Appendix D:
Friends of Fawnskin (2) Letter Exhibits

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Attachment A – Document titled "FOF 0112 Attachment A – eagle pt Adden to final EIR TT13966.pdf"

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ADDENDUM TO THE FINAL ENVIRONMENTAL IMPACT REPORT TENTATIVE TRACT 13966 SCH#89072402 CITY OF BIG BEAR LAKE

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COMMUNITY DEVELOPMENT

Introduction

Tentative Tract 13966 was approved by the City of Big Bear Lake in July 1991 and the Final EIR was certified by the City Council. The project was approved by the City with 123 buildable lots and 15 letter lots (open space, Lots A-N and P). Of these 15 letter lots, four lots, Lots C, F, G, and H) were designated as perch tree lots. Other lots were set aside for lake access, plant habitat protection, and wetland protection. The project applicant has requested that the City permit a tennis court be constructed on Lot H (a perch tree open space lot shown in the attached figure) and based on the evaluation in the EIR which identified the site as passive open space, this Addendum is being prepared to determine whether this proposed change in use of Lot H will cause any additional adverse impacts. In addition, the City intends to use this Addendum to define the potential uses allowable for each open space lot in order to clarify conflicting statements in the EIR. The analysis of these two issues follows.

Impacts of Constructing a Tennis Court on Lot H, Tentative Tract 13966

Lot H was created as a result of discussions with the U. S. Fish and Wildlife Service (FWS). Originally, the proposed Tentative Tract had placed known perch trees on individual lots with setbacks to prevent encroachment within the dripline of the individual trees. The FWS requested that the perch trees be placed on open space lots so that the lots could be managed by the Homeowners Association to better protect the trees and to minimize potential homeowner damage to the trees. The key issue of concern expressed by the FWS was to maintain the value of the perch trees for continued use by eagles during their wintering period from November 1 through April 1 of each year.

Lot H encompasses three large perch trees (two at the northeast corner of the lot and one at the southwest corner of the lot) on a rectangular lot that is approximately 134' wide and 157' feet long. The lot encompasses approximately 21,110 square feet.

The applicant proposes to install a paved (concrete or clay) tennis court with two parking spaces adjacent to a road presently identified as "Marina Point Drive". The tennis court dimensions are 60' x 120' (7,200 square feet). The two parking spaces were estimated to encompass 12' x 22' per space, or 600 square feet. Total disturbed area on Lot H would be 7,800 square feet.

The impacts of concern identified in the City's Initial Study are effects on bald eagles and effects on Land Use. The bald eagle issue is an indirect impact related to the potential for the paved areas to impact the perch trees or to disrupt the use of the perch trees during the period that the eagles occupy the site. To address this issue, Mr. James F. Bridges, a

Registered Professional Forester, was contacted to evaluate the potential effect of constructing and using the tennis court and parking spaces. The tennis court will be aligned in an east-west alignment between the existing perch trees. According to Mr. Bridges, the tennis court and parking spaces can be constructed as proposed without damaging or adversely impacting the existing perch trees on the site. A copy of a letter summarizing his site visit and conclusions is attached. Mr. Bridges recommends one mitigation measure be observed, and based on review of the site this document recommends a second measure be observed during the construction of the tennis court and parking spaces. These measures are:

1. If any perch tree roots over two (2) inches in diameter are damaged during construction of the tennis court or parking spaces, the damaged ends should be cleanly re-cut with a hand saw. The cut should be two inches to three inches back into the undamaged portion of the root. Application of a tree sealing compound is not necessary, but the root should be covered with soil as soon as possible to prevent further die back.

2. The construction area shall be identified with tape or rope boundary and no equipment disturbance shall be allowed beyond the limits of the boundary.

Based on the technical data provided, the construction and use of the tennis courts and parking area can be accomplished without damage to the perch trees.

Given that the perch trees can be preserved in healthy condition, the second issue is the effect of using the tennis courts on visiting bald eagles. After conferring with the applicant, the logical solution is to totally avoid impacts to the eagles. This can be accomplished by closing the courts to use for the period during which eagles visit Big Bear Valley. The following mitigation measure shall be implemented by the applicant:

3. The tennis court and parking spaces shall not be used during the period December 1 through April 1 of any given year. This closure period shall be identified and included as part of the Conditions, Covenants, and Restrictions (CC&Rs) for Tract 13966.

Data presented in the original EIR indicates that man-made features do not affect bald eagle use of perch trees. Unusual activities were identified as one cause of eagles abandoning perch trees, but with the tennis court closed for the eagle visiting period this potential impact can be fully avoided.

Based on the implementation of the above mitigation measures, it is concluded that construction and use of the proposed tennis court and parking spaces have no identifiable potential to adversely impact bald eagles and their future use of the preserved perch trees on Lot H.

<u>Allowable Uses on Tentative Tract 13966 Open Space Lots</u>

In its original design the only open space lots in the project were Lot A, the public access lot, Lot E, the private access and marina lot, and Lot K, the meadow. In preparing the EIR

with the meadow as the only plant habitat lot, a comment was made on page 8H-18 which states: "open space (meadowland, shoreline, perch trees, and the Summit Creek channel corridor) will be available for passive recreation (visual open space and scientific research), not active recreation such as walking, nature appreciation and bird watching." In fact, this statement is in error because it really applies to only a few lots and does not apply to all of the open space lots.

To clarify the actual uses that are compatible with the various open space lots, a tabular matrix has been created and is provided as an attachment to this Addendum. A discussion of the matrix follows:

Lot A: Lot A encompasses about 5,200 square feet and was designed to provide the public access to the lake shore. This lot will experience substantial foot traffic (no vehicle traffic except in an emergency) and was not created to preserve plant habitat or wetlands. An artificial perch was established on Lot A and activities on this lot should be restricted during the winter when eagles are present.

Lot B: Lot B encompasses about 15,600 square feet and was established to protect plant habitat and enhance wetland values. It does not need exclusionary fencing. The habitat on this lot will be managed to enhance wetland values, including possible recontouring, replanting, and other management techniques. After completion of management efforts, passive uses, including hiking (including access to the lake), bird watching, picnicking and scientific research, etc. are consistent with the goals of preserving for this lot as plant habitat. It should be identified with a sign as permanent open space and no vehicles or mechanical equipment should be allowed on this site except for maintenance or emergency activities.

Lot C: Lot C encompasses about 58,800 square feet and was established for a combination of purposes, to enhance wetland values and protect perch trees. It does not need exclusionary fencing. Portions of the habitat on this lot will be managed to enhance wetland values, including possible recontouring, replanting, and other management techniques. The remainder will be set aside to protect perch trees which are located at the periphery of the lot. After completion of management efforts, passive uses, including hiking (including access to the lake), bird watching, picnicking and scientific research are consistent with the goals of preserving this lot for perch trees. It should be identified with a sign as permanent open space and mechanical equipment should be allowed on this site only for maintenance or emergency purposes.

Lot D: Lot D encompasses about 15,000 square feet and was established to enhance wetland values. It does not need exclusionary fencing. The habitat on this lot will be managed to enhance wetland values, including possible recontouring, replanting, and other management techniques. After completion of management efforts, passive uses, including hiking (including access to the lake), bird watching, and scientific research are consistent with the goals of preserving for this lot as plant habitat. It should be identified with a sign as permanent open space and no vehicles or mechanical equipment should be allowed on this site except for maintenance or emergency activities.

Lot E: Lot E encompasses about 28,000 square feet and was established as the private access to the lake and an active recreation area for residents of the tract. The marina will be connected to this lot and it will contain the boat launching ramp. No use restrictions are required on this lot except during the winter when eagles are present.

Lot F: Lot F encompasses about 26,300 square feet and was established for a combination of purposes, to enhance wetland values and protect perch trees. It does not need exclusionary fencing. Portions of the habitat on this lot will be managed to enhance wetland values, including possible recontouring, replanting, and other management techniques. The remainder will be set aside to protect perch trees which are located at the periphery of the lot. After completion of management efforts, passive uses, including hiking (including access to the lake), bird watching, picnicking and scientific research are consistent with the goals of preserving for this lot as plant habitat. It should be identified with a sign as permanent open space and mechanical equipment should be allowed on this site only for maintenance or emergency purposes.

Lot G: Lot G encompasses about 38,700 square feet and was established strictly as a perch tree lot. Because of the location of perch trees on this lot, the potential for active recreational uses are limited and should be controlled in a manner to ensure the survival of the perch trees. Otherwise, passive uses, such as hiking, bird watching, picnicking and similar activities that do not harm the perch trees or carry over into the winter, are acceptable.

Lot H: Lot H encompasses about 21,100 square feet and was established strictly as a perch tree lot. Because of the location of perch trees on this lot, the potential for active recreational uses does exist and if properly designed will not to damage trees and will not to conflict with wintering eagle use, active use, such as the tennis court, would be acceptable.

Lot I: Lot I encompasses about 50,800 square feet and was established to protect the Summit Creek channel and the riparian habitat in the channel. No facilities should be constructed in the channel, but it may need periodic clearing by the City to ensure flood flows can be carried without damaging adjacent structures and it can be used by residents for hiking, bird watching and active play without vehicles or equipment.

Lot J: Lot J encompasses about 97,700 square feet and was established to protect the Summit Creek channel and the riparian habitat in the channel. No facilities should be constructed in the channel, but it may need periodic clearing by the City to ensure flood flows can be carried without damaging adjacent structures and it can be used by residents for hiking, bird watching and active play without vehicles or equipment.

Lot K: Lot K encompasses about 310,800 square feet and was established to protect a rare montane wet meadow plant community and related endangered species. This is the only lot on the property that is exclusionary and should be set aside, fenced and access strictly controlled. Entry should be restricted to prevent damage to the plant habitat and should be granted for scientific research or other limited impact uses.

Lot L: Lot L encompasses about 8,600 square feet and was established as open space for the tract. No specific constraints exist on this parcel and future use should be guided by the needs of the tract residents. Active and passive recreation activities are acceptable on this lot, consistent with retaining it as open space for the residents.

Lot M: Lot M encompasses about 9,500 square feet and was established as open space for the tract. No specific constraints exist on this parcel and future use should be guided by the needs of the tract residents. Active and passive recreation activities are acceptable on this lot, consistent with retaining it as open space for the residents.

Lot N: Lot N encompasses about 14,100 square feet and was established to enhance wetland values. It does not need exclusionary fencing. The habitat on this lot will be managed to enhance

wetland values, including possible recontouring, replanting, and other management techniques. After completion of management efforts, passive uses, including hiking, bird watching, picnicking and scientific research are consistent with the goals of preserving for this lot as plant habitat. It should be identified with a sign as permanent open space and mechanical equipment should be allowed on this site only for maintenance or emergency purposes.

Lot O: Lot O encompasses about 9,300 square feet south of Swan Drive and was established to protect the Summit Creek channel and the riparian habitat in the channel. No facilities should be constructed in the channel, but it may need periodic clearing by the City to ensure flood flows can be carried without damaging adjacent structures and it can be used by residents for hiking, bird watching and active play without vehicles or equipment.

The above review of each lot's potential uses is based on the actual intent when setting aside each lot. No adverse impacts to the environment on any lot would occur with the uses outlined above. The only lot with resources sensitive to human uses is Lot K. Even this lot could withstand some foot traffic, but due to the presence of endangered species and the intense visitor use it could incur when these species are in bloom, it is prudent to exclude all use except scientific research or essential habitat management.

The issue has been raised regarding the timing of creating the open space lots based on the phasing established for the tract (Phases 1, 2 and 3). In essence, the land outside of each phase remains in its natural condition until the phase is activated and the lots are created. No use of the remainder areas would be permitted without additional permits from the City. Therefore, no adverse environmental effects appear to be associated with establishing the individual open space lots as each phase of the tract is activated.

In conclusion, the proposed tennis court and parking spaces on Lot H can be constructed and used, in accordance with the recommended mitigation measures, without any identifiable adverse environmental effects on bald eagles or land use. The allowable uses have been defined for each lot and no additional adverse impacts are associated with such uses. With the exception of Lot K, it is unnecessary to fence the remaining open space lots and exclude human activities. Some restrictions are necessary, as outlined above, but the habitats on each lot are capable of sustaining limited use without incurring adverse environmental effects. Based on the review in this Addendum, the proposed modifications and clarifications on uses of open space lots will not cause any potential significant adverse impact to eagles or to land uses on the project site.

1516 Lassen St.
Redlands, CA 92374
June 24, 1992

Tom Dodson & Associates
444 N. Arrowhead Ave. Suite 203
San Bernardino, CA 92401

Dear Mr. Dodson,

Mr. Steve Foulkes and I examined the trees on Lot H, proposed for the tennis court, at Eagle Point Estates today. There are 3 large, 48"+ dia., Jeffrey pines in question. Based upon the survey lines for the tennis court, I feel that there is no significant potential damage to the trees from court construction. The construction boundaries are all outside the drip line of the trees. There is a potential that a few small tree roots could be encountered during excavation. If any roots over 2 inches in diameter are damaged, the damaged ends should be cleanly re-cut with a hand saw. The cut should be 2" to 3" back into the undamaged portion of the root. Application of a tree sealing compound is not necessary, but the root should be covered with soil as soon as possible to prevent further die back.

If you have any questions, please contact me at (714) 792-7696.

James F. Bridges
Registered Professional Forester
Calif. Lic. #1534

cc: S. Foulkes

Attachment B – Document titled "FOF 0112 Attachment B – Castle Glen 1989 review of cond.pdf"

Cedar Glen/
Eagle Mtn

A REVIEW OF CONDITIONS OF APPROVAL PERTAINING TO BIOTIC RESOURCES, EAGLE MOUNTAIN ESTATES, TRACT NO. 12488, CITY OF BIG BEAR LAKE, CALIFORNIA

BIO-TECH/ ENVIRONMENTAL PLANNING CONSULTANTS
18977 PATTON DRIVE, CASTRO VALLEY, CA 94546
(415)538-1210

OCTOBER 15, 1989

6/84 ORIG

I. INTRODUCTION

A review of the conditions of approval pertaining to biotic resources of the Eagle Mountain Estates, Tract 12488, in the City of Big Bear Lake was accomplished in September and October, 1989. These conditions of approval were attached to the Tentative Tract per Planning Commission Resolution No. 84-41 and adopted by the City Council. The conditions of approval pertaining to biotic resources are Condition #'s 44 through 53 and address concerns related to bald eagle and rare plant habitats on the site. The conditions of approval are discussed individually below. Recommendations for additional conditions to be appended to the tract or for more definitive language are identified by an asterisk (*) below. Conditions of approval and recommendations are summarized in Table 1 at the back of the report.

II. CONDITIONS PERTAINING TO BALD EAGLE HABITAT

The tract is situated within and includes wintering bald eagle habitat. Nesting does not occur on site. The area provides perching and perhaps roosting habitat for bald eagles during winter months from November to March. Lots "A" and "B" include approximately 130 acres (45%) of the 291-acre tract. Lot "A" contains both "occupied" and "key" eagle habitat, as defined and illustrated in City General Plan and EIR documents. The key habitat includes the western, shoreward portion of Lot A, which receives very frequent use of perch trees overlooking the Stanfield Pond. The rest of the Lot A is designated as occupied perching habitat, receiving occasional utilization. Lot B contains potential roosting habitat, but primarily was established to protect the significant rock outcrops along the ridge, and is not considered to be of further concern relative to bald eagle habitat.

Conditions pertaining to bald eagle habitat are Nos. 44 through 50 (See Attachment A) and are discussed individually below:

44. Require fencing and posting. Tract map currently reflects additional building setbacks, and reduction in lot and cul-de-sac depth in key eagle habitat.

This condition requires the provision of fencing (unspecified type) and signing the interface between Lot A and the residential lots. It is assumed, though not explicitly stated, that Homeowners shall be required to contribute to the costs of fencing and signing the Lot A boundary. This represents a great deal of fencing (approximately 6000 linear feet or 1.14 miles). Several possibilities for accomplishing this conditional requirement in the Conditions, Covenants and Restrictions (C,C,&R's) for the Tract may include:

*1. The Homeowners (for the whole tract or could be limited to those Lots adjoining Lot A) shall pay a fair share cost to the Fencing Account (to be established by the Association) for the provision of a fence (to be defined, see recommendation

Attachment B) between Lot A and the residential tract, and the posting and signing of same to prohibit entry or use of Lot A for recreation or other purposes. [Option: Could specify November 1 to April 1 absolute closure of all entry and define restricted entry allowances for nonwinter months.]

The establishment of the Fence Account should specify that only the Big Bear Valley Preserve Manager or other designated authority may disburse monies from the account for the expressed purpose of construction and maintenance of the specified fence. [Option: Could establish phases to provision of fence, such that the most sensitive area (western portion along Lots 279, 282-284, 289-291) is installed before recordation or according to a specified schedule.]

The rest of Condition 44 refers specifically to Lots 279-291 as enumerated above and Lots 294-297, 304-306, 312 and 313. A 25' building setback line (bsl) has been established as a nonbuildable area, ie. no permanent structures within the setback area. Said lots were actually surveyed and identified perch trees were plotted. Upon field review of the surveyed lots, it was determined that nine lots (282-284, 289-291, and 312-314) are of particular concern relative to their proximity to existing eagle perch trees. Four of these actually contain existing perch trees on the lots (283,284,289 and 290). The other lots mentioned above would be visible on a direct line-of-sight to existing perch trees. The following condition may be added to project C,C,&R's to provide additional review of these lots:

*2. Lots (nine lots as identified above) shall be subject to review and site approval by the Architectural Review Board (of the City and/or Homeowner's Association). Building permits shall not be issued unless the following conditions are satisfied:

A. Fencing, as required in Condition *1 above, is completed.

B. A review of the architectural plans for all structures on said lots is undertaken that establishes building envelopes that maximize setbacks from existing perch trees, such that the safety hazard that such trees represent (3 perch trees between Lots 284 and 289 are dead) is minimized, and such that visibility of structures from existing perch trees is reduced to the fullest extent possible.

C. Said plans shall include landscape screening and planting of native trees to further reduce visibility to perch trees. [Option: see additional 2C requirements, page 4.]

D. Parking pads shall be located within the frontyards of residential structures. [Option: Garages/carports should be considered, along with requirements for automatic garage door openers, to reduce pedestrian traffic from vehicles to the residential structures as much as possible.]

E. Deed restriction or redesign of Lot 290 (as discussed below).

Even with the inclusion of Condition 2 above, Lot 290 is problematic. The most heavily used perch tree of the entire Lot A is within direct line of sight from most of the lot as presently configured, with no native trees to provide a natural landscape

EXHIBIT "F"

barrier. The topography of the lot further reduces its buildable area. Line of sight from Lots 289 and 291 can be screened by design of building envelopes to utilize existing stands of trees and vegetation. Problems with Lot 290 can be resolved by either merging it with Lot 291 and/or readjustment of the rear lot line and b.s.l., or by issuance of a deed restriction that would prohibit construction on Lot 290 for the life of the perch tree in question or until such time as the perch tree can be screened from view by planting of additional vegetation.

45. Upon conferring with the United States Fish & Wildlife Service, the following conditions are required:

A. Posting of "No Parking" along both sides of Big Bear Boulevard to prevent trespassing onto eagle preserve.

B. Parking pads shall be located within the front of single-family homes away from bald eagle perch trees/roost habitat area, and garages/carports shall be required, should parking be located to the rear of residential units. This shall apply to lots along the ridge numbered 318-348 (numbers have been changed to correspond with new Lot #'s 282-313).

C. Require planting native trees along ridge line (Lots as above) in sparse areas, to staff's satisfaction.

Condition 45A requiring posting along Big Bear Boulevard has already been accomplished. The area still experiences trespassing as a snowplay area. This is not so much a problem of the Tract as it is one of a lack of enforcement of the closure and No Parking requirements by law enforcement agencies.

Condition 45B refers to parking as addressed in the proposed Condition *2D amendment to the C,C,&R's.

Condition 45C is too vague, though it obviously refers to provision of additional landscaping to screen perch trees in areas of sparse vegetation. This is most relevant to Lot 290, discussed above, and to lesser degrees for the other 9 lots subject to architectural review and site approval identified in Condition *2 above.

46. Applicant shall confirm whether or not the southern rubber boa or San Bernardino Mountain king snake are located on the site with the United States Fish and Wildlife Service. Should such be located on-site, necessary steps shall be taken to adequately mitigate.

A search of potential habitat was undertaken on September 7 and 8, 1989, to determine the suitability and presence/absence of the two snakes. Both the rubber boa and king snake are known to occur in rocky, heavily treed habitats with dense litter and high number of treefalls. The rubber boa is particularly known from the vicinity of springs or creeks, such as near Dogwood or Blue Jay creeks near Lake Arrowhead. Coincidently, a rubber boa was collected and positively identified from the Snow Summit Forest Service lease area near Knickerbocker Road on September 6, 1989, from a spring characterized by a dense growth of willow, American dogwood, bracken ferns, and substantial litter deposition of

cedars, white fir and other conifers.

Down logs and rocks were turned over in search of snakes, but none were located on site. Particular attention was focussed on the annual creek drainage easement in the central portion of the tract, but it was determined that this does not represent very suitable habitat for the snakes. The habitat on Tract 12488 differs from known habitat of rubber boas and king snakes in that it is much drier, with no willows, bracken ferns or other phraeatophytic (water indicating) vegetation, supports a much sparser tree cover and lacks much of any litter deposition and down logs. Potential habitat along the drainage near Stanfield Road contains willows and rocky habitat, but is within Lot B and will not be effected by residential development.

47. Work shall be in compliance with United States Forest Service Management Plan and General Plan Conservation and Open Space.

This is an ambiguous condition, presumably requiring compliance with the Sensitive Biota Management Plan of the U.S. Forest Service and the City of Big Bear Lake's General Plan conservation and open space element.

48. Require review of trees to be removed. Lots with eagle perch/roosting trees shall be identified and restrictions placed on those lots for the protection of trees.

Again, this condition refers to Lots 283,284,289 and 290, as discussed earlier. Appended C,C,&R condition *2 above would require these trees to be reviewed before building permits could be issued.

49. Require replacement of trees relative to removal of eagle perch/roosting trees.

Condition (3) of the draft Eagle Mountain Estates C,C,&R's (pg. 3 of draft) would require location of all living trees over 10" in diameter on the plat. It states that "excepting only those trees which must be removed for purposes of construction, no living tree on any lot in subject tract shall ever be cut down or removed unless designated by a public or licensed private Forester as diseased, or unless approved by the Architectural Committee for reasons of health and safety." It also specifically states that eagle perch trees "within residential lot boundaries will be preserved, and building set-back lines for these trees will be carefully observed." Again, this condition may be partially implemented by appended Condition *2 above, but some additional language may be added to Condition *2C as follows:

*2C. A tree replacement ratio of 3:1 (requiring planting 3 native jeffrey pines for every one (>10") removed for construction) shall be required. If one of the actual perch trees on Lots 283,284,289 or 290 must be removed for reasons of health and safety, the owner of said lot shall pay a fee of $200/tree to be used for trimming, limbing or otherwise creating additional perch trees within Lot A upon the discretion of the Big Bear Valley

EXHIBIT "F"

Preserve Manager.

50. Create perch and roost trees by trimming or with artificial structures.

A general condition, it does not specify who, where, or how many additional perch trees are to be created. It is certainly in the applicant's best interests to improve eagle perching habitat elsewhere in Lot A, thus relieving some of the pressure on the affected lots along the western property frontage. Furthermore, planned improvements and stabilization of higher water levels in the Stanfield Pond area may shift eagle habitat utilization patterns further to the east, where, generally, there is better screening of residential lots from perch trees.

III. CONDITIONS PERTAINING TO RARE PLANT HABITAT

Conditions 51-53 refer to the rare plant habitat found along an annual stream drainage extending through the central portion of Phase 2 of the tract. Additional reference is made to the drainage easement in the draft C,C,&R's (condition (i), pg.2), stating that "no material of any type, including pine needles and grass clippings, shall be deposited within any portion of the drainage channel or culverts located within the tract."

51. Require fifty-foot-wide drainage easement.

The 50-foot drainage easement is so indicated on the Tract Map.

52. Fence the vernal springs habitat where same is abutting residential lots.

This condition requires fencing along the drainage easement. As with fencing required for the eagle habitat easement, a condition could be added to the C,C,&R's that would require the fair-share participation in fencing of the drainage easement. The fencing should be of similar nature as that described for the eagle habitat. Drainage easement fencing should be installed upon recordation of the tract, and fair-shares reimbursed to the Homeowners' Association as individual lots adjoining the easement are sold. The following condition is submitted for consideration:

*3. The homeowners of lots abutting the rare plant drainage easement shall pay a fair-share of the total cost for provision of a fence and signing of said easement. Fees shall be deposited into an account to be established specifically for such purpose.

53. The full impact of heavy equipment used for road construction on the vernal springs habitat is unknown (at the time of the Tentative Tract). Possible mitigation measures include road realignment to bypass vernal springs habitat, or construction of bridge over same.

There are three road crossings of the primary 50-foot

EXHIBIT "F"

easement and one of a secondary 20-foot easement. The centerlines of these roads were surveyed and inspected in the field. Proposed crossings will result in the removal of at least two 28-foot paved road rights-of-way across the 50-foot easement and one across the 20-foot easement in sensitive habitat. The following additional condition is, therefore, recommended:

*4. Road construction in the rare plant drainage easement area shall be strictly confined to the rights-of-way by means of temporary equipment/vehicle barriers. Care shall be taken that the natural run-off through the drainage easement is maintained at all times. Drainage under the roadways shall be by means of flow-through pipes, sized to carry normal surface flows (which are nominal given the small headwaters of this drainage) under the crossings with the least alteration of natural drainage as possible.

Lots 244 and 272-275 (old Tentative Tract map lot #'s) include a pebble plain rare plant community adjacent to the rare plant drainage easement. Lots 273 and 275, particularly, are both severely restricted by both the 20- and 50-foot easements. Lot 273 is actually bisected by the 20-foot easement. Lots 244 and 272 are constrained by the 50-foot easement and an extension of Lot B that crosses the drainage easement at that point, and contain high densities of the pebble plains indicator species. It is suggested that these five lots be reviewed as to their practical, net buildable areas relative to the easements. Consideration should be given to removal or redesign of said lots to better conform to the drainage and topographic constraints of same, and/or reconfiguration and establishment of additional easement or building setbacks if feasible (especially for lots 244, 272 and 275).

*5. Review Lots 244 and 272-275 relative to drainage easements and topographic constraints. Consideration should be given to redesign and/or establishment of additional easement area to protect pebble plain habitat.

IV. GENERAL MEASURES

With incorporation of the conditions and measures described above in the project C,C,&R's, potential impacts of the development of the tract on the sensitive biotic resources of the project can be substantially reduced. As with any project, however, the best of mitigation plans are only as good as the enforcement of the conditions of approval. It is with this in mind that the following general measure is recommended for inclusion in the Homeowners' Association by-laws and conditions:

*6. The Homeowners' Association shall designate a member of its Board as the official Warden for the tract. The Warden shall report directly to the Board any and all violations of the C,C,&R's pertaining to the management and maintenance of the bald eagle or rare plant habitat easements. Repeat offenses shall result in a fine or injunction against the offending party. The

EXHIBIT "F"

Warden shall work closely with the Big Bear Valley Preserve Manager to coordinate volunteer stewardship, maintenance and monitoring programs of the sensitive biotic resources of the tract.

TABLE OF CONDITIONS PERTAINING TO BIOTIC RESOURCES,
EAGLE MOUNTAIN ESTATES, TRACT 12488

Bald Eagle Habitat	Status
44. Require fencing and posting, building setbacks, reduction in lot and cul-de-sac depth in key eagle habitat. eagle habitat.	Refer to C,C,&R's condition *1. BSL's in place.
45A. Posting "No Parking" on Big Bear Blvd.	Done.
45B. Parking pads within front yards, garages/carports may be required for lots along Lot A frontage.	Refer to C,C,&R's condition *2D.
45C. Require planting native trees along Lot A frontage lots.	Refer to C,C,&R's condition *2C.
47. Compliance with US Forest Service and City General Plans.	Will comply.
48. Require review of trees to be removed, i.d. of perch trees and protection.	Refer to C,C,&R's condition *2C and general req'ments.
49. Require replacement trees relative to eagle perch trees.	Refer to C,C,&R's condition *2C and discussion pg.4
50. Create perch and roost trees by trimming or construction of artificial perches.	May be accomplished but condition not specific.
Other Biota	
46. Accomplish surveys for rubber boas and mountain king snakes.	Done.
51. Require 50-foot drainage easement in rare plant habitat.	Done. See also condition *5.
52. Fence vernal springs habitat abutting residential lots.	Refer to C,C,&R's condition *3.
53. Assess road crossings, heavy equipment in vernal springs habitat area.	Refer to C,C,&R's condition *4 & *5.

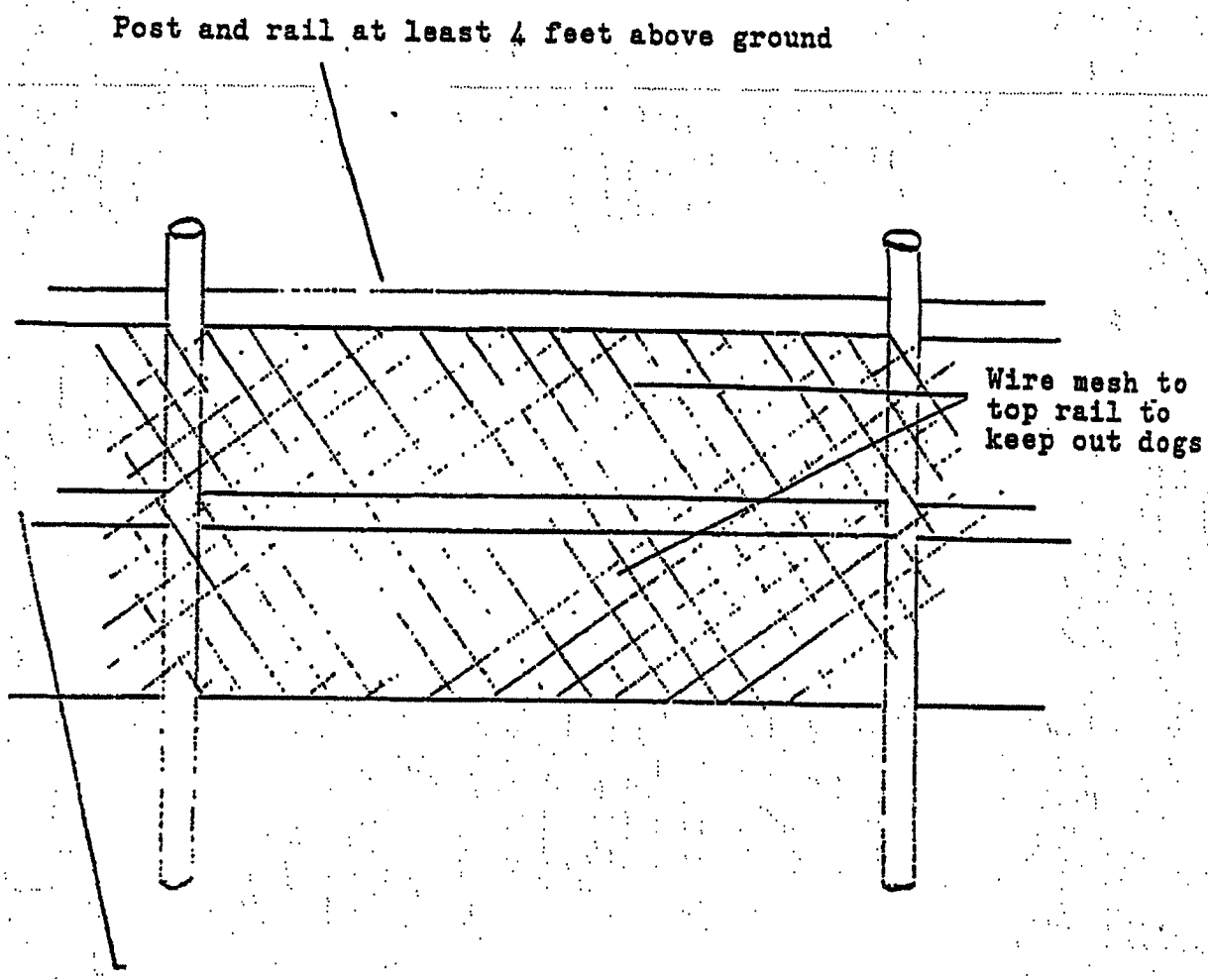
General condition *6 to be appended to C,C,&R's will provide additional supervision and monitoring of all biotic resources conditions.

EXHIBIT "F"

ATTACHMENT 1: BIOTIC RESOURCES CONDITIONS OF APPROVAL
(EXHIBIT "A", PLANNING COMMISSION RESOLUTION NO. 84-41)

EXHIBIT "F"

ATTACHMENT 2: RECOMMENDED FENCING TYPE FOR EASEMENTS



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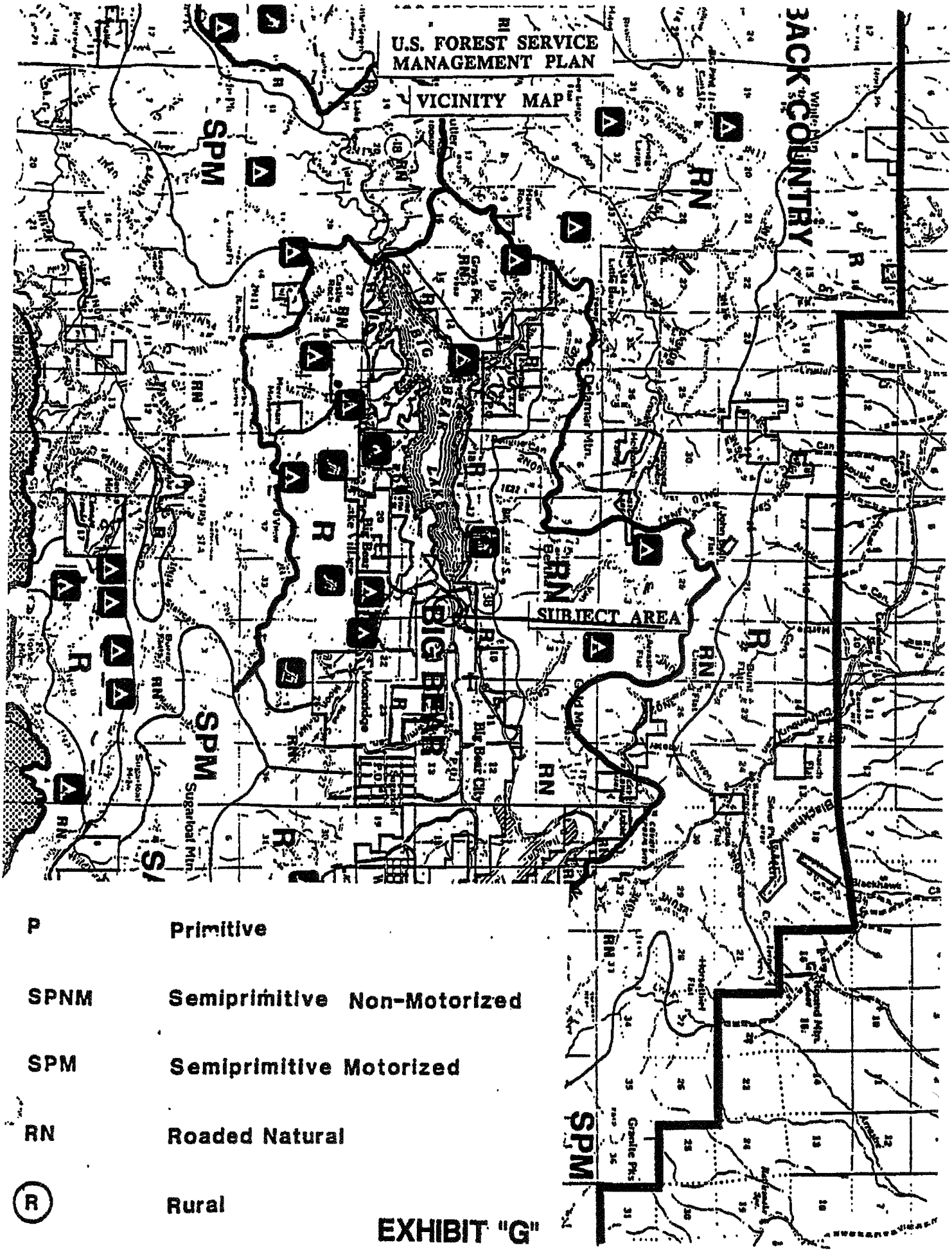

P	Primitive
SPNM	Semiprimitive Non-Motorized
SPM	Semiprimitive Motorized
RN	Roaded Natural
(R)	Rural

EXHIBIT "G"

Attachment C – Document titled "FOF 0112 Attachment C – 05 Castle Glen Easement Documentation Report 2011 Final (1).pdf"

The Nature Conservancy
Protecting nature. Preserving life.™

Easement Documentation Report

Castle Glen Conservation Easement
124.46 acres
San Bernardino County, CA

Prepared By: Sophie Parker, Ph.D.
Title: Ecoregional Ecologist
Office Location: Los Angeles
Address: 601 S. Figueroa St., Suite 1425, Los Angeles, CA 90017
Condition of Property as of July 8, 2011

The Nature Conservancy
Protecting nature. Preserving life.™

Acknowledgement of Condition

This acknowledgement constitutes a part of a Conservation Easement Documentation Report which documents the current condition of a Conservation Easement reserved on December 28, 1983, by The Nature Conservancy, a non-profit corporation organized and existing under the laws of the District of Columbia ("Conservancy"), over property currently owned by the Castle Glen Conservancy ("Owner"). The conservation easement covers a tract of land at Castle Glen in San Bernardino County, CA ("Property").

The Conservation Easement Documentation Report is dated July 8, 2011 was prepared by Sophie Parker and includes a cover page, table of contents, maps, photographs, tables, exhibits, and this Acknowledgement, and contains information about the natural resources of the Property, consisting of 124.46 acres. Owner and Sophie Parker, a representative of the Conservancy, acknowledge and agree that the Conservation Easement Documentation Report is an accurate representation of the Property at the time of the completion of this report.

OWNER

By:_____

_____
(print name)

Date: _____

THE NATURE CONSERVANCY

By: _____

Printed Name: Sophie Parker

Title: Ecoregional Ecologist

Date: 07/08/11

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Exhibit A: Legal Description
Exhibit B: USGS Topographic Map of Property
Exhibit C: Aerial Photograph of Property
Exhibit D: Maps of Selected Anthropomorphic and Other Features
Exhibit E: Map of Photo Point Locations
Exhibit F: List of Photographs and Photo Points
Exhibit G: Photographs

Conservation Easement Documentation

A. Introduction

This report has been prepared subsequent to a conservation easement ("**Conservation Easement**") reserved on December 28, 1983, by The Nature Conservancy, a non-profit corporation organized and existing under the laws of the District of Columbia ("**Conservancy**"), over Property owned by The Castle Glen Conservancy ("**Owner**"). The Conservation Easement covers approximately 124.46 acres of land at Castle Glen in San Bernardino County, CA, as legally described in attached Exhibit A ("**Property**"). The Property is shown on the map attached as Exhibit B.

This Conservation Easement Documentation Report is intended to document the condition of the Property as of July 8, 2011 and to provide natural resources information about the Property.

B. Location

The Property is located in San Bernardino County, near the City of Big Bear Lake. The Property is legally described in Exhibit A. Exhibit B shows the location of the Property on a USGS map. The Property can be reached by travelling north on Highway 330 from Highland, CA to the town on Running Springs, and then heading east on Highway 18 to Big Bear Lake. Highway 18 becomes Big Bear Boulevard. From Big Bear Boulevard, turn right onto Starvation Flats Road, drive 300 meters, and the Property is located on the left.

C. Site Description of Conservation Area

The Property is located within Big Bear Valley, near the south east portion of Big Bear Lake. The Property is comprised of two disconnected parcels, hereafter referred to as Parcel A, which is located to the north, and Parcel B, which is located to the south. The two parcels are separated by a housing development known as Castle Glen Estates.

D. Ecological Features/Conservation Values of the Property

The main plant community on the Property includes Jeffrey pine woodland with scattered incense-cedar, Sierra juniper, black oak, Ponderosa pine, manzanita, and *Artemesia tridentata.*

There is also some riparian willow woodland along an ephemeral stream area close to Starvation Flats Road. The Property is hilly, and features rocky outcroppings throughout.

At the time the Property was protected in 1983, the conservation values of the Property included wintering habitat for Bald Eagles and habitat for several rare plant species. Eagle perching and roosting trees were found on both Parcel A and Parcel B of the Property. A 1983 map of these perching and roosting sites is included in Exhibit D of this report.

Since 1983, the wintering population of Bald Eagles in the Big Bear Valley has significantly declined from numbers greater than 30 to only rare sitings on the Property. In recent years, the Owner has reported that no eagles have been sited on the Property. Multiple factors have been implicated as the causal agents in the decline of Bald Eagles use of the Big Bear Valley. The valley has experienced human population growth since 1980. Together, the City of Big Bear Lake and the unincorporated City of Big Bear had a total of over 17,000 people at the time of the 2010 census. The amount of traffic associated with vacation rentals and recreational activities in Big Bear Valley is considerable, and the resulting noise pollution along Big Bear Valley Boulevard could be partially responsible for the decline in Bald Eagle numbers.

