

HARVEY MONROE HALL RESEARCH NATURAL AREA MANAGEMENT PLAN

Wallace B. Woolfenden

Mono Lake Ranger District
Inyo National Forest

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I. POLICY

Research Natural Areas (RNAs) are part of a national network of ecological areas designated in perpetuity for research, education, and maintenance of biological diversity. They are established for conserving representatives of all ecosystems on National Forest land, conserving genetic diversity, providing opportunities for research in unmanipulated habitats, providing onsite educational opportunities, and to serve as controls to compare the effects of human manipulations in similar settings. (adapted from USDA Forest Service, Pacific Southwest Region 1990) The Forest Service recognizes their role in sound land use management and has provided for their establishment and management in FSM 4063. In summary, the basic policy is that Research Natural Areas may be used only for research, study, observation, monitoring, and those educational activities that maintain unmodified conditions (FSM 4063.03).

II. HISTORY AND BASIS FOR DEDICATION

The accessibility, high biodiversity, and relatively undisturbed condition of the Harvey Monroe Hall Research Natural Area (HRNA) have made it ideal for a research area. It was one of the the first RNAs to be established. The credit goes to Dr. H. M. Hall of the Carnegie Institution of Washington, who proposed such a research area in 1931 "where natural conditions will be preserved virtually free from disturbances excepting those necessary for the prosecution of scientific research" (Clausen 1969:1). Forester R. Y. Stuart (the title is now Chief of the Forest Service) approved the classification as a Natural Area on January 6, 1933.

One month following approval the Forest Service and the Carnegie Institution executed an unprecedented Cooperative Agreement permitting the Institution to conduct scientific research in the HRNA. The agreement specified the purpose for use and a set of conditions which are comparable to the management objectives and guidelines now being developed for the management plan except for one condition: the Carnegie agreement allowed changes in soil and vegetation cover and structures, improvements, and installations "required in the conduct of the research".

Under the agreement, the Carnegie Institution, based at their Timberline Experiment Station in the HRNA, conducted research there until 1971 or 1972 (M. Nobs, personal communication), although the Agreement has never been terminated. Research activities carried out by other institutions were reviewed by Carnegie as a condition for using their Timberline station. In developing the current management plan it became clear that the Agreement with Carnegie needed to be revised, and this is dicussed further in Section V.L. Since 1989 all research applications are reviewed and approved by the Forest Service-- the Inyo National Forest, the Region, and Pacific Southwest Research Station.

Between 1929 and 1970 the principal research effort focused on genecology, using transplant experiments to analyze morphological changes in plant species grown at several elevations and latitudes. This classic research plus the numerous studies in population genetics, plant autecology, synecology, pollination ecology, phenology, and systematics, population dynamics, behavioral ecology, adaptation, and distribution of rodents, birds, and trout,

glaciology and acidic deposition in streams and lakes during the past four decades have given the HRNA an international reputation. Some of the major California botanists cooperated in research at Timberline, notably the "Big Three", Jens C. Clausen, William M. Hiesey, and David D. Keck.

In retrospect, the basis for establishment is to preserve the integrity of what now has been identified as the four target elements: alpine meadows, subalpine meadows, Sierran mixed subalpine forest, and alpine fell fields.

III. MANAGEMENT OBJECTIVES

The HRNA will be managed according to the direction in FSM 4063.3 and the RNA Management Prescription (#5) in the Inyo National Forest Land and Resource Management Plan (1988:119) which stipulate that the basic objectives and purposes of establishing the area must be supported and promoted. Primary among these is the maintenance of the ecological integrity of target and natural ecological processes. Management actions and scientific research will be consistent with these objectives.

The HRNA was established before RNA Establishment Records were designed; instead the Forester (now Chief) signed the approval of the HRNA report "on atlas size sheet" in 1933. The record of classification, signed by the Forest Supervisor, W. M. Maule, on May 6, 1932, presents a "Plan of Administration" containing a list of management considerations which will be discussed below in section V. Therefore, no specific objectives had been written for the HRNA, until the draft of this plan.

The basic management objectives for the HRNA (as modified from FSM 4063.02) are to:

1. Preserve the ecological integrity of the four target elements in the area (alpine and subalpine meadows, subalpine mixed conifer forest, alpine fell fields), and maintain opportunities for natural processes of succession, climatic change, and evolution.
2. Preserve and maintain the genetic diversity of native plant and animal populations in the HRNA.
3. Provide a reference area for the nonmanipulative study of evolution, succession, population dynamics and other ecosystem processes; a baseline area for measuring long-term ecological changes and responses of ecosystems to climate change; and as a control area for comparing results from manipulative research and effects of resource management techniques and practices.
4. Provide onsite and extension educational activities.

Several features unique to the HRNA (Distinctive Features as listed in Keeler-Wolf 1990:133) have been identified. One is its historic significance. The classic studies on

genotype-environment interactions conducted by the Carnegie Institute may qualify the Carnegie facilities as a historic property eligible for listing on the National Register of Historic Places under the Science theme. The facilities include one of the two original transplant gardens and the cabin built in 1929 (Carnegie Institution, 1945).

The other features highlight the singular research opportunities of the HRNA. The floristic and vegetational diversity is high: Taylor (1984) and Keeler-Wolf (1990) have identified 398 taxa of vascular plants composing 66 plant associations. Included are five rare plants on CNPS list 1 and 2. Three glaciers, including the 160 acre (64 ha) Conness Glacier, feed the eight perennial streams in eight watersheds and the 15 lakes on both metamorphic and granitic substrates (Taylor 1984; Keeler-Wolf 1990). Scenic value and easy access to the public have subjected the HRNA to quite heavy recreational use, despite attempts to discourage such use.

Both the major issues of the plan and the concerns expressed by those scientists with active research interests in the HRNA focus on a sustained balance between research needs and environmental integrity while restricting public recreational use.

The plan will be implemented through the monitoring plan and specific management actions. Management actions which may be appealable and needing decisions through the NEPA and Section 106 processes are identified below.

