Vehicle Class/Size Restrictions

LEO's don't believe that there is a need to implement a forest order to restrict vehicles by class or size. The vast majority of vehicles encountered in the High Lakes are designed for the rugged use that the area demands. These vehicles include motorcycles, ATV's, buggies, jeeps, 4x4 trucks, etc. There are exceptions, however, where visitors choose to access the High Lakes area with vehicles not designed for the rugged conditions.

LEO's believe that visitors should not be restricted as to what class or size vehicle they may choose to bring to the area. Instead, the FS should adequately post the 2 entrances to the High Lakes, warning visitors that they are entering an OHV area and that travel is recommended for OHV's only. Visitors should be able to make their own choice at that point.

Seasonal Closures

LEO's have limited knowledge of the need for seasonal closures. The assumption is that a closure would be considered during part of the spring and fall, since these are the wet seasons when resource damage by vehicles is more likely to occur. LEO's patrol the High Lakes from July through September. Resource damage caused by vehicles is observed all season long, since there are numerous sensitive and meadow areas and much of the area can stay wet well into the summer. Another issue with a seasonal closure revolves around how the closure would be enforced. Generally, the High Lakes can only be accessed by FS vehicles from late spring/early summer until early fall. If prevention of resource damage is the driving force behind a seasonal closure concept, consider that there

are already sections under 36 CFR 261, Subpart A prohibiting resource damage.

Access on Posted Open Routes

There are currently 2 old forest orders (77-8 and 77-9) that restrict vehicle use to designated roads, trails, and routes only. There are many violations of these orders and probably numerous reasons, some of which follow. First, the routes and regulations are not adequately posted and signs are not maintained. Second, there is a need for sufficient barriers in numerous problem areas. Third, there has been a lack of enforcement. Fourth, while some visitors do respect the resources and others may not know that they are required to stay on designated roads, there is a contingency of “rogue” OHV users. These users either don’t care about damaging any resources or believe that they have the right to drive wherever they wish. Unfortunately, LEO’s observe that this attitude is on the increase, not only in the High Lakes, but over the rest of the district as well.

LEO’s believe that vehicles should be restricted, allowed only on designated roads, routes, trails, and areas. While the orders are certainly antiquated and should be rewritten as a 36 CFR 261, Subpart C regulation, this action should not occur at this time given likely changes in vehicle use management on NFS land. It seems that the direction the FS will take in managing vehicle use on NFS land will alleviate the need for any new forest orders in the High Lakes area.

Question #3

Controlling Access

LEO’s don’t believe that there is a need to actively restrict or control access to the area. That being said, LEO’s are unclear as to the desired level of difficulty of the routes in the High Lakes area. An assumption is made that, since an OHV management area is the topic of discussion, the routes should be somewhat challenging. An issue arose with an event that occurred some 5 years ago, the Storrie Fire. LEO’s understand that, in order to facilitate fire suppression activities, heavy equipment was brought into the High Lakes area to improve the routes. It is unclear to LEO’s whether the routes were rehabilitated to the state that they were in prior to the fire. If not, then visitors may have become accustomed to the “easier” conditions.

There are areas where new routes have been created due to vehicles circumventing the main route. LEO’s believe that this problem occurs because the main route is too rough and challenging. It is apparent that most visitors are creating and using these new routes, not just those with inferior vehicles that are not designed for the conditions. Visitors are either accustomed to encountering or simply want easier routes.

The FS should determine the desired level of difficulty at which the routes should be maintained. Should the routes be tough and challenging for the OHV users or should they be easier, allowing access to more visitors? Since this area is an OHV area, LEO’s believe in the former strategy. In choosing this strategy, the FS would be passively or indirectly controlling/restricting access to the area. Most vehicle use, except those with rugged OHV’s, would not be able to access the area. Of course, routes would have to be continuously monitored to assure that no unauthorized work is being performed (i.e., routes are being made easier). Corrective actions would need to be taken to return routes to the desired condition if unauthorized work is performed.

Restricting Users to Designated Routes

The issue of keeping vehicles on designated routes really opens up a plethora of concerns and problems. First, signing, both at trailheads and along routes, should be adequate. That is, signs should be installed properly and maintained. The maintenance of signs is, more often than not, neglected. Signs and other FS property are damaged, destroyed, and removed by visitors and naturally deteriorate over time, so it’s not good enough to put something up and never check it again.

Second, visitor education should be increased. This task can be accomplished through signing, contacts with High Lakes visitors by FS personnel, and the use of clubs to relay information to other visitors, to name a few.

Third, place barriers in problem or potential problem areas. This action will probably be the most difficult to

accomplish due to high expenses. There are numerous problem areas where barriers should be placed. LEO's strongly recommend the use of very large boulders that cannot be moved with winches, chains, or ropes, but only by heavy equipment. The placement of small rocks and trees along the sides of routes is not an effective means of deterrence.