Nine rare, threatened, or endangered plant species have been document on or in very close proximity to the Property. Of the nine, six of the species were located on the Property during botanical surveys conducted on May 6, 2005 and June 3, 2005. These surveys covered the majority of Parcel A and the western portion of Parcel B of the Property. The six species recorded in 2005 were: Big Bear Valley Woollypod (*Astragalus leucolobus*), San Bernardino Mountains Monkeyflower (*Mimulus exiguus*), Purple Monkeyflower (*Mimulus purpureus*), San Bernardino Ragwort (*Senecio bernardinus*), Big Bear Valley Phlox (*Phlox dolichantha*), and Parish's Rock Cress (*Arabis parishii*). All six species are on the CNPS 1B List, but none have state or federal listing status. Small numbers of Big Bear Valley Woollypod were located east of Starvation Flats Road on the southwest portion of Parcel B. A small number of San Bernardino Mountains Monkeyflower were located within a small ephemeral tributary east of the stream that runs along Starvation Flats Road on the western portion of Parcel B. Purple Monkeyflower was found on three areas of the Property, two within Parcel B and one within Parcel A. The occurrence on Parcel A was located on the western portion of the Property along an ephemeral drainage. On Parcel B, the first occurrence of the Purple Monkeyflower was alongside the only occurrence of San Bernardino Mountains Monkeyflower, and the second occurrence of Purple Monkeyflower was along the stream that runs along Starvation Flats Road. San Bernardino Ragwort was found in a few small patches on Parcel A. A very small patch of Parish's Rock Cress was found in the western portion of Parcel A. Numerous medium-sized patches of Big Bear Valley Phlox were located on the central portion of Parcel A. See Exhibit D for rare plants maps.

The Property has some evidence of human disturbance. See Exhibit D for a map of selected anthropomorphic features on the Property. The following is a list of current and historic human modifications to the Property, and other signs of human activities that were evident through visual examination:

1. There is a cleared and **graded access road** that has been constructed through the Property for the removal of dead trees, as required by municipal fire abatement rules. The road can been seen in Photo 2, and is visible in the aerial photo shown in Exhibit C.

2. Trees on the Property that have died as a result of recent drought, air pollution, and disease have been cut down, and the trunks have been removed from the Property. Many **stumps from the removal of standing dead trees** are evident on the Property.

3. **Signage** is located around the perimeter of the Property. These signs consist of small wooden/poly "no trespassing" indicators. Examples of signage can be seen in Photo 10.

4. A wooden **fence** is located on the north side of Parcel A of the Property, along Big Bear Boulevard. This fence has been repaired with wire. It can be seen in Photos 10, 11, and 12. Other fences along the Property line include one on the southern side of the western portion of Parcel A just north of and behind homes that are part of the Castle Glen Estates; a chain link fence to the south of the county senior center facility; and a chain link fence on the northwest slope of Parcel A along Big Bear Blvd. to prevent erosion from cutting off the road.

5. Several **trails** (footpaths) can be found on the Property. These have been created by trespassers.

6. Litter is not a significant problem, but only **occasional pieces of trash** are found along the edges of the Property. Styrofoam trash is visible in Photo 7.

7. Possible **encroachment** on the Property may have occurred by a neighbor who has dumped construction materials outside of his fence. Because the Property lot lines would need to be surveyed in order to know for certain whether encroachment has occurred, this is not a confirmed human activity on the Property.

E. Photographs

Photographs documenting the current condition of the Property accompany this report and are incorporated by reference. The photographs were taken July 8, 2011. A brief description of each photograph appears in Exhibit F and the photographs follow in Exhibit G. The points from which photographs were taken are shown on the map attached to this report as Exhibit E. A 2010 aerial photograph of the Property appears in Exhibit C.

EXHIBIT A

Legal Description of Property

Parcel "A"

All that portion of the East 1/2 of Section 16 and of the West 1/2 of Section 15, Township 2 North, Range 1 East, San Bernardino Meridian, in the City of Big Bear Lake, County of San Bernardino, State of California, described as follows:

COMMENCING at the center of said Section 15 in the centerline of Division Drive, as shown on Record of Survey recorded in Book 43, Page 56 of Records of Survey, records of San Bernardino County; thence along the boundary line of the 14.52 net acre parcel, as shown on said Record of Survey, South 89° 53' 50" West 420.00 feet to an angle point therein; thence North 69° 06' 10" West 434.00 feet to the TRUE POINT OF BEGINNING at an angle point in said boundary line; thence from the TRUE POINT OF BEGINNING, continuing along said boundary line, North 24° 22' 10" West 247.00 feet; thence North 7° 08' 10" West 255.08 feet to a point on the Southerly line of 80 foot wide Big Bear Boulevard, said point lies on a curve concave to the North and whose radius is 423.06 feet and whose initial tangent bears South 73° 18' 45" West; thence Westerly along said curve, 169.62 feet and through a central angle of 22° 58' 20"; thence continuing along said Southerly line of Big Bear Boulevard, as shown on Record of Survey recorded in Book 40, Pages 8 and 9 of Records of Survey, records of San Bernardino County, North 83° 42' 55" West 429.00 feet; thence leaving said Southerly line, South 0° 05' East 158.09 feet; thence South 73° 10' West 615.48 feet; thence South 89° 30' West 170.00 feet; thence North 45° 20' West 325.00 feet; thence North 0° 10' West 170.00 feet to a point on the aforesaid Southerly line of Big Bear Boulevard; thence along said line, South 87° 02' 05" West 1302.00 feet to the beginning of a tangent curve concave to the Southeast and whose radius is 343.06 feet; thence Southwesterly along said curve, 254.22 feet and through a central angle of 42° 27' 30"; thence South 44° 34' 35" West 256.46 feet to the beginning of a tangent curve concave to the Northwest and whose radius is 613.69 feet; thence Southwesterly along said curve, 265.99 feet and through a central angle of 24° 50'; thence South 69° 24' 35" West 191.98 feet; thence leaving said Southerly line of Big Bear Boulevard, South 29° 15' East 100 feet; thence North 63° 20' East 200 feet; thence North 71° 30' East 118 feet; thence North 88° 15" East 215 feet; thence North 33° 30' East 70 feet; thence North 51° 00' East 65 feet; thence South 41° 45' East 125 feet; thence South 50° 15' East 194 feet; thence South 86° 20' East 100 feet; thence South 47° 45' East 92 feet; thence North 51° 37' 25" East 357.39 feet; thence South 77° 30' East 145 feet; thence North 63° 50' East 223 feet; thence North 77° 20' East 138 feet; thence South 37° 35' East 90 feet; thence South 1° 30' East 225 feet; thence South 6° 50' East 195 feet; thence South 40° 00' East 165 feet; thence South 72° 45' East 86 feet; thence North 19° 45' East 80 feet; thence North 53° 35' East 121 feet; thence North 70° 30' East 172 feet; thence South 63° 30' East 462 feet; thence South 45° 55' East 140 feet; thence South 61° 50' East 102 feet; thence South 72° 00' East 103 feet; thence South 75° 30' East 105 feet; thence North 12° 10' East 145 feet; thence North 67° 00' West 40 feet; thence North 74° 40' West 155 feet; thence North 12° 00' West 168 feet; thence North 56° 20' West 160 feet; thence North 3° 05' East 255 feet; thence North 66° 30' East 192 feet; thence South 77° 15' East 120 feet; thence North 87° 55' East 290 feet; thence South 79° 40' East 220 feet; thence South 71° 35' East 112 feet; thence South 65° 15' East 75 feet to the TRUE POINT OF BEGINNING.

AND CONTAINING 39.772 acres of land, more or less.

December 16, 1983

Parcel "B"

All that portion of the East 1/2 of Section 16 and of the West 1/2 of Section 15, Township 2 North, Range 1 East, San Bernardino Meridian, in the City of Big Bear Lake, County of San Bernardino, State of California, described as follows:

COMMENCING at the Southeast corner of said Section 16, as shown on Record of Survey recorded in Book 40, Pages 8 and 9 of Records of Survey, San Bernardino County Records; thence North 0° 05' East 381.81 feet to the TRUE POINT OF BEGINNING; thence from the TRUE POINT OF BEGINNING, North 86° 50' 01" West 157.07 feet; thence South 63° 59' 59" West 220.49 feet; thence North 69° 01' 44" West 63.23 feet; thence South 82° 34' 47" West 67.07 feet; thence North 14° 35' 37" East 247.32 feet; thence North 68° 42' 13" West 66.35 feet; thence South 58° 05' 52" West 127.91 feet; thence South 69° 07' 15" West 166.20 feet; thence North 31° 39' 35" West 121.85 feet; thence North 88° 38' 35" West 135.87 feet to a point on the Northeasterly line of a road easement shown on said Record of Survey as Stanfield Road; thence along said line, North 35° 13' 15" West 330.43 feet; thence North 15° 53' 15" West 326.63 feet; thence North 38° 23' 15" West 362.45 feet; thence North 53° 52' 30" West 67.96 feet; thence leaving said road easement North 49° 00' East 149.48 feet; thence South 59° 05' East 233 feet; thence South 64° 10' East 229 feet; thence North 75° 00' East 132 feet; thence North 7° 35' East 193 feet; thence North 33° 45' West 75 feet; thence North 61° 10' West 310 feet; thence North 67° 50' West 202 feet; thence North 71° 05' West 168 feet; thence North 3° 05' West 33 feet to the beginning of a tangent curve concave to the Southeast and whose radius is 140 feet; thence Northeasterly along said curve, 174.30 feet and through a central angle of 71° 25'; thence North 68° 20' East 487.00 feet; thence South 24° 45' East 125 feet; thence South 51° 50' West 162 feet; thence South 1° 15' West 75 feet; thence South 34° 05' East 275 feet; thence South 66° 10' East 481 feet; thence North 85° 45' East 284 feet; thence South 72° 20' East 373 feet; thence North 41° 50' East 154 feet; thence North 36° 30' East 139 feet; thence South 20° 50' East 178 feet; thence South 8° 30' East 153 feet; thence South 20° 20' East 100 feet; thence South 37° 30' East 184 feet; thence North 87° 30' East 215 feet to a point on a non-tangent curve concave to the Northeast and whose radius is 790.00 feet and whose initial tangent bears South 51° 30' East; thence Southeasterly along said curve, 71.24 feet and through a central angle of 5° 10'; thence South 87° 20' West 605 feet; thence South 53° 00' West 140 feet; thence South 65° 00' East 90 feet; thence South 52° 10' East 295 feet; thence North 85° 15' East 395 feet; thence South 23° 10' East 244 feet; thence South 45° 35' East 155 feet; thence North 88° 15' East 120 feet; thence North 42° 20' East 127 feet; thence North 22° 55' West 382 feet; thence North 65° 15' East 154 feet; thence North 58° 35' East 112 feet; thence North 38° 25' East 115 feet; thence North 26° 50' East 110 feet; thence North 3° 00' West 115 feet; thence North 23° 30' West 118 feet; thence North 35° 50' West 178 feet; thence North 14° 30' East 58 feet; thence South 62° 00' East 110 feet; thence South 75° 40' East 104 feet; thence South 89° 30' East 340 feet; thence North 21° 40' East 439.79 feet; thence North 25° 40' West 66.17 feet; thence North 42° 45' West 90 feet; thence North 12° 10' West 80 feet; thence North 41° 20' East 109 feet; thence North 83° 50' East 141 feet; thence South 21° 45' East 210 feet; thence South 5° 00' East 130 feet; thence South 0° 25' West 123 feet; thence South 47° 00' East 156 feet; thence South 20° 35' East 70 feet; thence South 7° 40' East 128 feet; thence South 48° 15' East 220 feet; thence South 11° 00' East 30 feet; thence South 5° 00' West 65 feet; thence South 48° 45' West 105 feet; thence South 54° 20' West 198 feet; thence North 70° 15' West 230 feet; thence North 50° 30' West 78 feet; thence South 28° 10' West 184 feet; thence South 38° 10' East 120 feet; thence South 1° 45' West 288 feet; thence South 67° 15' West 192 feet; thence North 31° 00' West 62 feet; thence South 59° 00' West 95 feet; thence North 36° 40' West 235 feet; thence South 52° 45' West 137 feet; thence South 3° 20' West 369 feet; thence South 62° 15' West 110 feet; thence North 88° 40' 33" West 1008 feet; thence South 0° 05' West 53 feet to the point of beginning. CONTAINING 84.669 acres, more or less.

EXCEPTING therefrom that certain parcel of land described as Airport Beacon "B" and recorded in Book 8700, Page 1164, Official Records of San Bernardino County.

EXHIBIT B

USGS Topographic Map of Property

Boundaries shown in red are approximate.

EXHIBIT C

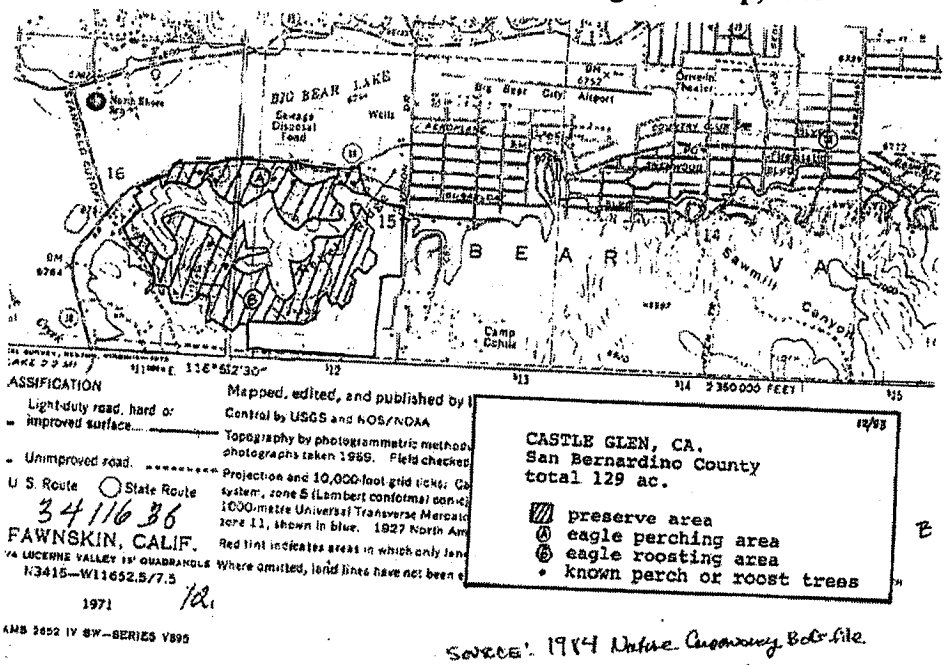
Aerial Photo of Property

Taken in 2010. Boundaries shown in yellow are approximate.

EXHIBIT D

Maps of Selected Anthropomorphic and Other Features

Map 1. Castle Glen Eagle Perching and Roosting Area Map, 1983



SOURCE: 1984 Nature Conservancy Bob file.

Map 2. Castle Glen Rare Plants Map, 1983

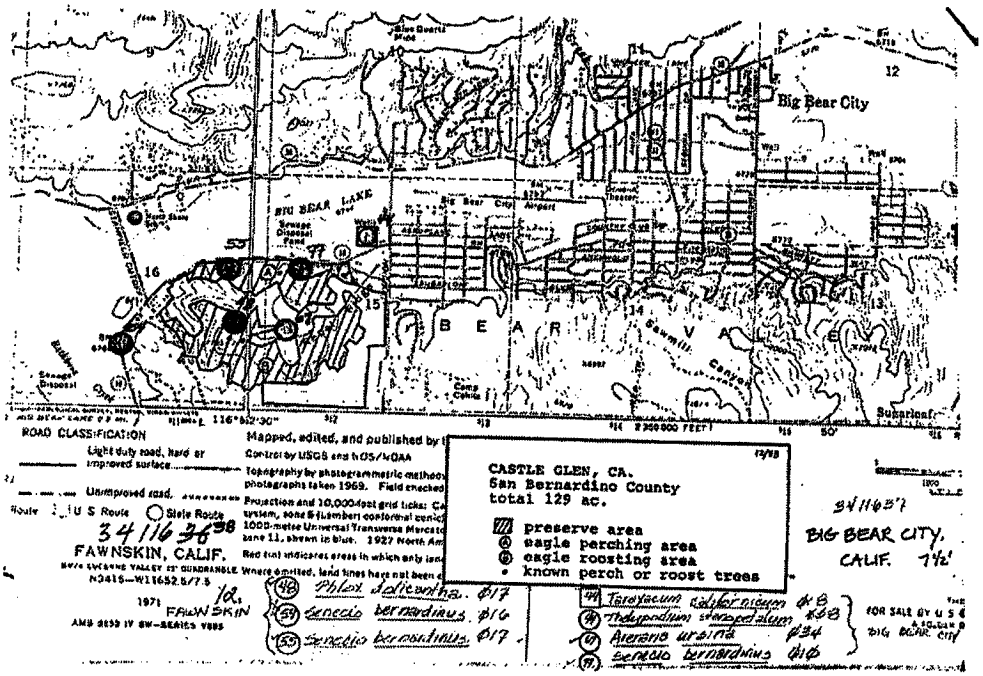


EXHIBIT D (continued)

Maps of Selected Anthropomorphic and Other Features

Map 3. Map of Anthropomorphic Features (boundaries shown in yellow are approximate)

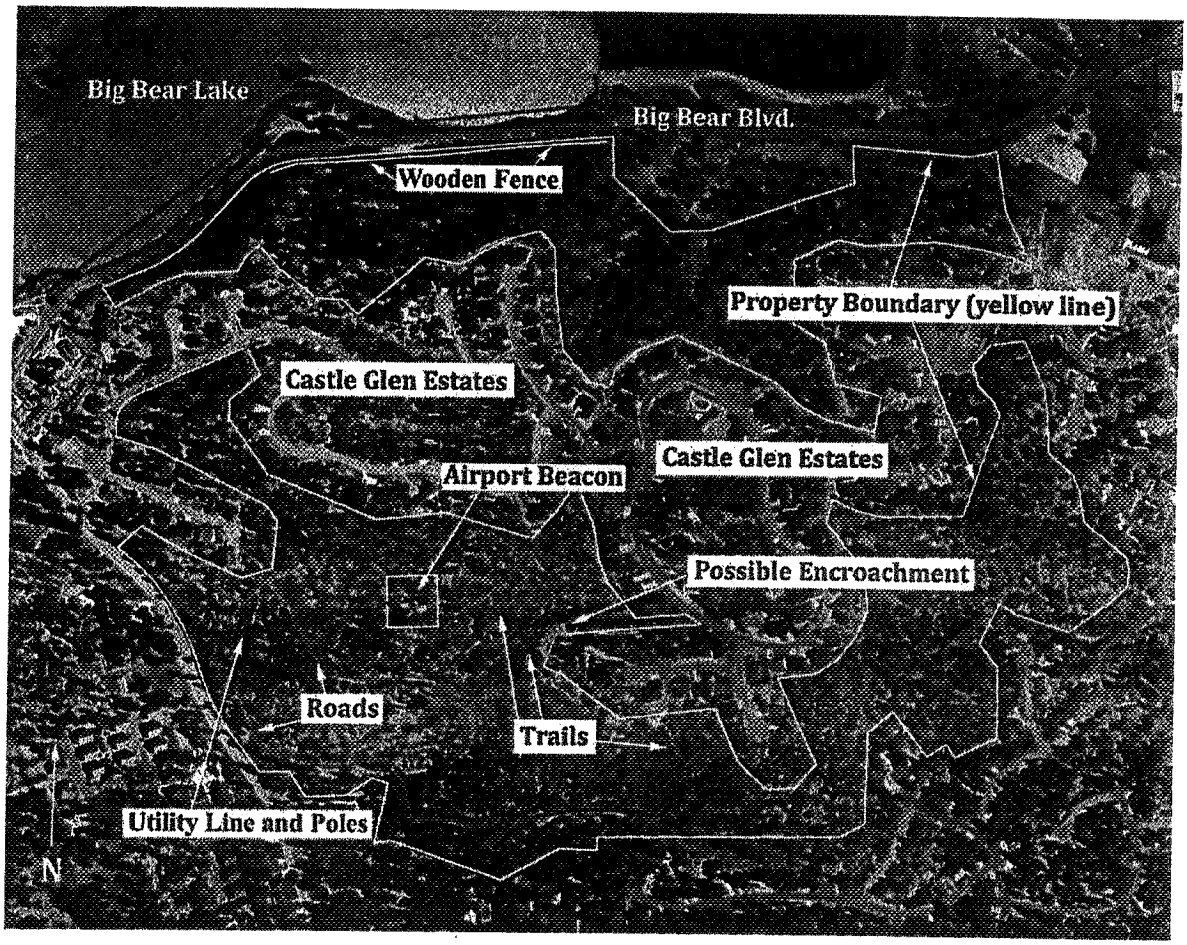


EXHIBIT E

Map of Photo Point Locations

These numbered points correspond to the Photo Point numbers shown in Exhibit F of this Report. Boundaries shown in yellow are approximate.

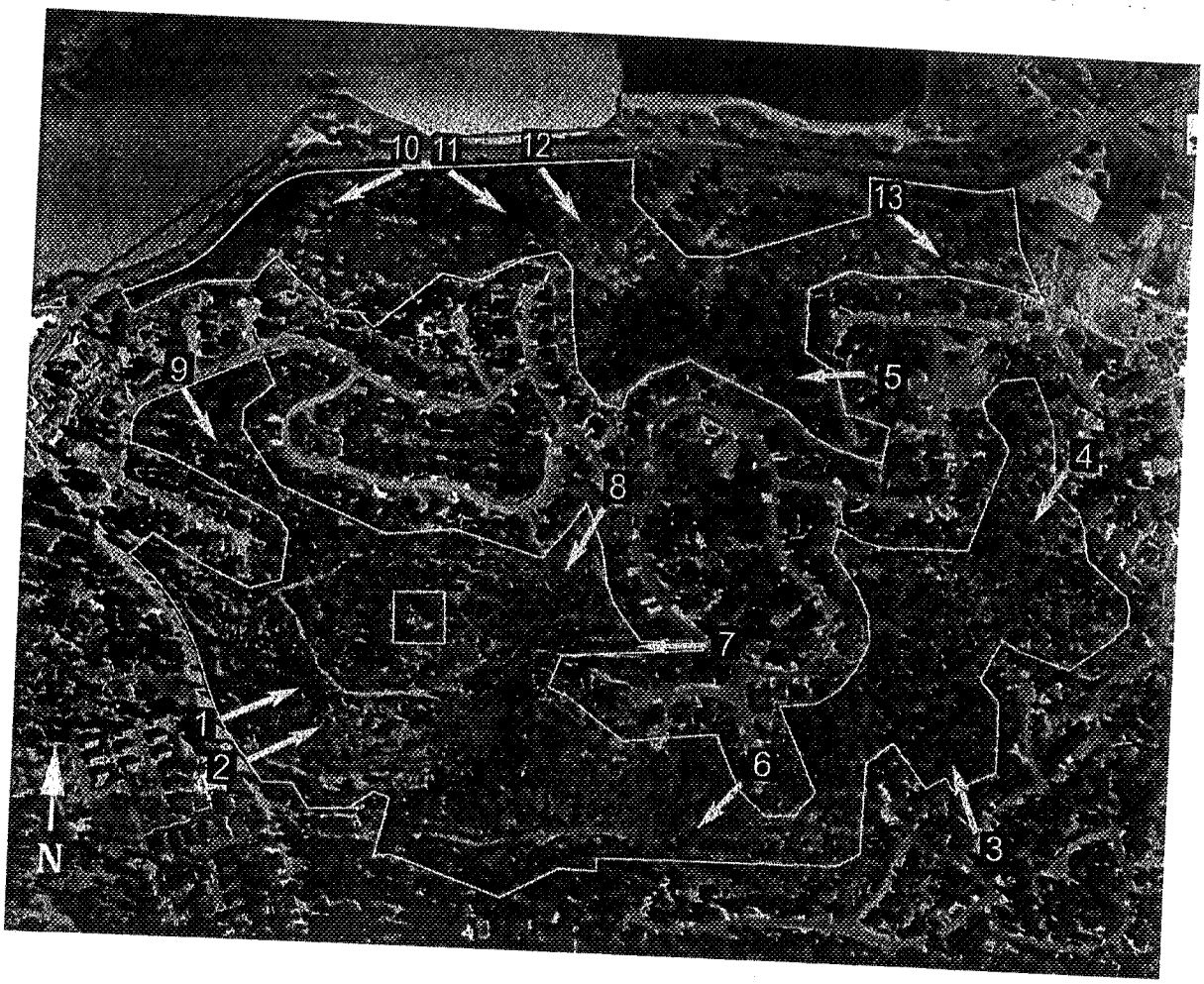


EXHIBIT F

List of Photographs and Photo Points

The photographs listed below and incorporated herein were taken July 8, 2011. The photographs accompany this report.

Photo points are outlined on the map attached as Exhibit E to this report. Photo Point coordinates for latitude and longitude were inferred from GoogleEarth.

Photograph and Photo Point #	Compass direction	Latitude	Longitude	Description
1	NE	34°15'10.83"N	116°52'47.92"W	Up hillside on Parcel B, showing airport beacon and utility lines/poles.
2	NE	34°15'9.43"N	116°52'46.45"W	Rock outcrop and graded access road on Parcel B.
3	NW	34°15'9.10"N	116°52'8.62"W	Rock outcrop up hillside on Parcel B.
4	SW	34°15'21.76"N	116°52'6.19"W	Eastern portion of Parcel B.
5	W	34°15'25.14"N	116°52'15.85"W	Southern portion of Parcel A.
6	SW	34°15'9.45"N	116°52'21.88"W	View from rocky outcrop on Parcel B.
7	W	34°15'14.95"N	116°52'25.52"W	Access point to Parcel B from within Castle Glen Estates.
8	SW	34°15'20.38"N	116°52'29.25"W	Forest on Parcel B.
9	SE	34°15'24.57"N	116°52'50.60"W	Northwest portion of Parcel B.
10	SW	34°15'33.50"N	116°52'39.08"W	Wooden fence and signage along Big Bear Blvd. on Parcel A.
11	SE	34°15'33.50"N	116°52'39.08"W	Wooden fence along Big Bear Blvd. on Parcel A.
12	SE	34°15'33.95"N	116°52'32.90"W	Snags in forest on Parcel A.
13	SE	34°15'33.14"N	116°52'16.59"W	Eastern portion of Parcel A.

EXHIBIT G

Photographs

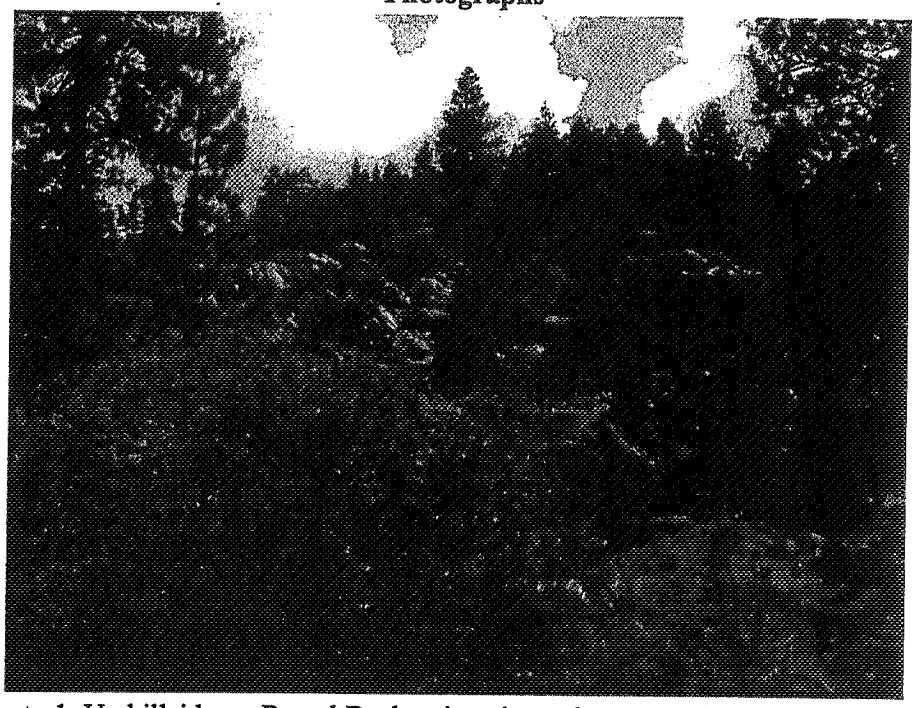


Photo 1. Up hillside on Parcel B, showing airport beacon and utility lines/poles.

Photo 2. Rock outcrop and graded access road on Parcel B.

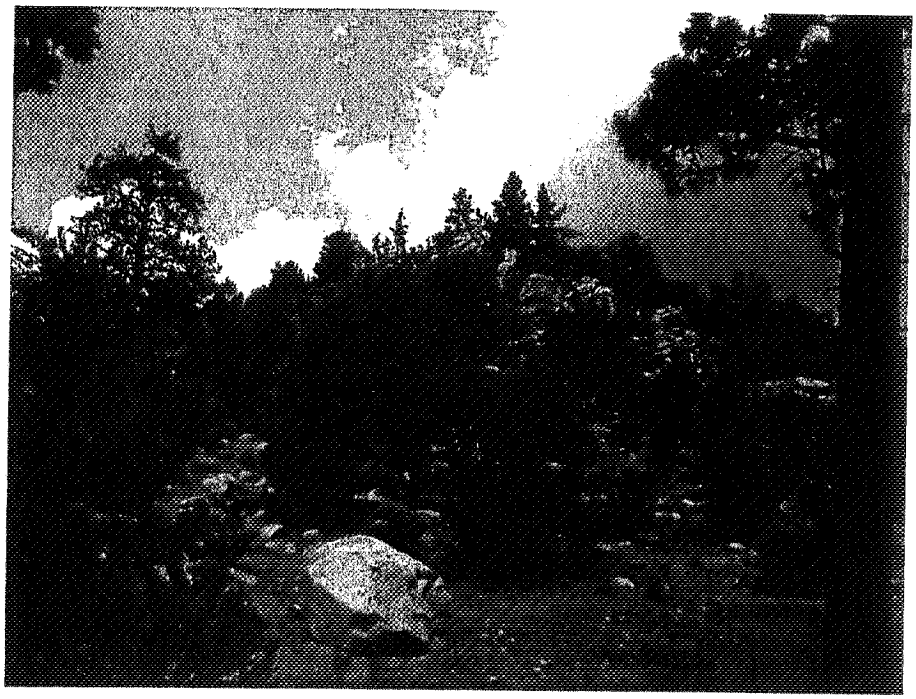


Photo 3. Rock outcrop up hillside on Parcel B.

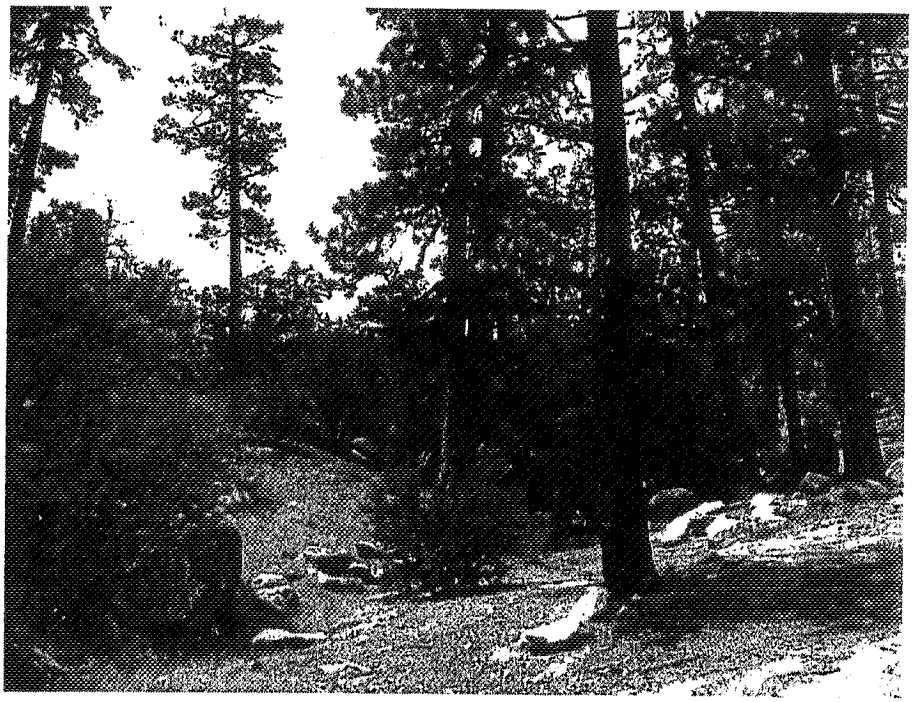


Photo 4. Eastern portion of Parcel B.

Photo 5. Southern portion of Parcel A.

Photo 6. View from rocky outcrop on Parcel B.

Photo 7. Access point to Parcel B from within Castle Glen Estates.

Photo 8. Forest on Parcel B.

Photo 9. Northwest portion of Parcel B.

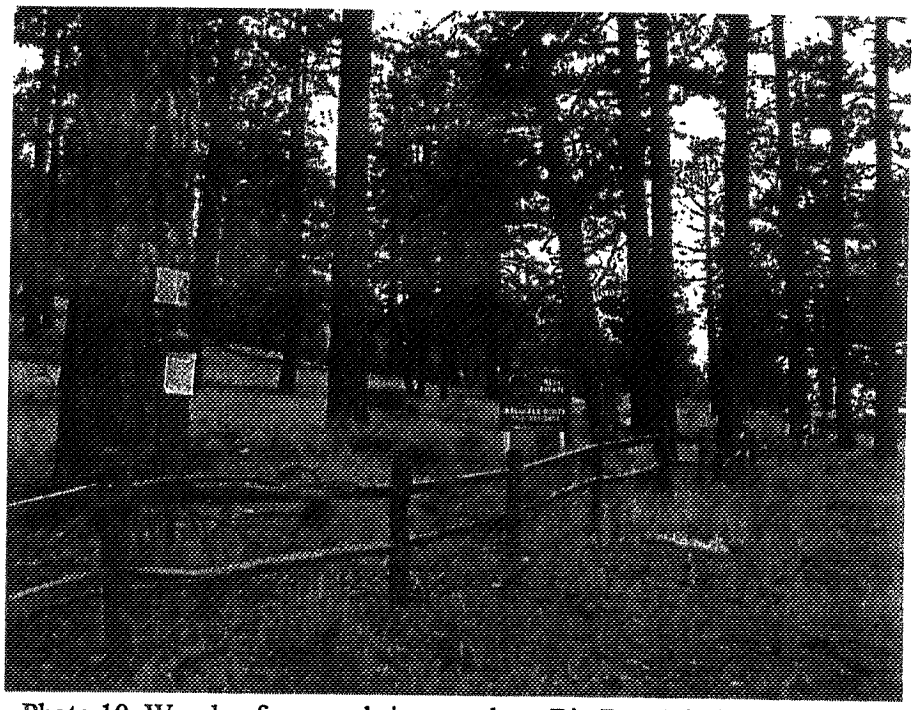


Photo 10. Wooden fence and signage along Big Bear Blvd. on Parcel A.

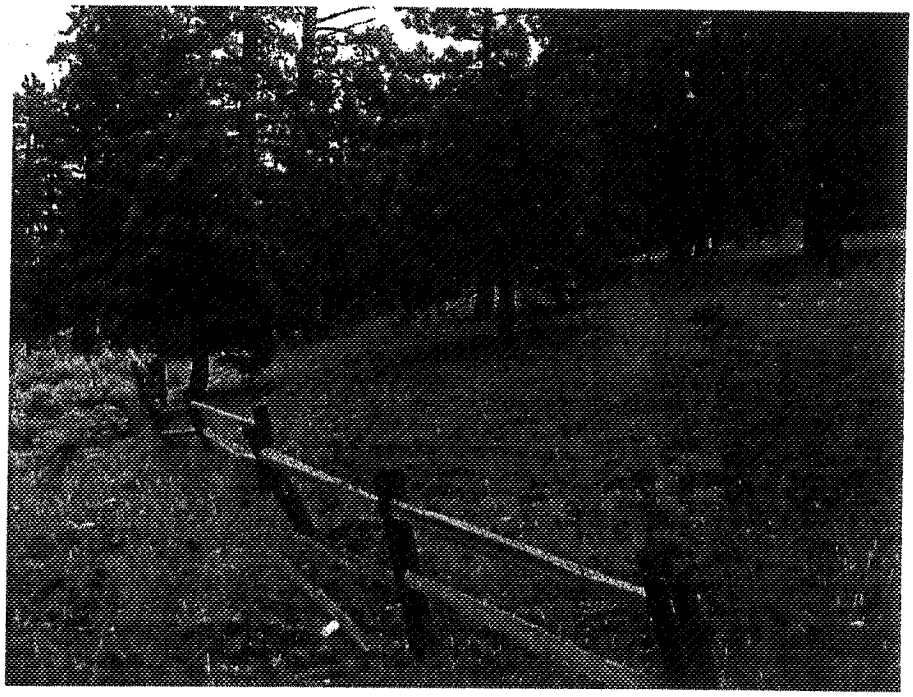


Photo 11. Wooden fence along Big Bear Blvd. on Parcel A.

Photo 12. Snags in forest on Parcel A.

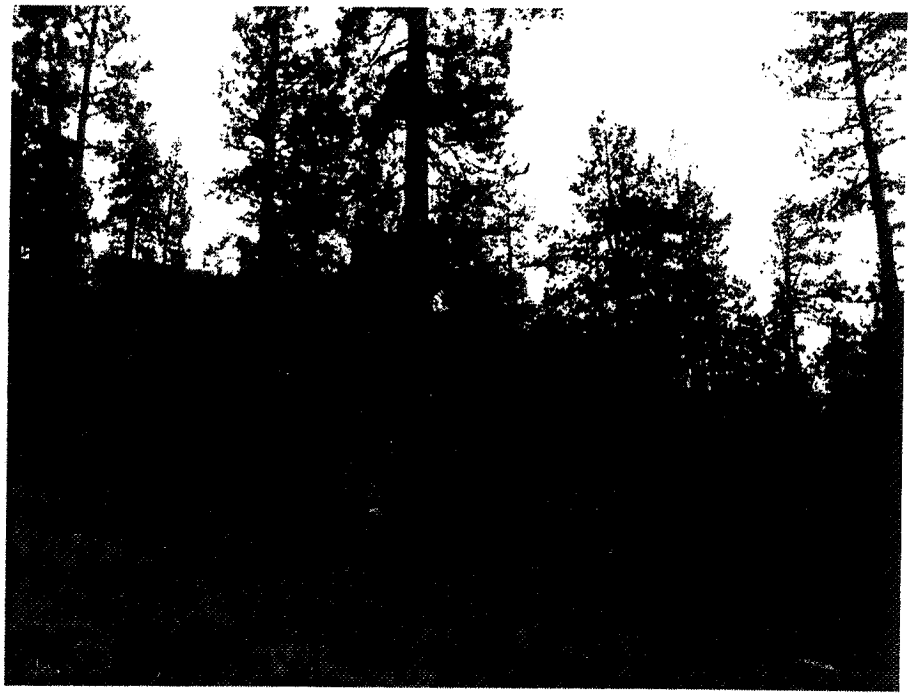
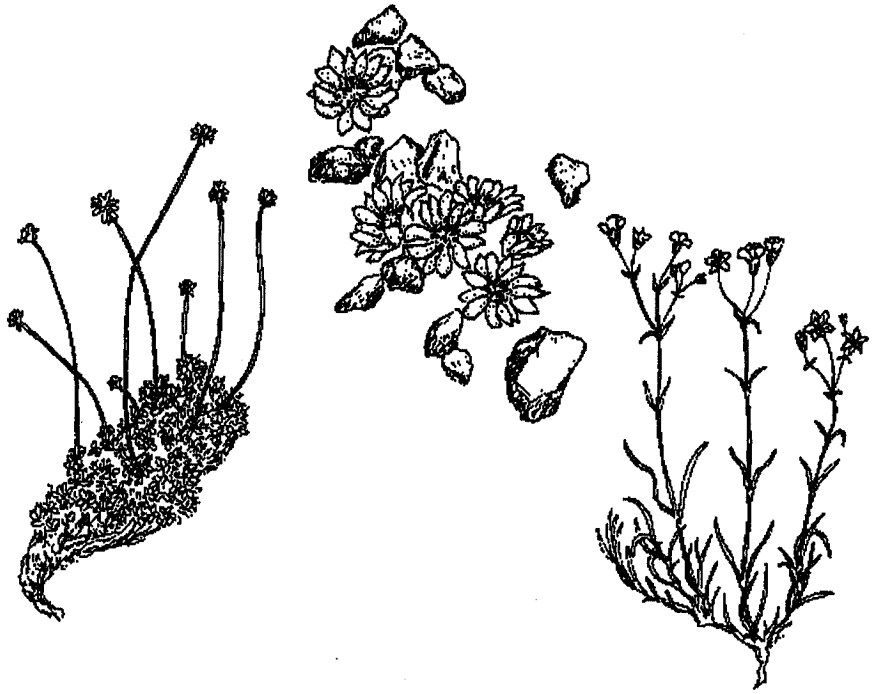


Photo 13. Eastern portion of Parcel A.