IV. DESCRIPTION OF THE HARVEY MONROE HALL RESEARCH NATURAL AREA

A. General Description.

Adequate descriptions of the area have been given in Taylor (1984) and Keeler-Wolf (1990:134-135); a summary is presented here. The HRNA encompasses about 3,883 acres (1571 ha) of alpine and subalpine plant communities on the crest of the Sierra Nevada, adjacent to Yosemite National Park. It occupies all or portions of sections 34 and 35, T2N., R24E. and sections 1,2,3,10,11,12,13, and 14, T.1N., R.24E., MDBM (37°58'N., 119°18'W.)(USGS 7.5' topographic map of Tuolumne Meadows NE, California). The area lies completely within the precipitous eastern escarpment of the range with a vertical relief of 2790 ft (850 m), from about 9800 ft (2987 m) at Slate Creek to 12,590 ft (3837 m) on the summit of Mt. Conness.

The subalpine and alpine climate is characterized by cold, wet winters and short cool, dry summers. Precipitation falls mainly as snow between November and March delivered by Pacific frontal storms. Growing season precipitation, averaging about 2 in (50 mm), is convectional from subtropical air masses. Although summer rains can be heavy, there is a water deficit from late May to early October.

The HRNA is underlain by granitic and metamorphic rock: the substrate of the western two thirds consists of the Half Dome Quartz Monzonite and Cathedral Peak Quartz Monzonite and the eastern third is a complex of metamorphosed sedimentary and volcanic rocks of the Paleozoic Gull Lake Roof Pendant and Mesozoic Ritter Range Roof Pendant.

The topography has been shaped by faulting of the uplifting escarpment since the late Pliocene, by Quaternary glaciation, by weathering, erosion, and colluvial and alluvial deposition. Glaciation of the joint planes in the granitic rocks produced the typical Sierran stepped topography (Wahrhaftig 1965). The northeast to southwest orientation of the fault system and attending escarpment provided for the glacial erosion of a series of northeast facing cirques. Some of the 15 lakes in the HRNA occupy the floors of three of the Pleistocene cirques. The floors of all the large cirques probably derived from middle to late Wisconsin glacial advances (late Tahoe and Tioga, centered at about 70,000 and 18,000 years ago, respectively). Elevations of the cirque floors average 10,670 ft (3252 m), which is also the Pleistocene firm line for this latitude. Three active glaciers occupy the smaller Neoglacial cirques of North Peak, Mt. Conness, and White Mtn. just below the crest and many of the other Neoglacial cirques contain perennial snowbanks.

The relatively young, shallow, nutrient poor sediments on the upper slopes have given rise to weakly developed inceptisols while the soils of the deeper alluvium of the lower slopes and basins have better developed profiles which have not yet been classified.

There is a very wide range of plant habitats in the HRNA, ten identified in all, with 66 vegetation associations grouped in 31 alliances arrayed along elevation and moisture gradients. The primary division is between wet and dry sites, including talus and rocky habitats, alpine communities, snowpatches, subalpine forests, tall herb and willow thickets, meadows, springs and shallow streams, and bodies of standing water. The flora is composed of 398 taxa of 55 families, 190 genera, 394 species and 4 infraspecific taxa. There are 9 families of ferns and fern allies, two conifer families, 36 dicot families, and 8 monocot families. (Taylor 1984)

Rare plants on CNPS List 2 are, Salix brachycarpa and Salix reticulata ssp. nivalis; and CNPS List 4 are, Astragalus kentrophyta var. danaus, Podistera nevadensis, and Scirpus clementis (Keeler-Wolf 1990:133).

B. Recent Environmental History

Knowledge of the environmental history and the history of human land use is important for understanding the development of the present landscape of the HRNA, for establishing a monitoring baseline which incorporates past natural and human modifications, and to integrate the full range of environmental and climatic variation into models for long range planning.

The marked seasonal cycle of cold, wet winters and cool, dry summers has been overlain by long term climatic fluctuations of varying frequencies. The physical environment has been continually altered as vegetation communities, animal populations, weathering and sedimentation rates, soil genesis processes, streamflow, water tables, snowpack and glaciers all responded to changes in climate.

When the last Ice Age peaked about 18,000 years ago, the Sierra crest was covered by an ice cap and a glacier slowly moved down Lee Vining Canyon to calve ice bergs into an expanded Mono Lake (Pleistocene Lake Russell). Areas not covered by ice were a treeless tundra.

Subsequent increase in summer temperatures rapidly melted the ice and allowed the establishment of an open montane forest by about 10,000 years ago. Continual warming accompanied the expansion of subalpine conifers above present timber line and closure of the montane forests. After about 3,000 years ago the climate began to cool causing a retreat of the upper tree line and a series of small mountain glacier advances interspersed by warmer and drier intervals of retreat. The last advance, a world wide phenomenon called the Little Ice Age, began about AD 1300 and ended just after the turn of this century. Modern weather instruments have recorded cycles of warm-dry and cool-wet periods within an apparent general warming trend of about 0.5°C since 1880. (Anderson 1988; Birman 1964; Burke *et al* 1983; Curry 1968, 1969; Davis *et al* 1985; Gillespie 1982; Lajoie 1969; LaMarche 1973; Scuderi 1984, 1987a, 1987b; Stine 1984; Stine *et al* 1984; Wood 1975, 1984)

C. Element Description

The target elements for the HRNA are alpine and subalpine wet meadows, Sierran mixed subalpine forest, and alpine fell fields. Taylor recognized three alliances of subalpine forests: Pinus contorta (lodgepole pine), Pinus albicaulis (whitebark pine), and Tsuga mertensiana (mountain hemlock). These forests grow best on the deeper, well drained soils of the RNA, especially glacial deposits. Within the Pinus contorta alliance are three associations ranging from xeric to mesic environments with attendant sparse Artemisia rothrockii alliance type to wetland type ericad shrub understory: P. contorta/Carex rossii, P. contorta/Thalictrum fendleri, and P. contorta/Ledum glandulosum. The two white-bark pine associations, the well developed P. albicaulis/Poa nervosa association and wind-pruned Krummholz P. albicaulis/Penstemon davidsonii association, grow at timberline. The single T. mertensiana/Arnica cordifolia association is uncommon in the HRNA.

Widespread subalpine meadow communities grow around and in the valley bottoms of the HRNA. Taylor classifies them into well-drained and poorly-drained communities. The first community is divided into a single dry meadow Carex exserta-Saxifraga aprica association (in the C. exserta alliance) and three mesic alliances. Calamagrostis breweri is the most common with four associations ranging from level, alluvial-filled valley bottoms (C. breweri/Vaccinium caespitosum and the rarer Juncus drummondii-C. breweri associations) to more mesic, sloping sites (C. breweri-Kalmia microphylla and Salix orestera-C. breweri associations). The other two alliances (Danthonia unispicata and Melica bulbosa) each have two associations. Piptagrostis (Oryzopsis) kingii-Senecio scorzonella grows along meadow edges bordered by Pinus contorta forest and Phleum alpinum-Danthonia unispicata grows at high elevations and along streams within the influence of cold-air drainage. The Stipa lemmonii-Carex stramineiformis association is found on the margin of springs and seeps in metamorphic rock; the Juncus balticus association is rare in the HRNA.