Fourth, an increase in the presence of FS personnel, specifically LEO's and FPO's that are aggressive and have the fortitude to take action with visitors that are in violation. As discussed in the response to Question #1, there has been a lack of enforcement in the area for some time. The High Lakes are quickly becoming more of a problem area on the district. In a perfect world, during the high use season, there would be some type of enforcement in the area on holidays, every weekend day, and many weekdays as well.

The FS must first determine the importance of this issue. If it is deemed important (and to reiterate, LEO's feel that it is), then the agency must realize what a huge investment it will take to accomplish this task. In order to be done correctly, a large commitment in time, personnel, and money must be made.

Question #4

All concerns have either been or will be discussed in the responses to other questions.

Question #5

Incidents, Violations, and Public Safety Concerns

LEO's encounter numerous incidents, problems, and violations in the High Lakes area. All incidents, problems, and violations are documented with either an Incident Report or a Violation Notice. Some of these problems and incidents, which are not so different from those seen around the rest of the district, are listed as follows (not all-inclusive and not in any particular order of importance):

- Fire violations - discharging of fireworks, abandoned campfires, etc.
- OHV violations - Registration, passengers/no helmets on ATV's, resource damage caused by vehicles, operating vehicles off of routes, removal of intentionally placed obstructions, open containers of alcohol in vehicles, etc.
- Resource damage - cutting/damaging green trees, creating new routes, etc.
- Drug possession/use.
- Cultivation of marijuana.
- Excessive alcohol use – which, of course, leads to many other issues.
- Minors in possession of alcohol.
- Groups making unreasonably loud noise.
- Illegal discharging of firearms - shooting over water, roads, trails, within 150 yards of an occupied area, etc.
- Littering - in and out of lakes and streams.
- Fishing and hunting violations.
- Abandoned property – mostly vehicles.
- Stranded visitors and vehicles.
- Search and rescue operations (including one known fatality in the past 4 years).

LEO's are aware of the presence of archeological sites in the area, but do not know if these sites have sustained any damage. Some visitors are aware of the sites.

Several of the concerns/problems listed above are obvious public safety issues. Specifically, the cultivation of marijuana, excessive use of alcohol (whether in or out of a vehicle), and illegal discharge of firearms are concerns that would have the most significant and immediate threat to public safety. Drug possession/use and minors in possession of alcohol could present public safety concerns given the right context.

User Conflicts

Although there are numerous user groups (OHV, horse, mountain bike, hikers, backpackers, fishermen, hunters, ranchers, etc.) that visit the High Lakes and a potential exists for conflict, LEO's are not aware of a large problem with conflicts between/amongst groups. However, there have been conflicts between some users and some of the owners of the property surrounding Lotts Lake. Most of the conflict involves visitors trespassing onto the private property, feeling they have the right to be there, when the property owners do not want them on their property.

Question #6

Creation of a Riding Area

It has been suggested (mostly by visitors) that a riding area be opened to vehicle use. LEO's are unclear as to the exact name of the area, but believe it to be adjacent to a location along the main route referred to as "the devil's staircase." This particular area is a rocky hill, devoid of any vegetation. It has been a traditional riding area, even though it is off of the designated route, by visitors because it provides challenges for the OHV users.

The benefits to opening this area to OHV use are two-fold. First, it would provide users the challenging opportunity that they desire. Second, the use would occur in an area that is already being used and exhibits resource damage. The FS would not have to spend money to rehab (which might be cost-prohibitive in this case) the area, which might be considered a "sacrifice" spot for OHV use. Even if the FS rehabbed the area, LEO's believe that visitors may still attempt to use the area due to their traditional use. Old habits die hard!

While LEO's realize the requirement for a NEPA-type review prior to opening an area like this one up to vehicle use, they are not against the idea of a designated riding area due to the possible benefits for both parties involved.

Conclusions

Other solutions that could mitigate major issues affecting the High Lakes have already been discussed, mostly in Question #3. As previously stated, the first step is the commitment (i.e., time, personnel, and money) of the agency to deal with these issues. Money is always the biggest roadblock in anything that the FS does. However, without a strong commitment, LEO's believe that any management strategy designed for the High Lakes is almost sure to fail.

The biggest impact that the agency can make is to effectively educate High Lakes users (through signing and direct contact), control where users operate their vehicles (with the use of barriers), and show an increased and consistent enforcement presence in the area (prevention is always the best medicine, as the saying goes).

LEO's believe that, by following the mitigation measures discussed in these responses, there would be a dramatic decrease in the number of problems (both in terms of public safety and resource damage) in the High Lakes area. LE is committed to continuing to work with other FS staff in finding solutions to the problems faced in the High Lakes and on the rest of the district.