Attachment D – Document titled "FOF 0112 Attachment D – Pebble Plain Habitat Management Guide 2002.pdf"

PEBBLE PLAIN HABITAT MANAGEMENT GUIDE



A Revision of the 1990
Pebble Plain Habitat Management Guide and Action Plan
by Katie Barrows and Maile Neel

Prepared by
USDA Forest Service
San Bernardino National Forest

-----SEPTEMBER 2002-----

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- Snow Valley Complex
- Coxey Meadow Complex
- Big Bear Lake Complex
- Holcomb Valley Complex
- Fawnskin Complex
- Arrastre Flats Complex
- Sawmill Complex
- Gold Mountain Complex
- Grinnell Ridge Pebble Plain
- North Baldwin Lake Complex
- Sugarloaf Ridge Complex
- South Baldwin Ridge/Erwin Lake Complex
- Broom Flat Complex
- Rattlesnake Complex

ACKNOWLEDGEMENTS

This document updates the 1990 Pebble Plain Habitat Management Guide and Action Plan (Neel and Barrows 1990) with the most current information on pebble plain habitat on the San Bernardino National Forest and adjacent lands. The Guide was designed to provide management direction for conservation of pebble plain habitat on the Forest, to aid in recovery of the three federally listed plants and to improve conditions for Forest Sensitive species occurring in this habitat.

Many sources of information were compiled for the completion of the 2002 Guide. We wish to thank the following people.

Maile Neel and Katie Barrows completed the 1990 Pebble Plain Habitat Management Guide and Action Plan, which identified and prioritized measures to promote pebble plain habitat protection. Many of these actions implemented over the last 12 years provided for education and interpretation of pebble plain habitat and began the effort to recover the three federally listed plant species.

Tim Krantz, Professor of Environmental Studies at the University of Redlands, and Kate Kramer, California Department of Fish and Game, provided information about sensitive habitat on private land.

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George Kenline, San Bernardino National Forest Lands Officer, provided Forest land acquisition information and historical accounts. Audrey Scranton, San Bernardino National Forest Recreation and Trails Specialist, contributed information about recreational uses on the Forest.

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Gene Zimmerman, Forest Supervisor, Allison Stewart, Mountaintop District Ranger, Elliott Graham, Front Country District Ranger and the Forest Leadership Team reviewed drafts and provided comments that were incorporated into the final Guide.

Charity Hall, Botanist on the San Bernardino National Forest, provided the botanical illustrations used on the front cover of the Guide.

SUMMARY

Purpose

Pebble plain habitat is found only on the San Bernardino National Forest in San Bernardino County, California and adjacent private lands. In addition to its narrow distribution, this habitat supports three federally Threatened, eight Forest Service Sensitive, and six Watch List plant species as well as four rare butterfly species. The Forest Service is responsible for the long-term conservation of these species and their habitat on National Forest land. This Guide is a revision of the 1990 Pebble Plain Habitat Management Guide and Action Plan (Neel and Barrows 1990) and provides management direction necessary for meeting this responsibility. The purpose of the Guide is to summarize the management goals for pebble plain habitat, characterize habitat and distribution status, and to recommend protection measures for working in or around pebble plain habitat. Information on the significance and biology of the habitat, technical information on Threatened, Forest Service Sensitive, and Watch List plant species, a pebble plain habitat distribution map, and maps of specific habitat occurrences are also included. For management purposes, pebble plains have been grouped into fourteen pebble plain complexes.

The Guide also serves as a Species Management Guide for *Castilleja cinerea*, as all known occurrences including those in other habitat types are included and mapped within this document. Specific recommendations for *Castilleja cinerea* occurrences in all habitat types are also included.

Habitat Management Goals and Actions

Management goals include protecting pebble plain habitat throughout its geographic range, reducing habitat loss and fragmentation, maintaining site viability and encouraging compatible uses. When implemented, recommendations proposed in the Guide will protect and enhance habitat by avoiding, minimizing, or eliminating site-specific threats.

One of the Forest's most important goals is to increase understanding of the significance of these biologically rich areas and need for their preservation through public education and interpretation opportunities. To accomplish this goal, Forest visitors and local community residents will be encouraged to interact with their natural surroundings while learning about the particular features that comprise these special areas. Through education and interpretation, the Forest and the public will work to ensure preservation and responsible uses of this special habitat. The Forest will continue to work with local communities and Forest visitors by increasing educational and interpretive activities in order to foster a mutual understanding and appreciation for this rare habitat and the species it supports.

Monitoring

Qualitative and quantitative monitoring provides a means of determining the adequacy of the goals and to what degree the goals are being met, as well as an evaluation of the methodology used to achieve those goals. Monitoring procedures are detailed in the Pebble Plain Monitoring Plan, included as Appendix F in the Guide.

Habitat Management Guide Revision Schedule

This Summary will be reviewed and updated annually to document accomplishments and changes in status of habitat occurrences or of contact personnel. The Guide itself will be updated as necessary to reflect new information based on the results of monitoring and other research. The Management Direction in sections B-4 through B-7 should be revised in 2004 after the Land and Resource Management Plan (LRMP) Revision is completed. Updates are recommended as information becomes available, and revisions are recommended every 10-15 years. We encourage ongoing participation and contribution to the Guide in the form of relevant, supported data. Please send this information to Melody Lardner, Forest Botanist, Dev Volgarino, District Botanist, or Scott Eliason, District Botanist (contacts below).

Contacts

In case of emergency, or if there is a question about potential conflicts between pebble plain habitat and activities funded, authorized, or carried out by the Forest Service, contact any of the following:

Supervisors Office

Forest Botanist – Melody Lardner (909) 884-6634 x 3138
Forest Biologist – Steve Loe (909) 884-6634 x 3131

Mountaintop Ranger District

District Ranger – Allison Stewart (909) 337-2444
District Botanist – Dev Volgarino (909) 866-3437 x 3236
District Botanist – Scott Eliason (909) 866-3437 x 3904
Wildlife Biologist – Robin Eliason (909) 866-3437 x 3225

I. INTRODUCTION

A. PURPOSE

Pebble plain habitat supports a unique plant community within the San Bernardino National Forest and adjacent private lands. In addition to being narrow in distribution, this habitat supports three federally Threatened, eight Forest Service Sensitive, and seven Watch List plant species as well as four rare butterfly species. The purpose of this document is to compile information known about the habitat and the rare species it supports, provide site status summaries, develop general and site-specific management direction, and establish an implementation schedule. The document also includes specific information for the management of the three federally Threatened species, *Arenaria ursina, Castilleja cinerea,* and *Eriogonum kennedyi* var. *austromontanum.* This Guide has conservation benefit for approximately half of all federally Threatened, Forest Service Sensitive, and Forest Service Watch List plant species on the SBNF.

B. LEGAL REQUIREMENTS AND MANAGEMENT DIRECTION

Management direction and prescriptions are based on existing general legislation and Forest Service policy. Applicable requirements and direction may be found in the Federal Endangered Species Act, the National Forest Management Act, Department of Agriculture 9500-4 Regulations, the Forest Service Manual and the San Bernardino National Forest Land and Resource Management Plan (USDA Forest Service 1989).

Additional management direction that applies to federally listed pebble plain plants and habitat can be found in the Biological Assessment on the Effects of Ongoing Forest Activities That May Affect Federally Threatened Pebble Plain Plants on the San Bernardino National Forest (USDA Forest Service 1999), the Biological Opinion for Various Ongoing and Related Activities Affecting Pebble Plains, San Bernardino County, California (USDI Fish and Wildlife Service 2001a), the Southern California Conservation Strategy Province Consultation Package (USDA Forest Service 2000a), and the Biological and Conference Opinions on the Continued Implementation of Land and Resource Management Plans for the Four Southern California National Forests, as Modified by New Interim Management Direction and Conservation Measures (1-6-00-F-773.2) (USDI Fish and Wildlife Service 2001b).

B-1. Federal Endangered Species Act

The Endangered Species Act contains protection for all species federally-listed as Endangered or Threatened:

- Federal agencies shall seek to conserve Endangered species and Threatened species and shall, in consultation with U.S. Fish and Wildlife Service, utilize their authorities in furthering the purposes of the Endangered Species Act by carrying out programs for the conservation of Endangered and Threatened species.

- Regulations for species that are proposed for listing as Endangered or Threatened are included in the Endangered Species Act: Federal agencies shall confer with U.S. Fish and Wildlife Service on any agency action that is likely to jeopardize the continued existence of any species proposed to be listed.

B-2. National Forest Management Act of 1976

- The National Forest Management Act of 1976 and its implementing regulations direct the Forest Service to maintain viable and well-distributed populations of all native vertebrate species (36CFR219.19). Additional direction (USDA Reg 9500-4) extends this mandate to include vascular plants.

- In addition, the Secretary of Agriculture's policy on fish and wildlife (Department Regulation 9500-4) directs the Forest Service to avoid actions "which may cause a species to become Threatened or Endangered."

B-3. Forest Service Manual 2670

- Avoid or minimize impacts to species whose viability has been identified as a concern.

- If impacts cannot be avoided, analyze the significance of potential adverse effects. A line officer can allow or disallow the impact but the decision must not result in loss of species viability or create a significant trend towards federal listing.

- Develop/implement management practices to ensure that species do not become Threatened or Endangered because of Forest Service actions.

B-4. Management direction resulting from Section 7 Consultation with the USFWS for ongoing effects to pebble plain plants 1999

As per a lawsuit settlement agreement, the Forest completed Section 7 formal consultation on Feb 14, 2001 with the USFWS for the effects of ongoing Forest activities that may affect federally Threatened pebble plain plants on the San Bernardino National Forest. The Biological Assessment (USDA Forest Service 1999) contains the most comprehensive source of Threatened and Endangered pebble plain plant population data to date and should be utilized in conjunction with this Habitat Management Guide. The Biological Opinion (USDI Fish and Wildlife Service 2001a) contained avoidance and minimization measures and conservation recommendations to protect Threatened species in pebble plain habitat.

B-4-1. Avoidance and Minimization Measures

Numerous measures to avoid or minimize ongoing impacts to pebble plain species and habitat are listed on pages 5-23 in the Pebble Plain Biological Opinion (USDI Fish and Wildlife Service 2001a). Most of these actions were completed from 1999-2001; the remaining measures are scheduled for completion in 2002. These actions are listed under "existing protection measures" for each pebble plain complex in this document.

B-4-2. Conservation Recommendations

Section 7 (a) (1) of the ESA directs Federal agencies to utilize their authorities to further the purpose of the ESA by carrying out conservation programs for the benefit of Endangered and Threatened species. Conservation recommendations

are discretionary agency activities to minimize or avoid adverse actions of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

- For each of the fourteen pebble plain complexes, quantify the aerial extent of pebble plain plant habitat and determine the proportion of that aerial extent that is affected or potentially affected by roads, trails, or other land use activities. This quantification could also be done for the additional ash-gray paintbrush occurrences not associated with typical pebble plain habitat.

- Participate in the development and implementation of regional, multispecies habitat conservation plans. In addition, participate in any future habitat and species conservation programs in Big Bear Valley and other communities within the congressional boundary of the San Bernardino National Forest.

- Protect and restore all remaining pebble plain habitat and associated physical features within the SBNF. The restoration program on the SBNF should include involvement of species and restoration ecology experts to develop and refine methods of restoring pebble plain plants on disturbed surfaces.

- Emphasize efforts to control or remove invasive, non-native plants and animals from the SBNF, to the maximum extent possible. In particular, we (the USFWS) strongly recommend that invasive, non-native grasses be suppressed and eradicated to the maximum extent possible from areas occupied by listed plants.

- Restrict, to the maximum extent possible, unauthorized human and vehicular activities in areas that contain pebble plain plants via patrols and other means. Permanently close Gold Mountain Road to vehicle travel. While we (the USFWS) recognize that measures have been taken to minimize unauthorized vehicle travel on the Gold Mountain pebble plains, success has been limited. We (the USFWS) consider the preservation of the Gold Mountain pebble plains in an undisturbed state to be vital to the long-term survival of the southern mountain buckwheat.

- Consult with us (the USFWS) early in the project planning process to avoid and minimize project impacts early in the design process, and to maximize the efficiency of the consultation process. A biological assessment or the minimum requirements for all formal consultations per 50 CFR 402.14(c) should be submitted to us early, so that you and any applicant can benefit from the informal consultation process.

- Perform routine maintenance to ensure that the fences, barriers, signs, and other items used to protect pebble plain occurrences remain effective.

- In order for the USFWS to be kept informed of actions that minimize or avoid adverse effects or benefit listed species or their habitats, notify them of implementation of any conservation recommendations.

B-5. Southern California Conservation Strategy (SCCS)

On February 27, 2001 the SBNF completed Section 7 programmatic formal consultation on the continued implementation of Land and Resource Management Plans for the four southern California National Forests. The Biological Assessment (USDA Forest Service 1999) described the proposed action for continued implementation of the LRMP's for the ANF, CNF, LPNF, and SBNF. It addressed the effects of that action on 59 federally listed plant and wildlife species, one species proposed for federal listing, designated critical habitat for 10 species, and proposed critical habitat for 4 species. Ongoing effects to *Arenaria ursina*, *Eriogonum kennedyi* var. *austromontanum* and *Castilleja cinerea* were included in this document and should be referenced for the cumulative effects analysis on these species. The Biological Opinion (USDI Fish and Wildlife Service 2001a, 2001b) contains new management direction and conservation measures that are to be implemented as interim management until the LRMP revision is completed in 2004.

For this consultation, a pebble plain habitat layer was created using GIS. This layer was derived through field mapping of known pebble plain habitat, aerial photo interpretation, and overlaying mapped distributions of federal-listed and Forest Service Sensitive species that occur on pebble plains to develop an overall distribution of pebble plain habitat on the SBNF. The pebble plain GIS layer was updated for this Habitat Management Guide in February 2002.

A modeled habitat map was created for *Castilleja cinerea* and is also available on a GIS layer. The *Castilleja* model appears to over-predict where this species could occur, however. It is thought that if the current model was revised to include only soils with clay content as a parameter, the model may yield a more accurate prediction of suitable habitat. Modeled habitat maps are available on GIS layers for most of the 59 listed plant and wildlife species analyzed in the SCCS Province consultation (USDA Forest Service 2000a). Maps at the 1:24,000 scale should be printed and used for field surveys of modeled habitat and to record survey results in proposed project areas.

The following management direction from the 2001 SCCS Biological Opinion (USDI Fish and Wildlife Service 2001b) applies to pebble plain habitat.

B-5-1. Treatment of Modeled habitat

- The Forest is required to complete a habitat assessment to determine whether modeled habitat is currently suitable for or occupied by the species. Current modeled habitat is based on physiographic and vegetative features (GIS databases).

- For new activities to be authorized or carried out by the Forest Service, modeled habitat will be treated as occupied habitat until surveyed for suitability (based on mutually agreed-upon suitability criteria) and, if necessary, for occupancy. All

applicable management direction and resource evaluation for the species and activity will be required.

- Results of the modeled habitat surveys shall be documented in the Affected Environment and Effects of the Proposed Action section of the Biological Assessment (USDA Forest Service 1999).

As of April 2002, Forest botanists continue to work on the development of Suitable Habitat Criteria for *Castilleja cinerea*. Once developed, the criteria will provide parameters to determine whether modeled habitat is suitable or unsuitable for *Castilleja cinerea* to occur. The criteria will also include how many surveys in the habitat are needed before concluding that the modeled habitat is unoccupied. Until the criteria is developed and approved by the USFWS, botanists are making this determination based on known parameters for the plants. In the interim, as modeled habitat is surveyed, botanists identify occupied, suitable or unsuitable habitat on modeled habitat maps and include documentation of how these determinations were made. As data is collected, GIS layers of modeled habitat will be revised to show occupancy and suitability.

B-5-2. Management Direction that Applies to All TEP Species Habitat

The SCCS 2001 Biological Opinion (USDI Fish and Wildlife Service 2001b) lists numerous measures to protect TES species during all types of Forest actions. Refer to pages 7-51 of that document for the list as it also applies to federally listed pebble plain plants and habitat.

B-5-3. Specific Management Direction that Applies to Ground-Disturbing Activities in Pebble Plain Habitat

- Forest Service will exclude areas of known pebble plain habitat from fuelwood and other miscellaneous forest product collection. The public fuelwood cutting and gathering policy has been revised to prohibit public fuelwood cutting and gathering in pebble plain habitat. If salvage or forest stand treatments are needed for safety or forest health, the treatments would be designed to avoid or minimize impacts to pebble plain plants and their habitat, and NEPA analysis and future consultation with USFWS would be conducted if the proposed action would affect listed species.

- The Forest will include messages on dispersed camping brochures about keeping vehicles on roads and about resource protection and rare habitats. (In 1999, pebble plain habitat mapped at that time was excluded from the dispersed camping maps and the resource message was included on camping brochures).

- Prohibit new ground-disturbing activities within key and occupied Threatened, Endangered and Proposed pebble plain plant habitat except where habitat would be improved. Consider in modeled pebble plain plant habitat.

- Preplan suitable routes for emergency responses to avoid or minimize effects to TEP pebble plain plant key and occupied habitat. Consider in modeled pebble plain habitat.

- Prohibit use of water from saline sources (e.g. Baldwin Lake) for fire suppression or water dispersal activities on TEP pebble plain plant key and occupied habitats. Consider in modeled pebble plain plant habitat.

- Prohibit vehicles, including emergency vehicles, in TEP pebble plain plant key and occupied habitats unless approved by the District Ranger. Consider in modeled pebble plain habitat.

- Cooperatively identify emergency routes around all areas of key and occupied TEP pebble plain plant habitat. Consider in modeled pebble plain plant habitat.

- Revise and update the Pebble Plain Habitat Management Guide and Action Plan during 2001 for incorporation into the LRMP revision.

- Continue habitat restoration activities at the North Baldwin pebble plain.

- Develop a rehabilitation plan for Snow Forest that includes stabilization of ski runs, revegetation, and restoration of TEP pebble plain plant key and occupied habitat. Install and maintain erosion control devices. Consider in modeled pebble plain plant habitat.

B-5-4. Additional Management Direction for *Castilleja cinerea*

- Prohibit any activity that causes long-term damage to ash-gray paintbrush host plants or host plant habitat in key and occupied habitats. Consider in TEP species modeled habitats.

- Continue coordination with Snow Valley Ski Area permit holder to protect ash-gray paintbrush key and occupied habitats within the permitted areas. (Prohibits stockpiling of snow from Snow Valley's parking lot into ash-gray paintbrush habitat, protection of upland occurrences on north side of parking area and any new occurrences that may be located in the future). Work with permit holder to repair, maintain and extend fence to protect habitat. Consider in TEP species modeled habitats.

- Continue to work with Juniper Point Marina to implement protection measures and to educate the public about the ash-gray paintbrush habitat.

B-6. 1989 SBNF Land and Resource Management Plan Management Direction for Threatened, Endangered and Sensitive Species (that apply to pebble plain habitat)

Diversity pg. 4-2

- Maintain the current distribution of plant and animal species.

Law Enforcement pg. 4-3

- Provide a level of law enforcement that ensures compliance with laws and regulations, and provides for the protection of Forest Employees, Forest resources, and the public.

Wildlife, Fish and Sensitive Plants pg. 4-5

- Protect and improve habitats of Threatened and Endangered plants and animals to aid in the recovery of the species in cooperation with the State and other Federal agencies.

- Manage other sensitive species habitat to maintain population viability (health), and to avoid future listing as Threatened or Endangered.

Dispersed Recreation pg. SG 34-35

- Monitor dispersed use. Modify use if necessary to prevent resource damage.

Diversity Pg. SG-1

- Maintain long-term health and vigor, species diversity and watershed stability, based on reproductive and regenerative potential of vegetation.

Land Adjustment pg. SG-21

- Acquire lands through purchase and exchange from willing land owners. Priority 1 for acquisition are lands necessary to protect resource or meet key objectives in resource programs such as lands with important habitat for TE&S species and riparian habitat.

Minerals pg. SG-23

- Investigate the need for mineral withdrawal or other suitable alternatives where mining significantly conflicts with unique resource values.

- Allow the production of minerals and energy with the assurance of adequate protection of other surface resources and resource values. Permits, leases, and Plans of Operation are to assure that adverse environmental effects are minimized or mitigated and that mined lands are reclaimed in a timely manner to regain surface production and use.

- Determine validity of all mining claims which operate or propose to operate in areas of sensitive plant or animal habitat.

- Review all lease applications submitted by the Bureau of Land Management and make recommendations necessary to protect surface resources.

- Authorize extraction of other mineral materials (non-locatable, or non-leaseable minerals) only if the on-site or downstream damage to lands and resources can be mitigated and the extraction does not interfere with other uses already occurring on the lands.

Mountain Bikes pg. SG-40

- Individual trails may be closed if safety or resource problems cannot be mitigated.

Off Highway Vehicles pg SG-34,36,37,38,40

- Evaluate events on a case-by-case basis. Events for OHV's not licensed for highway use will be confined to routes designated for their use in the OHV Plan or transportation roads designated for the event.
- Trials may be allowed in undesignated areas if determined appropriate by an Environmental Assessment.
- Administer routes and staging areas open for OHV use to promote the use of vehicles, protect resources and minimize conflicts.
- Criteria for designating OHV trails and staging areas require that potential damage to TE&S species is mitigable.
- Close roads and trails immediately when use is causing or is likely to cause unacceptable effects. Criteria for seasonal or year-long closure includes: Damage to TE&S plant and wildlife habitat, inability to protect adjacent resources, and unacceptable impacts on wildlife that cannot be mitigated.
- Design and construct trails and staging areas to minimize adverse impacts on other resources. Maintain vegetative screening along roads and trails to discourage illegal OHV use and avoid harassment to wildlife. Avoid riparian areas where possible.
- Include means to close routes if funding levels fall below that necessary to protect adjacent resources.
- Designate no open OHV areas.

Organization Camps pg. SG-33

- Make a future use determination if there is an apparent higher public use.

Pebble Plains pg. SG-67

- Establish refugia for pebble plain species which best represent the pebble plain endemic flora and also contain good representation of other sensitive plant species that are associated with pebble plain habitats (e.g. Baldwin Lake, Gold Mountain, Arrastre Flat, and Holcomb Valley).

Recreation Residences pg. SG-33

- A recreation residence tract future use determination will be made whenever there is an apparent higher public use.

- Include a clause in permits for recreation residences within a 100 year floodplain stating that if they are substantially damaged by flood, as determined by the deciding officer, the permit will be revoked. Permit holders will be so notified. Additions to existing structures that encroach on floodplains will not be permitted.

Roads and Trails (System Operation) pg. SG-7

- Control public and administrative use on the Forest transportation system by closures. Closures may be instituted for fish, wildlife, or plant mitigation or enhancement.

Skiing pg. SG-32

- Impacts to TE&S species must be mitigated.

Snowmobiles pg. SG-40

- Allow over-snow vehicle travel on snowmobiles where impacts to wildlife and plants can be mitigated.

Special Interest Areas pg. SG-45 (other than RNAs)

- Manage as Special Interest Areas (SIAs) lands which display special or unique values that clearly merit recognition and special management direction beyond that provided in multiple-use planning and management. Consider mineral withdrawal when mining would potentially conflict with management direction.

Special Uses pg. SG-19,20

- Issue special use permits for National Forest System land use only when the impacts to Forest resources can be mitigated.

Threatened, Endangered, and Sensitive Plants pg. SG-65-67

- Manage sensitive plant species to avoid future listing as Threatened and Endangered. Ensure maintenance of genetic and geographic diversity and viable populations. Inventory and monitor TE&S plant species. Protect as needed to maintain viability.

- Develop species management guides to identify population goals and compatible management activities that will maintain viability. Species management guides will function as recovery plans defining activity constraints in essential habitat and the need for monitoring land allocation and habitat management.

- Emphasize sensitive plant species habitat protection and improvement in all forest management activities. Restrict uses and activities to protect sensitive plants where needed. Prepare a biological evaluation on every Forest project with the potential to impact TE&S plants.

- Encourage land ownership adjustments to acquire lands with important habitat for TE&S plant species.

- Attempt to re-establish TE&S plant species in Historical or suitable habitat.

- Provide information and education for TE&S plants to optimize public enjoyment while providing adequate protection to the resource habitat enhancement.

Timber pg. SG-45

- Close skid trails following timber sales to prevent illegal vehicle travel.
- Create only those fuelwood opportunities which do not result in increased long-term illegal OHV conflicts and subsequent resource damage.

Wildlife and Fish pg. SG-57, 58, 59

- Coordinate with California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS) during preparation of environmental assessments and plans having significant effects on fish and/or wildlife habitat.
- Coordinate with other agencies, Southern California Forests, PSW, local universities and conservation groups developing management guides for TE&S species and emphasis species.
- Actively pursue land acquisitions for TE&S species.
- Manage habitat for TE&S species to enhance populations and to permit their timely removal from designated lists. Manage for genetic and geographic diversity and long-term viability of the species on the Forest. Conduct all management activities and regulate uses to support the needs of TE&S species.
- Strive to maintain at least the current distribution of all TE&S species.
- Prepare a biological evaluation on every Forest project with the potential to impact TE&S species.
- Attempt to re-establish species in unoccupied suitable habitat.
- Fully mitigate for unavoidable impacts to TE&S species and riparian habitat.
- Develop species management guides to identify population goals and compatible management activities that will maintain viability.

B-7. Proposed Management Direction for Pebble Plain Habitat in Province Land and Resource Management Plan (LRMP) Revision

As of April 2002, the Proposed Action for pebble plain habitat is currently in draft format for the Province LRMP revision. The proposed action is to include pebble plain habitat into the Wildlife/Plant Emphasis Area (land allocation) section of the LRMP with specific standards that apply to this habitat. A Research Natural Area with pebble plain habitat as the target community type is also proposed. Standards specific to TEPCS plants would also apply.

A final decision is expected on the Environmental Impact Report in 2004. Until that time, the Forest will implement management direction agreed upon in the Pebble Plain and SCCS Biological Opinions and in the 1989 LRMP.

The proposed management direction is attached as Appendix A.

C. NEED AND JUSTIFICATION FOR THE HABITAT MANAGEMENT GUIDE

A Habitat Management Guide was developed rather than species management guides because pebble plain habitat supports such a large number of Forest Service Sensitive and Watch List species. However, this guide also serves as a specific management guide for the three federally Threatened plant species that occur on pebble plain, *Arenaria ursina, Castilleja cinerea,* and *Eriogonum kennedyi* var. *austromontanum.* It is most cost-effective and biologically reasonable to combine a management plan for all of these species where they occur together rather than write individual plans for each species. Ultimately, species conservation is contingent on conservation of the habitat on which they depend.

The intent of this document is provide information on the distribution and current condition of pebble plain habitat and the special-status species it supports on the SBNF. The document also gives information on special-status species where they occur in other habitats in addition to pebble plains. All known information on the range and distribution of each species and their responses to disturbance has been compiled here in order to further protection goals. Activities that impact these species off of pebble plain habitat will be evaluated as necessary through the National Environmental Policy Act (NEPA) process as required by NEPA and Forest Service Manual 2670.

II. BIOLOGICAL INFORMATION

A. GENERAL HABITAT DESCRIPTION AND DISTRIBUTION

Pebble plain habitat occurs as open, rocky inclusions across an area spanning approximately 4,200 acres on Forest system, state and private lands. Pebble plains are highly insular habitats, restricted to small treeless areas with clay/quartzite soils across their range. Pebble plain habitat is delineated by unique vegetation associations, soil characteristics and climatic factors (Derby 1979; Krantz 1981). This habitat is found between 6,000 feet and 10,000 feet elevation and generally occurs in areas receiving less than 25 inches of annual precipitation, though precipitation varies from site to site. Precipitation records for individual sites are not available.

Pebble plains are treeless openings in the forest that have been called "islands of endemism" (Krantz 1983a). This expression refers to the small, isolated concentrations of endemic plants (i.e. plants restricted in geographic range) that occur within a "sea" of coniferous forest. Pebble plains and associated habitats are recognized as unique and distinct from the surrounding conifer forest and woodland. Plant community studies (Derby 1979) of the habitat and distributional studies of rare taxa (Krantz 1978, 1980a, 1980b, 1981, 1983a, 1983b) have been completed.

Seventy-three plant species are known to be associated with pebble plain habitat (Table 1). This list was compiled from data obtained during botanical surveys in 2001. Many of these species are relatively narrow in distribution, while others represent disjunct occurrences of species more common either north or south of the San Bernardino Mountains. The surface of undisturbed pebble plain habitat is composed of between 31% and 38% living vegetation, 15% litter, 45%-47% rock pavement and 0.89%-1.2% bare soil (Derby 1979; Barrows 1989).

Table 1. Flora of the pebble plains, San Bernardino Mountains. After Derby (1979), Ciano (1983), Barrows (1989), Neel (1989a, 1989b), Krantz (1989) and USFS botanical surveys in 2001. Nomenclature follows Hickman, ed. 1993.

Flora of the pebble plains
Achnatherum hymenoides (R. & S.) Barkworth
Achnatherum speciosum (Trin. & Rupr.) Barkworth
Allium parryi S. Watson
Androsace septentrionalis L. ssp. *subumbellata* G. Robb.
Antennaria dimorpha (Nutt.) T. & G.♣
Arabis dispar M.E. Jones
Arabis parishii S.Watson ♣
Arenaria macradenia S. Watson
Arenaria ursina Rob.♦
Artemisia nova A. Nels.
Astragalus purshii Hook. var. *lectulus* (S. Watson) M.E. Jones♣
Bouteloua gracilis (Kunth) Griffiths
Bromus tectorum L.**
Calochortus invenustus E. Greene
Calochortus kennedyi Porter
Carex douglasii Boott
Castilleja montigena Heckard (*Castilleja applegatei* ssp. *martinii* (Abrams)Chuang & Heckard X *Castilleja angustifolia* (Nutt.) G. Don)

Castilleja cinerea Gray♣
Castilleja lasiorhyncha (Gray) Chuang & Heckard
Castilleja plagiotoma Gray
Chaenactis glabriuscula DC.
Chrysothamnus viscidiflorus (Hook.) Nutt.
Collinsia childii Gray.
Collinsia parviflora Lindl.
Cordylanthus rigidus (Benth.) Jepson ssp. *setigerus* Chuang & Heckard
Cryptantha simulans Greene
Dodecatheon hendersonii Gray
Cusickiella douglasii (Gray) Rollins (*Draba douglasii* Gray var. *crockeri* (Lemmon) C.L. Hitchc.)
Dudleya abramsii Rose ssp. *affinis* K. Nakai♣
Echinocereus engelmannii (Engelm.) Lemaire *♣
Echinocereus triglochidiatus Engelm.
Elymus elymoides (Raf.) Swezey
Epilobium brachycarpum C. Presl.
Eriastrum sapphirinum (Eastw.) H. Mason
Erigeron aphanactis (Gray) Greene var. *congestus* (Greene) Cronq.♣
Eriogonum foliosum Watson
Eriogonum kennedyi Watson var. *austromontanum* Munz & I.M. Johnston♦
Eriogonum kennedyi Watson var. *kennedyi*♦
Eriogonum wrightii Benth. var. *subscaposum* Watson♣
Erodium cicutarium (L.) L'Her**
Gilia diegenesis (Munz) A.D. Grant & V. Grant
Gutierrezia sarothrae (Pursh) Britton & Rusby
Ivesia argyrocoma (Rydb.) Rydb. ♦
Juncus bryoides F.J. Herm.
Koeleria macrantha (Ledeb.) J.A. Schultes
Layia glandulosa (Hook.) Hook. and Arn.
Lewisia rediviva Pursh var. *minor* (Rydb.) Munz♣
Linanthus breviculus (Gray) Greene
Linanthus killipii Mason
Lomatium nevadense (Watson) Coult. & Rose var. *parishii* (J. Coulter & Rose) Jepson
Lupinus breweri Gray var. *grandiflorus* C.P. Smith
Lupinus lepidus Douglas var. *confertus* (Kellogg) C.P. Smith
Mimulus androsaceus Greene
Mimulus exiguus Gray
Mimulus purpureus Grant♣
Mimulus suksdorfii Gray
Muhlenbergia minutissima (Steud.) Swall.
Navarretia breweri (Gray) Greene
Opuntia basilaris Engelm. & J. Bigelow
Opuntia littoralis (Engelm.) Ckll.
Orobanche californica Cham. & Schldl. ssp. *feudgei* (Munz) Heckard
Phacelia curvipes Watson
Phacelia exilis (Gray) G.J. Lee
Phlox dolichantha Gray
Plagiobothrys hispidus A. Gray
Plagiobothrys tenellus (Nutt.) Gray
Plantago patagonica Jacq.
Phlox gracilis (Hook.) Greene
Poa secunda ssp. *secunda* J.S. Presl. (formerly *Poa incurva* Scribn. & Will.)
Pyrrocoma uniflora (Hook.) Greene var. *gossypina* (Greene) J. Kartesz & K. Gandhi
Sagina decumbens (Elliot) T. & G. ssp. *occidentalis* (Watson) G. Crow
Selaginella watsonii Underw.
Viola douglasii Steud.

Yucca brevifolia Engelm.

* Formerly known as *Echinocereus engelmannii* (Parry) Lem. var. *munzii* (Parish) Pierce & Fosberg (Munz 1974)
** Non-native species
♣ Weak pebble plain indicator species
♦ Strong pebble plain indicator species

B. HABITAT DETERMINATION

Derby (1979) provided the first habitat determination for pebble plains. Her quantitative studies revealed that pebble plain habitat was characterized by the presence of two indicator species, *Arenaria ursina* and *Eriogonum kennedyi* var. *austromontanum*. These species were chosen because they occurred on all pebble plains sampled and because they are both endemic to the San Bernardino Mountains. Derby further defined pebble plain habitat by the presence of oxidized clay soils with a saragosa quartzite component.

Subsequent work by Krantz (1983a, 1983b) revealed that pebble plains at the east and west ends of the habitat range fit the general soil description of pebble plains but did not always support both *Arenaria ursina* and *Eriogonum kennedyi* var. *austromontanum*. At the time of this discovery, conservation was focused on the more centrally located habitat occurrences that supported the highest densities of endemic species and/or the most "classic" examples of pebble plain. Consequently, little attention has historically been given to these atypical outlying occurrences. However, recent work by Forest botanists supports Krantz's findings, where several new occurrences of pebble plain habitat have been found that possess only one or neither of the indicator species.

These discoveries strongly suggest that a broader definition for pebble plain habitat is necessary to encompass the range of habitat characteristics present on the SBNF. In 2002, Forest botanists developed a point system to qualify pebble plain habitat. To qualify as a pebble plain, the area must possess at least four points, based on characteristics indicative of pebble plain habitat. Strong indicators, each worth two points, often occur on pebble plains and rarely occur off pebble plains. Weak indicators, each worth one point, often occur on pebble plains and frequently occur off pebble plains. Points are accumulated based on the following characteristics:

Strong Indicators (2 points each)
Clay soils
Presence of *Eriogonum kennedyi* var. *kennedyi*
Presence of *Eriogonum kennedyi* var. *austromontanum*
Presence of *Ivesia argyrocoma*
Presence of *Arenaria ursina*

Weak Indicators (1 point each)
Presence of *Allium parryi*
Presence of *Antennaria dimorpha*
Presence of *Arabis parishii*
Presence of *Astragalus purshii* var. *lectulus*
Presence of *Castilleja cinerea*

Presence of *Dudleya abramsii* ssp. *affinis*
Presence of *Echinocereus engelmannii*
Presence of *Erigeron aphanactis* var. *congestus*
Presence of *Eriogonum wrightii* var. *subscaposum*
Presence of *Lewisia rediviva* var. *minor*
Presence of *Mimulus purpureus*

Typical forest tree species surrounding the pebble plains include *Pinus jeffreyi*, *Pinus monophylla* and *Juniperus occidentalis* ssp. *australis*. Tree establishment on the pebble plains is presumably inhibited by high clay content in the soil (Derby 1979) and frost heave. Extreme diurnal and seasonal variation in soil temperature and reduced soil moisture are likely factors that help to create the special conditions to which the endemic species have adapted, or at least that they can tolerate better than surrounding vegetation. However, occasionally trees appear capable of becoming established. Once established, trees alter the surrounding microhabitat by increasing leaf litter and shading and probably by reducing temperature extremes. Derby (1979) found lower densities of *Arenaria ursina*, *Castilleja cinerea*, and *Eriogonum kennedyi* var. *austromontanum* where leaf litter was abundant under trees. The number of tree and shrub seedlings also increased under the canopy of overstory trees (Derby 1979).

Plants of the pebble plains show several physical adaptations to their harsh environment including low-stature growth habit, high reflectivity of the vegetative parts, and leaf succulence. Of course, not all pebble plain plants show all adaptations. This plant assemblage seems to occur wherever the proper physical conditions are present. Their distributional limitations may be similar to that of plants endemic to serpentine soils, which do not require ultramafic soils, but can tolerate the unusual mineral composition of serpentine soils that most species cannot. Serpentine endemics are not, however, able to compete as effectively with more vigorous vegetation off the serpentine. Similarly, pebble plain species flourish in their specific environment, but they cannot out-compete other vegetation found in shaded areas or in areas where heavy litter layers accumulate.

C. ACREAGE

Presettlement pebble plain acreages are not known. It is believed that some of the original acreage was lost to the inundation of Big Bear Lake. Subsequent urbanization of Bear Valley and associated high-impact land use also resulted in habitat loss. National Forest land currently supports approximately 3,473 acres of pebble plain habitat and private land supports 736 acres, for an estimated total of 4,209 acres.

D. SPECIAL-STATUS SPECIES AND GENETIC DIVERSITY

Distributions and abundances of special-status species vary on different pebble plain occurrences. Table 2 summarizes the California Native Plant Society status, California Natural Diversity Data Base (CNDDB) rank (CNDDB 2001; CNDDB 2002), U.S. Fish and Wildlife Service status and Forest Service status as well as the distribution of all Threatened, Endangered, Forest Service Sensitive, and Forest Service Watch List plant species associated with the pebble plains. Information on the biology and distribution of

individual plant species is compiled in Appendices C and D. Table 3 contains information on the five butterflies associated with pebble plains. Information on the biology and distribution of individual plant and butterfly species is compiled in Appendix E.

Quantitative data on species composition has been compiled from the Sawmill Complex, Arrastre Flats Complex, Holcomb Valley Complex and Gold Mountain Complex (Derby 1979, Ciano 1983, Barrows 1989). More recent data are also available for the Broom Flat Complex, Coxey Meadow Complex, and North Baldwin Lake Complex. Ciano (1983) examined species variability on pebble plains in relation to island biogeography theory. She found that species diversity was negatively correlated with distance from other pebble plains and positive correlated with the size of the pebble plain; thus larger pebble plains located closer to other pebble plains had higher species diversity.

Some basic information on genetic diversity of populations within or between pebble plains is available. Ciano (1983) examined the genetic variability of *Arenaria ursina* populations and the possible factors regulating genetic diversity within and between pebble plains at Sawmill, Arrastre Flat and Gold Mountain. Her findings indicate a high degree of genetic variability for six populations of *Arenaria ursina*. Genetic variability was lower in larger pebble plains, however.

A study of the pollination biology and genetic variability of *Ivesia argyrocoma, Eriogonum kennedyi* var. *austromontanum* and *Castilleja cinerea* was carried out by the Center for Conservation Biology (Freas 1988). Results indicate that little genetic material is exchanged between pebble plain occurrences. In fact, observed pollen transfer distances were less than four meters. There is still the possibility that extremely infrequent pollen dispersal between pebble plains does occur. The significance of this occasional gene flow is not known. Seed dispersal of pebble plain species also appears to be limited. Seed traps monitored between August and November of 1988 did not capture seeds of pebble plain species at distances greater than five meters from a pebble plain edge. However, seed traps do not estimate dispersal by animal vectors; thus, seed movement by animals has not been addressed.

Species most commonly associated with the pebble plain community also occur in small openings in the forest between pebble plains. The role of these fragmented occurrences in gene flow between pebble plains is not known but may be significant. For this reason, careful evaluation of potential effects on these occurrences is critical.

D-1. Federally Threatened Pebble Plain Species

Pebble plains support three federally Threatened plant species. Associated plant species and current threats are described below for each species. More detailed species descriptions are provided in Appendix C. For additional information, refer to the Biological Assessment on the Effects of Ongoing Forest Activities That May Adversely Affect Federally Threatened Pebble Plain Plants on the SBNF (USDA Forest Service 1999) and the Southern California Conservation Strategy Province Consultation Package (USDA Forest Service 2000a), on file at the Big Bear Ranger Station.

***Arenaria ursina* (Bear Valley sandwort)**
Arenaria ursina is restricted to pebble plain habitat in the San Bernardino Mountains. Associated species include *Eriogonum kennedyi* var. *austromontanum, Antennaria dimorpha, Arabis parishii, Dudleya abramsii* ssp. *affinis,* and *Ivesia argyrocoma.* Threats to *Arenaria ursina* on SBNF land include prospecting in habitat, roads and trails through habitat, road and trail maintenance, special use permit activities, and dispersed recreational activities. Dispersed recreational threats include unauthorized off-road vehicle use and to a lesser extent, cross-country mountain bike use. As of April 2002, no known occurrences of *Arenaria ursina* were present on lands claimed for mining with a current or proposed Plan of Operation; however, it is likely that impacts from prospecting activities continue to threaten the habitat. Occurrences on private lands are also threatened by the continuing increase in land development, and urbanization.

***Castilleja cinerea* (Ash-gray paintbrush)**
Castilleja cinerea is usually found on pebble plain habitat, however this species can also be found in habitats off of pebble plains. Other habitats where the plant is known to occur include upper montane coniferous forest, meadows, and piñon/juniper woodlands. Associated species on pebble plain habitat include *Artemisia nova, Eriogonum kennedyi* var. *austromontanum, Erigeron aphanactis,* and *Poa secunda* ssp. *secunda. Castilleja cinerea* occurs on private lands, SBNF lands, and CDFG lands. Because it has a wider geographical distribution than *Arenaria ursina*, plant habitat overlaps with a wider array of land use activities (USDI Fish and Wildlife Service 2001b). As of April 2002, *Castilleja cinerea* is known to occur on four mining claims with current or proposed Plans of Operation and has a potential to occur on two additional claims with current or proposed Plans of Operation. Threats include effects from gold mining, prospecting, roads and trails through habitat, road and trail maintenance, dispersed recreational activities, the potential patenting of lands claimed for mining, and development of private lands. Effects from unauthorized off-road vehicle use and unauthorized fuelwood cutting also impact this species.