Taylor identifies four alliances of the poorly drained meadows. The Carex luzulaefolia (with the C. luzulaefolia-Ranunculus alismaefolius association) and the Carex scopulorum-Pedicularis groenlandica (with the Eriophorum crinigerum-C. scopulorum, C. Scopulorum-Pedicularis groenlandica, and Heleocharis pauciflora associations) are found in saturated to submerged sites. The four associations of the Carex nigricans alliance (Salix arctica/ Carex subnigricans-Dodecatheon alpinum, C. nigricans-Kalmia microphylla, Carex vernacula-

Antennaria alpina) also grow in saturated or very wet soils with late season snowcover. The Carex vernacula-Antennaria alpina is also an alpine meadow association. The Carex deweyana alliance has two associations (Rorippa curvisiliqua-C. deweyana and Juncus mertensianus) which are characteristic of ephemeral meadow ponds (vernal pools).

Plant associations of low, sparse cover growing on the open, wind blown rock and gravel flats or "fell fields" above timberline are classified by Taylor under Xeric Alpine Communities (1984:45). The associations which, from habitat descriptions, seem to be part of the alpine fell field habitat are Calamagrostis purpurascens/Leptodactylon pungens on ridge crests, Chrysothamnus monocephalus-Leptodactylon pungens on metamorphic ridges; Festuca minutiflora-Penstemon davidsonii on dry ridges and side slopes, Podistera nevadensis-Erigeron pygmaeus on dry sites, and Astragalus kentrophyta-Draba oligosperma on sites with significant substrate movement.

D. Surrounding Land Use

Historic Use People have been an active part of the landscape surrounding the RNA since at least 10,000 years ago. Scant evidence for these early human settlers has been found on a former shoreline of Mono Lake and at a prehistoric campsite in Lee Vining Canyon (Bettinger 1981, Hall 1990). The archaeological record becomes increasingly complete after 6,000 years ago and shows a sequence of cultural phases characterized by changing projectile point styles, resource use, and settlement pattern (Bettinger 1982). Obsidian trade seemed to be a large part of the economy for almost two thousand years (Hall 1983); the locally obtained volcanic glass has been the primary toolstone throughout the prehistoric period and waste flakes from tool manufacture are a ubiquitous feature of archaeological sites.

The way of life characteristic of the Mono Lake Paiute, before their culture was disrupted, was probably developed by about AD 1300. Although they had a common identity, they were organized into highly mobile family groups which left the winter villages in the spring for a seasonal round of travel to temporary camps in various resource areas for the remainder of the year. In the summer the meadows and lakes of the Sierra crest were available for hunting, gathering, and trade. (Davis 1963, 1965) The HRNA must have been favorable although no prehistoric sites have been located in the more archaeologically sensitive areas.

The effect of prehistoric populations on the land surrounding the HRNA cannot yet be measured. Human effects became noticeable with the heavy settlement of the Mono Basin by Euroamericans beginning in the 1870's. The impetus was the mining booms in the Bodie Hills and Lundy Canyon (Fletcher 1987).

In 1878, the Tioga Mining District was organized after claims were filed on a silver lode which was discovered 18 years earlier. The district encompassed most of the present HRNA and although there is evidence of past prospecting within the Natural Area no mining was done there. All activity took place immediately to the southeast of the HRNA boundaries. Two settlements were founded: the city of Dana at the site of the Great Sierra Mine was merely a post office in 1880; another post office was assigned to the more substantial town of Bennettville, the temporary center of the Tioga Mining District from 1881 to 1884.

In order to quickly deliver the necessary supplies and equipment to the mines the major claimholder of the district, The Great Sierra Consolidated Silver Company of Illinois, built the Great Sierra Wagon Road over Tioga Pass and through Yosemite to the railhead at Copperopolis in the lower Sierra foothills. The road was completed in 1883 but the following year, before it could be used to any extent for hauling, the Great Sierra Company suspended operations due to a financial crisis. Another attempt to make the mine pay when the Great Sierra Company's properties were bought in 1888 also failed. The mining boom was over in the Mono Basin by this time, though smaller operations continued at May Lundy, Bodie, and Log Cabin Mine (at the base of Lee Vining Peak) until the middle of this century (DeDecker 1966; Sawyer 1988, 1991; Trexler 1980).

Tungsten prospecting within the HRNA was noted in 1940 (Nobs 1940). Claims were staked on the ridge east of Mt. Conness and a mining camp was set up nearby with an access road constructed through Slate Creek Valley the following year. Operations apparently continued until 1945 when it was noted that the camp may have been abandoned (Nobs 1945). The Epstein Mining Co. opened a tungsten mine on the northwest side of Steelhead Lake (mapped as the Hess Mine) in Twenty Lakes Basin in the late 1940's. By 1947 a road had been constructed along the east shore of Saddlebag Lake to the new mining camp on the north side of the lake and another road was located across the lakes basin to the mine (Nobs 1947). That road crosses the extreme northeast corner of the RNA.

After the Great Sierra mine closed, the Sierra Wagon Road (or Tioga Road) fell into disrepair but was frequently used by tourists, stockmen, and Army patrols. Tourism into Yosemite was a growing business and resorts were built along the road from Crocker's Station at the western portal to Murphy's little hospice at Tenaya Lake. Completion of the Sierran traverse into Mono Basin had been long considered so in 1899 money was appropriated for a state route to be constructed up Lee Vining Canyon and linked with the Tioga road at Tioga Lake. It was completed in 1909 but it took another six years before the U.S. Government acquired the Tioga Road for the National Park Service and reconstructed it to be passable for automobiles. As use increased throughout the 1920's improvements became necessary; paving began in 1937 and a major realignment was completed two years later. The Tioga Road plus the spur road to Saddlebag Lake, graded in 1920 for work on the the dam, increased visitor traffic into the RNA (Trexler 1980).