Minerals

I have listed below the points made in the High Lakes Master Plan (June, 2004) as they relate to the respected disciplines. Below each set of points I have posed questions in order to increase my knowledge of each disciplines issues, concerns, and mitigation approaches. If you are able, please answer the applicable questions in specific detail. If further information is needed, but not asked, please include it. In addition, if you feel the questions are not applicable, or repetitive, then do not answer them.

Minerals:

The High Lakes Master Plan shows:

- No major mining in area
- If occurs, insure prospecting and mining operations must be fully reclaimed upon completion
- Operations are consistent with semi-primitive area, protect wildlife values, and maintain water qualities

Questions:

1. What are the current monitoring protocols for this area, and what are the findings? *Kirk, currently we do not have a monitoring protocol for the minerals resource in the High Lakes area.*
2. Any other concerns (not listed above) related with minerals in the High Lakes area? *See below.*
3. Any issues with recreation as related to mining and prospecting?
Currently there are three active mining plans within the township around the High lakes. There are several abandoned mining claims within the high lakes area. Currently these sites are posted as abandoned. Generally mining activities can be consistent with semi primitive setting. However, unauthorized use may conflict with the current route designations (miners may travel off of the existing routes to access claims).

Existing Mining claims:

Little Johnny 1 – located at T25 N., R5 E, section 20

Little Johnny 2 – same Township, Range and section

Mad Dog Mining Assoc. – located at T25N., R5E., section 32.

Rangeland

The High Lakes Master Plan shows:

- Concern w/cattle drifting outside allotment

Cattle drift outside the Murphy Hill Allotment has not been an issue in recent years but there are notes from the 1970s and 1980's indicating there may have been drift problems in the Jones Meadow area. Cattle drift out of the Coon Hollow Allotment, which lies to the north is an issue however, but this drift mainly occurs to the west and the Philbrook area. The two allotments are run by different permittees. The Murphy Hill cattle (approximately 50 head) have bells and are moved through the allotment by riders who stay at the cabin and various other camps. The allotment has a late start date (7/1) and the permittees often delay turnout longer if needed depending on snow conditions. Cattle are unloaded in an area above the cabin near Henry's Flat, and placed in the fenced meadow for a few days, along with some horses. The cattle are then moved to the Grassy Flat area, and then up to Bear Lake and the higher country where they remain until they are brought back at the end of the season.

- Issue with cabin

Gerald Bryson, permittee of the Murphy Hill Allotment, was asked in a conversation with the District rangeland management specialist in 1999 regarding this cabin, also known as the Tin Shack. In this conversation, Gerald indicated that it was owned and used by them but there was no documentation of ownership or permitted use for this cabin, outhouse, and shed. The Bryson's were asked to submit any documentation indicating either ownership or authorization to build and use this cabin and associated structures, but no response was received and no further action was taken. The Bryson's are responsible for maintaining the barbed wire let-down fence, which they put up and take down each year.

- Issue of cattle and impacts to recreation sites

No information was found in the allotment file regarding this issue. In 2003, I met some people at Spring Valley Lake who said the "cattle have always been in this area, they had been there "as long as they could remember" and they knew the permittees family. The cattle in the Henry's Flat area can be easily heard since they have bells.

- Impact of cattle on resource

Cattle use some of the trails, which appear to be getting wider and rockier due to erosion and OHV tracks. Cattle sign is evident along trails in areas near small seeps and streams and meadows, such as near Grassy Flat. There could be questions regarding (drinking) water quality. There could also be some cumulative effects to trails and soils from cattle use. Portions of the allotment burned during the Storrie Fire, including the Murphy Flat and Murphy Lake areas, have not been assessed with regards to grazing. California Red-Legged Frogs are an issue for the allotment, but the management recommendations suggested are to continue to complete monitoring to improve compliance with standards and guidelines for riparian habitats.

- Upcoming NEPA for permit re-issuance

The NEPA schedule for allotments on the Lassen has been revised many times. The NEPA for all active allotments needs to be completed by 2010 or as soon as possible. The Murphy Hill Allotment was about last on the list, but it will likely be moved up so that analysis can be coordinated with the High Lakes analysis.