***Eriogonum kennedyi* var. *austromontanum* (Southern mountain buckwheat)**
Eriogonum kennedyi var. *austromontanum* is restricted to pebble plains and is found in association with *Arenaria ursina* and *Castilleja cinerea.* Major threats to this species include gold prospecting, roads and trails through habitat, road and trail maintenance, special use permit activities, and dispersed recreational activities. Unauthorized off-road and off-trail driving and biking and unauthorized woodcutting activities continue to threaten this species. As of April 2002, one *Eriogonum kennedyi* var. *austromontanum* population is known to occur on the boundary of a mining claim with a current or proposed Plan of Operation. An additional surveys are necessary to document whether or not the plants are located on the claim itself.

Confusion exists about the distinction between *Eriogonum kennedyi* var. *austromontanum*, a federally Threatened species, and *Eriogonum kennedyi* var. *kennedyi*, a SBNF Watch List species. *Eriogonum kennedyi* var. *kennedyi* also has a narrow distribution range and appears to be limited to pebble plain habitat in the San Bernardino Mountains. Field collection of flowering and fruiting *Eriogonum kennedyi* specimens

was conducted by Mountaintop District botanists Marc Stamer in 1999 and Molly Ward in 2003 in order to identify distinctive characters of each variety across the range of the

Table 2. Special-status plant species associated with pebble plain habitat. The California Native Plant Society status, USFWS status, CNDDB rank and USFS status and distribution are shown. (CNPS 2001; USDA Forest Service 2001c)

Species	CNPS List and R-E-D Codes	USFWS Status	CNDDB Rank	USFS Status	Species Distribution
Arabis dispar Piñon rock cress	2; 2-1-1	None	G3S2.3	Watch	3
Arabis parishii Parish's rock cress	1B; 2-2-3	None	G2S2.1	Sensitive	2
Arenaria ursina Bear Valley sandwort	1B; 2-2-3	Threatened	G2S2.1	Threatened	1
Castilleja lasiorhyncha Yellow owl's clover	1B; 2-2-3	None	G2S2.2	Sensitive	3
Castilleja cinerea Ash-gray paintbrush	1B; 2-2-3	Threatened	G2S2.2	Threatened	2
Castilleja montigena Heckard's Indian paintbrush	None	None	None	Watch	3
Castilleja plagiotoma Mohave paintbrush	4; 1-1-3	None	G3S3.3	Watch	3
Dudleya abramsii ssp. *affinis* San Bernardino Mountains dudleya	1B; 2-2-3	None	G3T2S2.2	Sensitive	2
Eriogonum foliosum Leafy buckwheat	1B; 3-2-2	None	G3SH	Watch	3
Eriogonum kennedyi var. *austromontanum* Southern mountain buckwheat	1B; 2-2-3	Threatened	G4T2S2.2	Threatened	1
Eriogonum kennedyi var. *kennedyi* Kennedy's buckwheat	None	None	None	Watch	1
Ivesia argyrocoma Silver-haired ivesia	1B; 2-2-2	None	G2S2.2	Sensitive	3
Linanthus killipii Baldwin Lake linanthus	1B; 2-2-3	None	G2S2.1	Sensitive	1
Mimulus exiguus San Bernardino Mountains monkeyflower	1B; 2-2-2	None	G2S2.2	Sensitive	3
Mimulus purpureus Purple monkeyflower	1B; 2-2-2	None	G2S2.2	Sensitive	3
Phacelia exilis Transverse Range phacelia	4; 1-1-3	None	G3QS3.3	Watch	3
Phacelia mohavensis Mohave phacelia	4; 1-1-3	None	G3QS3.3	Watch	3
Pyrrocoma uniflora ssp. *gossypina* Bear Valley pyrrocoma	1B; 2-2-3	None	G5T2S2.2	Sensitive	1

Species Distribution Codes:
1 = Endemic to Big Bear and Holcomb Valleys
2 = Endemic to the San Bernardino Mountains
3 = Nearly endemic to southern California but with one or two other occurrences

taxa. Specimens from 1999 were sent to Jim Reveal at the University of Maryland for identification, although taxonomic clarifications have not yet been received. Flowering specimens from 2003 efforts have been filed in the Kukitat Herbarium and RSABG, and leaf collections from 2003 field work were sent to Botanist Maile Neel of the University of Massachusetts for genetic analysis. Aditional field collection of achenes across the range of *Eriogonum kennedyi* will also be performed during fall of 2003. Achene length appears to be the only character that shows no overlap between varieties; thus, comparison of fruit length between and within populations may provide the answer to this taxonomic conundrum.

In addition, pebble plain habitat supports four USFS special-status butterflies and one non-status butterfly (Table 3). Threats to these butterflies include loss of habitat and host plant populations through the same activities that affect the threatened pebble plain plant species. Further information on these butterfly species is provided in Appendix E.

Table 3. Special-status butterfly species associated with pebble plain habitat. The USFWS status, CNDDB rank and USFS status and distribution are shown. (Emmel & Emmel 1973; Emmel 1997)

Species	Host Plant	USFWS Status	CNDDB Rank	USFS Status	Species Distribution
Coxey Meadow Blue *Euphilotes baueri (battoides) vernalis*	*Eriogonum kennedyi* var. *kennedyi*	C2	Not Assigned	RARE	One location – within a mile of Coxey Meadow
Baldwin Lake Blue *Euphilotes enoptes* near *dammersi* ssp.	*Eriogonum kennedyi* and *Eriogonum wrightii* var. *subscaposum*	C2	Not Assigned	RARE (being described)	Doble, Holcomb Valley, and Baldwin Lake
Arrastre Creek Blue (*Euphilotes enoptes* near *dammersi* ssp.)	*Eriogonum wrightii* var. *subscaposum*	C2	Not Assigned	RARE	Arrastre Creek
Ehrlich's Checkerspot (*Euphydras editha ehrlichi* ssp. nov.)	*Castilleja plagiotoma*	C2	Not Assigned	RARE	Ord Mountains and adjacent San Bernardino Mountains
Whitish Metalmark (*Apodemia mormo* near *dialeuca*)	*Eriogonum kennedyi* ssp. *austromontanum*, *Eriogonum wrightii* var. *subscaposum*	C2	Not Assigned	None	San Bernardino Mountains

E. COMMUNITY RANKING

The CNDDB ranks plant communities based on their rarity and the threats they face in a manner similar to the ranking of plant species. Pebble plain habitat is ranked G1S1.1. This rank indicates the highest level of rarity and endangerment on global, national, and statewide scales. The CNDDB ranking system and other ranking codes for rare plant species are described in Appendix B.

F. RESPONSE TO DISTURBANCE (WILDFIRE AND VEHICLES)

Responses of pebble plains and associated species to specific management treatments have not been investigated systematically or thoroughly. In general, the physiognomy of the pebble plains and the high percentage of rock substrate suggest that fire has not been an important factor in shaping this community. Fuels are limited and discontinuous and probably would not carry most wildfires; thus, the pebble plains may act as natural fuel

breaks. However, the introduction of annual grasses, such as *Bromus tectorum*, on pebble plains might enable a fire to spread more readily.

In October 1999, immediately following the Willow Fire, monitoring plots were installed in the Coxey Meadow/Little Pine Flat area to quantify the post-fire response of pebble plain habitat and specifically of *Eriogonum kennedyi* var. *kennedyi*. When fires burn in and around pebble plains, typically only the perimeter edge of pebble plains burn completely. This is because of low fuel loads within the pebble plains and the proximity of the habitat to higher fuel loads in adjacent woodlands. Plots were established in burned, partially burned, and unburned areas and data were recorded for species presence, density, frequency, and cover. All data collected between October 1999 and August 2001 were analyzed in November 2001 (USDA Forest Service 2001b).

As expected, the data showed that *Eriogonum kennedyi* var. *kennedyi* was adversely impacted by fire. Not only did burned plots tend to have fewer individuals of *Eriogonum kennedyi* var. *kennedyi*, but they also had lower species richness, fewer native grasses and more woody vegetation like *Artemisia tridentata* ssp. *tridentata* and *Chrysothamnus nauseosus*. These differences in vegetation structure and composition in burned areas as compared with unburned and partially burned areas suggest assimilation with surrounding non-pebble plain areas. This may be indicative of early succession into a non-pebble plain plant community.

Pebble plain species also respond negatively to disturbance from vehicles. Vehicles can cause considerable damage to this habitat, and all pebble plain complexes have at least some degree of impact. Tire treads of vehicles catch clumps of *Eriogonum kennedyi* plants and pull them out of the ground. Plants may also be ground down under repeated vehicle passage. Some pebble plains have been largely devegetated by vehicle traffic (e.g. Sawmill Complex occ.228). During the wet season, vehicle traffic creates deep ruts that both directly disturb or destroy vegetation and change hydrological patterns over pebble plains, potentially affecting larger areas indirectly. Some recovery of pebble plain plant species has been observed in slightly disturbed roadbeds. It remains to be seen how well natural regeneration will occur in more severely disturbed areas.

G. RESTORATION EFFORTS

The first attempts to restore pebble plains occurred in 1990 on the Arrastre Flat pebble plains in Holcomb Valley. Several roads that had traversed pebble plain habitat were decommissioned, sections of roads were ripped, and fences and signs were installed (Figure 1). Preliminary monitoring determined that ripping did not significantly increase the number of non-native species that became established in the closed roadbeds (Neel 1989a), although further monitoring is necessary to fully analyze the effects of the ripped roads on pebble plain habitat. To promote research on pebble plain ecological restoration, this area was proposed by SBNF botanists as a Research Natural Area for the Province LRMP revision (USDA Forest Service 2002). The proposal was approved by the Forest Leadership Team and will be included in the proposed action.

In May 1992, the first detailed restoration efforts of pebble plain habitat were outlined and implemented by Forest Service botanists Maile Neel and Sarah Cheney. This followed the North Baldwin trespass incident in 1992 in which a front-end loader was driven across the habitat, causing extensive damage. The front-end loader crushed and buried plants and created deep ruts that were vulnerable to erosion. The Forest's restoration objectives were to limit soil erosion, replace soil volume, and restore native vegetation.

Restoration techniques at the North Baldwin pebble plain included roto-tilling the deep tracks left by the front-end loader, filling in ruts with rocks, planting and direct seeding of pebble plain species. The first priority was to decrease the susceptibility of the damaged area to erosion. Because the appropriate soil type was not available to fill in the ruts, the compacted soil was roto-tilled. Decompacting soil had also appeared to be beneficial in pebble plains at Arrastre Flat. Rock was then used to fill in the remaining depths of the ruts. While small quartzite cobbles would have been more appropriate for the area, the Forest was not able to obtain this type of rock, and larger rock was subsequently used. This work successfully prevented future erosion, but these tracks are still largely denuded of vegetation because the dense cover of rocks is unsuitable for most pebble plain species. Many of these areas contain zero to low vegetation cover. Those that are vegetated support species more typical of surrounding woodlands, including *Gutierrezia microcephala* and *Elymus elymoides*, with only a few individuals of *Eriogonum kennedyi* var. *austromontanum*, *Arenaria ursina*, and *Arabis parishii* occurring along the edges where the restored ruts grade into undisturbed pebble plain.

Planting efforts at the North Baldwin pebble plains were largely unsuccessful. Native seed from the site was collected, germinated and grown in a greenhouse then transplanted into the old front-end loader tracks in the spring of 1992. Most of these plants fared poorly; the mortality rate was approximately 90%, with most mortality occurring during the 1996 drought year. *Arenaria ursina* and *Eriogonum kennedyi* var. *austromontanum* were particularly prone to mortality upon transplanting. However, *Poa secunda* ssp. *secunda* maintained a 35% survival rate after three years.

It is possible that the 1992 planting was also affected by the timing of planting. Planting during the spring may result in a lower success rate because temperatures are erratic, soils are vulnerable to disturbance, and precipitation tends to be low. In December 1999, a second planting effort was done, and *Poa secunda* ssp. *secunda* appeared to fare particularly well. However, the plots were vandalized several times; plant cages and rebar were pulled up. Additional monitoring should be done to determine the success of this planting.

In 1997, direct seeding was attempted and monitoring plots were installed. Clay soil was collected along the roadside of the North Baldwin pebble plains and cleaned of non-native seed. This soil was then mixed with the collected native seed and dispersed on the site. Water was sprayed over the site to hold the mixture in place. When the sites were re-visited in 2001, it was difficult to assess the actual success of direct seeding because the original plot selection designated most of the control plots in rocky areas and most of the seeded plots in areas which more closely resembled pebble plain soil and surface

conditions. However, the seeded plots do contain several native species, which suggests that seeding may indeed help to restore damaged areas of pebble plain.

An effort to salvage and transplant pebble plain plant species was also attempted in Fall 2002 on a private parcel in the community of Fawnskin that was slated for residential development. Several individuals of *Castilleja cinerea* and *Eriogonum wrightii* var. *subscaposum* were removed from the ground and placed in pots with the clay soil in which they were growing. Some pots included both *Castilleja cinerea* and its host plant, *Eriogonum wrightii* var. *subscaposum*, in the hopes that maintaining the host plant association would improve success. The plants were then moved to the greenhouse at the Big Bear Ranger Station. However, within one month of relocation, all individuals had perished.

Overall, the poor results of restoration efforts on pebble plains are most likely related to the factors that naturally limit plant growth on pebble plains (i.e.soil and soil disturbance regime). The lack of success and experience in pebble plain restoration measures highlights the difficulty in simulating a naturally dynamic ecological system, and emphasizes the need for conservation of the remaining intact, undisturbed pebble plains in the San Bernardino Mountains.

H. GEOLOGY AND SOILS

The San Bernardino Mountains are part of the Transverse Ranges Geomorphic Province of California. The compression that caused the uplift of the mountains most likely began a minimum of 6.2 million years ago. The uplift is a result of the San Andreas Fault pushing the Pacific Plate against the Mohave crustal block. Diblee (1975) provided evidence that the Mohave crustal block was probably on the desert floor during the late Tertiary and early Quaternary.

Typical pebble plains formed in areas where shallow clay deposits occur in association with saragosa quartzite cobbles or gravels. The red color and the structure of the clay soils indicate that they were formed during a warmer, wetter period and/or over an extremely long period of time. Basalt lava flows deposited over these clays and quartzite gravels in various places provide evidence for ages of at least 6-7 million years, at the time of and before the uplift of the mountains. These deposits also seem to be homologous with deposits that were once extensive in what is today the Mohave Desert (P. Sadler, University of California at Riverside, pers. comm. 1989).

These clay soils and quartzite fragments probably once occurred over much of the mountain range; however, they apparently eroded away as the mountains were uplifted or have been buried by more recent deposits. The soils of pebble plains such as those in the Sawmill Complex and on Nelson Ridge in the North Baldwin Lake Complex appear to be relictual surface examples of these deposits. The soils of other pebble plains, such as those in Arrastre Flat and at the base of South Baldwin Ridge near Erwin Lake, more likely represent re-deposition of the original deposits (Sadler, pers. comm. 1989).

The clay deposits belong primarily to the Deep Morical, Hodgson family complex and are deep, well-drained soils formed from weathered granitic and metamorphic rock. They are composed of clay with intermixed angular fragments of saragosa quartzite. These soils have an extremely slow infiltration rate, and thus have a high runoff potential. Because of the flat terrain and the impermeability of the clay soil, water tends to pool on the surface. However, once water has infiltrated the surface, it drains readily. The erosion hazard of Hodgson Family soils is moderate, as rainfall and slopes are moderate. Vehicle passage in wet conditions increases soil puddling or breakdown in natural soil aggregates (structure), and severe rutting from tires may occur (Sadler, pers. comm. 1989).

The quartzite cobbles appear to have been deposited at various times and under various circumstances; however, they were probably deposited before the uplift of the mountains. Quartzite cobbles continue to be deposited today from Gold Mountain near Delamar Mountain and from Sugarloaf Ridge near Onyx Summit. While they occur at almost every pebble plain site, these cobbles are distributed differently throughout the soil column at different sites (Sadler, pers. comm. 1989). Through frost heave and alternating wet and dry cycles, cobbles are forced to the surface of a pebble plain, creating the "pebble" or "pavement" part of the pebble plains (Derby 1979; Krantz 1987). These cobbles also show varying degrees of rounding or angularity. (Sadler, pers. comm. 1989) has correlated the degree of rounding with distance from the original source. Present day drainage patterns cannot explain the distribution of quartzite cobbles. Sadler (pers. comm. 1989) has spent a considerable amount of time reconstructing ancient drainage patterns that have been disrupted through faulting and uplift of the mountains to explain quartzite deposit patterns. The story is still incomplete and is worthy of further research.

It is important to note that while cobbles and clay soils are usually present and characteristic of pebble plain habitat, they are not prerequisites. There are a few pebble plain occurrences that occur on silty or sandy soils (e.g. occ.354 in the Big Bear Lake Complex). These occurrences support floristic assemblages similar to their clay and cobble site counterparts.

I. ASSOCIATED PLANT COMMUNITIES

Five plant communities are generally associated with pebble plains geographically. They have characteristic species on which their classification is based. These communities and their characteristic species on the SBNF are:

1. **Piñon/Juniper Woodland** – *Pinus monophylla, Juniperus occidentalis, Chrysothamnus nauseosus, Purshia tridentata* var. *glandulosa, Arctostaphylos glauca, Ericameria linearifolia, Achnatherum speciosum*

2. **Jeffrey Pine Forest** – *Pinus jeffreyi, Quercus kelloggii, Cercocarpus ledifolius, Artemisia ludoviciana, Artemisia tridentata* ssp. *tridentata, Chrysothamnus nauseosus, Cordylanthus rigidus* ssp. *setigerus, Elymus elymoides*

3. **Oak Woodland** – *Quercus kelloggii, Quercus chrysolepis, Cercocarpus ledifolius, Cercocarpus betuloides, Ceanothus cordulatus, Artemisia ludoviciana*

4. **Joshua Tree Woodland** – *Yucca brevifolia, Ephedra viridis, Eriodictyon trichocalyx, Chrysothamnus nauseosus, Achnatherum hymenoides*

5. **Sagebrush Shrubland** – *Artemisia nova, Artemisia tridentata* ssp. *tridentata, Chrysothamnus nauseosus, Ephedra viridis, Purshia tridentata* var. *glandulosa, Tetradymia canescens*

J. ASSOCIATED RARE PLANT HABITATS

Five other unique plant communities occur within the same geographic range as pebble plains. All have characteristic species and physical attributes. These communities and their characteristic species are:

1. **Montane Wet Meadows** (perennial wet meadows and stringer meadows) – *Sidalcea pedata, Thelypodium stenopetalum, Poa atropurpurea, Taraxacum californicum,, Packera bernardina* (formerly *Senecio bernardinus* Greene), *Juncus mexicanus, Pyrrocoma uniflora* var. *gossypina, Carex* spp.

2. **Montane Dry Meadows** – *Artemisia nova, Poa atropurpurea, Thelypodium stenopetalum, Packera bernardina, Poa secunda* ssp. *secunda*

3. **Vernal Wetlands** (associated with seeps and springs) – *Mimulus exiguus, Mimulus purpureus, Castilleja lasiorhyncha, Juncus bryoides, Phacelia exilis, Phacelia mohavensis, Calochortus palmeri* var. *palmeri*

4. **Carbonate** – *Eriogonum ovalifolium* var. *vineum, Oxytheca parishii* var. *goodmaniana, Astragalus albens, Swertia neglecta, Arabis dispar, Lesquerella kingii* ssp. *bernardinus, Arabis shockleyi, Astragalus biscristatus, Eriogonum microthecum* var. *corymbosoides*

III. STATUS, THREATS, AND MANAGEMENT RECOMMENDATIONS

A. HISTORICAL AND PRESENT USES

Settlers first entered Big Bear Valley in the mid 1800's. Soon after, gold was discovered and towns, such as Belleville and Doble, grew in response to the mining activities. However, the mines were not sufficiently rich to support these communities over the long-term and they were abandoned. Intensive sheep and cattle grazing occurred from the late 1860s to the 1940s. During the same time, Big Bear became popular as a resort and remains so today. Site-specific histories are described under each site summary in Section IV.

B. THREATS

Immediate threats to pebble plain habitat tend to be site-specific; however, there are some general threats affecting or potentially affecting most sites. Some threats to pebble plain habitat are further localized in that they will not impact an entire pebble plain complex. Other threats are likely to affect all occurrences within a pebble plain complex. The general threats to pebble plain habitat are outlined below.

1. Unauthorized vehicle use or unauthorized vehicle access, particularly during winter months. This activity has impacted all pebble plain complexes to varying degrees.

2. Urbanization. This is the primary threat to sites on private land.

3. Alteration of surface hydrology (generally as a result of above listed threats). The long-term effects and recovery potential of this threat are not known.

4. Cattle trespass. Threats include grazing (which removes reproductive parts), trampling, and the potential for non-native species introduction.

5. Invasion of exotic species, which cause crowding, overshadowing, alter fuel loads and hydrology, etc. Some populations of *Eriogonum kennedyi* on the SBNF appear to be negatively affected by heavy infestations of *Bromus tectorum*; fewer inflorescences (and consequently lower reproductive rates) were seen in 2003 in portions of several populations where *Bromus tectorum* was abundant in pebble plains.

6. Forest Service management activities.

7. Prospecting and/or gold mining operations through ground disturbance.

8. Unauthorized fuelwood harvest adjacent to pebble plain habitat. This reduces natural barriers to the habitat and is often associated with unauthorized off-road driving impacts.

9. Genetic drift.

Burros were introduced in the Big Bear area in the early 20th century. In the past, they were commonly seen on pebble plain habitat in the Big Bear Valley and considered a threat to pebble plain habitat. In 1997, the Forest Service removed approximately 100 burros from residential areas for safety reasons. A Burro Territory that now restricts the burros to a designated area east of Big Bear Lake was established. This territory currently includes the North Baldwin Lake, Gold Mountain, South Baldwin Rigde/Erwin Lake, Broom Flat, and Rattlesnake pebble plain complexes (USDA Forest Service 1996a, 1996b, 1997; USDI Fish and Wildlife Service 1997).

Global climate change is a potential threat to all habitats, including pebble plains. Little is known about the potential effects on pebble plain habitat. Many pebble plain species appear to be drought-adapted, at least in morphological features and their ability to survive extended dry periods. However, the ability to reproduce successfully in drought years, such as 1989, appears to be limited (Neel 1989a, 1989b). Because the Forest Service has no way to manage a changing climate and because little is known of the potential effects of this threat, global climate change is not discussed in further detail in this document.

C. ONGOING PROTECTION MEASURES

On April 27, 2001, the San Bernardino National Forest submitted an application to the Bureau of Land Management (BLM) to withdraw portions of the SBNF from mineral location and entry under the mining laws. The lands specified in the application for mineral withdrawal total approximately 44,575 acres and include habitat for 12 federally Threatened and Endangered plant species occurring in pebble plain, carbonate and meadow habitat, and for the Endangered southwest arroyo toad.

The BLM published a notice in the Federal Register on October 29, 2001 announcing that the application is being processed (Bureau of Land Management 2001). This publication initiated a public comment period and began a temporary 2-year segregation affecting the Forest system lands proposed for withdrawal. This temporary segregation period, now in effect, will terminate on October 29, 2003.

During this temporary segregation period, the lands specified in the application subject to valid existing rights are closed to activities provided under the general mining laws of the United States. These include mineral location and mineral entry. This means that during the temporary segregation period and within the specified area, prospecting is prohibited and no new mining claims may be located or relocated. It also means that during the temporary segregation period and within the specified areas, only those claims with pre-existing discoveries and possessing valid existing rights on the notice date (October 29, 2001) can be legally entered and worked. Any mining-related activities on valid claims within the National Forest remain subject to Forest Service Manual regulations under Title 36 of the Code of Federal Regulations, Part 2800.

The segregation does not affect leases, licenses, permits, rights-of-way, currently authorized public uses of or access to the National Forest (except those involving mineral location or mineral entry) or any use on/adjacent to nested private lands. Nor would the subsequent withdrawal, if and when finalized, affect the above Forest uses.

Should the requested withdrawal be finalized, all lands specified in the application, or some portion thereof, would be closed to mineral location and entry for a period of 20 years, subject to valid existing rights. No new claims could be located in the withdrawn area, nor could any lapsed claims be relocated within the withdrawn area. Claims located within the withdrawn area would not be recognized as valid unless all the requirements of the mining law, including discovery of a valuable mineral deposit, are met at the time of the withdrawal. Withdrawn areas not claimed, and those not validly claimed, would be closed to mineral entry, thus prohibiting prospecting and working these areas for the purpose of making a mineral discovery.

The SBNF submitted the withdrawal application to BLM on April 27, 2001 as part of a Section 7 formal consultation with the Fish and Wildlife Service under the Endangered Species Act. Submission of the application was a term of settlement of a suit brought by the Center for Biological Diversity (CBD) against the Forest Service. Processing the application is a term of settlement for the CBD lawsuit against the BLM.

Approximately 3,206 acres (out of the total 3,322 acres) of known pebble plain habitat on Forest land are proposed for withdrawal from mining and thus are currently segregated. All pebble plain habitat mapped at the time the request was submitted to BLM was included in the proposal. Since that time, the Forest has mapped additional locations of pebble plain habitat, which may be proposed for inclusion into the final withdrawal package. Identification of these pebble plain locations are noted in the site-specific summaries in this document.

D. GENERAL RECOMMENDED ACTIONS FOR PEBBLE PLAIN HABITAT

D-1. Forest Management Recommendations

1. Increase interpretation and educational outreach programs to promote the appreciation of pebble plain species and habitat, targeting the Big Bear Valley community and Forest visitors.

2. Work with the public, local communities, the San Bernardino Mountains Land Trust, the San Bernardino National Forest Association and other partners to gain support for pebble plain habitat and species conservation.

3. Encourage volunteers to assist Forest Service staff with patrol and visitor services.

4. Work with emergency response personnel to develop agreeable emergency routes into all areas of pebble plain habitat.

5. Work with utility companies to ensure that impacts resulting from maintenance and emergency repairs are avoided or minimized.

6. Increase regular patrols and volunteer patrols in areas that are infrequently patrolled and in areas with imminent threats. Patrols should continue to monitor sensitive areas, record impacts in these areas, and maintain fences, signs, and gates. As fences are repaired, replace barbed wire with smooth wire and install walk-throughs. Any instances of resource damage to pebble plains will be recorded and filed with the District Botanist.

7. Limit fuelwood collection around the perimeter of pebble plains or in the areas of vehicle closure that would result in further reduction of vegetative cover.

8. Complete NEPA for the proposal to withdraw portions of the SBNF containing pebble plain habitat from mineral location and entry. Include recently-mapped pebble plains into the mining withdrawal proposal.

9. Control assessment work on mining claims to prevent damage to pebble plain habitat.

10. In all locations where a Forest Service recreational residence tract overlaps pebble plain habitat, conduct a field visit with permit holders every five years to identify sensitive habitat locations and educate permit holders about habitat conservation.

11. Prohibit the development of new recreation facilities in pebble plain habitat

12. Map, address, and evaluate all unclassified roads for proposed closure and restoration upon completion of the NEPA process.

13. Evaluate roads to determine the level of effects to pebble plain habitat. Consider remedies including reengineering, re-route, and closure where needed.

14. Prohibit the development of utility corridors in pebble plain habitat except where project design and maintenance standards minimize effects, site-specific mitigations are in place, and degraded habitat is replaced at the 2:1 ratio.

D-2. Biological/Ecological Inventory, Research, and Management Recommendations

1. Continue to map and collect baseline information for pebble plain habitat as new occurrences are found.

2. Apply for a 10a1A permit to collect voucher specimens for all federally Threatened and Endangered plant species in each occurrence. If voucher specimens have already been obtained, but are older than 10 years, these species should be re-collected. Voucher specimens of all Threatened and Endangered, Forest Service Sensitive, and Watch List plants will be deposited in herbaria at Rancho Santa Ana Botanic Garden, U.C. Riverside, and the Big Bear Ranger Station.

3. Establish photo monitoring points with GPS coordinates within pebble plain complexes to monitor ecological processes over time.

4. Evaluate the distribution of non-native species in pebble plain habitat and develop a weed management plan for controlling these species on the SBNF that is consistent with the Noxious Weed Management Strategy (USDA Forest Service 2000b) and the Guide to Noxious Weed Prevention Practices (USDA Forest Service 2001b).

5. Write a management guide for *Arabis johnstonii* and associated rare species on the San Jacinto Ranger District. Include information about occurrences of *Arabis johnstonii* in pebble plain habitat.

6. Identify and document successful methods for restoring degraded pebble plain habitat. Implement restoration where necessary.

7. Acquire baseline information and refine maps for pebble plain complexes for which little information exists. The complexes that require the most information include the Broom Flat Complex, Sawmill Complex, and the Grinnell Ridge pebble plain.

8. Establish a prioritized list of data needs for pebble plain taxa. Encourage agencies, universities, corporations, foundations, and other entities to conduct research in areas that would provide the Forest with valuable botanical and ecological data on pebble plain habitat and species.

9. Compile information on the ecology of isolated *Castilleja cinerea* occurrences.

10. Gather information about the morphological and genetic differences between *Eriogonum kennedyi* varieties.

11. Compare the soil characteristics and geology of each pebble plain site to determine relationships among habitat occurrences, for use in management and conservation of whole complexes.

12. Determine the impacts of cattle trespass with respect to use, grazing, trampling, and the introduction of non-native species on pebble plain habitat.

13. Conduct research on the distribution and host-plant associations of rare butterfly species that occur in pebble plain habitat (Coxey Meadow blue butterfly, Baldwin Lake blue butterfly, Arrastre Creek blue butterfly, the whitish metalmark butterfly, and Ehrlich's checkerspot butterfly).

14. Standardize field data collection methods and classify each pebble plain occurrence based on the presence of federally Threatened species, indicator species and site characteristics.

IV. CURRENT STATUS OF HABITAT SITES

SITE SUMMARIES
The occurrences described below are based on field reconnaissance and have been mapped using a combination of 1:10,000 air photos, 1:24,000 orthographic photos, 1:24,000 topographic maps, and field verification (ground-truthing) with GPS units. Acreages were derived through field mapping with 1:24,000 topographic quadrants, GPS coordinates, and ArcView GIS. Acreages are included in the text and are summarized in Table 4. The table is to be used in conjunction with the pebble plain complex maps in this guide.

Individual pebble plain occurrences are combined into complexes where occurrences are clustered within a defined geographic area. Pebble plains within complexes presumably have similar origins. Some complexes are clearly clustered and isolated from other complexes, making their delineation clear. In other cases, some outlying pebble plains are included into a complex solely for management and tracking convenience. The complexes are ordered in the text according to their geographic location from west to east across the Mountaintop Ranger District. Management status and land ownership is noted under each site summary.

Each pebble plain is assigned an occurrence number to enable tracking of specific occurrences. These occurrence numbers do not represent individual species occurrence numbers, because many of the rare and Forest Service Sensitive and Watch List species that occur on pebble plains are not restricted to pebble plain habitat. Occurrence numbers for all pebble plains within each complex are included in Table 4 and on the complex maps included at the back of this Guide.

A. Snow Valley Complex (USFS)

A-1. Site Description
This complex consists of three occurrences (occs. 266,270,271) located in T2N R2W S ½ of section 25 on the San Bernardino Base Meridian. Together, these sites comprise approximately 33 acres of pebble plain habitat. The populations are located predominantly on the north side of State Highway 18 across from the Snow Valley Ski Resort; however, a small part of one occurrence (occ.270) extends into the Snow Valley Ski Resort parking lot on the south side of the highway. This occurrence supports *Castilleja cinerea* and *Castilleja lasiorhyncha.*

A-2. Historical Uses and Impacts
The construction of State Highway 18, the Snow Valley Recreation Residence Tract and the Snow Valley Ski Area parking lot all resulted in the direct loss of pebble plain habitat.

The Snow Valley Complex occurs in heavy-use recreational areas near the Snow Valley timber plantation. Some pebble plain occurrences are located adjacent to the Little Green Valley Trail; others lie within the Snow Valley Recreation Residence Tract and the Rim

Nordic Ski Area, both of which are under special use permit. Various events have been held in the area, including mountain bike and biathlon competitions. Snow piling was

Table 4: Summary of known occurrences of pebble plain habitat.

Pebble Plain Complex	PP Occ. Number	Acreage			Special-Status Plant Species on Pebble Plains and in Adjacent Habitats within the Complex (FT= Federally Threatened; FE=Federally Endangered; SE=State Endangered; FS=Forest Sensitive; FW=Forest Watch List)
		USFS	PVT	Total	
Snow Valley Complex	266, 270, 271	33.1	0	33.1	*Castilleja lasiorhyncha* (FS) *Castilleja cinerea* (FT)
Coxey Meadow Complex	1-63, 65-70, 72-73, 75-77, 79-80, 83, 88, 380-392, 394-399	289.0	0	289.0	*Arabis parishii* (FS) *Calochortus palmeri* var. *palmeri* (FS) *Castilleja plagiotoma* (FW) *Dudleya abramsii* ssp. *affinis* (FS) *Eriogonum kennedyi* var. *kennedyi* (FW)
Big Bear Lake Complex	239-240, 242-249, 251-254, 259, 261, 328-330, 352-355, 412-413, 420-423, 454-458, 460-462, CC 149	56.0	49.0	105.0	*Arabis parishii* (FS) *Arenaria ursina* (FT) *Castilleja lasiorhyncha* (FS) *Castilleja cinerea* (FT) *Eriogonum kennedyi* var. *austromontanum* (FT) *Ivesia argyrocoma* (FS) *Mimulus exiguus* (FS) *Mimulus purpureus* (FS) *Packera bernardina* (FS) *Phlox dolichantha* (FS) *Poa atropurpurea* (FE) *Pyrrocoma uniflora* ssp. *gossypina* (FS) *Sidalcea pedata* (FE, SE) *Taraxacum californicum* (FE) *Thelypodium stenopetalum* (FE, SE)
Holcomb Valley Complex	64, 74, 84, 89-90, 97-99, 101, 104, 109, 112, 113, 115-117, 120, 122, 124-125, 127, 129, 131-133, 135, 137-138, 142, 144-148, 150-153, 155, 163, 168-169, 171-175, 177-179, 182, 184, 314-325, 331-351, 414, 429-437, 463 CC 168	396.0	65.0	461.0	*Arabis parishii* (FS) *Arenaria ursina* (FT) *Astragalus bicristatus* (FS) *Castilleja cinerea* (FT) *Castilleja lasiorhyncha* (FS) *Castilleja plagiotoma* (FW) *Eriogonum kennedyi* var. *austromontanum* (FT) *Eriogonum microthecum* var. *corymbosoides* (FW) *Ivesia argyrocoma* (FS) *Mimulus exiguus* (FS) *Mimulus purpureus* (FS) *Packera bernardina* (FS) *Phacelia exilis* (FW) *Phlox dolichantha* (FS) *Poa atropurpurea* (FE) *Pyrrocoma uniflora* ssp. *gossypina* (FS) *Sedum niveum* (FS) *Swertia neglecta* (FS) *Taraxacum californicum* (FE) *Thelypodium stenopetalum* (FE, SE)

Pebble Plain Complex	PP Occ. Number	Acreage			Special-Status Plant Species on Pebble Plains and in Adjacent Habitats within the Complex (FT= Federally Threatened; FE=Federally Endangered; SE=State Endangered; FS=Forest Sensitive; FW=Forest Watch List)
		USFS	PVT	Total	
Fawnskin Complex	206, 301-302, 400-411, CC 65, CC66	39.6	24.6	64.2	*Arabis parishii* (FS) *Arenaria ursina* (FT) *Astragalus lentiginosus* var. *sierrae* (FS) *Castilleja cinerea* (FT) *Dudleya abramsii* ssp. *affinis* (FS) *Eriogonum kennedyi* var. *austromontanum* (FT) *Eriogonum kennedyi* var. *kennedyi* (FW) *Ivesia argyrocoma* (FS) *Mimulus purpureus* (FS) *Phlox dolichantha* (FS) *Rupertia rigida* (FW)
Arrastre Flats Complex	71, 78,81, 82, 85, 86, 87, 91, 93, 95, 96, 100, 103, 111, 114, 121, 123, 130, 134, 154, 156, 157, 160-162, 164-167, 308, 313, 327, 356	419.0	0	419.0	*Arabis parishii* (FS) *Arenaria ursina* (FT) *Castilleja cinerea* (FT) *Dudleya abramsii* var. *affinis* (FS) *Eriogonum kennedyi* var. *austromontanum* (FT) *Ivesia argyrocoma* (FS)
Sawmill Complex	210, 217, 219-221, 224, 228, 230, 234, 236, 255-257, 265, 282, 326, 453	85.0	335.0	420.0	*Arabis parishii* (FS) *Arenaria ursina* (FT) *Castilleja lasiorhyncha* (FS) *Castilleja cinerea* (FT) *Eriogonum kennedyi* var. *austromontanum* (FT) *Ivesia argyrocoma* (FS) *Linanthus killipii* (FS) *Mimulus exiguus* (FS) *Mimulus purpureus* (FS) *Phlox dolichantha* (FS) *Sidalcea pedata* (FE, SE) *Taraxacum californicum* (FE)
Gold Mountain Complex	183, 185-189, 192, 195-197, 200-205, 417-419	144.6	5.4	150.0	*Arabis parishii* (FS) *Arenaria ursina* (FT) *Castilleja cinerea* (FT) *Eriogonum kennedyi* var. *austromontanum* (FT) *Linanthus killipii* (FS) *Poa atropurpurea* (FE) *Sidalcea pedata* (FE, SE) *Thelypodium stenopetalum* (FE, SE)
Grinnell Ridge Pebble Plain	300	0.9	0	0.9	*Castilleja cinerea* (FT)

Pebble Plain Complex	PP Occ. Number	Acreage			Special-Status Plant Species on Pebble Plains and in Adjacent Habitats within the Complex (FT= Federally Threatened; FE=Federally Endangered; SE=State Endangered; FS=Forest Sensitive; FW=Forest Watch List)
		USFS	PVT	Total	
North Baldwin Lake Complex	102, 118, 119, 126, 128, 136, 139-140, 149, 170, 180-181	466.0	66.0	532.0	*Arabis parishii* (FS) *Arenaria ursina* (FT) *Castilleja cinerea* (FT) *Dudleya abramsii* ssp. *affinis* (FS) *Eriogonum kennedyi* var. *austromontanum* (FT) *Eriogonum kennedyi* var. *kennedyi* (FW) *Ivesia argyrocoma* (FS) *Linanthus killipii* (FS) *Mimulus exiguus* (FS) *Mimulus purpureus* (FS) *Poa atropurpurea* (FE) *Sidalcea pedata* (FE, SE) *Taraxacum californicum* (FE)
Sugarloaf Ridge Complex	286-300, 424-428	587.5	29.0	616.5	*Arabis parishii* (FS) *Arenaria ursina* (FT) *Castilleja lasiorhyncha* (FS) *Castilleja cinerea* (FT) *Eriogonum kennedyi* var. *austromontanum* (FT) *Ivesia argyrocoma* (FS) *Phlox dolichantha* (FS)
South Baldwin Ridge/ Erwin Lake Complex	214, 225-226, 229, 231, 233, 241, 438-441	123.0	50.0	173.0	*Arabis parishii* (FS) *Arenaria ursina* (FT) *Castilleja cinerea* (FT) *Eriogonum kennedyi* var. *austromontanum* (FT) *Ivesia argyrocoma* (FS) *Linanthus killipii* (FS) *Mimulus exiguus* (FS)
Broom Flat Complex	213, 216, 218, 222, 223, 262-263, 267-269, 274-277, 279-280, 283-285, 309-312	656.8	109.5	766.3	*Arabis dispar* (FW) *Arabis parishii* (FS) *Arenaria ursina* (FT) *Castilleja cinerea* (FT) *Dudleya abramsii* ssp. *affinis* (FS) *Eriogonum kennedyi* var. *austromontanum* (FT) *Eriogonum kennedyi* var. *kennedyi* (FW) *Eriophyllum lanatum* var. *obovatum* (FW) *Ivesia argyrocoma* (FS) *Linanthus killipii* (FS) *Phlox dolichantha* (FS) *Taraxacum californicum* (FE)
Rattlesnake Complex	278, 281 303-307	111.9	0	111.9	*Arabis parishii* (FS) *Dudleya abramsii* ssp. *affinis* (FS) *Eriogonum kennedyi* var. *austromontanum* (FT) *Eriogonum microthecum* var. *corymbosoides* (FW) *Eriogonum ovalifolium* var. *vineum* (FE)
TOTAL ACREAGES:		**3473.0**	**736.0**	**4209.0**	

also practiced in the past at *Castilleja cinerea* sites located within the Snow Valley Ski Area parking lot.

A-3. Ongoing Threats

Primary threats to this complex include heavy recreation use in and around the area. The Snow Valley pebble plains are easily accessible, given their location along both sides of State Highway 18 in and around the Snow Valley and Rim Nordic ski areas. The area

receives heavy use particularly during winter months. Trash accumulation is always high and is removed frequently each winter.

Water accumulation from runoff associated with the parking lot is type-converting the fragment of pebble plain habitat on the south side of State Highway 18 (occ.270).