While Yosemite was becoming a popular tourist attraction the neighboring public lands were included first in the newly created Sierra Forest Reserve in 1893 and later in the Mono National Forest in 1908, which was formed from those parts of the Sierra, Stanislaus, and Tahoe Forest Reserves located east of the Sierra Nevada crest. According to Calhoun (1986:151) the Lee Vining Ranger Station was in existence by 1916 when Wallace Green became the second Ranger; a new station compound was subsequently constructed in 1935 and 1941 by the Civilian Conservation Corps. The Mono National Forest was incorporated into the Inyo National Forest in 1946.

During the second decade of this century hydroelectric facilities were constructed in the Lee Vining Creek drainage basin by the Southern Sierras Power Company of Riverside. A

construction camp and sawmill were located at Sylvester's Meadow in July 1917. By 1920 other camps were established at Rhinedollar and Saddlebag Lakes and a second sawmill was operating on upper Lee Vining Creek about 1/2 mile east of the present RNA boundaries (Diamond and Hicks 1988). This mill cut 354,000 board feet of mostly lodgepole pine from local stands. Tree stumps show that some logging was done in the HRNA. Stacks of old cordwood are also in the Natural Area. The sawmill site was later converted into a Forest Service campground.

Slate Creek Valley and upper Lee Vining Creek were grazed by domestic sheep since the late nineteenth century, a practice that was discontinued in 1946. As the Timberline Station was being installed the District Ranger cautioned the sheepherders against grazing near the experimental parcel (Maule 1929), a caution which was ignored the following season. Taylor (1984:14) quotes H. M. Hall, who wrote in a 1931 letter, "the area has been badly overgrazed by sheep in the past, but the native vegetation has not been destroyed". Sheep continue to graze the Lee Vining Creek Sheep Allotment at a distance sufficient to prevent any effect on the vegetation within or surrounding the HRNA.

It almost goes without saying that historic land use included the transplant garden research at Timberline Station. In order to find suitable taxa for the new transplant experiments, Dr. Harvey Monroe Hall first collected plants along Slate Creek in 1902 (Nobs 1991). Transplants were set at Mather, Tuolumne Meadows, and a series from Snow Flat to Tioga Pass in 1922 (Hall 1922). It soon became apparent that keeping track of so many small plots was impractical and otherwise maintaining transplants in Yosemite National Park was controversial so the Sierra gardens were reduced to one at Mather and another established in 1929 at Slate Creek.

A Special Use Permit was issued in 1929 designating a 26.7 acre (10.7 ha) parcel for the field station and a road was built to it by the Mono National Forest, extending the existing spur from Saddlebag Lake road to the sawmill (Carnegie Institution 1945; Hall 1929a). The permitted buildings and improvements consisted of two garden plots, a cabin sheathed with corrugated iron, and a shed used for an automobile garage and storage. The latter was built of lumber salvaged from the nearby sawmill; it was replaced in 1955 (Hall 1929b; Huber 1929; Hiesey 1955).

The alpine country including the present HRNA has always been popular for fishing and hiking. Dr. Hall attempted to control visitor traffic around Timberline by posting a NO CAMPING sign on the new road (Hall 1930). Recreation increased over the years and soon became a problem during the 1960's. Existing roads provided easy access for off-highway vehicles, including trail bikes, which were driven across Slate Creek into the valley, often bogging down, and rutting the meadows. The HRNA was closed to motor vehicles and signed in 1966-1967. (Balint, personal communication, 1992). The counterculture revolution in the late 1960's also brought flower children to the area where they camped at Sawmill Campground for the entire summer (Nobs 1991).

In sum, mining, the Tioga Road, and the establishment of a National Forest did much to concentrate public attention on the mountain setting around the HRNA which has increased to the present day.

2. Contemporary Use The primary land use now surrounding the HRNA is recreation. Yosemite National Park lies along the entire western boundary which is defined by the Sierra watershed divide. The remainder of surrounding lands are administered by the Inyo National Forest as the Lee Vining Management Area (#2) of which the HRNA is a part. To the north is the Hoover Wilderness which is managed to protect and perpetuate its wilderness values, including visual, fish and wildlife, watershed, and primitive recreation experience. To the east is the upper portion of Lee Vining Creek canyon and two lakes impounded by Southern California Edison (SCE) dams, Saddlebag Lake and Tioga Lake.

Recreation use in the Lee Vining Management Area is heavy because of the beauty of its alpine landscape and easy accessibility from Highway 120 and Saddlebag Lake Road (1N04) besides the nearby east entrance to Yosemite. Saddlebag and Tioga Lakes both have resorts and developed campgrounds; a third, walk in, campground on Lee Vining creek, Sawmill, overlooks the HRNA. Fishing on the SCE lakes is popular as is backpacking into the Twenty Lakes Basin at the southern end of the Hoover Wilderness adjacent to the Natural Area. Rock and ice climbers test their skills on Mt. Conness and the spectacular wildflower displays in Slate Creek Valley attract many botany enthusiasts. Winter sports include cross country skiing and snowmobiling. Another visitor attraction is the historic silver mining town site of Bennettville situated on a ridge between Lee Vining Creek and the Natural Area; the Forest Service and National Park Service are interpreting it with signs and guided tours along a trail beginning at Tioga Lake.

Controlling visitor use within the HRNA is a management issue. Wilderness and snow rangers enforce the prohibition of overnight camping and snowmobiling, but day use in the form of hiking and cross-country skiing during winter is not disallowed. Instances of firewood gathering within the Natural Area by visitors camping at Sawmill Campground have been reported. The cumulative effects of recreation use are not known but the HRNA appears remarkably free of trash and significant trail erosion.

Sierra Nevada bighorn sheep (*Ovis canadensis californiana*) were reintroduced into Lee Vining Canyon in 1985 to increase the population of this rare subspecies. Although 3000 acres (1200 ha) of designated sheep management habitat do not include the HRNA, it is part of the anticipated maximum range. No effects have been predicted; since the Natural Area is within the former range, however, it is anticipated that bighorn occupancy will be compatible with the ecosystems (Inyo National Forest n.d.).

A spur of the Saddlebag Lake Road (1N04B) goes through Sawmill Campground and terminates at the Carnegie facilities either within or on the boundary according to the USGS Tuolumne Meadows NE Quadrangle (7.5 minute series) and the Forest Land Status Atlas, respectively. The road is closed to vehicle traffic; it is gated at the intersection with 1N04 and signed at the boundary of the RNA. The signs are a metal road closure sign and a routed wood sign with the text, "NO CAMPING OR WOOD FIRES IN THE HALL NATURAL AREA".