Questions:

1. Are there any other concerns (not listed above) related to range management and the High Lakes?

Some concerns not listed could include:

- *Potential livestock/OHV safety issues.*
- *Trail erosion, creating new routes (for example the trail off 25N04 down the steep hill to the cabin, used by cattle and OHV)*
- *Meadow damage, potential for OHV's tearing up, camping in meadows used by cattle. Potential for soil compaction and tracks, and damage, crushing and tearing of vegetation.*
- *Cattle harassment/chasing cattle (scattering horses/cattle, hindering gathering efforts, etc.)*
- *Potential of vandalizing range improvements (fenced meadow, cabin, loading area at top of hill above cabin)*

1. Any concerns with OHV and other recreation use, which are directly linked to grazing within High Lakes area?

- *Weed spread by OHV and cattle could be a concern.*

2. What approaches could be taken, if any, to mitigate problems with regards to grazing and recreation.

Information posted at trailheads, handouts etc. could include things such as:

- *Water quality (bring or filter drinking water)*
- *Dispersed camp areas available should not show key areas or camps used by permittees.*
- *Block off meadows to OHV use if damage starts to occur.*
- *Use of weed free hay*
- *“Do not disturb” or “close the gate” signs for the fence and cabin near Henry’s Flat.*
- *Restoration of gullies, trail ruts etc.*

3. Have we done any monitoring of range condition and utilization? If so, what are the findings?

Trend studies have been established on the allotment, although the studies need to be re-sampled and some need to be relocated (such as the Lotts Lake site, not used by cattle), and the methodology needs to be updated to Regional standards. Existing information on condition and trend contained in the Murphy Hill Allotment files is as follows:

Murphy Hill Allotment Condition and Trend Ratings (Vegetation/Soil)

**Map
Ref.**

Trend Study Name

1976 1970

1969

1967

1965

1964

1960 a C118 Henrys Flat Good/

Good Good/

Good Good/

Good Good/

Good b C16A Grassy Flat Good/

Fair c C120 Brown’s Ravine Good/

Good Good/

Good d C1 Grassy Lake Good/

Fair Fair/

Fair 119 Lotts Lake Very
 Poor/
 Fair

Utilization measurements have been conducted at key areas established on the Murphy Hill Allotment. The key areas are listed below and shown on maps included with the Annual Operating Instructions. Following is a summary of utilization information contained in the Murphy Hill Allotment files:

Murphy Hill Allotment Utilization Record

Map

Ref.

Key Area Name

2004 2003

2002

2001

2000

1999 a Henrys Flat 23% 21% 35% 58% b Grassy Flat 24% 35% 30% 35% c Browns Ravine/ Dresser d
 Grassy Lake 32% e Tin Shack Meadow 18% 40% Road 6E14 Meadow 48% 20% Campbell Lake 25%
 Meadow along road 6E11 22%

4. Are we meeting Standards and Guidelines?

- *Although utilization has not been monitored at all key areas annually, with the exception of Henry's Flat (partially private) in 1999 and the Meadow along road 6E14 (not sure of location) in 2001, the key areas sampled on the Murphy Hill Allotment have remained within standards by the end of the season. The standards for riparian vegetation are currently 45%. In order to implement the January 21, 2004, Record of Decision (ROD) for the Sierra Nevada Forest Plan Amendment, it is expected that Lassen term grazing permits will be modified in 2005 to incorporate new, additional standards and guidelines.*

Wildlife

I have listed below the points made in the High Lakes Master Plan (June, 2004) as they relate to the respected disciplines. Below each set of points I have posed questions in order to increase my knowledge of each disciplines issues, concerns, and mitigation approaches. If you are able, please answer the applicable questions in specific detail. If further information is needed, but not asked, please include it. In addition, if you feel the questions are not applicable, or repetitive, then do not answer them.

Wildlife:

The High Lakes Master Plan shows:

- Summer use by buck's mountain deer herd
- Uncommon but expected wildlife are: marten, red fox, wolverine, spotted owl, and goshawk
- Spotted Owl habitat area (1), and Goshawk area (2)
- Provide high habitat capabilities for harvest species and other species with low levels of tolerance to human activities
- Let natural vegetation succession occur, unless other treatments needed for wildlife/fish
- Develop water if desired and feasible
- Use prescribe fires when appropriate for vegetation treatment
- Allow for acceptable densities of down logs
- Maintain current snag guidelines until high habitat capabilities are met

Questions:

1. What are the current monitoring protocols for this area, and what are the findings?
None related to wildlife unless a specific project affects habitat for TES species.
2. Are there any other concerns (not listed above) related to wildlife management and the High Lakes?
OHV use and the effects to vegetation, primarily around lakeshores and riparian vegetation as a whole.
3. Are there problems with trail and/or site location as related to wildlife habitat? *None are known however no specific surveys (including habitat monitoring) have been conducted in the high lakes area.*
4. Is there a problem with encroachment on habitat created by user trails? If so where? *None are known however no specific surveys (including habitat monitoring) have been conducted in the high lakes area.*
5. Are there problems with hunting, or any other concerns with wildlife in relation to recreational use?
None have been identified at this time.
6. What approaches would you suggest to decrease wildlife disturbances or maintain wildlife populations? *Limitations on the size of organized activities. Limits on the number and size of defined campsites. Fieldwork is necessary to provide a more specific list.*
7. Have we assessed habitat effectiveness against 1993 LRMP Standard and Guideline 5-a-6 regarding road density? *Not that I know of.*