A-4. Existing Protection and Restoration Measures
The Forest installed barriers along portions of the Little Green Valley Trail in FY 2000 to prevent trail widening and to minimize impacts to *Castilleja cinerea* and its habitat. The Forest amended the Snow Valley Ski Area's special use permit in FY 1999 to require that they discontinue the practice of piling snow in portions of their parking lot where *Castilleja cinerea* occurs. The Forest amended the permit for the Rim Nordic area in FY 1999 to require that *Castilleja cinerea* occurrences be flagged off before summer events to restrict spectators from these areas. The area with the largest *Castilleja cinerea* occurrence (occ.270) will be used for winter activities only; entry by spectators or racers for summer activities will be prohibited.

In FY 2000, cabin owners (cabin nos. 10, 14, 16, and 19) in the Snow Valley Recreation Residence Tract were notified of *Castilleja cinerea* locations, and parking and driving area limits were delineated. The owner of cabin 17 could not be contacted; thus, this owner still needs to be notified. Residents were also prohibited from using non-native species for landscaping. These actions were taken in order to minimize encroachment into habitat.

A-5. Monitoring Efforts
Monitoring will ensure that snow piling does not occur in sensitive habitat in the Snow Valley Ski Area and that additional stipulations in the Snow Valley and Rim Nordic permits are implemented.

A-6. Recommended Actions

1. Evaluate effectiveness of rock barriers along the Green Valley Trail (classified trail 2W10) to protect pebble plain habitat (occ.266,270,271). Construct an informational kiosk at the trailhead and/or other interpretive signs along the trail to educate the public about the unique ecology and diversity of pebble plain habitat.

2. Show permit holders the habitat occurrence (occ.270) along the northern border of the Snow Valley Ski Area parking area in FY 2002 and every five years thereafter. Implement protection measures for the occurrence as necessary, and add the occurrence location to the ski resort operating plan.

3. Monitor summer activities at the Rim Nordic Ski Area for impacts to pebble plain habitat (occs.266,270,271). If impacts are occurring on trails, work with the permit holder to implement additional measures to protect habitat or consider relocation of trails out of sensitive habitat areas. If evaluation indicates that these measures are still ineffective, recommend cessation of summer activities in these areas.

4. Continue to work cooperatively with permit holders to protect pebble plain occurrences from disturbance as permits are updated (occ.270).

5. Survey the entire Snow Valley timber plantation and identify areas likely to have supported pebble plain habitat prior to tree planting (occ.270). Consider recommending termination of the plantation within pebble plain habitat. In the meantime, protect *Castilleja cinerea* occurrences by preventing unauthorized off-road driving, eliminating scalping, and protecting host plants in habitat.

6. Monitor effects of barriers placed in the Snow Valley Recreation Residence Tract in FY 2000 and reconstruct barriers as necessary (occ.270).

7. Work with cabin owners to remove the non-native sweet pea (*Lathyrus latifolius*) around the Snow Valley Recreation Residence Tract cabins, especially cabin 16 (occ.270).

8. Contact the owner of cabin #17 to complete delineation of parking area in *Castilleja cinerea* habitat (occ.270).

B. Coxey Meadow Complex (USFS)

B-1. Site Description

The Coxey Meadow Complex consists of approximately 289 acres of pebble plain habitat in T3N R1W E 1/8 section 18, E ¼ of section 30, T3N R1W section 13, section 23, N ½ of section 26, NE ¼ of section 27, E 2/3 of section 22, and SE ¼ of section 15 on the San Bernardino Base Meridian. This complex includes (occs.1-63,65-70,72-73,75-77,79-80,83,88, 380-399). Coxey Meadow contains deposits that are geologically isolated from the main group of pebble plains by an intrusion of quartz monzonite rock. This complex supports *Arabis parishii, Castilleja plagiotoma* (in lieu of *Castilleja cinerea*), *Dudleya abramsii* ssp. *affinis,* and *Eriogonum kennedyi* var. *kennedyi*. The rare Coxey Meadow blue butterfly and Ehrlich's checkerspot also occur in this complex. The Coxey Meadow blue butterfly uses *Eriogonum kennedyi* var. *kennedyi* as its larval host plant. The *Eriogonum kennedyi* metapopulation within this complex typically flowers earlier than *Eriogonum kennedyi* populations in other pebble plain complexes.

B-2. Historical Uses and Impacts

Vehicular disturbance has occurred throughout the area. In T3N R1W NW ¼ section 23, a helispot occurs on pebble plain occurrence 32. A road to the helispot runs through the pebble plain.

The complex is located within the Deep Creek Allotment. Although there are currently no active grazing allotments in the pebble plain habitat, historical grazing occurred, and several areas near Little Pine Flat were type-converted. Cattle grazing associated with these allotments has impacted the area.

B-3. Ongoing Threats
Vehicle damage to pebble plain habitat is evident. Trespassing cattle have been found in the Coxey Meadow area of the Deep Creek Allotment, which is an area currently closed to grazing. The cattle traveled from the Mohave Unit on the Forest on the Front Country Ranger District and from the Round Mountain Unit on BLM lands. In FY 1999, the Forest suspended use of this allotment, and trespass no longer occurs at this time. The extent to which cattle grazing is a threat to pebble plain habitat in the occurrence is unknown.

B-4. Existing Protection and Restoration Measures
After the 1999 Willow Fire, Forest Road 3N41 was gated and a trailhead was installed at the 3N41/3N14 junction. This was to discourage off-road vehicle use in a popular hunting camp area. This road is scheduled to re-open in June 2002. In FY 2001, fencing was also installed to delineate camping area for a 2001 motorcycle trials event and remains intact at this time.

B-5. Monitoring Efforts
In October 1999, immediately following the Willow Fire, monitoring plots were installed in the Coxey Meadow/Little Pine Flat area to quantify the post-fire response of pebble plain habitat and specifically of *Eriogonum kennedyi* var. *kennedyi*. When fires burn through pebble plains, because of the low available fuel loads, typically only the perimeter edge of pebble plains burn completely, given their proximity to the higher fuel loads in adjacent woodland. Plots were established in burned, partially burned, and unburned areas, and data were recorded for species presence, density, frequency, and cover. All data collected between October 1999 and August 2001 were analyzed in November 2001. See Section II.F (p.24) of this Guide for results.

Pebble plains in this complex were also monitored frequently after the 1999 Willow Fire to ensure off-road driving was not occurring. Although fuelwood collection was not authorized adjacent to pebble plain habitat, effects from unauthorized woodcutting were documented.

B-6. Recommended Actions
1. Complete surveys for the Coxey Meadow blue butterfly and Ehrlich's checkerspot butterfly and their host plant associations (occs.1-63,65-70,72,73,75-77,79,80,83,88,380-399).

2. Map the pebble plain occurrences in T3N R1W SE ¼ section 15 for inclusion into the GIS pebble plain habitat layer.

3. Evaluate reengineering, re-route, or closure of Forest Road 3N96 (occ.388). Maintain barriers along the road to eliminate vehicle activity in pebble plain habitat.

4. Maintain closure of Forest Road 3N41 at Forest Road 3N14 to vehicle access until June 2002, when vehicle access in the Willow Fire area is re-opened. Propose designation of a trailhead at the 3N14/3N41 junction. Propose conversion of Forest

Road 3N41 into a trail to prevent hunter camping effects and improve pebble plain habitat currently bisected by the road.

5. Propose installation of a gate at the junction of Forest Road 3N14 and the helispot road to limit vehicle use in pebble plain habitat (occ.32).

6. Complete surveys for *Eriogonum kennedyi* varieties in the complex (occs.1-63,65-70,72, 73,75-77,79,80,83,88,380-399).

7. Maintain patrols through the area (occs.102, 118,119,126,128,136,139,140,149, 170, 180,181).

8. Discourage unauthorized driving and fuelwood cutting activities in the Willow Fire Area that would affect habitat.

C. Big Bear Lake Complex (USFS/PVT)

C-1. Site Description

This complex consists of a series of habitat fragments within and adjacent to the City of Big Bear Lake. Several isolated parcels comprise this complex, most of which contain listed and indicator species. These sites are located in T2N R1W sections 23, 24, and 25 and T2N R1E sections 15, 16, 19, 20, 21 and 30 on the San Bernardino Base Meridian. Approximately 105 acres of pebble plain habitat are known in this complex. Sites in the complex on Forest land include the Aspen Glen Picnic Area and Pineknot Trail (occs.248 and 261), Coldbrook Campground (occ.251), Buttercup Campground (occ.353), Pineknot Campground (occ.352), and Snow Forest Ski Area (occs.249,254,253,259,328). Private land habitat occurrences include City Hall (occ.247), Metcalf Bay (occs.243,354,458), Boulder Bay (occ.245), Eagle Point (Parcel K) (occ.329), Alden Road (occ.454), and several other small occurrences throughout the City of Big Bear Lake (occs.215,239,240, 242,244,246,250-253,261,328-330,352-353,355,412,413,422,455-457,461).

The Coldbrook Campground occurrence includes *Castilleja cinerea* and *Ivesia argyrocoma*. This pebble plain is adjacent to wet meadow habitat that supports *Sidalcea pedata* and *Pyrrocoma uniflora* var. *gossypina*. Two small pebble plain fragments also occur east of Coldbrook Campground along Forest Road 2N10 (occs.252,422).

The Aspen Glen pebble plain is located along the Pineknot Trail, which leads east from the Aspen Glen Picnic Area. *Arenaria ursina, Castilleja cinerea, Arabis parishii, Ivesia argyrocoma, Phlox dolichantha,* and *Eriogonum kennedyi* var. *austromontanum* are present.

A group of small pebble plains exists east of Aspen Glen in the former Snow Forest Ski Area. *Arenaria ursina, Eriogonum kennedyi* var. *austromontanum, Castilleja cinerea, Ivesia argyrocoma, Packera bernardina*, and *Phlox dolichantha* are present. Two pebble plains supporting *Castilleja cinerea, Ivesia argyrocoma*, and *Mimulus purpureus* occur along Forest Road 2N99/Bristlecone Road in and around the Pineknot and Buttercup

Campgrounds and the U.S. Marine Corps Community Services (MCCS) Recreation Facility (under special-use permit) (occs.352,353). Two small pebble plains are also known along the Lower Bristlecone Trail and support *Castilleja cinerea* (occs.412,413).

A habitat occurrence is known from Rebel Ridge southeast of Big Bear Lake, adjacent to a small vernal spring drainage (occ.443). *Arenaria ursina, Ivesia argyrocoma, Castilleja cinerea, Arabis parishii, Mimulus exiguus, Mimulus purpureus, Castilleja lasiorhyncha, Phlox dolichantha,* and *Packera bernardina* have been recorded from the site. A fragment of habitat remains on a lot on Eagle Point, known as Parcel K, (occ.329) which contains *Castilleja cinerea, Eriogonum kennedyi* var. *austromontanum* and *Ivesia argyrocoma.* Several meadow species also occur, including *Sidalcea pedata, Taraxacum californicum, Thelypodium stenopetalum, Poa atropurpurea, Castilleja lasiorhyncha, Mimulus exiguus, Mimulus purpureus,* and *Packera bernardina.* Two other habitat fragments containing *Eriogonum kennedyi* var. *austromontanum* and *Arenaria ursina* are also known from vacant lots on Oriole Drive in Eagle Point (occs.420,442).

The Metcalf Bay occurrence historically consisted of two small pebble plains. The west pebble plain (occ.243) supported *Arenaria ursina, Ivesia argyrocoma, Phlox dolichantha,* and *Sidalcea pedata.* However, this pebble plain no longer exists due to extensive ground disturbance in the area. The east occurrence (occ.354), off of Delamar Road, is characterized by sandy soils and supports *Eriogonum kennedyi* var. *austromontanum, Castilleja cinerea,* and *Sidalcea pedata.* This pebble plain is in good condition.

The Alden Road pebble plain (occ.454) on private land supports *Arenaria ursina, Castilleja cinerea, Eriogonum kennedyi* var. *austromontanum, Ivesia argyrocoma,* and *Arabis parishii.* This pebble plain is in fairly good condition, although a gated road goes through the center leading to a boat ramp.

The old Snow Forest ski area currently supports four pebble plains (occs.253,254, 259,328). A fifth pebble plain existed historically (occ.249); however, ground disturbance associated with ski area development has extirpated that occurrence. The remaining pebble plain near the base of the slope is degraded (occ.328), while upslope pebble plains (occs.253,254,259) are in good condition. Jeffrey pine encroachment is evident on pebble plain occurrence 254, however.

Several small fragments of pebble plain habitat also exist on private land throughout Big Bear Lake, including the neighborhoods around Boulder Bay (occs.244,245), Papoose Bay (occs.456,457), Metcalf Bay (occs.242,461), and Eagle Point (occs.462,330). Currently, most of these pebble plains exist as small inclusions of no more than one acre, in vacant lots between homes or as yards of existing homes. However, some occurrences have been extirpated by development, and most show some level of degradation. Given the patchy network of pebble plains throughout Big Bear Lake, it is assumed that pebble plains were historically much more extensive prior to the development of these residential communities.

There are some occurrences of *Castilleja cinerea* within the Big Bear Lake Complex that do not exclusively occur on pebble plains. One such *Castilleja cinerea* population exists

near City Hall (occ.CC149). This population occurs with *Ivesia argyrocoma* and *Eriogonum kennedyi* var. *austromontanum* at an interface between meadow, pebble plain, and mixed conifer forest communities. Other *Castilleja cinerea* populations are found near the Civic Center and along Fox Farm Road (T. Krantz, University of Redlands, pers. comm. 2002), although these occurrences are not mapped.

C-2. Historical Uses and Impacts

Prior to residential development in Big Bear Valley and construction of the Big Bear Dam, pebble plain habitat was more widespread and contiguous. Today, only small fragments of pebble plain habitat remain in this complex.

In 1988, horse traffic from the Magic Mountain Stables increased the width of the trail through the Aspen Glen pebble plain. Trail use was subsequently restricted to a narrower trail to reduce further damage.

Coldbrook Campground is indefinitely closed due to a need for major renovations. The area is currently used for dispersed recreation, especially as a snow play area in winter months. The road through the campground is closed to the public, although it provides access to residents of the Metcalf Recreation Residence Tract.

Annual bicycle races are held in the Snow Summit Ski Area south of the Pineknot and Buttercup Campground occurrences. Several classified and unclassified bicycle trails are present in this area.

C-3. Ongoing Threats

Primary threats to this complex include development of unprotected private property sites, trampling from horses, hikers, and vehicles, and other private land uses. Loss of genetic diversity through genetic drift in these small, isolated populations also poses a risk. Due to the fragmented nature of this complex, long-term conservation of these occurrences will be a management challenge. Threats to pebble plain habitat on Forest land include dispersed recreation through trampling, soil compaction, and unauthorized vehicle use.

Several lots in the Castle Glen residential development (still in construction) lie next to the drainage along which the pebble plain (occ. 443) occurs. However, a 30-foot wide drainage easement exists at the site, protecting most of the pebble plain from impacts.

C-4. Existing Protection and Restoration Measures

Barriers were installed along the edge of Pineknot Trail at Aspen Glen in FY 2000 to prevent further encroachment onto pebble plain habitat. In FY 2001, existing barriers around the Pineknot Campground occurrence were reinforced with cross rails, the walkthrough in the fence was closed and disguised with slash, and an alternate path was cleared and signed to direct foot traffic around the pebble plain. Barriers were installed in FY 2001 along the Lower Bristlecone Trail, and a pre-existing fence was repaired. The indefinite closure of Coldbrook Campground provides some protection for pebble plain habitat at this time, although no formal protections within the campground are in place.

In FY 2000, cabin owners in the Metcalf Recreation Residence Tract were informed of *Castilleja cinerea* locations in and around their residences, and parking and driving area limits were delineated. Residents were also encouraged to refrain from using non-native species for landscaping.

The pebble plain occurrence at Buttercup Campground is protected by fences along Forest Road 2N99, although maintenance of this fence is an ongoing Forest management activity. This road is gated during the winter to prevent vehicle impacts during the wettest months.

In June 2003, SBNF personnel worked with the Marine Corps Community Services Recreation Facility to relocate three tent sites out of pebble plain habitat occupied by *Castilleja cinerea* and *Ivesia argyrocoma* (occ.353). The actual relocation of the sites will occur in Spring 2004, with SBNF guidance. A smooth-wire fence was installed in June to protect the *Castilleja cinerea* occurrence from impacts during the 2003 summer use season.

Gates and fences are currently in place in the Snow Forest Ski Area to prevent motorized access to the pebble plains. A new gate and cable fencing were also constructed in FY 2001 to exclude vehicle access. SBNF personnel also removed trash, wood, and pipe scraps from *Arenaria ursina* habitat in the Snow Forest Ski Area in FY 2000.

C-5. Monitoring Efforts

A pebble plain mapping effort that began in FY 1999 at Coldbrook Campground was completed in FY 2001. Existing signs and protective structures are monitored for maintenance needs.

C-6. Recommended Actions

1. Complete and implement a restoration plan for the Snow Forest Ski Area (occs.249,253,254, 259,328) that will focus on stabilization of ski runs, installation and maintenance of erosion control devices, revegetation, and restoration of TEP pebble plain plant key and occupied habitats.

2. Regularly monitor gate conditions at the Snow Forest Ski Area (occs.249,253, 254,259,328), and maintain all gates and fencing as necessary to protect pebble plain habitat in this area.

3. Implement trash clean-ups after annual snow melt at the Snow Forest Ski Area (occs.249,253,254,259,328).

4. Continue to monitor equestrian activity and invasive species along Pineknot Trail at Aspen Glen (occ.248). If impacts are occurring, consider measures to prevent further habitat degradation from horse trampling and exotic plant introductions.

5. Evaluate relocation or decommissioning of Coldbrook Campground (occs.251,252) to protect T/E species and pebble plain habitat.

6. Maintain protection measures and fences along Pineknot Trail (occ.248) and Forest Road 2N99 at Buttercup Campground (occ.353).

7. Design turnaround facilities to prevent turnaround impacts at the gate at Buttercup Campground where Forest Road 2N99 is seasonally closed (occ.353).

8. Work cooperatively with the CDFG and the City of Big Bear Lake to plan and establish a habitat corridor along Metcalf Creek from Forest land to the lakeshore (occs.243,247,354).

10. Work cooperatively with the CDFG and the City of Big Bear Lake to conserve isolated private land occurrences of pebble plain habitat (occs.239,240,242-248,328-330,353-355,420, 421,423,CC149).

D. Holcomb Valley Complex (USFS/PVT)

D-1. Site Description

This complex includes three pebble plain assemblages, termed Lower Holcomb Valley (occs.97,98,101,104,113,115,117,120,124,125,133,169,173,182,314-321,331,338,348, 351,414,CC168), Upper Holcomb Valley (occs.99,129,137,138,144,146,150,152,163, 171,172,175,177,184,322,323,339,340-347), and Van Dusen (occs.112,116,122,131,132, 142,145,147,148,151,153,155,174,463,178,179,324,325,350,430-435). The entire complex covers approximately 461 acres and is located in T2N R1E NW ¼ of section 4, N ½ of section 5 and section 6, and T3N R1E sections 31, 32, 33, and 36 on the San Bernardino Base Meridian. The site lies within the North Baldwin Lake/Holcomb Valley Special Interest Area.

Twenty-seven occurrences are present in the Lower Holcomb Valley assemblage, southwest of Hitchcock Ranch in the western part of the complex. These pebble plains support *Eriogonum kennedyi* var. *austromontanum, Arenaria ursina, Castilleja plagiotoma, Ivesia argyrocoma,* and *Arabis parishii.* Other special-status species including *Poa atropurpurea, Taraxacum californicum, Packera bernardina,* and *Pyrrocoma uniflora* var. *gossypina,* and *Swertia neglecta* also occur within the complex. A large, insular pebble plain on Forest Road 3N12 (occ.98), is bordered to the north by a carbonate outcrop that contains several rare species, including *Sedum niveum* (Forest Service Sensitive), *Eriogonum microthecum* var. *corymbosoides* (Forest Service Watch List), and *Pellaea breweri.*

The Upper Holcomb Valley assemblage encompasses Holcomb Valley Campground and includes 25 pebble plain occurrences. Forest Roads 3N23, 3N25, and 3N16 run through the largest pebble plain in this group. The area is unusual in that it supports more trees than most other sites. It may represent a later stage of successional forest encroachment onto the pebble plains. The site supports *Arenaria ursina, Eriogonum kennedyi* var. *austromontanum, Castilleja cinerea, Ivesia argyrocoma, Arabis parishii, Castilleja*

lasiorhyncha, Astragalus bicristatus, Phlox dolichantha, Mimulus exiguus, and *Mimulus purpureus.*

The Van Dusen assemblage includes Belleville Meadow and contains 24 pebble plain occurrences. Forest Road 3N16 also bisects this pebble plain area. Species present include *Arenaria ursina, Eriogonum kennedyi* var. *austromontanum, Castilleja cinerea, Ivesia argyrocoma, Arabis parishii, Poa atropurpurea, Taraxacum californicum, Thelypodium stenopetalum,* and *Packera bernardina.*

Five outlying pebble plain occurrences (occs.64,74,84,89,90) are also mapped on a south-facing slope northeast of the main complex near John Bull Flat. These pebble plains support *Arenaria ursina* and *Eriogonum kennedyi* var. *austromontanum.*

D-2. Historical Uses and Impacts

The Upper Holcomb Valley group has been impacted by previous silvicultural treatments, campground development and vehicle damage, particularly during the wet season. The pebble plains in Lower Holcomb Valley were also heavily affected by vehicle activity prior to protection. The section of Forest Road 3N12 that passes through this area is extremely slick and muddy after rain or snow, and it became a popular wet season play area. Consequently, the road widened, and vehicles often veered from the roadbeds. This site was fenced as off-site mitigation for destruction of the habitat of *Arabis parishii* by Pleuss-Staufer, California (PSC) in 1987. The fencing has controlled heavy vehicle activity. The town of Belleville existed in the current Belleville Meadow in the Van Dusen assemblage of the complex. Nearly all of Holcomb Valley is heavily utilized for dispersed recreation today.

D-3. Ongoing Threats

Vehicle use of classified roads during the wet season is an ongoing threat to adjacent pebble plain habitat. There is a low point in the road where Forest Road 3N16 intersects the largest pebble plain in the Upper Holcomb Valley group. Water accumulates here during the winter. Vehicles pull onto the pebble plain to avoid this puddle, causing road widening that extends onto the pebble plain. The low spot was partially built up in 1988 with material from the Claudia limestone quarry owned by OMYA, Inc.

OMYA, Inc. has a well within the fenced area immediately north of the Lower Holcomb pebble plains. Use of this well was proposed by OMYA, Inc. in 1987. Activation of the well was contrary to the use of this site as mitigation for a previous project, and this use was discouraged at that time. If proposed for future use, NEPA would be completed to assess potential effects to rare habitats in the area.

Additionally, a deposit of high-grade limestone exists immediately west of this pebble plain. Quarrying of this limestone would likely result in extirpation of this pebble plain occurrence. Approximately 83 acres of pebble plain habitat on Forest system land are under mining claims in this complex. Access for emergency and regular maintenance of gas pipeline that runs through this area to the south of the pebble plain habitat also remains a threat in this area.

Baldwin Lake Stables conducts equestrian rides along the portion of the PCT west of Van Dusen Canyon Road. The trail goes through a pebble plain (occ.463) that supports *Arabis parishii* and *Ivesia argyrocoma*. Divergence from the trail and subsequent trampling or soil compaction by horses could pose a threat to pebble plain habitat at this site.

D-4. Existing Protection and Restoration Measures

In FY 1999, NEPA documentation was completed and a decision was issued for the decommissioning and rehabilitation of classified Forest Roads 3N12B, 3N16B, 3N16C, 3N18, 3N25, and 3N26 in Holcomb Valley to protect pebble plain habitat. Forest roads 3N18, 3N25, and 3N26 were subsoiled, barricaded, and planted in Fall 2001, providing protection for pebble plain occurrences in the Upper Holcomb Valley group. Protective measures for pebble plain habitat along 3N12B were initially taken in FY 1999 when the Mountain Man event was relocated to avoid habitat, and camping permits for the area were discontinued. Forest Road 3N12 was fenced to exclude vehicle traffic in FY 1999 and was subsoiled and revegetated in FY 2001 to promote recovery. Further road decommissioning and restoration efforts are proposed within this complex, contingent on completion of the NEPA process. Barriers were erected along Forest Roads 3N05 and 3N07 in FY 1999 to prevent vehicle access to pebble plain habitat in that area. Fencing along both sides of Forest Road 2N09A was completed in FY 2002 to protect these pebble plain occurrences in the Upper Holcomb Valley assemblage (occ.173,182).

Modifications were made to the Gold Fever Trail beginning in FY 1999 to protect pebble plain habitat throughout Holcomb Valley. At stop #3 (Two Gun Bill's Saloon), trails were lined with rock, and "Stay on Trail" signs were posted to prevent impacts to potential *Arenaria ursina* and *Castilleja cinerea* habitat. At stop #5 (Hangman's Tree), the Forest continued the existing split rail fence along the trail and around the site to limit disturbance to adjacent pebble plain habitat.

In FY 1999, split rail fencing was installed to delineate access to Gold Fever Trail stop #6 (Gold Diggings). This area was included in the mineral withdrawal application submitted to BLM to protect and conserve habitat for Threatened and Endangered species. Prospecting is now restricted through October 29, 2003 while an environmental analysis for the withdrawal is being completed. During this time, *Castilleja cinerea, Arenaria ursina,* and *Eriogonum kennedyi* var. *austromontanum* will be protected at this location. The Forest is also working to minimize effects to habitat from mountain bike use in the area.

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In FY 1999, the Gold Fever Trail brochure was supplemented with interpretive information on the ecological significance of the area for TES plants. In that same year, the Forest formally delineated a single trail around Belleville Cabin and the nearby area. "Stay on Trail" signs were posted to prevent encroachment of activities into *Castilleja cinerea* habitat. This delineation prevented access to an unclassified trail that crossed the meadow near Belleville Cabin. Regulatory signs have been installed in rare plant areas in Belleville Meadow along Forest Road 3N16, and "Stay on the Road" messages have been included in all SBNF handouts and brochures. Signs will be installed at the Belleville

Cabin in FY 2002 to explain historical mining activities in the area and the Endangered plant habitat.

D-5. Monitoring Efforts

The pebble plain occurrences along Forest Road 3N12 (Lower Holcomb assemblage) and Forest Road 3N16 (Upper Holcomb and Van Dusen assemblages) were surveyed as part of a comprehensive review of SBNF classified roads near pebble plains. Additional patrol in the area was implemented in FY 1999 and will remain ongoing.

Annual monitoring of *Thelypodium stenopetalum* was initiated in Belleville Meadow in FY 1990 and ended in FY 1999. No monitoring projects are currently underway for the pebble plains in the complex.

D-6. Recommended Actions

1. With the exception of emergency response crews, work with the gas company to restrict all regular maintenance crews to access by foot along the extent of the gas pipeline through areas of pebble plain habitat (occs.109,120,124,125, 169,317, 318,332,336).

2. Continue working with landowners in Holcomb Valley to manage the habitat for conservation and to assess their road access needs in conjunction with the proposal to rehabilitate some unclassified roads in the area (occs.98,99,104,109,115,117,137, 314-316,319,321,336-339,340,341,348).

3. Collect baseline information for the pebble plain occurrences in section 28 (occs.64, 74,84,89,90).

4. Evaluate classified roads in the area to determine the level of effects to pebble plain habitat. The Forest has identified the northern end of Forest Road 3N12 (occs.97,98,109, 414) and several portions of Forest Road 3N16 (occs.99,127, 129,131,132,135, 437) as areas with chronic maintenance problems that adversely affect pebble plain species and habitat. Consider reengineering, re-route, and seasonal or permanent closure as necessary.

5. Seek to acquire private land parcels as they become available. Specific targets include all or parts of Hitchcock Ranch, the southeastern section of the Lithuanian camp, the northeast section of the Tibetan retreat parcel, and the four small private parcels in Section 32 (occs.98,99,104,109,115,117,137,314316,319,321, 336-339,340,341,348).

6. Develop a management plan for the North Baldwin/Holcomb Valley Special Interest Area (occs.64,74,84,89-90,97-99,101,104,109,112,113,115-117, 120,122,124, 125, 127,129,131-133,135,137,138,142,144-148,150-153, 155, 163, 168,169,171-175,177-179,182,184,314-323,334-350,414,429-437,CC168).

7. Conduct surveys of mapped *Eriogonum kennedyi* var. *austromontanum* and *Arenaria ursina* occurrences southeast of John Bull Flat (T3N, R1E Section 28) to document

presence and collect baseline data.

E. Fawnskin Complex (USFS/PVT)

E-1. Site Description

The Fawnskin Complex is located at T2N R1W section 12, E ½ of section 11, N ¼ of section 13, N ½ of section 18 on the San Bernardino Base Meridian. It supports approximately 64 acres of pebble plain habitat (occs.206,301-302,400-411,CC 65,CC66).

The Fawnskin pebble plain (occ.301) is northeast of the town of Fawnskin, adjacent to Forest Road 2N06Y. The occurrence is on a flat hilltop on the eastern side of the road and covers approximately 25 acres. There are no water sources or drainages within the occurrence. The Fawnskin pebble plain contains a very cobbly clay substrate and several indicator species. *Arenaria ursina* and *Ivesia argyrocoma* are present, along with *Castilleja cinerea, Arabis parishii, Antennaria dimorpha, Astragalus purshii* var. *lectulus, Lewisia rediviva* var. *minor, Dudleya abramsii* ssp. *affinis, Lomatium nevadense,* and *Poa secunda* ssp. *secunda.* The site is characterized by an overstory of Jeffrey pine forest and mountain mahogany woodland.

The Poligue pebble plain (occ.302) is an oblong south-facing pebble plain located on the top of a gentle grade between Poligue Canyon Road and the town of Fawnskin at T2N R1W E ½ of SE ¼ of section 12. This occurrence was initially surveyed in FY 1999 as part of an unclassified roads survey, and it was resurveyed in FY 2001 in order to more accurately record the pebble plain species present. The Poligue pebble plain comprises approximately 24 acres. The northern half of the occurrence is characterized by a cobbly clay substrate and several indicator species. *Arenaria ursina, Castilleja cinerea, Eriogonum kennedyi* var. *austromontanum,* and *Eriogonum kennedyi* var. *kennedyi* are present, along with *Arabis parishii, Ivesia argyrocoma, Antennaria dimorpha,* and *Poa secunda* ssp. *secunda.* The pebble plain becomes fragmented and scattered in the southern half. The SBNF Watch List species *Rupertia rigida* occurs on the fringes of one of these scattered areas. The entire occurrence is characterized by an overstory of black oak (*Quercus kelloggii*)/mountain mahogany (*Cercocarpus ledifolius*) woodland.

Occurrence 206 is privately owned and contains approximately 19 acres of habitat. It is located immediately north of State Highway 38. The occurrence supports *Castilleja cinerea, Ivesia argyrocoma,* and *Mimulus purpureus.*

Several small isolated pebble plain occurrences (occs.401-411) exist on private land within the town of Fawnskin. These are not mapped nor included in acreage figures.

The remaining three occurrences (CC64,CC65,CC66) are small isolated *Castilleja cinerea* occurrences at Serrano Campground and Juniper Point that support *Castilleja cinerea* and *Astragalus lentiginosus* var. *sierrae.*

E-2. Historical Uses and Impacts
Development within Fawnskin has extirpated some areas of pebble plain habitat. Some pebble plain areas were used as landings and still show signs of these impacts.

Several unclassified roads are present adjacent to Forest Road 2N06Y in the northeast part of the pebble plain. Forest Road 2N06Y is gated north of Fawnskin near a water tank and is currently restricted to access. The road was historically used for logging operations north of the pebble plain. These operations are no longer active, and the road has no outlet or identifiable purpose. The road crosses through the western portion of the site. An unclassified road connecting to Poligue Canyon Road (Forest Road 2N09) bisects the length of the Poligue pebble plain. Although this road was closed in the early 1990's, barriers have been repeatedly breached over the last decade, and unauthorized vehicle use along the road still continues.

E-3. Ongoing Threats
There is a proposal for development of the parcel that overlaps with pebble plain occ.206. This parcel, known as Moon Camp, supports two federally Threatened species (*Castilleja cinerea* and bald eagle, *Haliaeetus leucocephalus*) that would be impacted if this site is developed.

The main threat to the Fawnskin pebble plain is unauthorized vehicle use through trespass beyond the gate. Cheat grass is also abundant particularly on the south end, posing a threat to native species at the site.

The primary threat to the Poligue pebble plain is illegal off-highway vehicle use. Despite the road closure, vehicle traffic is still occurring, and there is high potential for damage to high-quality occupied habitat. The advancement of cheat grass further onto the pebble plain is also a threat.

Approximately 24 acres of pebble plain habitat are under mining claim on Forest land in this complex (occ.302).

E-4. Existing Protection and Restoration Measures
The western side of Poligue Canyon Road that allows foot access to the Poligue pebble plain has been fenced to exclude vehicles. Forest Road 2N09D was closed and removed from the National Forest System in 1990 and has been barricaded since 1994 to protect the pebble plain habitat. Signs have been installed informing visitors that vehicles are prohibited in order to protect the rare plant habitat. Points of trespass on the west side of this pebble plain were also identified and fenced by SBNF personnel in February 2003.

The Fawnskin pebble plain is not protected by fencing, although the locked gate at Forest Road 2N06Y provides some protection from vehicle traffic.

E-5. Monitoring Efforts
No monitoring activities have been initiated for this complex.

E-6. Recommended Actions

1. Work cooperatively with the CDFG and San Bernardino County to preserve as much pebble plain habitat as possible on private lots in Fawnskin (occ.206,400-411).

2. Seek to acquire the Moon Camp property near the lakeshore (occ.206) to conserve pebble plain and wintering bald eagle habitat.

3. Include the 80-acre parcel in section 12 in the area requested for mining withdrawal to protect habitat (occ.302).

4. Evaluate re-route or closure of the portion of Forest Road 2N06Y north of the water tank to conserve the Fawnskin pebble plain (occ.301). Maintain the gate on Forest Road 2N06Y in Fawnskin south of the water tank.

5. Conduct ecological studies of the *Castilleja cinerea* occurrence at Juniper Point (occ.CC66) to examine *Castilleja cinerea* populations that occur off of typical pebble plain habitat.

6. Continue to maintain signs, barriers, and fences along Poligue Canyon Road (Forest Road 2N09) and the road formerly identified as 2N09D (not on current Forest Road inventory).

7. Restore the road bed of the road formerly identified as 2N09D currently bisecting the Poligue pebble plain (occ.302) to connect habitat on both sides of the road. Install "sensitive plant habitat" signage or protective fencing in the northern part of the occurrence where the highest-quality habitat occurs.

F. Arrastre Flats Complex (USFS)

F-1. Site Description

The Arrastre Flats Complex consists of large and small areas of habitat at Arrastre Flat (occs.93,95,96,100,103,111,114,121,123,130,134,154,156,157,160,161,162,164,165,167, 327,356) Union Flat (occs.71,78,81,82,85,86,87,91,313) and Burnt Flat (occ.308). The sites are located in T2N R1E NW ¼ of section 2, SW ¼ of section 23, NE ¼ of section 3, section 26, section 34, NW ½ of section 35, and E ½ of section 27 on the San Bernardino Base Meridian. Approximately 419 acres of pebble plain habitat are included in this complex. Several areas of vernal spring habitat are also present.

The Arrastre and Union Flat pebble plains vary in composition, ranging from areas with high densities of cushion plants to areas with high densities of Great Basin sagebrush and scattered junipers. *Eriogonum kennedyi* var. *austromontanum*, *Arenaria ursina*, *Castilleja cinerea,* and *Arabis parishii* are present throughout the pebble plains in Arrastre and Union Flats.

In the northern extent of Burnt Flat, there is a wash with fine clay sediments, supporting a population of dwarfed *Eriogonum kennedyi* var. *austromontanum* individuals. Tim

Krantz (University of Redlands, pers. comm. 2002) speculates that this unique phenotype resulted from an isolation event relating to the Arrastre Flats mesa, approximately 1,000 feet above the mesa on which this dwarfed population currently resides. Derby (1979) originally identified this occurrence as *Eriogonum kennedyi* var. *austromontanum* (CNDDB occ.#18). Tim Krantz (University of Redlands) subsequently identified this population as *Eriogonum kennedyi* var. *kennedyi*. Scott White (White and Leatherman Bioservices) further revised this identification as *Eriogonum kennedyi* var. *alpigenum*. Scott Eliason (USDA Forest Service) finally determined it to be *Eriogonum kennedyi* var. *austromontanum*. Although *Eriogonum kennedyi* var. *austromontanum* is considered a strong indicator of pebble plains, no other pebble plain species were found in this immediate area. In the southern area of the occurrence, the substrate is cobbly and more characteristic of typical pebble plain soil. Several pebble plain species are present with *Eriogonum kennedyi* var. *austromontanum*, including *Antennaria dimorpha*, *Arabis parishii*, *Astragalus purshii* var. *lectulus*, *Poa secunda* ssp. *secunda*, and *Lomatium nevadense*. Several shallow ephemeral drainages occur throughout the Burnt Flat area. A meadow and seasonal pond border the pebble plain to the northwest.

F-2. Historical Uses and Impacts

Pebble plains in this complex have historically been impacted by authorized uses and Forest Service road maintenance activities. A series of unimproved Forest roads originally crossed one of the largest pebble plains in Union Flat. Roads also bisect Arrastre Flat. One unclassified road is present at Burnt Flat, but is proposed for closure. Forest Road 3N02 also runs through the site. One trail is present in the eastern section of Burnt Flat. This trail is not a classified Forest trail and may be associated with an old homestead. There are small mining claim posts on the western fringes of the pebble plain, identified as Mohawk claims #1 and #3. At the time of surveys in FY 2001, there was no evidence of any site impacts related to these claims. An old apple orchard is present in the western portion of Burnt Flat, suggesting a past homestead in the area.

F-3. Ongoing Threats

Forest Roads 3N14, 3N41, 3N95, and 3N96 extend through the complex. Ongoing unauthorized vehicle access is a continual threat at Arrastre Flat and Union Flat. This activity appears to be related to woodcutting and camping. Approximately 69 acres of pebble plain habitat remains under claim in this complex and is therefore threatened by potential ground disturbance.

Future mining on existing claims could also degrade the site; potential effects will be analyzed if a Plan of Operation is proposed. Like Arrastre and Union Flats, unauthorized vehicle damage is the greatest threat to the Burnt Flat area. Non-native cheatgrass (*Bromus tectorum*) is also present throughout the complex.

F-4. Existing Protection and Restoration Measures

Pebble plain habitat in Arrastre and Union Flats has been impacted by unauthorized vehicle use. A temporary winter closure of roads providing access to these areas was instituted in 1987. An environmental analysis and decision notice for permanent closure of Forest Roads 3N01, 3N04, 3N30, 3N70, 3N70A, 3N71, 3N71A, 3N73, 3N75, 3N79, and all unclassified routes and a reroute was signed and implemented in 1988. Decal

signs, which read, "Help us conserve this sensitive plant habitat. Careful foot travel welcome but please, no vehicles," were installed, and some roads in the area were ripped to discourage vehicle trespass around fences by removing visual evidence of passable roads. Ripping reduces compaction, and it was thought that this might enhance vegetation recovery. The following areas were ripped and/or fences were installed (Figure 1):

A. Northernmost section of 3N04 that accessed 3N02
B. Westernmost section of 3N73 where it met 3N32
C. Southern portion of 3N04 where it connected with 3N22; a fence was also installed here
D. Eastern portion of 3N01 where it connected with 3N16
E. Northern part of 3N30 where it met 3N16 (Holcomb Valley Road); a fence was also installed here
F. Southern section of 3N13 where it connected to 3N16 (Holcomb Valley Road)
G. Northern portion of 3N79 where it connected to 3N16 (Holcomb Valley Road); a fence was also installed here
H.-I. At both ends of 3N71 where it connected to 3N02
J. At western extent of 3N01 where it connected to 3N73
K. Along an unclassified route extending west from 3N04

Unauthorized vehicle use is still occurring on the pebble plains in this complex. Pebble plain habitat at Burnt Flat has only recently been mapped, and this area is currently unprotected.

F-5. Monitoring Efforts

A brief monitoring study was conducted at Arrastre and Union Flats after the road closure to determine the effects of ripping. Neel (1989a) found that ripping did not significantly increase the number of introduced species. No monitoring efforts have been initiated at Burnt Flat. Patrols have been increased in this complex and are ongoing.

F-6. Recommended Actions

1. Nominate a Research Natural Area north of Forest Road 3N16 to include Arrastre, Union, and Burnt Flats (occs. 71, 78,81, 82, 85, 86, 87, 91, 93, 95, 96, 100, 103, 111, 114, 121, 123, 130, 134, 154, 156, 157, 160-162, 164-167, 308, 313, 327, 356).

2. Work cooperatively with Mitsubishi, the holder of the Mohawk and Upper Pinyon claims in Burnt Flat (occ.308), to voluntarily quit-claim in coordination with a Forest Service withdrawal for the permanent protection of pebble plain habitat.

3. Slash/disguise entrance points to the unclassified road off of Forest Road 3N02 in the Burnt Flat pebble plain occurrence (occ.308).

4. Evaluate effects to pebble plain habitat from the unclassified trail in the eastern section of Burnt Flat (occ.308). Propose actions to eliminate effects.

5. Patrol existing road closures at Arrastre Flat to ensure barriers remain in place. (occs.93,95,96,100,123). Maintain all existing fences and install additional barriers and signs as needed to discourage unclassified road use and the formation of new unclassified roads.