V. MANAGEMENT CONSIDERATIONS AND GENERAL GUIDELINES

A. Fire Management

1. Policy. For protection from fire FSM 4063.32 directs that fires which endanger the HRNA are to be extinguished as quickly as possible, using means that will cause minimal damage to the area. For vegetation management FSM 4063.34 authorizes the Station Director, with the concurrence of the Forest Supervisor, to permit prescribed burning within a Research Natural Area to preserve vegetation for which it was created but only when it is absolutely necessary and with extreme caution. The criterion for the use of fire as a vegetation management technique, as with the other techniques of grazing and animal population control, is that a closer approximation of the naturally occurring vegetation and the natural processes governing the vegetation must be achieved with certainty.

The Land and Resource Management Plan (LMP) management prescription for Research Natural Areas (#5) directs the use of fire suppression strategies of confinement, containment, or control for unplanned natural fires and to control all unplanned human-caused fires.

2. Current and Needed Information The 1980 Mono Lake District Pre-attack Plan, Block I-B covers an area from Lundy Canyon to Big Sandy Flat following the eastern boundaries of but excluding the Hoover Wilderness, Ansel Adams Wilderness and the HRNA. Preconstruction of fire breaks, helispots, and fire camps along this boundary are prohibited. The HRNA is not classed as a high risk area. A fire history study is needed to understand the past ignition sources, intensity, and frequency of natural fires in the HRNA and how fire has affected the protected elements. One of the main causes of fires in the Mono Lake Ranger district is campfires; heavy recreation in and around the HRNA increases the chance of human induced fire. All but one of the nine fires occurring near the natural area between 1978 and 1988 were campfire induced. The single fire in the HRNA at Conness Lake was also caused by a campfire.

3. Management Actions. **(a) Amend the Pre-attack Plan for inclusion of fuel conditions, fire suppression practices, topographic constraints on suppression, and identification of access and natural fire breaks specifically for the HRNA.**

(b) Amend the Fire Management Direction in LMP Management Prescription #5 to prescribe natural fires within the HRNA constrained by the objective of preserving the values of the natural area and allowing burned areas to regenerate without human intervention and that all other forms of post-fire management be undertaken only after consultation with the Station Director.

B. Insects and Disease

1. Policy. FSM 4063.32 authorizes the Regional Forester and Station Director to authorize actions to be taken against endemic insects, diseases, wild plants, or animals if they deem such action necessary to protect the features for which the research Natural Area was established, or to protect adjacent resources. Where pest management activities are prescribed, they shall be as specific as possible against target organisms and induce minimal impact to other components of the ecosystem (FSM 4063.3(8)). LMP management prescription for Research Natural Areas (#5) is to allow forces of nature to prevail and, following the Manual, to manage pests only when necessary to preserve the values for which the HRNA was established.
2. Current and Needed Information. Information about any historical infestation or epidemics affecting the HRNA and information on present susceptibility of species to disease and disease organisms is needed to assess potential for future outbreaks.
3. Management Actions. **Prepare an Insect BE for the HRNA. Specify control actions to be taken, if any, under what circumstances, and with what restrictions in case of an insect or disease outbreak in the HRNA.**

C. Timber

1. Policy. FSM 4063.3(2) and LMP prescription #5 prohibits commercial timber harvesting, fuelwood gathering, miscellaneous forest products harvesting, timber stand improvement, and reforestation.
2. Current and Needed Information. An estimation of historic logging intensity in and adjacent to the RNA is needed as part of disturbance history.
3. Management Actions. None

D. Domestic Grazing

1. Policy. FSM 4063.3.3(3) specifies that the Regional Forester and Station Director shall, as appropriate, establish a level of acceptable livestock use that can be tolerated and is consistent with the management prescription for the research Natural Area. LMP management prescription #5 restricts livestock to those areas where grazing is essential for the maintenance of a specific vegetative type. Otherwise livestock grazing is not permitted and, therefore, is not allowed in the HRNA.
2. Current and Needed Information. A determination of the residual effects of historic sheep grazing is needed as part of the disturbance history of the Natural Area (Taylor 1984:14). Include seasonal grazing patterns, breeds, numbers of sheep, and locations of shepherd camps, and physical impacts (soil erosion patterns and rates, soil compaction, structural changes in the vegetation, nutrient

inputs, streambank morphology, runoff, infiltration erosion, and hydrological regime). The HRNA and surrounding area are not included in present grazing allotments.

3. Management Actions. None

E. Vegetation Management.

1. Policy. FSM 4063.34 directs that only tried and reliable vegetation management techniques-- such as grazing, animal control, and prescribed fire-- are to be used and only where the natural vegetation type would be lost without management. The criterion to be applied in deciding the need for management is that management practices must provide a closer approximation of the naturally occurring vegetation and the governing natural processes than would be possible without management. Vegetation management may be authorized by the Station Director with the concurrence of the Forest Supervisor. See Section C., Fire for burning policy. LMP prescription #5 prohibits management practices except as required to preserve or restore the vegetative condition for which the area was established.

2. Current and Needed Information. Taylor's vegetation report (1984) which includes an exhaustive plant species list identifies no exotic species to be controlled.

3. Management Actions. None

F. Watershed and Riparian

1. Policy. LMP prescription #5 prohibits modification of soil, watercourses, and riparian areas and directs that "man-induced damage to a natural condition" be restored. It also prohibits alteration of the groundwater system.

2. Current and Needed Information. There needs to be an assessment of damage to upper Slate Creek Valley and other areas by Tungsten prospecting and construction of the mine road between 1941 and 1951.

3. Management Action. **(a) Provide a Watershed Needs Inventory (WIN).**

(b) Accomplish needed restoration (if any) identified in the WIN.

G. Wildlife, Fisheries, and Sensitive Plants.

1) Policy. FSM 2603 defines Forest Service policy to maintain diverse and productive wildlife, fish, and sensitive plant habitats as an integral part of managing National Forest ecosystems. The policy established by 2670.31 is to place top priority on conservation and recovery of endangered, threatened and

proposed species and their habitats and includes the listed measures to carry out this policy.

LMP prescription #5 allows legal hunting and fishing in Research Natural Areas but prohibits enhancement of wildlife habitat and stocking all waterways in coordination with the California Department of Fish and Game.