6. Complete a survey at Arrastre Flat in 2002 to evaluate the effectiveness of the ripped roads, twelve years later, in comparison with the non-ripped roads in the area (occs.93,95,96,100,123). Document results for use in future restoration of pebble plain habitat. Continue to monitor this area periodically.

7. Seek to acquire private lands as they become available (occs.87,103).

G. Sawmill Complex (USFS/PVT)

G-1. Site Description

This complex includes a series of north/south-oriented pebble plains that extends east from the town of Moonridge past State Highway 38 and south past the town of Sugarloaf. The 420 acres of habitat in this complex are located in T2N R1E sections 13, 17, 18, 23, 24, 25, 26, and 36 and T2N R2E section 30 on the San Bernardino Base Meridian. The pebble plains south and east of Sugarloaf are known as the Upper Sugarloaf occurrences (occs.255-257,265,282,453). This area includes five occurrences, the largest of which supports *Arenaria ursina, Eriogonum kennedyi* var. *austromontanum, Castilleja cinerea, Ivesia argyrocoma, Arabis parishii, Mimulus exiguus, Phlox dolichantha,* and *Castilleja lasiorhyncha.* One occurrence of *Taraxacum californicum* is also found in association with *Ivesia argyrocoma* in pebble plain/montane wet meadow habitat (occ.306) east of Sugarloaf.

The two westernmost pebble plains in the Sawmill Complex are known as the Horseshoe (occ.228) and Sawmill (occ.236) pebble plains*. Portions of both occurrences are on private land, and both support *Arenaria ursina.* The northern portion of the Sawmill pebble plain (primarily on Forest land) is referred to as Sawmill, and the southern portion on private land is referred to as the Villa Grove pebble plain. The Horseshoe pebble plain contains *Eriogonum kennedyi* var. *austromontanum, Ivesia argyrocoma, Castilleja cinerea, Linanthus killipii,* and *Sidalcea pedata* and borders meadow habitat. A discrete, isolated pebble plain (occ.448) also exists at the end of a mesa north of the Horseshoe pebble plain.

The pebble plain in the northeast corner of Sugarloaf (occ.210) was once far more widespread across the area; however, residential development and the construction of the Big Bear High School have extirpated and degraded most of this pebble plain. The portion that remains supports *Eriogonum kennedyi* var. *austromontanum, Arenaria ursina, Castilleja cinerea, Ivesia argyrocoma, Arabis parishii, Linanthus killipii,* and

* There is some confusion about the names "Horseshoe" and "Sawmill" and the pebble plains to which they refer. Neel (1990) did not specify the location of the Horseshoe or Sawmill pebble plains in her Guide, although her text descriptions suggest that Horseshoe is occ.228 and Sawmill is occ.236 (although the current polygons are larger than her original polygons).

Mimulus exiguus. These species are also found scattered across the smaller pebble plains in the northern part of the complex [occs.217,219,220,221,224(historically known as the Sugarloaf pebble plain),230,234].

A new pebble plain was discovered near the southern boundary of the Sawmill Complex in 2003 in the Upper Sugarloaf portion of the complex (occ.453). This pebble plain supports *Castilleja cinerea* and *Ivesia argyrocoma* and was in good condition at the time of survey.

G-2. Historical Uses and Impacts
Pebble plains within the complex have been historically used for dispersed recreation and have been affected by unauthorized vehicle activities.

G-3. Ongoing Threats
Occurrences in the Sawmill Complex are threatened by residential development, vehicle use, and invasion of exotic cheat grass (*Bromus tectorum*). The southern portion of the Sawmill pebble plain (encompassing the Villa Grove pebble plain) falls within the northern parcel of the proposed 176-acre High Timber Ranch Development.

The Horseshoe pebble plain is deteriorating due to unrestricted vehicle access from the road that bisects the habitat. The open terrain and private/ National Forest co-ownership make this site difficult to protect without the cooperation of the landowner. Illegal vehicle use is a threat at all sites, even at the relatively well-protected Sawmill pebble plain where trespass into the closed area continues to be a problem. Illegal dumping is also an impact.

G-4. Existing Protection and Restoration Measures
The Sawmill pebble plain was completely fenced in September 1987 by the Friends of the Big Bear Valley Preserve. Walk-through access at the north and south ends of the closure maintain access to a partially devegetated vehicle track that bisects the pebble plain. This track is a popular walking trail used heavily by local residents. Access to this trail has been maintained to encourage interpretation of the pebble plain habitat and for public enjoyment. Signs reading "Critical Rare Plant Habitat. No Vehicles" were installed in August 1989 at both walk-throughs to advise the public of the nature of the closure. Additional "Stay on Trail" signs were installed in FY 1999 in areas where frequent foot traffic off of the trail had been observed. The occasional foot travel off of the existing path that still occurs is not considered to be a significant impact to pebble plain habitat or species.

An additional 10 acres of pebble plain habitat to the northwest of Sugarloaf, not adjacent to National Forest land, was dedicated partly in fee and partly in conservation easement to The Nature Conservancy as an off-site mitigation or "biota bank" in 1982. This property was initially fenced in 1986 to prevent unrestricted access along a road bisecting the pebble plain. Fencing was completed in 1988. There is a walk-through at the southern end of the parcel that provides access for walkers.

The portion of the Horseshoe pebble plain on private land has recently been approved for acquisition by the State Wildlife Conservation Board (Krantz, pers. comm. 2002). This acquisition should enable the CDFG and the Forest Service to coordinate resource management efforts, such as fencing and unauthorized road closures, to protect the pebble plains in this area from further deterioration.

Although some fencing exists around the Forest-managed Upper Sugarloaf pebble plains, impacts from human use continue to degrade these occurrences. Access to the area for woodcutting and other recreational activities has resulted in an intricate network of unclassified roads. One pebble plain in this area is completely devegetated as a result of heavy vehicle use. *Eriogonum kennedyi* var. *austromontanum* and other pebble plain species are now found only around the margins of this pebble plain. Other pebble plains in this immediate area have also been degraded.

G-5. Monitoring Efforts

No monitoring efforts are currently underway for the pebble plains in the Sawmill Complex. Qualitative and quantitative monitoring was conducted from 1988 through 1992 by the USDA Forest Service and the Friends of Big Bear Valley Preserve. The Sawmill pebble plain is periodically monitored when fence or sign maintenance is required in the area.

G-6. Recommended Actions

1. Evaluate the unclassified trail through the Sawmill pebble plain (occ.228) to determine the level of effects to pebble plain habitat. Consider remedies including reengineering, re-route, or rehabilitation where needed.

2. Evaluate current impacts to the Horseshoe pebble plain (occ.236) and implem\ent necessary measures to conserve the occurrence. Work cooperatively with the CDFG to protect the portion of the habitat occurrence on private property.

3. Work to identify, protect and restore devegetated pebble plain habitat within the complex.

4. Work with private landowners, CDFG, and San Bernardino County to protect the southern portion of the Sawmill pebble plain where it occurs on private land (occ.236). Propose a cooperative relocation or reengineering of the road to avoid or minimize effects to pebble plain habitat.

5. Evaluate redundant roads in section 25 (occ.255, 257,265), Forest Road 2N05 (occ.228), and Forest Road 2N14Y (occ.255) to determine the level of effects to pebble plain habitat. Consider remedies including reengineering, re-route, and closure where needed.

6. Work with Forest Service patrol units to include the Upper Sugarloaf pebble plains in their patrol area.

H. Gold Mountain Complex (USFS)

H-1. Site Description

The pebble plains in this complex occur on the south-facing slope of Gold Mountain overlooking Baldwin Lake. They are located in T2N R2E SE ¼ of section 2, S ½ of section 1 and N ½ of section 12, and T2N R3E SW ¼ of section 6 and NW ¼ of section 7 on the San Bernardino Base Meridian. The complex includes approximately 150 acres of pebble plain habitat. This site consists of two separate areas, termed Upper Gold Mountain (occs.183,185-187,189) and Lower Gold Mountain (occs.188,192), on a bench northwest of Baldwin Lake. A third group of small pebble plains is also present at the base of Gold Mountain along the northwest shore of Baldwin Lake (occs.195-197,200-202,204,205, 418,419). The entire complex lies within the North Baldwin Lake/Holcomb Valley Special Interest Area, designated by the SBNF.

The Upper and Lower Gold Mountain pebble plains are adjacent to Forest Road 3N69. The Upper Gold Mountain group supports *Arenaria ursina, Castilleja cinerea, Eriogonum kennedyi* var. *austromontanum,* and *Arabis parishii.* The Lower Gold Mountain pebble plains support these species in addition to *Castilleja cinerea* and *Linanthus killipii.* The scattered occurrences along the north shore of Baldwin Lake support *Castilleja cinerea* and *Arabis parishii.*

H-2. Historical Uses and Impacts

The Gold Mountain area is accessed by Forest Road 3N69 and historically provided vehicle access for fuelwood collection. Forest Road 3N69 is currently a designated off-highway vehicle route, but several unclassified routes have also become established in the area, leading to soil compaction and plant crushing.

Gold Mountain was historically a popular rock collection site (common variety minerals) and provided residents and construction companies in Big Bear Valley with large amounts of material. State Highway 18 bisects the group of pebble plains along the shore of Baldwin Lake, and its construction contributed to habitat loss and fragmentation. Development of the Doble and Lucky Baldwin Mines also resulted in habitat loss.

H-3. Ongoing Threats

Soil compaction and erosion resulting from unauthorized activities, off-road driving, woodcutting, and rock collection are concerns for the Upper and Lower Gold Mountain occurrences. Vehicle tracks were observed in April 2003 through the pebble plain occurrences 186 and 188. Installation of a proposed power line also threatens the area.

Although no studies have been performed to analyze the effects of non-native species on pebble plain taxa, a noticeable difference in *Eriogonum kennedyi* reproductive success was observed in 2003 when areas invaded by cheatgrass (*Bromus tectorum*) and non-colonized areas were compared. In pebble plain occurrences 192 and 187, considerably more flowering inflorescences were noted in portions of the pebble plain that were free of cheatgrass. Conversely, areas that were heavily dominated by cheatgrass appeared much less vigorous, and far fewer flowering stems were observed. This may suggest that cheat

grass invasion in pebble plains is affecting reproduction and fitness levels of *Eriogonum kennedyi* populations in the Gold Mountain Pebble Plain Complex.

H-4. Existing Protection and Restoration Measures

In the summer of 1988, Forest Road 3N69 was relocated to reduce impacts to the Upper Gold Mountain pebble plains, and unclassified routes were closed using funds from the California Green Sticker Program. Vehicle trespass continued to be a problem through the spring of 1989, when extra barriers were erected to alleviate impacts. The Gold Mountain area was closed to woodcutting in the fall of 1989. Two gates were also installed in FY 1999 to exclude public access to an unauthorized dumpsite, and posts were installed on Forest Road 3N69 to prevent off-road use. Despite these efforts and although this area is currently patrolled, unauthorized vehicle use continues to be a problem.

H-5. Monitoring Efforts

A new resource patrol position was funded in FY 1999 to increase patrol on Forest Road 3N69. The road is patrolled twice per week to increase Forest Service presence. SBNF OHV volunteers patrol the route and replace barriers as necessary. Baseline plot data were collected at this site in the past, and some permanent plots were established (although no known efforts have been made to relocate them). Data were also collected in roads as they were closed in the area and in adjacent undisturbed pebble plain habitat.

H-6. Recommended Actions

1. Ensure that barricades along Forest Road 3N69 are providing reliable protection for pebble plain habitat (occ.183,185-189,192,195) especially during winter months. If impacts continue to occur, consider remedies including reengineering, re-route, winter closure, or closure of Forest Road 3N69 as necessary.

2. Prohibit development of utility corridors in pebble plain habitat except where project design and maintenance standards minimize effects, site-specific mitigations are in place, and degraded habitat is replaced at the 2:1 ratio.

3. Work cooperatively with San Bernardino County and the CDFG to conserve pebble plain habitat around Pan Hot Springs (occ.204,205).

4. Limit common variety mineral activities to designated quarries and areas only accessible from classified roads. Maintain closure of the Gold Mountain area to rock collection (occs.183,185-189,192,195).

5. Install additional rock barricades along previously decommissioned routes to reduce unauthorized vehicle use along Forest Road 3N69.

I. Grinnell Ridge Pebble Plain (San Gorgonio Wilderness)

I-1. Site Description

Little information is known about the Grinnell Ridge site, which consists of a single occurrence at T1N R1E NE ¼ of section 26 on the San Bernardino Base Meridian. The total area of this pebble plain is 0.9 acres. The occurrence supports *Castilleja cinerea*. The site occurs along the ridgeline on the east side of Lost Creek Trail at an elevation of 8,060 ft. It is possible that other occurrences of pebble plain habitat occur along Grinnell Ridge. The surrounding area consists of granite-derived sandy loam soils, though the local soil assemblage and quality at the Grinnell Ridge pebble plain is unknown.

I-2. Historical Uses and Impacts

The Grinnell Ridge pebble plain has historically been accessed by hikers and equestrians along the Lost Creek Trail.

I-3. Ongoing Threats

The occurrence is located adjacent to the Lost Creek Trail, and it continues to be at risk of trampling by hikers and horses. It occurs on a flat area that is easily accessible from the trail. Given the steep flank on the western side of the trail and the otherwise uneven topography of adjacent areas, the flat area may attract hikers and horseback riders to veer off from the trail into this site. Vehicle access is prohibited in this area, and because of the surrounding topography, it is unlikely that unauthorized vehicle impacts threaten this area.

I-4. Existing Protection and Restoration Measures

Portions of the Lost Creek Trail in *Castilleja cinerea* habitat in the San Gorgonio Wilderness have been closed to explorer permits. Rare plant information was updated and delineated on wilderness maps in FY 1999.

I-5. Monitoring Efforts

No monitoring efforts are currently underway for the Grinnell Ridge Pebble Plain. Monitoring should include an assessment of potential threats and solutions. An initial monitoring visit will help determine the necessary frequency of monitoring. Given the difficulty of accessing this population due to its remote setting, it is unlikely that monitoring will be conducted as frequently at this occurrence as in other more easily-accessible pebble plain occurrences.

I-6. Recommended Actions

1. Collect baseline information for the known pebble plain occurrence (occ.300). Conduct surveys to identify and map any other occurrences of pebble plain habitat in the area.

2. Encourage outside parties to conduct research to examine the ecology and genetic diversity of the *Castilleja cinerea* population at the site (occ.300).

J. North Baldwin Lake Complex (USFS/PVT)

J-1. Site Description

This complex supports several large pebble plains over a 2.5 square mile area. Approximately 532 acres of pebble plain habitat are included in this complex, located at T3N R2E SE ¼ of section 36, T2N R2E NE ¼ of section 1, and T3N R3E sections 31, 32, and N ½ of sections 5 and 6 on the San Bernardino Base Meridian. The complex includes occurrences known as Mohave View and North Baldwin. The complex is adjacent to the Doble Landfill, which lies to the north and serves the communities of Big Bear Valley. The North Baldwin Lake pebble plains were the focus of cooperative management of sensitive resources by the Forest Service and CDFG. The Nature Conservancy (TNC) purchased 320 acres at this site in the 1980's to protect pebble plain and wet meadow habitat. Part of this property was exchanged to the Forest Service, and part of it was sold to the CDFG in 1986 with the understanding that these lands would continue to be managed for the conservation of the unique habitats they support. A separate management plan has been written for the CDFG-owned lands in this area (Barrows 1989), part of which has been designated as an Ecological Reserve. A few small parcels of the Starland Tract remain under private ownership. This pebble plain complex lies within the North Baldwin Lake/Holcomb Valley Special Interest Area.

The North Baldwin Lake pebble plains support a high diversity of pebble plain species. Many of these are Threatened or Forest Service Sensitive taxa, including *Arenaria ursina, Castilleja cinerea, Arabis parishii, Dudleya abramsii* ssp. *affinis, Eriogonum kennedyi* var. *austromontanum, Eriogonum kennedyi* var. *kennedyi, Ivesia argyrocoma, Linanthus killipii, Mimulus exiguus,* and *Mimulus purpureus.* The rare Baldwin blue butterfly also occurs here.

J-2. Historical Uses and Impacts

Southern California Edison (SCE) and Bear Valley Electric Company (BVEC; formerly Southern California Water and Electric) own and operate 33-kilowatt overhead power lines through this area. The SCE substation is located on Forest land adjacent to the North Baldwin pebble plains and operates under special use permit. Access roads for repair and maintenance of power lines are present. A line, owned by SCE, also runs through the area but does not significantly impact pebble plain habitat. A portion of the BVEC system crosses the Knoll pebble plain (occ.149) and vehicle use for repair and maintenance of this line is a constant source of disturbance to the pebble plains. The Pacific Crest Trail also runs through the North Baldwin Lake pebble plains.

In March 1992, a front-end loader was driven from the Doble Landfill site onto the North Baldwin Lake pebble plains. This incident is known as the "North Baldwin Trespass." The loader caused extensive damage, including the formation of ruts up to 1.5 ft. in depth and the displacement of 274 cubic yards of soil. The vehicle also created approximately 5,450 lineal ft. of tracks on pebble plain habitat. Several pebble plains species were affected, including *Arenaria ursina, Castilleja cinerea, Eriogonum kennedyi* var. *austromontanum, Arabis parishii, Linanthus killipii,* and *Ivesia argyrocoma.* Funds were collected, and a rehabilitation plan was immediately initiated at the site to fill in the ruts with cobbles and rocks and revegetate the area by transplanting seedlings grown in a

greenhouse (by Chaney and Neel). Direct seeding was attempted in FY 1997 after transplanting was unsuccessful, and monitoring plots were established at that time. The plots were revisited in FY 2001. Regeneration of native grass species was observed, suggesting that direct seeding may be somewhat effective at restoring damaged pebble plain habitat. Vehicle tracks in less severely impacted areas are still visible, but density and composition of native species in these areas is generally similar to surrounding undisturbed pebble plain areas.

Burros were common in the North Baldwin Lake area until the Forest removed them from the Big Bear area in 1997 because of safety and habitat protection concerns. Although burros no longer frequent the area, old burro scat offers evidence of their past habitation of the North Baldwin Lake Complex.

Nelson Ridge supports several pebble plains. Occurrence 118 includes pebble plains formerly known as Mohave View and The Saddle. Until 1988, Forest Road 3N65 traversed this ridge between State Highway 18 and Holcomb Valley Road. Many spur roads accessed the entire North Baldwin Lake area east of the Holcomb Valley Road from Forest Road 3N65. Vehicle trespass into TNC-owned property was a significant problem. A turnout exists today on the east side of State Highway 18 and has severely degraded this pebble plain occurrence.

J-3. Ongoing Threats

Unauthorized vehicle access, mining activity, residential development and burros remain threats at this site. Impacts from maintenance and improvement of the utility lines in the area are significant concerns. Two exotic species, *Bromus tectorum* and *Lepidium perfoliatum*, are present at the site, and their advancement is also a threat. Approximately 62 acres of pebble plain habitat remain under mining claims in this complex (occs.102, 118,119,126, 139,140,149).

J-4. Existing Protection and Restoration Measures

Most of the pebble plain and wet meadow habitat has been fenced on both sides of Holcomb Valley Road and along most of the frontage of State Highway 18. Forest Road 3N65 is now closed to public vehicle use; a gate at the east end provides emergency access. The west end of the road was closed by personnel from the County landfill in 1987.

In FY 1999, the Forest began using walk-in access only to turn on and off the Doble Trail Camp water system and began to take monthly water samples on foot to minimize impacts to *Castilleja cinerea* and *Eriogonum kennedyi* var. *austromontanum*. Vehicles are now used only for toilet pumping and other maintenance activities that require a vehicle. Also in FY 1999, the Forest installed "Stay on Trail" signs along the old roadbeds and in other areas with frequent foot traffic along the Pacific Crest Trail in the North Baldwin Lake pebble plains. "Critical Plant Habitat" signs were installed at access points along the Pacific Crest Trail at Nelson Ridge to ensure the parking area does not encroach into areas occupied by *Arenaria ursina* and *Eriogonum kennedyi* var. *austromontanum*. Signs would also be helpful at the access point by the Southern California Edison site.

A brochure for the North Baldwin Lake Interpretive Trail was completed in March 1990. The trail was completed soon after. Consultation with USFWS was completed in 2001 for trail use at this site, and "Stay on Trail" signs were installed.

J-5. Monitoring Efforts

Several plot data were collected for the North Baldwin Lake pebble plains in the 1980's for overall species composition. Transects were also established for *Echinocereus engelmannii* var. *munzii* monitoring. Qualitative monitoring of fence maintenance was also performed for each of the pebble plains within the complex. Photo points were also established at the pebble plains in the early 1980's.

In FY 1997, plots were established to determine the success of seeding in restored areas of the North Baldwin trespass. However, the placement of the monitoring plots in the area damaged by the loader was not sufficient for drawing sound conclusions about the regeneration of native species. All control plots are located in the most heavily disturbed area where deep ruts were formed, and many of the plots marking sites of direct seeding are located in an area only minimally impacted by the loader. A future monitoring effort utilizing a different methodology may provide better results.

J-6. Recommended Actions

1. Promote public interpretation and education of pebble plain habitat in this complex. In cooperation with CDFG, incorporate use of the North Baldwin Lake Interpretive Trail and brochure. Create educational programs through local schools on the ecology and biological significance of pebble plain habitat.

2. Conduct annual intensive monitoring of the pebble plains on the North Baldwin Lake trespass site (occ.118). Establish photo points in place of pre-existing rebar plots at the trespass site in order to more effectively monitor regeneration over time. Remove old rebar and vexar cages from the original transplanting effort in 1992.

3. Monitor the complex annually to check for signs of trespass and other impacts to pebble plain habitat (occs.102,118,119,126,128,136,139,140,149,170,180,181).

4. Maintain fences, protective signage, and slashing along old vehicle tracks as necessary throughout the complex (occs.102,118,119,126,128,136,139,140,149, 170,180,181).

5. Implement annual trash cleanups within the northern area of the complex adjacent to the dump (occs.118,128).

6. Propose relocation of facilities at the Doble Trail Camp that require vehicle access (occs.149,118). Evaluate restricting access to Doble Trail Camp to foot traffic only.

7. Seek to acquire isolated parcels within the Starland Tract in T2N R2E sec.6. (occs.149,168,170). Seek to acquire the 60-acre inholding in Section 36 (occ.140).

8. Work cooperatively with the CDFG to conserve pebble plain occurrences in the area (occs.118,140,149,168,170,181).

9. Continue to work with Caltrans to approve a State Highway 18 worksite on the east side of the highway at the PCT crossing, and delineate a parking area for PCT use.

K. Sugarloaf Ridge Complex (USFS/PVT)

K-1. Site Description

The Sugarloaf Complex is located in T1N R1E, E 1/8 of section 1; T1N R2E section 6, section 5, section 4, section 3, section 2, N ½ of section 10, N 1/8 of section 9; and T2N R2E SE 1/8 of section 33 on the San Bernardino Base Meridian. This complex comprises approximately 616 acres of pebble plain habitat on Sugarloaf Mountain and along the ridgeline to the east (occs. 286-300, 424-428), making these pebble plains the highest in elevation. The pebble plains support a variety of species including *Arenaria ursina, Castilleja cinerea, Arabis parishii, Castilleja lasiorhyncha, Ivesia argyrocoma,* and *Phlox dolichantha*. The population of *Arenaria ursina* in the Sugarloaf Complex is the highest elevation occurrence known for this species and is considered disjunct from other populations. Also, a population of *Castilleja cinerea* that is morphologically distinctive from other populations occurs in this complex. While *Castilleja cinerea* bracts and flowers generally range from yellowish to slightly reddish in color, this population contains individuals that are dark red. These bracts and entire inflorescences are narrower than other populations as well. Neel and others have collected data on flower/bract variation among six populations of *Castilleja cinerea* on the SBNF. There is also a historical occurrence of *Podistera nevadensis*, which is an associated rare species. Shrubby pinyon pines on the margins of pebble plain occurrence 289 may represent the highest known population of this species, at 9,450 ft (T. Krantz, pers. comm. 2002).

K-2. Historical Uses and Impacts

The Sugarloaf Trail (2E18.2 and 2E18.1) runs in an east-west direction across the ridgeline. There are two trailheads that provide access to this trail. One is located at Green Canyon on Forest Road 2N83; the other is the Wildhorse Trailhead (Trail 2E02) on State Highway 38. Three unmaintained trails from Sugarlump Ridge run eastward to Sugarloaf Ridge, though they are overgrown and do not currently provide public access to the pebble plains on Sugarloaf Ridge. Forest Road 2N93 crosses through one small pebble plain (occ.288) within the Sugarloaf Complex.

K-3. Ongoing Threats

Forest Road 2N93 traverses part of the complex. Sugarloaf Ridge has a high potential for fire from lightning strikes, and each year several small fires are suppressed there. Helicopters are not permitted to land on the pebble plain habitat, but in the event of a fire, it is possible that helicopters may need to utilize the area for transportation of hand crews to the fire. In this event, fire officials would need to work with resource advisors to initiate emergency consultation with USFWS.

The Wildhorse Trail (2E02) is used moderately during the summer months and is currently designated for hiking, mountain biking, and equestrian use. However, some unauthorized OHV use also occurs periodically.

K-4. Existing Protection and Restoration Measures
In FY 1999, an occurrence of *Castilleja cinerea* was fenced along Forest Road 2N92, although this area has been fenced and barricaded with berms in the past. The Forest installed "Stay on Trail" signs on Sugarloaf Ridge in FY 1999. The area has been a designated Roadless Area for several years and may be recommended as a Wilderness Area in the future.

In 1990, NEPA was completed to decommission and restore roads south of the Sugarloaf community. Closures were implemented but are in need of constant repair. Fire prevention officers patrol the area and work with adjacent landowners to prevent vehicle access.

K-5. Monitoring Efforts
Monitoring has not yet been initiated for the Sugarloaf Complex. It is important to monitor for weeds along the Sugarloaf Trail, associated with equestrian use.

K-6. Recommended Actions

1. Nominate a Research Natural Area to include Wildhorse Meadows and the western portion of Lightning Ridge (occs.288-290,292,294,424-427).

2. Seek to acquire the Lightning Ridge pebble plain (occ.428). If the Forest is able to acquire this parcel, evaluate removal of the access road to this area. If the parcel is not acquired, propose installation of a gate on the road and allow access under special use permit.

3. Evaluate all unclassified roads for closure and restoration that appear on current topographic maps within the Sugarloaf Ridge complex (occs.286-300,424-428).

4. Monitor classified trail 2E18.2 to evaluate the effects of trail use on pebble plain habitat (occ. 293). If trail maintenance is proposed, consultation will be required with the USFWS to determine potential effects to federally Threatened pebble plain species.

5. Coordinate with Forest staff through the Forest Plan Revision process in the evaluation of the Sugarloaf Wilderness proposal.

6. Monitor Lightning Ridge Trail (occs.286,287,289, 290,292) to discourage unauthorized vehicle use.

7. Monitor habitat occurrences in the complex near target shooting areas to discourage unauthorized driving and shooting (occs.295-299).

8. Coordinate with fire managers and other emergency response personnel to identify areas outside of pebble plain habitat on Sugarloaf Ridge (occs.286, 291,293) for an emergency helispot.

9. Maintain fences on Forest Road 2N93 to protect habitat and maintain "Stay on trail" signs along Sugarloaf Trail (occs.288,427).

10. Collect baseline information for the southernmost habitat occurrences within the complex (occs.295-299).

11. Locate the historical *Podistera nevadensis* occurrence on Sugarloaf Peak.

12. Continue to work with adjacent landowners to maintain existing road closures south of the town of Sugarloaf. Promote educational and interpretive activities to protect the area and encourage volunteer patrols and coordination between the Forest Service and the Sugarloaf community. Complete additional rock barrier work at the south end of Highland Road, Holmes Road, and Leonard Road on Forest land to prevent access onto previously decommissioned road 2N18Y and maintain existing fence lines using smooth wire.

L. South Baldwin Ridge/Erwin Lake Complex (USFS/PVT)

L-1. Site Description

This complex consists of several scattered pebble plains along South Baldwin Ridge (occs.211,212,214,225,226,439,441,438), Erwin Lake (occs.229,231,233,440) and Deadman's Ridge (occ.415). The site comprises approximately 173 acres of pebble plain and is located in T2N R2E section 17, E ½ of section 18, and sections 20, 21, 28, and 29 on the San Bernardino Base Meridian.

The occurrence on South Baldwin Ridge covers approximately 23 acres. Small isolated pockets of pebble plains occur along the ridge top on both Forest and private land. The pebble plain supports *Arenaria ursina, Castilleja cinerea, Eriogonum kennedyi* var. *austromontanum, Ivesia argyrocoma, Arabis parishii, Linanthus killipii,* and *Mimulus exiguus*. A large population of *Echinocereus engelmannii* is also present here. The South Baldwin Ridge occurrence meets the southern boundary of the North Baldwin Lake/Holcomb Valley Special Interest Area.

Approximately 18 acres of habitat are contained in several small private occurrences at the bottom of the slope of South Baldwin Ridge (occs.211,214,225,226,438). These occurrences support *Ivesia argyrocoma, Arabis parishii,* and *Linanthus killipii*. This clay deposit is thought to represent a re-deposition of clay that eroded from higher on the ridge. A small pebble plain also occurs on the ridge at the saddle of an equestrian trail (occ.449).

There is a notable significant habitat occurrence (occ.440) on the adjacent privately-owned Hamilton Ranch in the middle of Erwin Lake that supports *Ivesia argyrocoma,*

and *Arabis parishii*. The portion of this pebble plain on the spit between the two halves of Erwin Lake also contains significant cultural resources (T. Krantz, pers. comm. 2002). The Hamilton Ranch subdivision established two lots on this spit prior to listing of the pebble plains species. Residential development of this property has begun. An isolated occurrence south of the residential development of Woodlands near Meadow Lane exists on Forest and private land (occ.241). This occurrence supports *Castilleja cinerea*.

A pebble plain occurrence (occ.415) comprising approximately 83 acres also exists along Deadman's Ridge, south of Erwin Lake. This site is present on Forest and private lands. The floristic composition of this occurrence is unknown, and the mapped extent should be refined.

L-2. Historical Uses and Impacts
The occurrence on South Baldwin Ridge has been impacted by woodcutting and associated vehicle activity. The occurrence also falls within the Burro Territory on the Forest. Evidence of gold mining activity can be seen around the pebble plains in this complex and on the western end of the South Baldwin Ridge occurrence.

L-3. Ongoing Threats
Unauthorized vehicle use and woodcutting continue to damage habitat on South Baldwin Ridge. New vehicle tracks and cut piñon trees are evident. Cheat grass is also abundant throughout the South Baldwin Ridge Complex.

A proposal to develop private lands on the east side of North Baldwin Ridge may affect adjacent habitat in the near future. The occurrences on Deadman's Ridge are also currently threatened by unauthorized vehicle use and woodcutting.

Burros still inhabit the area occasionally. Although they pose little threat of grazing pebble plain vegetation (pebble plain vegetation is typically low-growing, and burros have prehensile lips which interfere with their ability to graze very close to ground level), the threats of trampling, nutrient addition and weed introduction still exist. However, because of the sparse vegetation available on pebble plain habitat, burros are probably more common in other areas with more abundant forage.

L-4. Existing Protection and Restoration Measures
The South Baldwin Ridge site was closed to dead and down fuelwood cutting in the early 1990's. At that time, the road that traversed the ridge (2N57Y) was removed from the Forest road inventory and access points to the top of the ridge were barricaded to exclude vehicle use. Walk-through gates were installed to allow for equestrian and hiking access.

In 2002, an unclassified road leading from Hamilton Ranch Road to the ridge top was fenced to exclude access, and other previously closed access points were evaluated for maintenance needs. Fences have been repaired and barriers were added as necessary. Private property owners in section 16 on the east side of the ridge bladed the ridge-top road (on their property), cut trees along the road for better access, and gated the road at both ends of their property. If these gates remain in place, vehicle access from the east to Forest land on the ridge top will continue to be restricted.

Habitat along the lower slope of South Baldwin Ridge and in Hamilton Ranch is closed to public access and is thus protected from related vehicle damage. However, the Hamilton Ranch occurrence is currently threatened by a residential development proposal. There is no existing agreement to preserve pebble plain habitat in this area.

L-5. Monitoring Efforts
Plots were sampled in this complex in the early 1990's. The pebble plains in this area were also sampled as part of a morphological and genetic study of *Echinocereus engelmannii* var. *munzii.*

L-6. Recommended Actions

1. Maintain regular patrols along Shay Road, Hamilton Ranch Road and the ridge top to monitor unauthorized use on and adjacent to South Baldwin Ridge (occs.212,439, 441). Survey barricades to ensure they are still in place and functional. Implement additional protective measures as needed to prevent unauthorized vehicle use. Work cooperatively with private landowners in the area to reduce unauthorized vehicle activity.

2. Evaluate findings of the NEPA analysis of potential effects of trail rides under special use permit from Baldwin Lake Stables along portions of South Baldwin Ridge (occs.212,439,441), and implement measures to protect pebble plain habitat.

3. Collect baseline information for the Deadman's Ridge occurrence (occ.415).

4. Develop a management plan for the North Baldwin Lake/Holcomb Valley Special Interest Area (occs.211,212).

5. Seek to acquire private lands as they become available, particularly in areas like Section 16, which contain valuable habitat and are adjacent to SBNF land (occs.439,441).

6. Provide comments on development proposals in Section 16 (east side of South Baldwin Ridge) if Forest system lands would be affected.

M. Broom Flat Complex (USFS/PVT)

M-1. Site Description
This extensive complex stretches from Onyx Peak to Rose Valley. It comprises approximately 766 acres of habitat, making it the largest pebble plain complex on the Forest. Four main clusters of occurrences are present in the complex. They are Onyx Ridge (occs.285,309), Broom Flat (occs.262,263,267-269,274-277,279,280,283,284, 310,311), Yocum (occ.312), and Broomtop (occs.213,216,218,222,223).

The Onyx Ridge occurrences consist of a nearly continuous strip of habitat along Onyx Ridge in T1N R3E N ½ of section 7, W ½ of section 6, T2N R3E SW ¼ of section 31 (on

private land), and T2N R2E NE ¼ of section 1 and S ½ of section 38 on the San Bernardino Base Meridian. *Arenaria ursina, Ivesia argyrocoma, Castilleja cinerea, Arabis parishii,* and *Phlox dolichantha* are present. The northwest portion of the occurrence supports *Arabis parishii* and *Arabis dispar.*

The Broom Flat group includes an occurrence in Broom Flat proper and several smaller pebble plain areas south and east of Broom Flat. They are located in T2N R2E N ½ of section 38 and SE ¼ of section 25, and T2N R3E W ½ of section 30 and NW ¼ of section 31 on the San Bernardino Base Meridian. Broom Flat itself (occs.274,311) supports *Arenaria ursina, Eriogonum kennedyi* var. *austromontanum, Castilleja cinerea,* and *Arabis parishii.* Montane wet meadow habitat supporting *Taraxacum californicum* is interspersed with pebble plains east of this occurrence. The small pebble plains east of Broom Flat near the Juniper Springs Group Campground (occ.279,280) may include *Arenaria ursina* and *Eriogonum kennedyi* var. *austromontanum* (positive identification of *Arenaria ursina* and *Eriogonum kennedyi* var. *austromontanum* at this location has yet to be confirmed). *Arabis parishii, Linanthus killipii,* and *Taraxacum californicum* also occur in this area. These pebble plains support the eastern-most occurrences of *Castilleja cinerea* on the Forest. A pebble plain occurrence is also present south of Broom Flat (occ.310) that supports *Arabis parishii* and *Arabis dispar.* The proposed Broom Flat Research Natural Area exists at the southern end of Broom Flat.

The Yocum occurrence north of Broom Flat covers approximately 227 acres of habitat in T2N R2E W ½ of section 19 and E ½ of section 24 on the San Bernardino Base Meridian. This site is characterized by small inclusions of sparsely vegetated habitat scattered throughout piñon/juniper woodland. *Arabis parishii, Dudleya abramsii* ssp. *affinis,* and *Linanthus killipii* are present. *Arenaria macradenia* var. *macradenia* occurs in this area, in lieu of *Arenaria ursina. Eriophyllum lanatum* var. *obovatum* also occurs beneath trees throughout the complex near pebble plain areas.

The Broomtop group consists of five pebble plains that are scattered along Forest Road 2N02 in T2N R2E S ½ of sections 13 and 14 on the San Bernardino Base Meridian. *Arenaria ursina* is absent in this area, while *Arenaria macradenia* ssp. *macradenia* is present in four of the five occurrences. An unidentified variety of *Eriogonum kennedyi* also occurs, along with *Dudleya abramsii* ssp. *affinis, Linanthus killipii, Arabis dispar,* and *Arabis parishii.*

M-2. Historical Uses and Impacts

The eastern portion of the Onyx Ridge occurrence is relatively undisturbed, although a fire in June 1950 burned habitat on the north slope of Heartbreak Ridge. Forest Roads 2N01 and 2N68Y bisect the northwestern part of the occurrence, and a hiking trail also cuts through the pebble plain at two locations on the south-facing slope in this area. Despite these access routes, no visible impacts to habitat were noted in 2001.

Several unclassified roads are present in the occurrence south of Broom Flat (occ.310). Crushed plants and devegetated areas were observed in 2001. Forest Road 2N01 bisects the pebble plain in Broom Flat, and several minor roads also go through the area. Damage from unauthorized vehicle use is evident in the northeast corner, where a few

unclassified roads and a large turnout are present. This area supports several pebble plain species, including *Eriogonum kennedyi* var. *kennedyi*.

Smokey Valley Muzzle Loaders historically used the area near Juniper Springs for shooting, but this use was discontinued in the mid 1990's. However, the presence of shell casings in the northern part of the pebble plain suggests this area may still be used for unauthorized shooting.

Past uses of the recently-acquired 80-acre parcel in Broom Flat are unknown; however, it is likely that this area was also used for unauthorized shooting because it remained unfenced by the previous owner and easily accessible to the public.

Cattle trespass from the Rattlesnake allotment has also potentially affected pebble plain habitat throughout the Broom Flat Complex. This allotment is administered by the Bureau of Land Management under a Memorandum of Understanding with the SBNF, and the two agencies and the permit holder are currently working together to resolve this ongoing problem.

This complex lies within the Burro Herd Management Area. The extent to which burro use has affected this area is not known.

The presence of an old mine and two mining prospects within the Yocum occurrence indicate past use of the area for mineral extraction. An unclassified road borders the northwest part of the site, although it did not show signs of recent use in 2001. Forest Road 2N01 bisects the pebble plain in both the southwest and northern parts of the occurrence. Cheat grass is also scattered throughout the complex.

M-3. Ongoing Threats

Unauthorized vehicle use poses the greatest threat to the Broom Flat pebble plain, primarily in the northeast region of the occurrence. Non-native cheatgrass (*Bromus tectorum*) is also present along Forest Road 2N01 throughout Broom Flat, and its progressive invasion is a concern. Common knotweed (*Polygonum arenastrum*), another non-native plant species, is also present in the roadbed. The primary threat to the Yocum occurrence is also unauthorized vehicle use. Continued cattle trespass from the Rattlesnake allotment is also a threat that could lead to grazing and trampling of sensitive plant species and increased weed encroachment. Broom Flat is located within the Burro Herd Management Area. Monitoring should determine the effects of burroz use in this area. A total of 0.2 acres of habitat are under mining claim on Forest land.

M-4. Existing Protection and Restoration Measures

Barriers and signs were installed along the access road (1N01) to the Onyx Peak communications site in FY 1999 to protect pebble plain habitat.

In FY 1999, NEPA documentation was completed and a decision was issued for closure and rehabilitation of classified Forest Road 2N01B northeast of Broom Flat to protect pebble plain habitat. The road rehabilitation is scheduled to occur by FY 2005. The Forest acquired the 80-acre parcel in Broom Flat from a private landowner in FY 2001.

Provisions for maintenance of Forest Road 2N01 were modified in FY 2000 to protect *Castilleja cinerea* and pebble plain habitat in this area. A small fence exists along Forest Road 2N01 north of Forest Road 2N64Y (on Forest land) to exclude vehicle access to the meadow. In FY 1999, signs and barriers were installed at the Juniper Springs Group Camp to delimit roads and camping areas in order to prevent parking and camping on pebble plain plants. These barriers are constantly in need of monitoring and repairs. Rocks were also used to delineate the road bed on Forest Road 2N64Y to prevent off-road parking.

The Forest is currently working with BLM and the permit holder of the Rattlesnake allotment to curb cattle trespass off of the allotment. In FY 1999, drift fences were installed and guidance was given to the permit holder to improve response time on gathering trespass cattle. Despite these protective measures, trespass still occurs throughout the Broom Flat Complex.

In 1998, two target shooting areas were designated along Forest Road 2N02. Pebble plain habitat in this vicinity was excluded from locations designated for shooting. To protect pebble plain occurrences in this area, an unclassified route through the easternmost occurrence along Forest Road 2N02 (occ.218) was fenced in FY 1999. The Yocum occurrence is currently unprotected.

M-5. Monitoring Efforts

The Forest implemented monitoring in FY 1997 to assess species composition and abundance for the pebble plains near the Juniper Springs Group Campground. Broom Flat along Forest Road 2N01 was also examined in FY 1999 as part of a classified roads survey to assess impacts of road maintenance on listed plant species.

M-6. Recommended Actions

1. Maintain barriers installed in FY 1999 along the access road (1N01) to the Onyx Peak communications site (occ.285). Work with the permit holder to ensure that the gate remains closed and locked.

2. Consider remedies such as signs and barriers to protect pebble plain habitat along Forest Road 2N68Y (occs.285,309). Install "Stay on Trail" signs along the Pacific Crest National Scenic Trail.

3. Evaluate Forest Road 2N68Y to determine the level of impacts to pebble plain habitat. Consider remedies including reengineering, re-route, or decommissioning as necessary.

4. Close and rehabilitate Forest Road 2N01B (occs.262,263,269,267,311). NEPA analysis for decommissioning of this road was completed in FY 2001. Install signs, slashing and/or fencing at the junction of Forest Roads 2N01 and 2N01B to prevent unauthorized vehicle use. Consider road ripping as a component of rehabilitation.

5. Continue burro monitoring in the complex to evaluate impacts to pebble plain habitat (occs.213,216,218,222,223,262,263,267-269,274-277,279,280,283-285,309-312).

6. Install signs, slashing, and/or barriers at the entry points to new unclassified roads in habitat south of Broom Flat (occ.310). Complete a survey to clearly define the extent of habitat on the hills south and east of the currently mapped occurrence.

7. Install "Sensitive Plant Habitat-Stay on Road" signs along Forest Road 2N01 in the Yocum occurrence (occ.312) where the road is adjacent to pebble plain habitat.

8. Refine survey and mapping of the Yocum occurrence (occ.312). Collect baseline information for the ridge southeast of the occurrence.

9. Determine the *Arenaria* species and the *Eriogonum kennedyi* variety at the Juniper Springs Group Campground pebble plains (occs.276,277,280,283,284, 279,280).

10. Repair barriers installed in FY 1999 at Juniper Springs Group Campground as necessary to protect habitat (occs.279,280).

11. Evaluate Forest Road 2N64Y east of Juniper Springs Group Campground (occs.283,284) to determine the level of effects to pebble plain habitat. Consider remedies including reengineering, re-route, or decommissioning as necessary.

12. Continue to limit the use of Juniper Springs Group Campground to disturbed areas off of pebble plain habitat (occs.283,284). Special use permits shall be reviewed by a botanist prior to issuance.

13. Consider installation of barriers or other protective measures along Forest Road 2N02 to protect pebble plain habitat from impacts associated with adjacent shooting areas (occs.213,216,218,222,223). Monitor along Forest Road 2N02 to ensure that unauthorized shooting and driving is not occurring on pebble plains.

14. Evaluate impacts from unauthorized cattle grazing on pebble plain habitat within the complex (occs.213,216,218,222,223,262,263,267-269,274-277,279,280,283-285,309-312). Continue to coordinate with BLM and the permit holder to ensure compliance and resolve the problem of unauthorized cattle grazing beyond the allotment boundaries. Implement direction in FSH 2209.13.

15. Increase regular patrols in the Broom Flat area to discourage unauthorized uses and impacts to pebble plain habitat (occs.262,263,267-269,274-277,279,280,283,284, 310,311).

16. Seek to acquire the parcel in sec.31 containing pebble plain habitat (occ.285) if the owner is willing. Encourage the current landowner to remove roads in the parcel prior to Forest acquisition.

17. Remove shooting trash from Juniper Springs meadow and pebble plain areas.

N. Rattlesnake Complex (USFS)

N-1. Site Description

This occurrence is a complex of six pebble plains southeast of Rattlesnake Canyon at the northern base of Heartbreak Ridge. The four westernmost pebble plains in this complex (occs.278,303-305) are located at T2N R3E E ½ of SE ¼ of section 28, T2N R3E W ½ of SW ¼ of section 27, and T2N R3E NE ¼ of NE ¼ of section 33 on the San Bernardino Base Meridian. The two easternmost pebble plains (occs.207,281) are found at T2N R3E N ½ of section 34 on the San Bernardino Base Meridian. The pebble plains cover approximately 112 acres and are situated on north- and south-facing 0-25% slopes. The complex is predominantly characterized by cobbly clay soils, though it lies in a zone of convergence between clay and carbonate soils.

The northernmost pebble plain (occ.303) is on a broad south-facing slope and is the highest quality pebble plain in the Rattlesnake Complex, with very cobbly soils and several indicator species. *Eriogonum kennedyi* var. *austromontanum* is present on all pebble plains except the easternmost site, along with *Arabis parishii, Dudleya abramsii* ssp. *affinis, Astragalus purshii* var. *lectulus, Echinocereus engelmannii,* and *Poa secunda* ssp. *secunda.*

The easternmost pebble plain (occ. 307) contains *Dudleya abramsii* ssp. *affinis* and *Arabis parishii* (the southeastern-most occurrence on the Forest), but its carbonate soils and lack of strong indicator species make this occurrence a low-quality pebble plain compared to the other four occurrences in the complex. Carbonate endemic species *Eriogonum ovalifolium* ssp. *vineum* and *Eriogonum microthecum* var. *corymbosoides* are also scattered throughout the complex.

N-2. Historical Uses and Impacts

The area has historically been important for mining. Designated off-highway vehicle use appears to be the main use of this area today. Forest Roads 2N74Y and 2N76Y and unclassified roads were constructed through the pebble plains and resulted in direct loss of habitat. Remnants of an old stone structure are also evident near the west end of the largest pebble plain in the complex (occ.281).

N-3. Ongoing Threats

Unauthorized vehicle use is the greatest threat to the Rattlesnake pebble plains. Cattle trespass from the Rattlesnake allotment also continues to be a potential. This allotment is administered by the BLM under a Memorandum of Understanding with the SBNF, and the two agencies and the permit holder are currently working together to resolve this ongoing problem. Continued cattle trespass could lead to grazing and trampling of sensitive plant species and weed encroachment. Cheat grass is sparse, but present. Approximately 96 acres in this complex are under mining claim (occs.278,281,303, 304,305,307).

N-4. Existing Protection and Restoration Measures
Very little protection exists for the Rattlesnake pebble plains. The Forest is currently working with BLM and the permit holder of the Rattlesnake allotment to curb cattle trespass off of the allotment. In FY 1999, drift fences were installed and guidance was given to the permit holder to improve response time on gathering trespass cattle. Despite these protective measures, recent trespass is evident in Old Timer Canyon and Rattlesnake Canyon north of the pebble plain complex.

N-5. Monitoring Efforts
The Rattlesnake Complex was first identified in FY 1998 and was surveyed and mapped in FY 2001. There are currently no monitoring efforts underway for the site.

N-6. Recommended Actions

1. Install signs and/or fencing along Forest Roads 2N74Y and 2N76Y to protect pebble plains from unauthorized off-road vehicle activity (occs.281,303). Consider remedies including road reengineering, re-route, or decommissioning in the future if barriers are ineffective.

2. Evaluate impacts from unauthorized cattle grazing in the complex (occs.278,281, 303-305,307). Continue to coordinate with BLM and the permit holder to resolve the problem of unauthorized cattle grazing beyond the allotment boundaries. Implement direction in FSH 2209.13.

3. Increase patrols in the area to discourage unauthorized uses (occs.278,281,303-305,307).

V. CONCLUSION

This Habitat Management Guide articulates the goals and intentions of the SBNF for protection and conservation of pebble plain habitat. Use of the Forest is expected to increase over the next 15 years, intensifying the challenges of species and habitat conservation. As we continue through the early years of the new millennium, we hope that this Guide will be used to steer the Forest toward thoughtful resource planning and commitment to species and habitat preservation, and increased partnerships with public and private organizations that represent the people whom the Forest serves. However, the preservation of pebble plain habitat and its species depends not on the text of this Habitat Management Guide, but instead on the commitment of the people who implement and enforce its guidelines and recommendations and share with the public the beauty and ecological significance of this community. Only through successful preservation efforts will the Forest be able to share the unique diversity of pebble plain habitat with future generations.

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APPENDIX A. Draft Proposed Action for Pebble Plain Habitat on the San Bernardino National Forest for the Province Land and Resource Management Plan Revision

Background

Pebble plain habitat supports one of the most threatened and biologically plant rich communities on the San Bernardino National Forest. These isolated patches of Pleistocene clay deposits support plant species found nowhere else in the world. The San Bernardino National Forest contains 4/5 of the total distribution of pebble plain habitat with the remainder occurring on private land in and around Bear Valley. Three federally Threatened, eight Forest Sensitive and seven Watch List plant species occur on this habitat. Most of these 17 plant species are locally restricted to habitat in the eastern San Bernardino Mountains or the Big Bear area. The habitat also provides the necessary host plant requirements for four species of rare butterflies. Three of these butterfly species are endemic, known only from small patches of pebble plain habitat on the Forest.

Although the Forest has promoted public awareness, increased protection measures, and acquired additional habitat, a variety of uses continue to threaten pebble plains. Routine operations for the management and protection of this habitat include public education, surveying for habitat and species presence, assessment of uses and activities in the habitat, monitoring sites to ensure protective measures are adequate and remain in place, and implementation of conservation strategies.

Area Description

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The Pebble Plain Land Allocation is mapped as shown on Map _____.

Desired Conditions

The primary emphasis is the conservation of all pebble plain habitat throughout its range. This is achieved by reducing habitat loss and fragmentation, maintaining site viability and encouraging responsible, compatible uses through education and forest management.

Partnerships are in place with agencies, universities, corporations, foundations, and other entities to conduct conservation activities, including research, education, interpretation, and protection.

The habitat characteristics necessary for all rare plant and wildlife species associated with pebble plains are discovered and conserved to promote and enhance survival. Existing exotic species are controlled and further introductions are prevented.

Pebble plain habitat within the North Baldwin/Holcomb Valley Special Interest Area (SIA) is protected, interpreted and restored through completion and implementation of the SIA Management Plan.

A Research Natural Area (RNA) for pebble plain habitat is designated and approved.

Forest activities that directly or indirectly affect pebble plain habitat are at a level that maintain desired conditions.

Unauthorized grazing continues to be addressed on Forest lands.

Continued emphasis on the acquisition of manageable pebble plain habitat improves the agency's ability to protect resources and meet key objectives in resource management programs.

Successful ecological restoration methods are developed for pebble plain habitat and degraded habitat is restored.

Objectives

Heighten public awareness and support of pebble plain habitat through interpretive talks, walks, field trips, informative signs and visitor center displays. Initiate a public environmental education program with the San Bernardino National Forest Association, enlisting volunteers, at the Big Bear Discovery Center by 2004. Encourage volunteer support for pebble plain habitat protection and restoration projects.

Provide interpretive and educational visitor information for developed areas where pebble plain habitat is directly or indirectly impacted by existing/ongoing recreational activities. If results are not satisfactory, implement perimeter control (fences, barriers), management presence (Forest employees, volunteers), and as a last resort, direct action (temporary, seasonal, or permanent site/area closures).

Implement recommended actions outlined in the Pebble Plain Habitat Management Guide (HMG) as necessary over the life of the LRMP.

Promote partnerships with agencies, universities, corporations, foundations, and other entities to conduct conservation activities, including research, education, interpretation, and protection.

Complete the North Baldwin/Holcomb Valley Special Interest Area (SIA) Management Plan and associated NEPA by 2008 to provide interpretive opportunities.

Maintain or improve all pebble plain habitat on Forest land for habitat conservation over the life of the LRMP to the maximum extent possible. Consider mitigation where long-term benefits to pebble plain habitat would result. Evaluate success using the Pebble Plain Habitat Monitoring Plan.

Work with USFWS over the life of the LRMP toward the recovery of the listed pebble plain plant species.

Nominate designation of a Research Natural Area north of Forest Road 3N16 that includes Arrastre, Union and Burnt Flats by 2005 to promote ecological and restoration research.

Restore degraded habitat and establish success criteria to evaluate restoration methodology by 2005.

Minimize threats associated with unauthorized Forest uses (unauthorized forest products collection, unauthorized vehicle use, unauthorized camping) by 2008, and minimize threats associated with authorized Forest uses over the life of the LRMP.

Identify, map, review, and rank private inholdings of pebble plain habitat and/or land that can provide buffers to habitat by 2005. Provide this information to the Forest Leadership Team annually to aid in future land acquisition/exchange from willing sellers.

Standards

All Standards in both the Forest-wide Allocation section for Pebble Plain and the Forest-wide Direction of Threatened, Endangered, Proposed, Candidate and Sensitive (TEPCS) Species section of the 2/02 Draft of the LRMP apply to all pebble plain habitat. This will ensure that suitable habitat considered important for the recovery of listed species receives protection. This will also promote recovery of listed species and prevent future listing of Forest Service Sensitive species. Additional management direction can be found in Forest Service Manual 2670, Forest Service Handbook 2609.25 R5 supplements 2600-97-1 and 2600-92-3, and the Endangered Species Act.

Standards specific to pebble plain habitat are listed below.

General

The 2002 Pebble Plain Habitat Management Guide shall serve as the recovery direction for *Arenaria ursina, Eriogonum kennedyi* var. *austromontanum*, and *Castilleja cinerea* until the U. S. Fish and Wildlife Service finalizes the recovery plan.

Avoid new ground-disturbing activities within pebble plain habitat except where habitat would be improved or where necessary to achieve desired conditions, or mitigated.

In key *Castilleja cinerea* habitat, avoid, minimize, or mitigate any activity that disturbs host plants (*Eriogonum* and *Artemisia* species) or impacts the host plant habitat, including pollinators and seed dispersal mechanisms.

Prohibit all vehicles from driving off of classified roads and trails in pebble plain habitat.

Administrative Infrastructure

Do not construct new administrative infrastructure in areas where direct or indirect impacts to pebble plain would occur unless necessary or mitigated.

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Habitat Improvement Projects

Improve and restore damaged pebble plain habitat.

Forest Product Harvesting
Prohibit fuelwood cutting in areas where direct or indirect impacts to pebble plain habitat would occur.

Do not issue permits for native seed collection of rare butterfly host plants within the known or expected range of rare butterfly species that occur in pebble plain habitat.

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Law Enforcement Activities
Law enforcement officers and participating agencies shall not perform training sessions in pebble plain habitat. Law enforcement activities shall be confined to existing classified roads.

Minerals Management
For all claims in pebble plain habitat, notify claimants of all requirements under 39 CFR 228 including requirements that say significant ground-disturbing activities require a Notice of Intent (NOI) prior to any activity. Ground-disturbing activities are defined as any impacts to pebble plain habitat, no matter what size. Request a Plan of Operations (POO) and conduct validity exams for any area where ground-disturbing activities are occurring in pebble plain habitat.

Every three years conduct reviews of existing Plans of Operation to ensure ground disturbing activities are being avoided or minimized to the maximum extent possible. Where additional avoidance measures beyond those specified in the Plan of Operation are possible, request a modified Plan of Operation.

Do not authorize the non-commercial collection of rocks and minerals in areas where such activities may negatively affect pebble plain habitat.

Pest Management and Exotic Species
Conduct exotic species control in pebble plain habitat using methods and timelines that do not negatively affect listed or Forest Service Sensitive plants, or the lifecycles or host plants of rare butterflies associated with pebble plains.

Work with crews to avoid impacts to pebble plain habitat during mistletoe removal.

Recreation
Prohibit dispersed camping in pebble plain habitat.

Implement seasonal or temporary closures of existing developed areas where necessary where pebble plain habitat would be directly or indirectly impacted.

Prohibit new recreation activities in areas where pebble plain habitat would be directly or indirectly impacted.

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Roads (road use, construction and maintenance)
Continue implementation of the Annual Road Maintenance Plan on the Mountaintop District to avoid, minimize, or mitigate effects to pebble plain habitat. Revise contract provisions as necessary to avoid or minimize effects to pebble plains.

Develop and implement a transportation system plan that reduces road densities in pebble plain habitat to a level that is consistent with habitat protection.

No new roads shall be constructed, and no unclassified roads shall be added to the Forest Transportation System within the Habitat Management Area (portion of the Pebble Plain Land Allocation), unless Threatened/Endangered habitat would be improved.

Soil and Watershed Management
Soil and watershed management in pebble plain habitat should have long-term beneficial effects.

Special Use Permits
Recreation Special Uses
Do not issue new special use permits if adverse effects to pebble plain habitat will result unless effects can be minimized and limited to short-term effects with no destruction or degradation of habitat surface.

Condition re-issuance of expired special use permits and amendment of existing permits on avoidance or minimization of impacts to pebble plain habitat.

Manage existing special use permits to avoid or minimize effects to pebble plain habitat through monitoring, education of permit holders, and compliance with permit stipulation.

Non-Recreation Special Uses
Do not issue new permits unless effects to pebble plain habitat can be avoided, minimized, or mitigated.

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Authorizations for new and existing utilities and other non-recreational special use permits will require operating plans addressing how activities will be managed to protect pebble plain species and habitat.

Wilderness
Manage trail use and maintenance along Grinnell Ridge to minimize effects to *Castilleja cinerea*.

Wildland Fire Management
Protect pebble plains from damage caused by fire suppression activities to the maximum extent possible.

Allow fire to burn through pebble plain habitat where it does not compromise safety.

Plan suitable routes for emergency response personnel to avoid or minimize effects to pebble plain species and habitat.

Due to salinity content, prohibit use of water from Erwin and Baldwin Lakes for fire suppression within or adjacent to pebble plain habitat except when necessitated by imminent risks to life or property.

Monitoring

Implement the monitoring plan as described in the 2002 Pebble Plain Habitat Management Guide.

Special Area Designations

Research Natural Areas

Nominate a Research Natural Area with pebble plain being the target community north of Forest Road 3N16 to include Arrastre, Union, and Burnt Flats.

Suitable Use Determinations

See Table 1.

TABLE 1.

SUITABLE USE DETERMINATION TABLE FOR PEBBLE PLAIN AND CARBONATE PLANT LAND ALLOCATIONS ON THE SAN BERNARDINO NATIONAL FOREST

	Pebble Plain	Carbonate Plant Habitat Management Area (MA)	Carbonate Mining Management Area (MA)
EXOTIC SPECIES CONTROL AND PESTMANAGEMENT			
Mistletoe removal	Y*	Y*	Y*
Manual/mechanical	Y*	Y*	Y*
Herbicide use	Y*	Y*	Y*
Biological control	Y*	Y*	Y*
Competitive seeding	Y*	Y*	Y*
Grazing to control weeds	N	N	N
Aerial application of pesticides	N	N	N
Ground application of pesticides	N	N	N
FIRE MANAGEMENT			
Fire Suppression			
Allow fire to burn over	Y	N	N
Driving/staging	N	Y*	Y*
Dozer line construction	N	Y*	Y*
Hand line construction	N	Y*	Y*
Helicopter landing sites	N	Y*	Y*
Backfiring	Y*	Y*	Y*
Use of aerial retardant	Y	Y	Y
Use of water from Baldwin or Erwin Lakes	Y***	Y***	Y***
Prescribed burning			
Use of wetline or foam	Y	Y	Y
Mechanical fuelbreak Construction	N	N	Y*
Shaded fuelbreak construction/maint.	N	Y*	Y*
Understory burning	N	Y*	Y*
Pile burning	N	Y*	Y*
Helitorch use	N/A	Y*	Y*
Helitorch fuel mixing	N	N	Y****

	Pebble plain	Carbonate High Habitat Management Area D/E	Carbonate Mining Management Area A/B/C
FOREST PRODUCT HARVESTING			
Fuelwood collection	N	Y*	Y*
Tree/shrub collection	N	N	N
Seed collection	N	Y*	Y*
Moss harvesting	N	N	N
HABITAT RESTORATION			
Subsoiling roadbeds	Y*	Y*	Y*
Native planting	Y*	Y*	Y*
Native seeding	Y*	Y*	Y*
Barrier placement/signing	Y*	Y*	Y*
Erosion/sediment control	Y*	Y*	Y*
Erosion blankets w/o netting	Y*	Y*	Y*
Erosion blankets with netting	N	N	N
Mine restoration/reclamation	Y*	Y*	Y*
Snag creation	N/A	Y	N
Brush pile construction	N	N	N
Create water developments	N	N	N
Maintain water developments	Y*	Y*	Y*
Education/Interpretation adjacent	Y	Y	Y
Education/Interpretation Within	Y*	Y*	Y*
LANDS ADJUSTMENT			
Acquisition	Y	Y	Y
Exchange for	Y	Y	N
Exchange out of	N	N	Y
LAW ENFORCEMENT			
Off road driving	N **	N **	N**
Training exercises	N	Y*	Y*
LIVESTOCK GRAZING			
Cattle grazing	N	N	N
New water developments	N	N	N
Maintain existing water Developments	N	Y*	Y*
Type conversion	N	N	N
Salt blocks in habitat	N	N	N

	Pebble plain	Carbonate Habitat Management Area D/E	Carbonate Mining Management Area A/BC
MINERALS MANAGEMENT			
Prospecting	N	N	Y
Assessment work w/NOI or POO	Y**	Nv	Y
Mining under POO	Y*	Nv	Y
Minerals withdrawal	Y	Y	N
Rock collection permits	N	Y*	Y*
RECREATION			
New developed sites	N	N	N
Maintain developed sites	Y*	Y*	N
Dispersed camping	N	Y*	Y*
Green Sticker use on classified Roads	Y*	Y*	Y*
ROADS			
Use on existing roads	Y*	Y*	Y*
Road maintenance using Road Maintenance Plan protecting TES	Y	Y	Y
New road construction in	N*	N	Y*
Asphalt surfacing	Y	Y	Y
Hazard tree removal	Y*	Y*	Y*
Dust abatement with water	Y	Y	Y
Dust abatement with chemicals	Y*	Y*	Y*
Road decommissioning actions (subsoiling, water bars, culvert removal, erosion control, reveg)	Y*	Y*	Y*
SPECIAL AREA DESIGNATIONS			
New Research Natural Areas	Y	Y	N
New Special Interest Areas	N	Y*	N
New Wild and Scenic River	Y	Y	N
New Wilderness	Y	Y	N
SPECIAL USE PERMITS			
Recreational Special uses			
New permits on classified roads/trails	Y*	Y*	Y*
New permits off classified Roads/trails if effects to TE Avoided, minimized or mitigated	Y*	Y*	Y*
Continue cabin permits	Y*	Y*	Y*
Filming permits	N	Y*	Y*
Group events	N	Y*	Y*

	Pebble plain	Carbonate Hab. Management Area D/E	Carbonate Mining Management Area A/B/C
Non Recreational Special Uses			
New water developments	N	Nf	Y*
Maintain water developments	Y*	Y*	Y*
Permit new communication sites	N	Y*	Y*
Permit new wells or water diversions	N	N	Y*
TRAILS			
Existing trail use	Y*	Y*	Y*
New trail construction if effects to TE Avoided, minimized or mitigated	Y*	Y*	Y*
Trail maintenance	Y*	Y*	Y*
WILD BURRO MANAGEMENT			
Grazing allowed on habitat within territory	Y NBL, SBR/EL BF, GM	Y	Y

Legend
All uses assume NEPA is completed

Y	Suitable use
Y*	Suitable with avoidance/minimization measures in place
Y**	Suitable if working with claimant to avoid impacts or ask claimant to pay annual assessment fee instead
Y***	Yes, but only if necessitated by imminent risks to life and property
Y****	Yes, on active mine and overburden only
N	Non-suitable use
N*	No, unless long term net benefit to habitat
N**	No, except with approval from District Ranger
N/A	Not applicable
Nf	No, unless dedicated as "Category F" in Carb. Hab. Management Strategy
Nv	No, subject to Valid Existing Rights
BF	Broom Flat Pebble Plain Complex or portion thereof
GM	Gold Mountain Pebble Plain complex or portion thereof
MT	Mountaintop Ranger District
NBL	North Baldwin Lake Pebble Plain Complex or portion thereof
R	Rattlesnake Pebble Plain Complex or portion thereof
SBR/EL	South Baldwin Ridge Pebble Plain Complex or portion thereof
SJ	San Jacinto Ranger District

APPENDIX B: CNPS, USFWS, CNDDB, and USFS Species and Community Ranking Codes

B-1. CNPS Lists and Codes

Lists

List 1B	Plants rare, threatened, or endangered in California and elsewhere
List 2	Plants rare, threatened, or endangered in California, but more common Elsewhere
List 3	Plants about which we need more information – a review list
List 4	Plants of limited distribution – a watch list

R (Rarity)

1	Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time
2	Occurrence confined to several populations or to one extended population
3	Occurrence limited to one or a few highly restricted populations, or present in such small numbers that it is seldom reported

E (Endangerment)

1	Not endangered
2	Endangered in a portion of its range
3	Endangered throughout its range

D (Distribution)

1	More or less widespread outside California
2	Rare outside California
3	Endemic to California

B-2. USFWS Status

T	Threatened
Former C2	Formerly a Category 2 candidate species. Threat and/or distribution data are not sufficient to support federal listing at this time (no longer used by FWS but often cited by other agencies as "federal species of concern")
C3c	Too widespread and/or not Threatened

B-3. CNDDB Codes

Note: Global Rank (G) is the overall condition of a species throughout its global range.

G1	Less than 6 occurrences or less than 1,000 individuals or less than 2,000 Acres
G2	6-20 occurrences or 1,000-3,000 individuals or 10,000-50,000 acres
G3	21-100 occurrences or 3,000-10,000 individuals or 10,000-50,000 acres
G4	Greater than 100 occurrences or greater than 10,000 individuals or greater than 50,000 acres
G5	Population demonstrably secure to ineradicable due to being commonly found in the world

State Rank (S) is the condition of the species within the state border. Rankings S1-S5 follow those listed above for global rankings.
Relative threats are associated with the global and state population rankings as follows:

- G#.1 or S#.1 – very threatened
- G#.2 or S#.2 – threatened
- G#.3 or S#.3 – no current threats known
- S4 and S5 rankings do not have threat descriptions

B-4. USFS Status Codes
S – USFS Sensitive Species
W – USFS Watch List Species

B-5. Species Distribution Codes
1 = Endemic to Big Bear and Holcomb Valleys
2 = Endemic to the San Bernardino Mountains
3 = Nearly endemic to southern California, but with one or two other occurrences

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APPENDIX C. Biological Species Accounts of Federally Threatened Pebble Plain Plants on the San Bernardino National Forest

San Bernardino National Forest files have the most current information for the following federally Threatened species (USDI Fish and Wildlife Service 1998). This information should be utilized when performing pre-field surveys for projects affecting these species (USDA Forest Service 1999, 2000, 2001).

Although the following species accounts provide the most current information on official status and ranking of the species (CNPS 2001; CNDDB 2001, 2002), some known occurrences have not yet been recorded in the CNDDB database and are thus not reflected in the total number of occurrences.

C-1. *Arenaria ursina* Robinson – Bear Valley sandwort

Family
Caryophyllaceae

CNPS Ranking
List 1B/RED 2-2-3

Nomenclature and Taxonomy
- *Arenaria capillaries* Poiret var. *ursina* (Robinson) Robinson (1897) in Gray
- PLANTS database symbol*: ARUR
- The type specimen was collected from Bear Valley in the San Bernardino Mountains in August 1882 (Parish and Parish #1490, RSA-102339)

Description (R. Hartman in Hickman, ed. 1993)
Caespitose perennial, the caudex densely branched, woody, the crown rarely more than 3 cm high, the flowering branches erect or ascending, 4-15 cm high, glandular puberulent above; leaves opposite, 4-12 mm long; rigid, straight, subulate, ciliate, dark green, drying straw colored; inflorescence a loosely flowered cyme; pedicels 4-12 mm long; sepals 5, 3-4 mm long, ovate, with scarious margins; petals 5, white, 4-5 mm long, ovate-oblong, rounded or somewhat notched at apex; fruit a capsule, 3-5 mm long; seeds brown, reticulated, ca. 1.2 mm long.

Look-alikes
Several other species of *Arenaria* are known from the San Bernardino Mountains; however, they are all easily distinguishable from *Arenaria ursina*. *Arenaria macradenia* var, *macradenia* is a woody perennial like *Arenaria ursina*, although it is readily differentiated by longer leaves (2-5 cm), larger nectaries (0.7-1.5 mm) and broader distribution. *Arenaria confusa*, reported from "damp places near meadows" (thus differing in habitat), has wider leaves which do not have sharp-pointed tips. *Arenaria nuttallii* ssp. *gracilis* is reported from granitic gravel slopes and the entire plant is

* The PLANTS database web address is: http://www.plants.usda.gov.

glandular pubescent. The petals of *Arenaria nuttallii* ssp. *gracilis* are also shorter than the sepals, and the sepals are distinctly one-nerved. In *A. rubella,* the petals are shorter than the sepals and the sepals are distinctly three-nerved.

Species Occurrences and Range
The California Natural Diversity Database (CNNDB 2001) contains records for 25 occurrences of *Arenaria ursina.* The reported range has been from Onyx Peak to Cactus Flat, though this was recently reduced after surveys identified some of those occurrences as *Arenaria macradenia* var. *macradenia.*

Arenaria ursina has been recorded from the following pebble plain complexes:

Big Bear Lake	Gold Mountain
Holcomb Valley	North Baldwin Lake
Fawnskin	South Baldwin Ridge (Erwin Lake)
Arrastre Flats	Broom Flat
Sawmill	

Phenology
Blooms June-July, occasionally responding to summer rains and also blooming from August-September (Munz 1974).

Distribution and Ecological Requirements
Arenaria ursina is known from the mountain slopes and ridge tops to the northeast and south of Big Bear Lake. This perennial is found on dry hills and pebble plains in Jeffrey pine forest or pinyon-juniper woodland in the northeastern section of the San Bernardino Mountains between 5,800 and 9,400 feet (1,950 and 2,100 meters) (US Fish and Wildlife Service 1998; Hickman, ed. 1993). *Arenaria ursina* is one of two indicator species of the pebble plain plant community (the other being *Eriogonum kennedyi* var. *austromontanum*), as defined by Derby (1979).

This species appears to have a high degree of microhabitat preference. For example, on the "Knoll" pebble plain at North Baldwin Lake, this species occurs only in scattered patches on north-facing slopes. A similar scattered distribution has been observed at Arrastre Flat and the Mohave View pebble plain (in the North Baldwin Lake Complex), although the habitat parameters that account for this distribution have not been determined (Barrows 1989).

This taxon is almost always found in association with both varieties of *Eriogonum kennedyi. Arenaria ursina* is considered to have the second most restricted range of the pebble plain "endemics", having a slightly wider elevational range than *Eriogonum kennedyi* var. *austromontanum* and appearing to tolerate more shaded or north aspect situations (Krantz 1981).

Species Variability
No quantitative data have been collected on the morphological characteristics of this species. However, casual observations suggest that variability is low.

Species Threats and Impacts
Some occurrences are located on private lands where they may be unprotected. Other potential threats to this species and its habitat may include unauthorized off-highway vehicle disturbance (mainly to access unauthorized woodcutting areas), trampling, snow play, and development.

C-2. *Castilleja cinerea* Gray – Ash-gray paintbrush

Family
Scrophulariaceae

CNPS Ranking
List 1B/RED 2-2-3

Nomenclature and Taxonomy
- Synonyms: None
- PLANTS database symbol: CACI-2
- The type specimen was collected in Bear Valley by S.B. and W.F. Parish in 1882.

Description (Chuang and Heckard in Hickman, ed. 1993)
Perennial with few to many ascending to 1-2 dm long decumbent stems from woody root-crown; leaves short-linear (1-2 cm), entire or the upper leaves with a pair of small lobes, with grayish and whitish hairs, the leaves densely clothed; inflorescence a greenish yellow (or reddish-orange tinged) spike; bracts and calyces shaggy-hairy on lower half, the lobes and apex covered with distinctive, minutely spiculate, yellowish hairs; bracts 1-2 cm long, broadly rounded with 1-2 pairs of lobes; calyx 15 mm long tubular with 4 narrow lobes of about equal length (5-8 mm); corolla 15-17 mm long, tubular below and 2-lipped at the apex, the lower lip with 3 short greenish, incurved lobes that are about as long as the pointed upper lip (galea); stamens 4, the anthers in 2 pairs within the folded upper lip; stigma hemispheric, often slightly bilobed, protruding from tip of galea; fruit a many-seeded capsule, 6-10 mm long; seed about 1 mm long with a brown, reticulate seed coat.

Look-alikes
This species is easily distinguishable from other species of *Castilleja* in the area by the yellow color of the spike and the equal length of the calyx lobes. However, *Castilleja plagiotoma* also possesses a yellow-green inflorescence when dry, and close observation may be necessary to distinguish the two. *Castilleja lasiorhyncha* is also present within the range of *Castilleja cinerea,* but it is readily differentiated by the conspicuous yellow pouches on its corolla and its annual habit.

Species Occurrences and Range
Thirty-three occurrences are recorded in the California Natural Diversity Database (CNNDB 2001), although more are known to occur on the SBNF.

Castilleja cinerea has been recorded from the following areas:

Big Bear Lake	Gold Mountain
Holcomb Valley	North Baldwin Lake
Fawnskin	South Baldwin Ridge/Erwin Lake
Arrastre Flats	Broom Flat
Sawmill	Grinnell Ridge
Snow Valley	

The plant is also known from Keller Peak and Moonridge.

Phenology
Blooms from May to August, but principally in June and July. Phenology varies considerably from early blooming on the eastern pebble plains to later blooming on the western sites.

Distribution and Ecological Requirements
This perennial is known to occur on clay soils, pebble plains, in dry meadows, and in openings within upper montane conifer forest, pinyon-juniper woodlands, and Mojavean desert scrub between 5,000 and 9,800 feet (1,800 and 2,800 meters) (Hickman, ed. 1993).

Little information is available on the ecological requirements of this taxon. The presence of *Castilleja cinerea* is not strictly limited to pebble plains, as it may be found on clay soils not associated with the plains. Like other "endemics", it is patchily distributed within a pebble plain. In a study of microhabitat differences at Sawmill pebble plain, Derby (1979) found this species to be more common on northwest exposures; this taxon was absent from sample plots on southwest exposures. It was also not present in sample plots in the understory of western juniper trees, though it occurred in low densities in open areas of the pebble plain.

Castilleja cinerea is a green-root parasite on *Eriogonum kennedyi* var. *austromontanum, Eriogonum kennedyi* var. *kennedyi, Eriogonum wrightii* var. *subscaposum, Artemisia tridentata, Artemisia nova,* and other *Artemisia* species.

Species Variability
This species is highly variable in inflorescence color, both within and among sites. For example, at Sawmill inflorescences vary from a bright greenish yellow to a rather dull crimson red as a result of varying levels of anthocyanin pigments. Similar variation in flower color can be seen at other sites. A general trend is seen going from northwest to southeast, where yellow and yellow-green inflorescences appear to be more frequent to the north and west while red inflorescences are more frequent to the south (particularly near Sugarloaf Ridge). Inflorescence size also appears to decrease from north to south.

Individuals from Sugarloaf Ridge have shorter uniformly maroon bracts and reduced inflorescences.

Species Threats and Impacts
Occurrences are located on both public and private lands. The SBNF has undertaken protection measures to aid in the recovery of this species from effects due to erosion control practices, competition from non-native plants, proximity to hiking trails, development, grazing, and recreational activities such as skiing, bicycling and unauthorized off-highway vehicle activities. Protection of host plants is also important in the recovery of this species.

C-3. *Eriogonum kennedyi* Watson var. *austromontanum* Munz & I.M. Johnston – Southern mountain buckwheat

Family
Polygonaceae

List
List 1B/RED 2-2-3

Nomenclature and Taxonomy
- The species *Eriogonum kennedyi* includes a complex group of infra-specific taxa distributed in the Sierra Nevada, the San Gabriel and San Bernardino Mountains of California. See Munz (1974) or Reveal (1989) for a complete discussion.
- PLANTS database symbol: ERKEA-2
- The type specimen was collected in Big Bear Valley, San Bernardino Mountains, on dry ground near Big Bear Lake on July 4, 1920 (Harwood 4369; POM 9162).

Description (Hickman, ed. 1993)
Perennial with a branched, woody caudex, forming loose leafy mats; leaves oblanceolate to elliptic, tip acute, blades 6-10 mm long, often sheathing up from the stem; inflorescences head-like, generally ± tomentose, axis 8-15 cm; bracts scale-like, subtending involcures; involucre 2.5-4 mm, sessile, rigid, ± hairy with 5-7 teeth. Perianth 2-3 mm, white to rose, glabrous, lobes ± widely elliptic, stalk-like base 0. Fruit 3.5-4 mm.

Look-alikes
Eriogonum kennedyi ssp. *austromontanum* and *Eriogonum kennedyi* ssp. *kennedyi* overlap in range and habitat and are difficult to distinguish. Characteristics used by Reveal (CNDDB occ.11, collected in 1979) are as follows:

Eriogonum kennedyi var. *austromontanum*	*Eriogonum kennedyi* var. *kennedyi*
Leaves 6-12 mm long	Leaves 2-4 mm long
Leaves loosely matted	Leaves forming dense mats
Flowering July-September	Flowering April-June
Achenes 3.5-4 mm long	Achenes ca. 2 mm long

Reveal (1989) felt that leaf length was the most reliable characteristic.

Eriogonum wrightii ssp. *subscaposum* also resembles *Eriogonum kennedyi* var. *austromontanum* in that it has loosely matted leaves. However, the branched inflorescence of *Eriogonum wrightii* var. *subscaposum* is an obvious key difference. In addition, *Eriogonum wrightii* var. *subscaposum* occurs more frequently in the understory of the yellow pine forest. There is a possibility that the two species hybridize occasionally, especially along the ecotone between pebble plain habitat and the forest (e.g. Holcomb Valley Complex).

Species Occurrence and Range
The California Natural Diversity Database (CNNDB 2001) contains records for 22 occurrences in the following areas:

Big Bear Lake	Gold Mountain
Holcomb Valley	North Baldwin Lake
Fawnskin	South Baldwin Ridge (Erwin Lake)
Arrastre Flats	Broom Flat
Sawmill	

Phenology
This species flowers from July through September.

Distribution and Ecological Requirements
This perennial grows on pebble plains between 5,800 and 7,500 feet elevation (1,900 and 2,100 meters) (Hickman, ed. 1993). On the San Bernardino National Forest, this variety is one of the two most restricted pebble plain taxa. This species is one of two indicator species for the pebble plain plant community (the other being *Arenaria ursina*), as defined by Derby (1979). *Eriogonum kennedyi* var. *austromontanum* is typically the dominant species present on a pebble plain. However, it has the most limited range of the endemic taxa and is strongly affected by activities on the Forest. *Eriogonum kennedyi* var. *austromontanum* serves as a host plant for the hemi-parasitic *Castilleja cinerea (*also federally Threatened) and also for a rare race of blue butterfly called the Baldwin Lake blue butterfly (*Euphilotes enoptes* near *dammersi* ssp.) (Emmel & Emmel 1973).

Eriogonum kennedyi var. *austromontanum* is restricted to dense clay soils, usually with a pavement of saragosa quartzite pebbles. The taxon occurs primarily on typical cobbled clay pebble plain soils, but it also occurs in sandy soils (e.g. Burnt Flat). Moreover, at North Baldwin Lake, *Eriogonum kennedyi* ssp. *austromontanum* occurs on clay soils on the east side of State Highway 18 in an area dominated by sagebrush with no cobbly "pavement".

This variety is often confused with *Eriogonum kennedyi var. kennedyi* and possibly *Eriogonum kennedyi var. alpigenum.* When in doubt, occurrences and habitat are to be protected as the federally listed variety, *Eriogonum kennedyi var. austromontanum.*

Species Variability
Eriogonum kennedyi var. *austromontanum* appears to be extremely variable. However, part of this may be due to confusion with *Eriogonum kennedyi* var. *kennedyi*. According to Krantz (1981), there is a clinal gradient from *Eriogonum kennedyi* var. *austromontanum* in the south and west to *Eriogonum kennedyi* var. *kennedyi* in the north and east, with *Eriogonum kennedyi* var. *kennedyi* occurring on drier sites. This morphological gradient may follow the rainfall gradient in the valley. *Eriogonum kennedyi* var. *austromontanum* is best represented by plants at Arrastre Flat and Sawmill, where the morphology is relatively homogenous.

Species Threats and Impacts
While fencing protects some occurrences of *Eriogonum kennedyi* var. *austromontanum*, roads bisect most of the occurrences, and unauthorized off-road driving can degrade the habitat and adversely affect individual plants. Other potential threats to this species include urban development, off-highway vehicle activity, grazing, and competition from non-native plant species.

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APPENDIX D. Suitable Habitat Criteria and Survey Requirements for Federally Threatened Pebble Plain Plant Species

D-1. Suitable Habitat Criteria and Survey Requirements for:

Arenaria ursina Robinson (Caryophyllaceae) Bear Valley Sandwort
January 2003

Modeled habitat for *Arenaria ursina* is based on known San Bernardino Mountains pebble plain distribution plus a 1/8 mile buffer.

Suitable Habitat:

Suitable habitat is limited to pebble plains in openings within pinyon and juniper woodland, Jeffrey pine forest, and mixed conifer forest. Pebble plains are generally found on ridgetops and gentle slopes and flats (USDA Forest Service 2000).