According to the Forest-wide Standards and Guidelines, T&E species will be considered as below viability until recovery is achieved. Especially relevant to the HRNA is the guideline to permit scientific studies on sensitive species only if the studies would benefit the species.

2. Current and Needed Information. As itemized in the General Description there are two rare willows on CNPS List 2 and three other rare plants on List 4. A determination of potential impacts on TE&S species and species proposed for listing due to implementation of this plan is needed.

There may be a conflict between hunting and non-manipulative research policy in the HRNA. Specifically, if ptarmigan (Section V.H.) are not removed from the Natural Area and if continued monitoring of productivity and survivorship of populations is permitted as necessary research, then ptarmigan hunting interferes with such research. Several birds killed in the Conness Lakes area in 1989 were banded. (DeSante 1990)

3. Management Actions Needed. **(a) Write a biological evaluation (BE) prior to implementation of this plan.**

(b) Remove non-native trout from HRNA lakes and restore the mountain yellow-legged frog (see H. below).

H. Introduced Species

1. Policy. Executive Order 11987 of May 24, 1977 directs executive agencies to "restrict the introduction of exotic species in the natural ecosystems on lands and waters which they own, lease, or hold for purposes of administration" unless "the Secretary of Agriculture or the Secretary of the Interior finds that such introduction or exportation will not have an adverse effect on natural ecosystems."

The criteria for selecting Research Natural Area candidates (FSM 4063.2) make allowance for the difficulty in locating areas without exotic plants and animals. The Protection and Management Standards (FSM 4063.3) and Resource Protection Guidelines (FSM 4063.32) include the removal of exotic plant and animal life, if practicable (standard #9) by control measures that are "in keeping with established management principles and standards".

2. Current and Needed Information. There is a population of white-tailed ptarmigan (Lagopus leucurus) in the HRNA which were introduced to the Sierra Nevada. Information on population density, distribution, rate of increase, survivorship, and effect on the ecosystem is needed. Such a study is being carried out by David DeSante of the Institute for Bird Populations, Inverness, CA (Section V.G.).

The lakes of HRNA contained no fish prior to stocking with golden and brook trout at the turn of the century. This stocking is implicated in the drastic reduction of the native populations of the mountain yellow-legged frog (Rana muscosa).

3. Management Action. **(a) Implement the Monitoring Plan.**

(b) Implement a program to survey the HRNA lakes to determine composition of the fish species, remove trout from the lakes where feasible, and reintroduce genetically similar mountain yellow-legged frog to the HRNA lakes. This action requires NEPA documentation.

I. Recreation

1. Policy. FSM 4063.3(5,6) prohibits any form of recreational use if such use threatens or interferes with the objectives or purposes for which a Research Natural Area is established. The Forest Supervisor can submit orders (36 CFR Part 261) to protect an area's features if needed to restrict, limit, or control recreational activities. LMP management prescription #5 allows the dispersed recreation activities appropriate to the Primitive ROS class, but discourages or expressly prohibits any public uses that contribute to modification of the area. Overnight camping, campfires, and motorized uses including OHVs-- unless authorized by special use permit-- are to be prohibited as are OSVs unless otherwise indicated on the Winter Motor Vehicle Use Map. The Inyo National Forest Winter Motor Vehicle Use Map, issued in 1977, shows the HRNA closed to OSVs.

2. Current and Needed Information. Summer recreation use of the HRNA varies on the north and south sides which are divided by East Ridge. The North Peak side receives up to about 30 visitor use days, mostly day hikers who follow trails from Saddlebag Lake to Wasco Lake and the Twenty Lakes Basin, or along the south side of Greenstone Lake and along the drainage to Conness Lakes. The south side, which receives only 2-3 visitor use days, mostly day hikers, can be subdivided into two areas: (1) the Bennettville access follows a trail along Mine Creek to Shell Lake, Fantail Lake and finally Spuller Lake where a few campsites have been noted; (2) the Sawmill Campground access follows a trail along Slate Creek to Alpine Lake where "bivy campers" sometimes stay overnight.

3. Management Action. **(a) Manage recreation use with regulatory and interpretive signs placed at strategic points of ingress and egress.**

(b) Issue a Forest Order to prohibit overnight camping, campfires, and non-permitted motorized vehicles in the HRNA.

(c) Issue special use permits for Over Snow Vehicles (OSV) in the HRNA when conditions warrant.

J. Lands

1. Policy. LMP prescription #5 prohibits utility and transportation rights-of-way and permits scientific study by special use permit or cooperative agreement only. All permits or agreements are executed between the proponent and the Pacific Southwest Research Station Director with prior approval of the District Ranger and Forest Supervisor.

Revision of boundaries are the same as those for forest and range experimental areas, according to FSM 4063.44. FSM 4062.3 states, "If boundaries of experimental forests or ranges change, the Station Director must submit a designation statement for the Chief's approval...The Deputy Chief for Research shall file the signed designation statement with the original designation order as part of the establishment record."

2. Current and Needed Information. Land Status for the HRNA includes withdrawal under the Indian Allotment Act of 6/25/1910 (E.O. 10355) and PLO-3224, 9/11/1963 (SAC-050114) for T.1N., R.24E., Sec. 2, 3, 10, 12, 13, 14. Sec. 1 is as above in addition to power withdrawal (F.P.P.) or (U.S.G.S.). Use impediments as Classified or Dedicated areas and Sec. Agr. Reg L-20. (Forest Land Status Atlas).

Wasco Lake, situated in the extreme northeast corner of the HRNA (NE 1/4, NW 1/4, Sec. 35, T.1N, R.24E.), is an integral part of the popular Twenty Lakes Basin in the Hoover Wilderness in terms of geomorphology and recreational use (although not part of the Wilderness). Just to the south of Wasco Lake the outlet drainage from Conness Lakes, which feeds Greenstone Lake which, in turn, feeds Saddlebag Lake provides a natural entry into the Natural Area. An unmarked, unofficial trail runs along the south side of Greenstone Lake, up the drainage to the Conness Lakes Basin and from there to Conness Glacier. Given the heavy backpacking use into the Twenty Lakes Basin and the lack of signing along the "Conness Trail", it is difficult to enforce the prohibition of overnight camping within this part of the RNA.

3. Management Actions. **(a) Sign the Conness Lakes drainage at the HRNA boundary to control overnight camping in Conness Lakes basin (since this drainage provides the easiest point of entry into the Natural Area along a very steep rocky slope).**

(b) Revise the HRNA boundary to exclude Wasco Lake and the contiguous southeast portion of Twenty Lakes Basin in order to legalize camping at Wasco Lake. The proposed boundary revision is to move the northern boundary to the natural topographic features of the ridge running east from North Peak to the center of Section 35 then southeast along the steep slope which divides the Conness Lakes basin from the Twenty Lakes Basin. Connie Millar (PSW, Berkeley) has researched the ecological values of the excluded area and concludes that they do not significantly add biological or physical diversity to the HRNA. This action may require NEPA documentation.

K. Minerals and Energy

1. Policy. FSM 4063.35 authorizes the Regional Forester to request the Bureau of Land Management to withdraw a Research Natural Area from mineral entry in accordance with section 204 of the Federal Land Policy and Management Act of 1976. The direction in LMP management prescription #5 is to "recommend and/or maintain withdrawal from mineral entry... to allow no surface occupancy for mineral leasing including geothermal... and to permit no sales or extraction of common variety minerals".

The Mining Law of 1972 provides the authority to usurp other Federal uses, including uses offered by Research Natural Areas. Unless specifically withdrawn from mineral entry, miners have the right to explore and exploit mineral resources on Federal and State lands.

2. Current and Needed Information. According to the Land Status Atlas the RNA was been withdrawn from mineral entry under Public Land Order (P.L.O.) 3224, 9/11/1963 (SAC-05114) S-agre: Surface Estate and Mining Laws. There are no existing mining claims within the RNA.

A few years after The Great Sierra Consolidated Silver Company of Illinois suspended operations due to lack of high grade ore, nine quartz claims just southwest of the HRNA were patented. Seven of them were acquired by the Forest Service in a 1972 land exchange with all mineral rights reserved to the grantor until 1995. Two claims, Atherton Quartz and Summit Quartz Mine, (patented in 1887 and 1892, respectively) are still under patent.

3. Management Actions. None

L. Facilities

1. Policy. FSM 4063.3(7) and LMP prescription #5 do not permit new roads or trails within Research Natural Areas or improvement of the standard of existing roads and trails unless they specifically contribute to the objectives of the area. Existing roads and trails can be maintained to the existing current standards. FSM 4063.3(7) further prohibits buildings but allows temporary gauging stations and

instrument shelters as authorized by the Station Director according to procedures at FSM 4063.31.

2. Current and Needed Information. As described above in Section IV.D. existing improvements and buildings include one of the transplant gardens with remains of the redwood lathe fencing, one storage shed, one cabin, and an outhouse. The garden plot has been abandoned and, although Carnegie has not used the buildings in recent years, it has maintained them and made them regularly available to scientists from other institutions. The Director has made known the intention of the Carnegie Institution to continue to use the buildings and to keep them fully functional, if permitted by the Forest Service. (Winslow Briggs, letter to District Ranger William Bramlette, 22 August, 1991).

The 1933 Cooperative Agreement between the Carnegie Institution and the Forest Service has outlived its usefulness. This management plan replaces the provisions of that agreement; the Forest Service will have complete control over policy, research, and access. Soil modification will no longer be permitted as a research method.

The location of Timberline Station relative to the HRNA boundary is not sufficiently defined to determine whether or not it is actually within the Natural Area. The Tuolumne Meadows NE Quadrangle shows the boundary line and the building symbol representing the station coincident. In either case the location is marginal and has no effect on the values of the HRNA. The only purpose to be served by removing the buildings if they are in fact within the Natural Area is to comply with policy; on the other hand, they contribute towards efficient research by providing onsite housing and facilities.

3. Management Actions. **(a) Cancel the 1933 Cooperative Agreement by mutual consent of the Carnegie Institution and the Forest Service. Issue a Special Use Permit (SUP) to the Carnegie Institution for continued use of their facilities and for vehicle access to them via 1N04B in order to perform maintenance.**

(c) Whether or not the Timberline garden is eligible to the National Register of Historic Places, do not restore it to natural conditions but manage it for "benign neglect".

M. Cultural Resources

1. Policy. LMP prescription #5 directs that identified cultural resources be protected and that ground disturbing activities be coordinated with the Pacific Southwest Research Station Director. As a general rule, excavations for cultural resources may be permitted when the natural integrity of the HRNA is not endangered.

2. Current and Needed Information. Current information on cultural resources is summarized in Section IV.D. A complete cultural resource inventory and evaluation is needed to expand the data base on prehistoric and historic land use, to avoid impacts on historic properties by research, educational, and management activities, for establishing base line environmental conditions, for public interpretation, and for the monitoring plan.

The LMP prescription allowing archaeological subsurface investigations may conflict with the nonmanipulative policy for Research Natural Areas.

3. Management Actions. **(a) Perform a cultural resource inventory to include archival research, oral histories, and field survey.**

(b) Evaluate Timberline Station to determine its eligibility for listing on the National Register of Historic Places.

(c) Ensure that the Station Director reviews and approves of non Forest Service archaeological research within the HRNA.

N. Visual

1. Policy. LMP prescription #5 directs that the Preservation VQO be met.

2. Current and Needed Information. None

3. Management Actions. None

O. Research and Study

1. Policy. FSM 4063.03 and .33 encourages the use of Research Natural Areas by responsible scientists and educators for those activities that maintain unmodified conditions. Educational use is restricted to those of upper division college level and above. The Station Director has the authority to approve research proposals and the District Ranger has the authority to approve access to a Research Natural Area. LMP prescription #5 directs that Research Natural Areas be made available for maximum scientific and academic uses that are nondestructive and nonmanipulative.

According to FSM 4063.33 Forest Service scientists have the responsibility for cooperating with non-Forest Service scientists, to keep informed of the research, ensure protection of Research Natural Area values, and ensure that copies of data and reports are filed.

2. Current and Needed Information. The HRNA has been heavily used for a wide variety of research projects resulting in several masters and doctoral theses and numerous publications. The scientific interest has the potential for conflict

between research programs, for example when use of a temporary water monitoring installation interferes with animal behavior studies of another investigator.

3. Management Actions. **(a) The Station Director shall assess each research proposal for appropriateness and potential impact to the natural values of the area. Proposals will be accepted, modified or disallowed as the situation warrants.**

(b) Forest Service specialists shall monitor research for consistency with Research Natural Area policy and to minimize conflicts between research activities.

(c) Filing of research data, reports, and other documents with the Station, Region, and Forest will be required.

VI. MONITORING PLAN (Connie Millar, PSW, Berkeley)

The primary objective of this monitoring plan is to identify general categories for monitoring on the HRNA. These include long-term ecological trend analysis, management treatment, defensibility, and compliance monitoring. Individual monitoring plans will be needed to describe details of location, intensity, frequency, timing, and responsibilities of many of the monitoring needs listed below. The detailed plans should be developed by appropriate District or Forest staff, and should be attached as appendices to this management plan.

Reports including information on baseline data, trend analysis, and management recommendations should also be attached to this management plan.

A. Ecological Status Monitoring

Record long-term trends in ecological conditions of the RNA

Objective: Document long-term trends in ecological status of target vegetation types, representative animal populations, and changes in certain physical conditions. Establish baseline data that will allow comparison with subsequent measurements. Special focus: effects of climate change on subalpine and alpine community composition.

Key indicators: plant community structure (vertical and horizontal), species composition, age, size distribution and density of representative species; vertebrate composition and abundance; genetic diversity of representative species; changes in glacier size and in lake levels.

Methods:

Plant Communities: Plant communities on the HRNA will be mapped and monitoring according to Ecological Unit Inventory guidelines for existing

vegetation. Permanent data collection and photo plots will be established along transects for baseline documentation and subsequent monitoring. At least one transect will be established in each of the ten habitat types in the RNA. Special attention will be given to the five species identified on the CNPS Lists 1 and 2.

Plots to establish baseline inventory will be established and measured as soon as funding becomes available and in conjunction with EUI or relevant local research efforts. After initial inventory, plots will be measured at intervals of 1 to 10 years, depending on the specific objective. After any major human or natural change (e.g., fire), measurements will be made, and the subsequent monitoring schedule adjusted.

Genetic diversity can be monitored from seed collected from species that have seeds capable of long-term storage. Seeds collected at regular intervals and stored afford the potential for genetic trend analysis should this become affordable or critical in the future. Seeds will be stored at the Institute of Forest Genetics. Stored seeds also provide a source of germplasm for restoration, should there be a future need.

Animal Monitoring: Permanent transects will be established for monitoring mammals. Special attention will be given to introduced bighorn sheep. Sampling techniques may include live traps, pitfall traps, bait stations, scent and photo stations, track plates, pellet counts, and radio collaring or banding. Collecting of live animals will not be considered.

Since there are no known native fish in the lakes or streams of the HRNA (fide Sarah Chubb), ecological monitoring of aquatic species will concentrate on species inventory and population trends in amphibia (frogs and salamanders) and in aquatic macro-invertebrates. Comparisons will be made between lakes once stocked by Fish & Game (inventory of lakes from DF&G) and lakes never stocked.

Physical Conditions: Annual mass balance of the glaciers will be monitored by (1) measuring winter snow accumulation using snow depth and density surveys across the glacier in late spring and (2) measuring summer ablation relative to stakes placed in drill holes in the ice in addition to daily measurements of snow melt and meteorological parameters. Permanent photo points will be established for photo-monitoring of glacier size. Lake levels of several permanent tarns will be measured in late summer against high water level.

B. Management Treatment Monitoring

Assess the effectiveness of management treatments

No identified needs at present

C. Defensibility Monitoring

Assess factors that affect the ability to protect the RNA and to maintain targeted communities and natural processes

Recreation

Objective: Monitor the effects of trampling by hikers on subalpine meadow vegetation and on wildlife abundance. If monitoring suggests that current level of recreation use is detrimentally affecting natural processes (e.g., causing a decline in cover of species, or increase in bare ground), level of recreation should be reduced.

Key indicators: Plant community structure (vertical and horizontal), species composition, age, size distribution and density of meadow species, soil compaction, wildlife abundance, visitor use.

Methods: Establish permanent photo points in heavily used and little used areas in Slate Creek basin. Photo monitoring and paced transects will be used to record plant density and cover and wildlife abundance. Wilderness Ranger make inventories of actual visitor use in HRNA.

Exotic Species--Ptarmigan

Objective: Monitor ptarmigan abundance and mating/nesting habits to determine if the species is established in HRNA. Monitor the effect of expanding ptarmigan populations on Salix spp. and on other herbaceous vegetation, and on natural predator-prey relationships. If monitoring suggests that ptarmigans significantly alter vegetation composition and distribution, or prey relationships, ptarmigan control measures should be taken.

Key indicators: Ptarmigan abundance, distribution, rate of population increase, foraging habits, Salix abundance and distribution, abundance of prey species.

Methods: Determine abundance of ptarmigan in representative areas of RNA. Establish photo points and paced transects in heavily used and little used ptarmigan habitat to measure density and cover of Salix and other shrubby species.

D. Compliance Monitoring

Assess compliance with RNA regulations by agencies and groups whose actions could affect RNA. Monitoring that indicates flagrant non-compliance should trigger change in management.

Freshwater Fish Stocking

Objective: Monitor compliance by Department of Fish & Game with regulation that prohibits stocking of any lakes or streams in the HRNA; monitor populations of fish in previously stocked lakes and use results of ecological status monitoring to

determine if presence of exotic populations is detrimentally affecting amphibia and macro-invertebrate populations. If monitoring indicates, consider eliminating exotic fish.

Methods: Coordinate with local DF&G representatives to monitor fish populations in lakes previously stocked by DF&G. Determine if these lakes are now barren or not. For any lakes that still have fish populations, coordinate with ecological monitoring to determine if amphibia and macro-invertebrates are being affected.

Contact local DF&G representatives regularly to ensure no further stocking is occurring.

Camping in RNA

Objective: Monitor compliance by general public with regulation that prohibits overnight camping in RNA.

Methods: Wilderness Ranger/Recreation Officer monitors camping in RNA.

Firewood Cutting in RNA

Objective: Monitor compliance by general public with regulation that prohibits firewood cutting in RNA.

Methods: Wilderness Ranger/Recreation Officer monitors cut stumps in vicinity of public campground outside RNA and in vicinity of illegal campsites in RNA.

Special Use Permit with Carnegie Institute (once SUP in place)

Objective: Monitor compliance by Carnegie Institute with specifications of Special Use Permit (esp. septic facilities/building maintenance/transplant garden, vehicle use).

Methods: Inspect Carnegie facilities for evidence of non-compliance; periodically call Carnegie representative and discuss conditions of use.

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