Pebble plains are determined using a point system, where characteristics indicative of pebble plains are given a point value, depending on the reliability of the indicator (USDA Forest Service 2002). A pebble plain is present when at least four points are achieved. Any combination of the following criteria adding up to four points must be met:

- **Strong Indicators** (2 points each: often occur on pebble plains, rarely occur off of pebble plains)
  - Clay soils with open canopy
  - Presence of *Eriogonum kennedyi* var. *kennedyi*
  - Presence of *Eriogonum kennedyi* var. *austromontanum*
  - Presence of *Ivesia argyrocoma*

- **Weak Indicators** (1 point each: often occur on pebble plains, frequently occur off of pebble plains)
  - Presence of *Allium parryi*
  - Presence of *Antennaria dimorpha*
  - Presence of *Arabis parishii*
  - Presence of *Astragalus purshii* var. *lectulus*
  - Presence of *Castilleja cinerea*
  - Presence of *Dudleya abramsii* ssp. *affinis*
  - Presence of *Echinocereus engelmannii*
  - Presence of *Erigeron aphanactis* var. *congestus*
  - Presence of *Eriogonum wrightii* var. *subscaposum*
  - Presence of *Lewisia rediviva*
  - Presence of *Lomatium nevadense* var. *parishii*
  - Presence of *Mimulus purpureus*

Protocol for Surveys of Suitable Habitat – Presence/Absence Determinations

Detectability Profile:
Arenaria ursina plants are moderately detectable when flowering. Flowering has been documented from June through September (Munz 1974), but flowering is often strongly associated with summer rainfall. Plants are diminutive woody short-lived perennials and exhibit low to moderate annual variability in distribution.

Survey Requirements for Negative Determination in Suitable Habitat

Repeat Requirements:
Because this species generally has low to moderate annual variability and is moderately detectable during peak survey months, a negative determination (absence finding) may be made in a single survey season. However, because rainfall affects detectability of *Arenaria ursina*, a representative reference population must be visited prior to survey to confirm detectability during the survey period. If detectability at the reference population is found to be low, one additional survey season with moderate or better detectability will be required for a negative determination.

One survey will be completed at a time when high detectability is confirmed at a reference population, and one follow-up survey will be completed 4-6 weeks later, to account for phenological variability. This will provide sufficient repeat confidence for a negative determination.

Survey Intensity:
Suitable habitat must be surveyed in walking transects no more than two meters apart.

References:

Krantz, T.P. 1981. A survey of two pavement plain endemics: the Bear Valley sandwort, *Arenaria ursina*, and Big Bear Buckwheat, *Eriogonum kennedyi* var. *austromontanum*. A study of the taxa throughout their ranges. Unpublished report prepared for the San Bernardino National Forest on file at the Big Bear Ranger Station, Fawnskin, Ca.

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USDA Forest Service. 1999. Biological Assessment on the effects of ongoing Forest activities that may adversely affect federally Threatened pebble plain plants on the San Bernardino National Forest. Unpublished report on file at the Forest Supervisor's Office, San Bernardino, Ca, and the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2000. Criteria for Modeled Suitable Habitat – Threatened and Endangered Species: *Arenaria ursina*. Draft Unpublished document on file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2002. Pebble Plain Habitat Management Guide. Unpublished report on file at the Big Bear Ranger Station, Fawnskin, Ca.

D-2. Suitable Habitat Criteria and Survey Requirements for:

Castilleja cinerea Gray (Scrophulariaceae) Ash-Gray Paintbrush
January 2003

Modeled habitat for *Castilleja cinerea* is based on GIS parameters: Elevation: 6500-10200 feet; Slope: 0-30% slope + 120 meter buffer to capture where plant occurrences spread out onto steeper slopes; Franklin GIS vegetation layer for SBNF (BA, JP, EP, MP, MF, BS, PJ, HG vegetation types). Low conifer density or openings. San Bernardino Mountains. Rock types: Elq, JKgr, Jhd, KJqm, Qal, Ql, Qls, Qo, Qod, TRmz, pElb, pElb-Q, pElq.

Suitable Habitat:

The site must be in the San Bernardino Mountains and meet either of the following criteria:

1. Either of the following host plants are present: *Eriogonum kennedyi* or *Eriogonum wrightii* var. *subscaposum.*

2. *Artemisia nova* or *Artemisia ludoviciana* are present, with dry sandy or silty soils, adjacent to or within meadow systems.

In addition to the host plants listed above, any of the following species may be associated with *Castilleja cinerea*: *Ivesia argyrocoma, Arabis parishii, Arenaria ursina, Lomatium nevadense* var. *parishii, Linanthus killippii, Lewisia rediviva, Mimulus purpureus, Antennaria dimorpha, Elymus elymoides*. Of these, *Ivesia argyrocoma* is the best plant indicator of suitable habitat.

Protocol for Surveys of Suitable Habitat – Presence/Absence Determinations

Detectability Profile:
Castilleja cinerea plants are perennial but exhibit high annual variability in detectability. Plants are highly detectable just prior to flowering and remain visible and identifiable until the first winter snow event. Detectability is low or zero during the rest of the year.

While plants are highly detectable in average or above-average rainfall years, detectability may be low to zero in very dry years.

Survey Requirements for Negative Determination in Suitable Habitat

Repeat Requirements:
Although this species exhibits high annual variability, plants are highly detectable following average or above-average wet season. For this reason, a negative determination (absence finding) may be made in a single survey season. However, a representative reference population must be visited prior to survey to confirm high detectability during the survey period. If detectability at the reference population is found to be low, a negative determination cannot be made that year.

One survey will be completed at a time when high detectability is confirmed at a reference population, and one follow-up survey will be completed 4-6 weeks later, to account for phenological variability. This will provide sufficient repeat confidence for a negative determination.

Survey Intensity:
Suitable habitat must be surveyed in walking transects no more than two meters apart.

References:

Munz, P.A. 1974. A Flora of Southern California. University of California Press, Berkeley and Los Angeles, Ca.

USDA Forest Service. 1999. Biological Assessment on the effects of ongoing Forest activities that may adversely affect federally Threatened pebble plain plants on the San Bernardino National Forest. Unpublished report on file at the Forest Supervisor's Office, San Bernardino, Ca, and the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2000. Criteria for Modeled Suitable Habitat – Threatened and Endangered Species: *Castilleja cinerea*. Draft Unpublished document on file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2002. Pebble Plain Habitat Management Guide. Unpublished report on file at the Big Bear Ranger Station, Fawnskin, Ca.

D-3. Suitable Habitat Criteria and Survey Requirements for:

Eriogonum kennedyi Watson var. *austromontanum* Munz & I.M. Johnston
(Polygonaceae) Southern Mountain Buckwheat
January 2003

Modeled habitat for *Eriogonum kennedyi* var. *austromontanum* is based on known pebble plain distribution plus a 1/8 mile buffer.

Suitable Habitat:

Suitable habitat is found on pebble plains in openings in pinyon and juniper woodlands, Jeffrey pine forest, and mixed conifer forest. Pebble plains are generally found on ridgetops and gentle mountain slopes with less than 15% slope (USDA Forest Service 2000a).

Pebble plains are determined using a point system, where characteristics indicative of pebble plains are given a point value, depending on the reliability of the indicator (USDA Forest Service 2002). Suitable habitat is present when at least four points are achieved. Any combination of the following criteria adding up to four points must be met:

- **Strong Indicators** (2 points each: often occur on pebble plains, rarely occur off of pebble plains)
  Clay soils with open canopy
  Presence of *Eriogonum kennedyi* var. *kennedyi*
  Presence of *Arenaria ursina*
  Presence of *Ivesia argyrocoma*

- **Weak Indicators** (1 point each: often occur on pebble plains, variably occur off of pebble plains)
  Presence of *Allium parryi*
  Presence of *Antennaria dimorpha*
  Presence of *Arabis parishii*
  Presence of *Astragalus purshii* var. *lectulus*
  Presence of *Castilleja cinerea*
  Presence of *Dudleya abramsii* ssp. *affinis*
  Presence of *Echinocereus engelmannii*
  Presence of *Erigeron aphanactis* var. *congestus*
  Presence of *Eriogonum wrightii* var. *subscaposum*
  Presence of *Lewisia rediviva*
  Presence of *Lomatium nevadense* var. *parishii*
  Presence of *Mimulus purpureus*

Protocol for Surveys of Suitable Habitat – Presence/Absence Determinations

Detectability Profile:
Eriogonum kennedyi var. *austromontanum* plants are highly detectable throughout the year (unless there is snow on the ground), but they are identifyable only during peak flowering period. While flowering has been documented from July through September, commencement of the flowering period may vary across occurrences with climate and geography.

Eriogonum kennedyi var. *austromontanum* is difficult to distinguish from *Eriogonum kennedyi* var. *kennedyi* where they co-occur on pebble plains, as they overlap in some morphological characteristics. *Eriogonum kennedyi* var. *kennedyi* flowers from April to June, and *Eriogonum kennedyi* var. *austromontanum* flowers from July to September, varying with climate and geography (Munz 1974; USDA Forest Service 2000b). Although variability exists, SBNF botanists have used flowering time with other key characters to identify *Eriogonum kennedyi* var. *austromontanum* in the field. Studies are being conducted by SBNF botanists to determine whether length of mature fruits may also be used to reliably distinguish the varieties (per Reveal 1989). Any occurrences of *Eriogonum kennedyi* (within the range of *Eriognonum kennedyi* var. *austromontanum*) that cannot be identified to variety will be treated as the listed variety.

Eriogonum kennedyi can be easily distinguished from *Eriogonum wrightii* var. *subscaposum* during peak flowering. *Eriogonum wrightii* var. *subscaposum* flowers July through October (Munz 1974) and possesses branched inflorescences when fully developed, while *Eriogonum kennedyi* varieties generally possess unbranched scapes and inflorescences. However, the species cannot be separated with confidence from *Eriogonum wrightii* var. *subscaposum* before the peak flowering period or after inflorescences have fallen off plants.

Eriogonum kennedyi varieties are perennial and occur in the same locations year to year, exhibiting low annual variability in presence and high variability in flowering phenology, based on climate and geography. Plants may flower very late or not at all in very dry years.

Survey Requirements for Negative Determination in Suitable Habitat

Repeat Requirements:
Once consistently reliable characters are identified to distinguish *Eriogonum kennedyi* var. *austromontanum* from *Eriogonum kennedyi* var. *kennedyi*, representative reference occurrences will be established for the listed taxon. A negative determination for *Eriogonum kennedyi* var. *austromontanum* will require two surveys over one survey season. A survey will be completed at a time when high detectability of *Eriogonum kennedyi* var. *austromontanum* is confirmed at a reference population. One follow-up survey will be completed 4-6 weeks later, to account for phenological variability. This will provide sufficient repeat confidence for a negative determination.

Until reliable characters are identified for differentiating *Eriogonum kennedyi* var. *austromontanum* from *Eriogonum kennedyi* var. *kennedyi*, a negative determination (absence finding) within the range of *Eriogonum kennedyi* var. *austromontanum* can be made on a species level (*Eriogonum kennedyi*) only. Although *Eriogonum kennedyi* var. *kennedyi* and *Eriogonum kennedyi* var. *austromontanum* are perennial and exhibit low variability within occurrences from year to year, some individuals within an occurrence do not flower in any given year. For this reason, a negative determination (without confident identification) requires the following three surveys over two survey seasons:

- A survey will be conducted during the peak flowering periods for *Eriogonum kennedyi* var. *kennedyi*, *Eriogonum kennedyi* var. *austromontanum*, and *Eriogonum wrightii* var. *subscaposum*.

- The first survey will be conducted in May, during peak flowering for *Eriogonum kennedyi* var. *kennedyi*. If either variety of *Eriogonum kennedyi* is found during this first survey, a positive determination will be made at the species level. If neither variety of *Eriogonum kennedyi* is positively identified, a second survey will be conducted in August, during the peak flowering period for *Eriogonum kennedyi* var. *austromontanum* and *Eriogonum wrightii* var. *subscaposum*.

- During the second survey, all flowering *Eriogonum* plants in the occurrence will be identified as *Eriogonum wrightii* var. *subscaposum*, *Eriogonum kennedyi* var. *austromontanum*, *Eriogonum kennedyi* var. *kennedyi*, or other *Eriogonum* species.

- Even if all of the flowering *Eriogonum* plants in the occurrence can be confidently identified as *Eriogonum wrightii* var. *subscaposum* (or taxa other than *Eriogonum kennedyi* varieties) in the second survey, the site must be re-surveyed the following year in August to confirm that no non-flowering individuals from the initial survey year are *Eriogonum kennedyi*. If no *Eriogonum kennedyi* individuals are found after the second survey year, a negative determination can be made with sufficient confidence.

Survey Intensity:
Suitable habitat must be surveyed in walking transects no more than five meters apart.

References:

Krantz, T.P. 1981. A survey of two pavement plain endemics: the Bear Valley sandwort, *Arenaria ursina*, and Big Bear Buckwheat, *Eriogonum kennedyi* var. *austromontanum*. A study of the taxa throughout their ranges. Unpublished report prepared for the San Bernardino National Forest on file at the Big Bear Ranger Station, Fawnskin, Ca.

Munz, P.A. 1974. A Flora of Southern California. University of California Press, Berkeley and Los Angeles, Ca.

Reveal, J.L. 1989. The Eriogonoid Flora of California (Polygonaceae: Eriogonoideae). *Phytologia*: 66(4): 295-414.

USDA Forest Service. 1999. Biological Assessment on the effects of ongoing Forest activities that may adversely affect federally Threatened pebble plain plants on the San Bernardino National Forest. Unpublished report on file at the Forest Supervisor's Office, San Bernardino, Ca, and the Big Bear Ranger Station, Fawnskin, Ca.

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APPENDIX E. Biological Species Accounts of USDA Forest Service Sensitive and Watch List Pebble Plain Plants on the San Bernardino National Forest

San Bernardino National Forest files have the most current information for the following SBNF Sensitive and Watch List species (Neel and Barrows 1990; Stephenson and Calcarone 1999; USDA Forest Service 2001; other recent work by the USDA Forest Service and other regional botanists). This information should be utilized when performing pre-field surveys for projects affecting these species (USDA Forest Service 1999, 2000). We will continue to avail ourselves of relevant new data from publications as well as herbarium records entered at RSABG and U.C. Riverside.

Although the following species accounts provide the most current information on official status and ranking of the species (CNPS 2001; CNDDB 2001, 2002), some known occurrences have not yet been recorded in the CNDDB database and are thus not reflected in the total number of occurrences.

E-1. *Arabis dispar* (pinyon rock cress)

Status: Forest Watch

Arabis dispar is a San Bernardino National Forest Watch list species. This relatively wide-ranging perennial occurs in four California Counties (Inyo, Mono, Tulare, San Bernardino) and in southwestern Nevada. The California Natural Diversity Database contains records for 17 occurrences in California; these are presumed to be extant but have not been revisited since the 1920's, 1930's, and 1960's (CNNDB 2002).

Occurrences are known from the White Mountains, the Dome Land Wilderness, the Panamint Mountains, the Argus Range, and other mountains bordering the Mojave Desert. This plant also occurs in Joshua Tree National Park. Occurrences in the northern region of the San Bernardino Mountains are associated with desert montane plant communities (*i.e.,* pinyon-juniper woodlands, Joshua tree woodlands, and Mojavean desert scrub). *Arabis dispar* also occurs in the clay pebble plains along Forest Roads 3N03 and 2N02 in the Big Bear Valley area, where it is associated with *Linanthus killipii.* It typically grows on granitic soils, on gravelly substrates (including pebble plains), and on compact talus between 2,900 and 7,900 feet (1,200 and 2,400 meters) (Hickman, ed. 1993). This species usually flowers between April and May. *Arabis dispar* is extremely rare in the San Bernardino Mountains. Occurrences found on the SBNF grow in habitat affected by mining, unauthorized shooting and dumping, and off-highway vehicle use.

E-2. *Arabis parishii* (Parish's rock cress)

Status: Forest Sensitive

Arabis parishii is a Forest Service Sensitive species known from the San Bernardino Mountains. In addition to San Bernardino County, this plant is also found in Inyo County and Nevada. The CNDDB (2001) contains records for 45 occurrences, although some recently discovered locations have not yet been entered into the database. These

occurrences are distributed on the San Bernardino National Forest between Onyx Peak, Sugarloaf Ridge, Big Bear Valley, Holcomb Valley, Coxey Meadow and the northern slopes of the San Bernardino Mountain range.

This perennial is a predictable occupant of pebble plains (clay soils with quartzite cobbles), but also grows in other habitats that are dry, sunny, and have rocky soils (carbonate, pinyon-juniper woodlands) (Munz 1974; CNDDB 2001; S. Boyd pers. comm. *in* Stephenson and Calcarone 1999). This species can be found between 5,800 and 10,000 feet elevation (1,950-2,900 meters) (Rollins in Hickman, ed. 1993).

Arabis parishii typically flowers between April and May (Munz 1974). It may be found with other rare plants such as *Linanthus killipii*, *Arenaria ursina*, and *Eriogonum kennedyi* var. *austromontanum*. At some locations, this species is adversely affected by habitat conversion, competition from non-native species, mining operations, road construction, woodcutting, dumping, and recreational activities such as shooting, off-trail hiking and unauthorized off-highway vehicle use.

E-3. *Castilleja lasiorhyncha* (San Bernardino Mountains owl's-clover)
Status: Forest Sensitive
Castilleja lasiorhyncha is a Forest Service Sensitive species. It is a hemi-parasitic plant known from 36 occurrences, primarily in the San Bernardino Mountains (CNDDB 2001). A historical location is recorded in the San Jacinto Mountains (CNDDB occ. #12). It is also knowns from the Cuyamaca Rancho State Park in San Diego County. *Castilleja lasiorhyncha* typically grows on the edges of meadows and along vernal streams in chaparral and montane conifer forests, sometimes only in the drying edges of the wet areas. Plants typically flower from June to July (Munz 1974).

In FY 2000, occurrences were discovered in wet swales of granitic soils north of Keller Peak on the SBNF. *Castilleja lasiorhyncha* typically grows between 4,600 and 7, 400 feet in elevation (1,300 and 2,300 meters) (Chuang and Heckard in Hickman, ed. 1993). Occurrences appear stable, but the species is dependent on annual rainfall to maintain normal fluctuations. Habitat for *Castilleja lasiorhyncha* is affected by ground disturbance that affects the hydrological regime. The habitat is especially fragile when soils are wet in spring and early summer.

Some occurrences of *Castilleja lasiorhyncha* are located in the Deep Creek cattle allotment on the San Bernardino National Forest. The species is vulnerable to trampling, unauthorized off-road vehicle use, development projects, road maintenance, fire suppression activities, exotic grass invasion, erosion, and flooding. Timing of survey is crucial for this plant, as it is a short-lived annual which is hard to identify after seed set.

E-4. *Castilleja montigena* (Heckard's Indian Paintbrush)
Status: Forest Watch
*Castilleja montigena*is a Watch List species on the San Bernardino National Forest. There are no occurrences listed in the California Natural Diversity Database (CNDDB 2001); however, not all currently known locations have been entered. This perennial is locally common and endemic to the eastern San Bernardino Mountains, where it grows in pinyon/juniper woodlands and lower and upper montane coniferous forests. In the Big Bear area, occurrences are known from USFS lands claimed for mining around the 3N88 Haul Road. *Castilleja montigena* is presumed to be a stable hybrid of *Castilleja applegatei* ssp. *martinii* and *Castilleja angustifolia* Habitat may be vulnerable to ski area development and high-level recreation use. Occupied habitat on the north slope of the San Bernardino Mountains may be affected by large-scale industrial limestone mining operations.

E-5. *Castilleja plagiotoma* (Mojave Indian paintbrush)
Status: Forest Watch
Castilleja plagiotoma is a San Bernardino National Forest Watch List species. While there are no records for this annual species in the California Natural Diversity Database (CNNDB 2001), occurrences are known on the San Bernardino and Angeles National Forests and span Los Angeles, San Bernardino, San Luis Obispo, and Kern Counties. Plants have not been found on the Los Padres National Forest, although a significant amount of potential habitat may exist within the LPNF boundaries (Foster 1998 pers. comm. *in* Stephenson and Calcarone 1999). This plant is also known from the Hamilton Preserve.

In the San Bernardino Mountains, *Castilleja plagiotoma* is found on the ridge above Coxey Meadow, at Little Pine Flats on pebble plains, and at Las Flores Ranch and Round Mountain (Krantz *et al.* 1995). This perennial grows in Great Basin alluvial scrub, pinyon-juniper woodlands, and Joshua tree woodlands between 950 and 8,200 feet (300 and 2,500 meters), where it is a hemi-parasite on other plants (Hickman, ed. 1993). *Castilleja plagiotoma* typically flowers between April and June.

When dry, the yellow-green inflorescence of this species resembles the federally Threatened *Castilleja cinerea,* and observation under a dissecting microscope may be needed to differentiate the two. This plant is also important as the host plant for Ehrlich's Checkerspot butterfly (*Euphydryas editha ehrlichi*) (Emmel & Emmel 1973). Potential threats to *Castilleja plagiotoma* on National Forest System lands include urbanization, recreational activities, fire suppression activities, and uses that would affect host plants.

E-6. *Dudleya abramsii* ssp. *affinis* (San Bernardino Mountains dudleya)
Status: Forest Sensitive
Dudleya abramsii ssp. *affinis* is a Forest Service Sensitive species found in the San Bernardino Mountains. This perennial occurs in desert-side montane, upper montane conifer forest, and subalpine habitats (including pebble plains and pinyon-juniper

woodlands) between 5,900 and 8,500 feet elevation (1,800 and 2,600 meters) (Bartel in Hickman, ed. 1993). Plants grow on soil outcrops and talus slopes composed of granite, quartzite and occasionally limestone/carbonate. The California Natural Diversity Database (CNNDB 2001) contains records of 12 occurrences, although additional occurrences in the Big Bear Valley have not yet been reported to the database. Some occurrences are adversely affected by limestone mining. Other potential threats to *Dudleya abramsii* ssp. *affinis* include unauthorized off-road vehicle use and recreational activities. *Dudleya abramsii* flowers from April-June (Munz 1974), but flowering time for this subspecies may vary and is currently unknown.

E-7. *Eriogonum foliosum* (leafy buckwheat)
Status: Forest Sensitive
Eriogonum foliosum is a San Bernardino National Forest Sensitive species. This annual is known historically from Big Bear Valley in the San Bernardino Mountains, Pine Valley in San Diego County, and more recently from Garner Valley in the San Jacinto Mountains. The species is also known to occur in the Sierra San Pedro Martir in Baja California, Mexico. The California Natural Diversity Database contains records for three occurrences of this species; however, not all currently known locations may be entered (CNNDB 2001). The CNPS Inventory (CNPS 2001) also cites two occurrences in the San Diego ranges (Pine Valley and Warner Springs) and potential habitat exists on the Cleveland National Forest, but the plant has not been confirmed there. *Eriogonum foliosum* inhabits sandy areas of chaparral, meadows, yellow pine forest, closed-cone conifer forest, and pinyon-juniper woodlands. It grows between 3,900 and 7,300 feet (1,200 and 2,200 meters) and typically flowers between March and August (Hickman, ed. 1993). It is easily confused with other annual buckwheats (e.g., *Eriogonum davidsonii*) and is difficult to key. Occurrences in the Big Bear area are known from the southwest slopes of Baldwin Lake at 6,800 feet, and in Bear Valley near Old Mill at 7,000 feet (Krantz *et al.* 1995). *Eriogonum foliosum* was recently discovered in Holcomb Valley by USDA Forest Service Mountaintop District Botanist Scott Eliason.

E-8. *Eriogonum kennedyi* var. *kennedyi* (Kennedy's buckwheat)
Status: Forest Watch
Eriogonum kennedyi var. *kennedyi* is a San Bernardino National Forest Watch list species. This perennial is known from the San Bernardino Mountains, Mt. Pinos, and the eastern slope of the Sierra Nevada (Krantz et al. 1995 and Krantz 1981). The historic record of an occurrence at Mt. Pinos was surveyed by a Forest Service botanist in 2002, but no individuals of *E. kennedyi* var. *kennedyi* were found. *Eriogonum kennedyi* var. *kennedyi* occurs on dry gravel or rocky soils between 1500-2600m. This variety occurs on the easternmost pebble plains, preferring slightly drier habitats than *E. kennedyi* var. *austromontanum* (Krantz, et al. 1995). *Eriogonum kennedyi* var. *kennedyi* also differs from *E. kennedyi* var. *austromontanum* by its shorter leaves (2-4 mm long), tendency of the leaves to form denser mats, shorter achenes (ca. 2mm long), and earlier flowering period (April-June) (CNPS-Reveal 1979). However, there is still confusion about the distinctions between the varieties of *Eriogonum kennedyi* because intermediates have

been found. Krantz (1981) stated that there is, "a clinal gradation between ERKEA and ERKEK from west to east, with distinct isotypes at either end of the population."

E-9. *Ivesia argyrocoma* (silver-haired ivesia)
Status: Forest Sensitive
Ivesia argyrocoma is a Forest Service Sensitive species. This plant is known from Big Bear and Holcomb Valleys in the San Bernardino Mountains, where it appears to be declining due to habitat loss. A disjunct occurrence that may prove to be taxonomically distinct is located near Laguna Hansen, Sierra San Pedro Martir, in Baja California, Mexico. *Ivesia argyrocoma* occurs on pebble plains and in alkaline meadows between 6,500 and 7,500 feet elevation (2,000 and 2,300 meters) (Hickman, ed. 1993) and typically flowers between June and August (Munz 1974). The California Natural Diversity Database currently contains records for at least 24 occurrences on both public and private lands (CNNDB 2001). One occurrence is protected within a California Department of Fish and Game Ecological Reserve north of Baldwin Lake. Rouse Meadow, north of Lake Arrowhead, also supported a historic SBNF occurrence (CNDDB occ.#38). *Ivesia argyrocoma* is considered an early pioneer species in disturbed pebble plain habitat (Stephenson & Calcarone 1999).

Plants have recently been observed recolonizing water bars and old roadbeds within pebble plain habitat. Potential threats to this species and its habitat include grazing, off-highway vehicle activity, woodcutting, development, and illegal dumping.

E-10. *Linanthus killipii* (Baldwin Lake linanthus)
Status: Forest Sensitive
Linanthus killipii is a Forest Service Sensitive species endemic to Holcomb, Lone, and Big Bear Valleys (USDA Forest Service 2000). This annual is found on pebble plains, in alkaline meadows, and on dry slopes within pinyon-juniper woodlands, Joshua tree woodlands, and upper montane conifer forests. It grows between 5,000 and 8,000 feet elevation (1,700 and 2,400 meters) (Patterson in Hickman, ed. 1993) and typically flowers between May and July (Munz 1974). The California Natural Diversity Database (CNNDB 2001) documents 15 occurrences. The highest density of plants on the SBNF is found on granitic and clay soils around Baldwin Lake. An additional 100 acres of occupied habitat were mapped east of Baldwin Lake in 1998 along Forest Road 2N02. *Linanthus killipii* was also observed in the Cactus Flats area in the western portion of a previous shooting area on the north side of Forest Road 3N03 in clay soils. The El Niño event during that year is thought to have played a major role in the number of individuals observed. *Linanthus killipii* appears to be declining as a result of impacts from dispersed camping, unauthorized woodcutting and unauthorized vehicle activity. Timing of survey is crucial for this plant, as it is a short-lived annual which is hard to detect and identify after seed set.

E-11. *Mimulus exiguus* (San Bernardino Mountains monkeyflower)
Status: Forest Sensitive
Mimulus exiguus is a Forest Service Sensitive species. Also known as the "eye-strain monkeyflower", this tiny (less than 1 inch in height) annual plant is known from approximately 13 occurrences in Big Bear and Holcomb Valleys in the San Bernardino Mountains (CNNDB 2001). Eight of the occurrences are located on the SBNF. One occurrence is reported from northern Baja California (Sierra de Juarez) but needs confirmation. The plant grows primarily in mesic places within yellow pine forests (*i.e.*, meadows, vernal seeps, and springs), but occasionally occurs on pebble plains (Neel and Barrows 1990). *Mimulus exiguus* is found between 6,000 and 7,600 feet elevation (1,800 and 2,300 meters) (Hickman, ed. 1993) and typically flowers between June and July (Munz 1974). Occurrences in unprotected areas appear to be declining. Little is known about the ecological requirements of this species; however, observations indicate that it may tolerate limited disturbance (Neel and Barrows 1990). For example, natural disturbances brought on by stream flows and frost heave may be an important component of the habitat for this species. Occurrences are vulnerable to trampling, unauthorized off-road vehicle activity, development projects, and mining. Timing of survey is crucial for this plant, as it is a short-lived annual which is hard to detect and identify after seed set.

E-12. *Mimulus purpureus* (purple monkeyflower)
Status: Forest Sensitive
Mimulus purpureus is a Forest Service Sensitive species. This annual is known from 11 occurrences in the Big Bear and Holcomb Valleys of the San Bernardino Mountains; there is also one known location in the Sierra San Pedro Martir of Baja California, Mexico (CNNDB 2001). This species occurs in meadows, on moist, sandy openings in yellow pine forest and pinyon-juniper woodland, and on the edges of pebble plains. This plant grows between 6,700 and 7,500 feet elevation (1,900 and 2,300 meters) (Thompson in Hickman, ed. 1993) and typically flowers between May and July (Munz 1974). The ecological requirements of *Mimulus purpureus* are poorly understood, but it appears to tolerate some disturbance and consistently occupies open areas of forest habitat that have low accumulations of leaf litter (Neel and Barrows 1990). In some areas, this species appears to be declining due to habitat degradation from development projects, unauthorized off-road vehicle use, overgrazing, trampling, mining activities, and parking that occurs along roadways and turnouts. Timing of survey is crucial for this plant, as it is a short-lived annual which is hard to detect and identify after seed set.

E-13. *Phacelia exilis* (Transverse Range phacelia)
Status: Forest Watch
Phacelia exilis is a San Bernardino National Forest Watch List species. Occurrences for this plant are known in San Bernardino, Los Angeles, Ventura, Kern, and Tulare Counties. This annual species is found in lower and upper montane conifer forests on sandy or rocky slopes, on pebble plains, and in subalpine forest and meadows between 3,600 and 8,900 feet elevation (1,100 and 2,700 meters) (Wilken *et* al. in Hickman, ed.

1993). *Phacelia exilis* typically flowers between June and July. Currently the California Natural Diversity Database (CNNDB 2001) lists no occurrences for this species. The CNPS Inventory (2001) notes that this plant is known from fewer than 10 occurrences, but it can be locally common. Occurrences in the Big Bear area include Van Dusen Canyon, Holcomb Valley, north shore of Baldwin Lake and others (Krantz, *et al.* 1995). Potential threats to this species include loss of habitat, unauthorized off-road driving and competition from non-native species. Timing of survey is crucial for this plant, as it is a short-lived annual which is hard to identify after seed set.

E-14. *Phacelia mohavensis* (Mojave phacelia)
Status: Forest Watch
Phacelia mohavensis is a San Bernardino National Forest Watch list species. There are no occurrences listed in the California Natural Diversity Database (CNNDB 2001); however, not all currently known locations are entered into the database. This plant is known from occurrences in the San Gabriel and San Bernardino Mountains. It occurs on northern slopes of the San Bernardino Mountains in areas affected by large-scale industrial limestone mining. *Phacelia mohavensis* is also found in the Sierra Nevada Mountains of Kern and Tulare Counties. This annual grows in sandy or gravelly soils and on dry streambeds within pinyon-juniper woodlands and dry meadows. It also is found in cismontane woodlands and lower montane conifer forests. *Phacelia mohavensis* occurs between 4,000 and 7,300 feet (1,400 and 2,500 meters) (Wilken *et* al. in Hickman, ed. 1993). This species typically flowers between June and July. Occurrences in the San Bernardino Mountains are known from east of Running Springs, north Baldwin Lake, north of Lake Silverwood, and others (Krantz *et al.* 1995). *Phacelia mohavensis* may be difficult to differentiate from *Phacelia exilis*. Potential threats to this species are unknown. Timing of survey is crucial for this plant, as it is a short-lived annual which is hard to identify after seed set.

E-15. *Pyrrocoma uniflora* var. *gossypina* (Bear Valley pyrrocoma)
Status: Forest Sensitive
Pyrrocoma uniflora var. *gossypina* is a Forest Service Sensitive species. This perennial typically occurs on pebble plains and in wet meadows of Big Bear and Holcomb Valleys between 6,700 and 7,500 feet (1,600 and 2,300 meters) (Hickman, ed. 1993). This plant is known from 12 occurrences (CNNDB 2001). Occurrences are documented from Baldwin Lake, Arrastre Flat, and Metcalf Meadow, and other locations. *Pyrrocoma uniflora* var. *gossypina* is thought to be declining due to loss of habitat. Fencing protects some occurrences on the SBNF, while another occurrence is protected within a California Department of Fish and Game Ecological Reserve. However, the majority of occurrences are located on private lands. Potential threats to this species include grazing, alteration of meadow hydrology, trampling by vehicles and horses, soil compaction, high levels of recreation use, snowplay, competition from exotic species, brush clearing, and development projects. This plant flowers late in the summer.

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APPENDIX F: Biological Species Accounts of Rare Butterflies on the San Bernardino National Forest

F-1. Andrew's Marble Butterfly (*Euchloe hyantis andrewsi*):
This small white and green marbled butterfly is endemic to the San Bernardino Mountains. Andrew's marble butterfly is restricted to the San Bernardino Mountains with all known occurrences of Andrew's marble butterfly occurring on the San Bernardino National Forest. (Murphy 1990). It is found at elevations above 5,000 feet (1524 meters) near Lake Arrowhead and Big Bear Lake and in other locations across the crest and north slope. Recent records include Baldwin Lake, Sugarloaf Mountain, and Wild Horse Meadow (**Murphy 1990**).

Marble butterfly individuals can be distinguished from other species of *Euchloe* using wing venation and coloration and genitalic differences (**Opler 1970**). Andrew's marble butterfly populations are differentiated from other *E. hyantis* subspecies by geographical range and habitat. *E. hyantis hyantis* occurs in the north Coast Ranges of California (**Opler 1968**). *E. hyantis lotta* is widely distributed in western North American desert scrub.

The larvae eat seed pods of a few food plants: mountain tansy mustard (*Descurainia richardsonii*), Holboel's rock cress (*Arabis holboelii var. pinetorum*), and San Bernardino jewel flower (*Streptanthus bernardinus*). *Streptanthus* and *Thelypodium stenopetalum* are the main larval food plants. *Arabis holboelii* is used, but probably to a lesser extent (**Pratt 2001**). Other species in these and other closely related genera are likely used as food plants. *Descurainia richardsonii* is probably rarely used and is more a host genus of other races of *Euchloe hyantis.* (**Pratt 2001**).

All of the host plants for this species are members of the mustard family. The hosts are found in different habitat types: *Theylpodium stenopetalum* is found in wet meadows; *Arabis holboelii* var. *pinetorum* is found on in dry openings in conifer and mixed conifer forests; and, *Streptanthus bernardinus* is found in disturbed areas. Because of this, it appears that this butterfly species focuses on plant type rather than habitat type.

Adults take flight during late May/early July, according to **Garth and Tilden (1986)**, and between late June to early July, according to Emmel and Emmel (**1973**). Andrew's marble butterflies have one brood per year. Frequently, eggs are laid on the unopened flower buds of the host plants, but oviposition is not limited to the buds (**Opler 1974**).

The eggs are a lemon-yellow shade that changes to orange-red within a day if fertile. The day before the larva ecloses, the egg turns dark gray. Emmel and Emmel (**1973**) report, based on the description of Comstock and Dammers (1932), that marble butterflies require approximately 20 days from hatching to pupation and that eggs hatch 3 days after oviposition.

The young larvae feed upon the flowers and then switch to fruits as they develop (**Pratt 2001).** Often, Andrew's marble butterfly larvae will bore through the calyx to get inside the flower. The larvae then remain within the flower until the flower is consumed. More mature larvae include seedpods in their diet (**Opler 1974**). Often, Andrew's marble butterfly larvae will bore through the calyx to get inside the flower.

The larvae are green; the later instars exhibit a white lateral line down the middle on each side. This line does not extend on to the head capsule as it does in the Sara Orangetip (which often use the same food plants) (**Pratt 2001).** Larvae go through five instars before pupation, which occurs on the host plant (**Opler 1974**).

In the eastern part of the San Bernardino Mountains, the male butterflies fly along hilltops; while, in the western part of the San Bernardino Mountains, they search draws and canyons. This difference is probably due to blending with the nominate race (**Pratt 2001).**

One threat to butterflies, especially rare butterflies, is that of collectors. Habitat loss could be a factor for this species—two of its known host plants are rare and have restricted ranges. It is likely that before the inundation of Big Bear Lake and development in the valley, *Thelypodium stenopetalum* was more abundant than it is currently. Another host plant, *Streptanthus bernardinus* is on the SBNF watch-list species and is limited to the eastern transverse range, peninsular range, and Baja California. The other host plant, *Arabis holboelii* var. *pinetorum*, is known from 5000-8000 feet in Sugarloaf, Moonridge, and Forest Falls in the San Bernardino Mountains. It also extends to Baja California. It is unclear whether Andrew's marble butterflies are limited by host plants or whether they forage on other species of mustards.

NFS lands occurrences: Near Lake Arrowhead and Big Bear Lake at elevations between 5000 and 7500 feet.

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F-2. Vernal Blue Butterfly (*Euphilotes battoides vernalis*):
SBNF Status: RARE.

This butterfly is a member of the battoides comples. Gordon Pratt (**Pratt 2001**) changed the species since it is sympatric with other members of the battoides complex: battoides, bernardino, and comstocki in the Coso Mountains. The subspecies vernalis is restricted to about a square mile of the northwestern end of the San Bernardino Mountains around Coxey Meadow and the Coso Mountains just east of Inyokern. The Coso Mountains population was discovered recently and after the Pratt and Emmel 1998 paper was written (**Pratt 2001**). The range of this taxon is very disjunct with 100-miles separating the populations. Gordon Pratt (U.C.-Riverside) suggests that this species should be listed as endangered due to its extremely limited distribution (**Pratt 1998**).

As of 1998, there are 11 described subspecies of *Euphilotes battoides* (**Pratt and Emmel 1998**). Of these 11, vernal blue butterfly is the only subspecies to occur on the four southern California National Forests. *E. b. allyni* occurs in Los Angeles County on the El Segundo Dunes (Pratt and Emmel 1998).

The only known occurrence in the San Bernardino Mountains is from within 1-square mile of Coxey Meadow on the Mountaintop Ranger District at approximately 5500' elevation. Pratt and Emmel (1998) suggested that vernal blue butterfly may be a relict population of *E. battoides* that once had a wider range. Vernal blue butterflies are one of the earliest flying of the *E. battoides* subspecies. It is the only *E. battoides* subspecies to use wild buckwheat (*Eriogonum kennedyi* var. *kennedyi*) as its host plant. Based on information provided by Pratt (1988), Pratt and Emmel (1998) indicated that this subspecies' allozyme characters show it to be atypical compared to other *E. battoides* subspecies.

The host plant is *Eriogonum kennedyi* var. *kennedyi*, an early-spring blooming wild buckwheat found in pebble plain habitats. Both larvae and adults of this species feed on the flowers of the host buckwheat; larvae feed solely on the flowers (**Shields 1975**). Adults feed mainly on flowers of the host (**Pratt and Emmel 1998**)

Collection dates for adult vernal blue butterfly suggest that it is single brooded. Collection dates also indicate that the flight period includes, but is not necessarily limited to, mid-April–May (**Pratt and Emmel 1998**). Eggs are pale bluish-white, turning white. They are laid singly on host flowers. Larvae eat flowers and young fruits and are tended by ants. They do not have nests. Larvae vary: pale blue-green with cholcolate marks; lemon-yellow with chocolate marks; pale soiled yellow; pale reddish-brown; or uniform pink. The body of larvae is often marked with chocolate mid-dorsal, subdorsal, and paired lateral stripes. Pupae are pale brown (with a twinge of green on wing cases) or orange-brown. Pupae hibernate in litter or sand, rarely at the leaf base. Diapause occurs during the pupal stage (**Scott 1986**).

They fly at the time that most hostplants are starting to bloom, in early spring (mid-April to early May; as early as April), the earliest flier of the *E. battoides* complex **(Pratt and Emmel 1998)**.

Adults are distinguished from *E. b. bernardino* (with which they overlap flight periods) by the presence of narrow black boarders on males and blue on the females **(Emmel 1998).** This butterfly is extremely fast and erratic in flight and is very difficult to follow; they may travel 30-40 meters within a few minutes **(Pratt 2001)**. Adults may live up to a couple of weeks. Generally, males take a couple of days just to mature for mating **(Pratt 2001).** Males actively seek females with which to mate **(Scott 1986).** Presumably, like other species in the genus, females oviposit a single egg on a buckwheat bud or inside a flower **(Shields 1975).**

There is currently much confusion among botanists about the identification and differences between two varieties of *Erigonium kennedyi*: var. *kennedyi* and var. *austromontanum* (a listed species). The occurrence of *Erigonium kennedyi* var. *kennedyi* in the Coxey Meadow, Little Pine Flats, Dawn-O-Day area appears to be different in flower than many of the other occurrences of *Erigonium kennedyi* on the Mountaintop Ranger District. If it turns out that this is the only true occurrence of the *kennedyi* variety, then the distribution of this plant is extremely limited within the San Bernardino Mountains. While it also occurs in the San Gabriel Mountains, west to the Los Padres National Forest, the occurrences are quite disjunct.

If this is the only occurrence of variety *kennedyi*, the vernal blue butterfly may be threatened by isolation and be susceptible to catastrophic events. These pebble plains complexes (Coxey Meadow, Little Pine Flats, and Dawn-O-Day) all burned partially or completely during both the Devil Fire (1st two weeks of July 1994) and the Willow Fire (last week of August and first week of September 1999). It is unknown how the fires affected vernal blue butterfly survival. The lateness of both fires probably mean that larvae were present during the fires and that they may have been affected.

Biologists on the SBNF are concerned that repeated (or even single) fires may result in type conversion of native vegetation to non-native grasslands of cheatgrass (*Bromus tectorum*). If these isolated pebble plain complexes become smaller and less robust, the vernal blue butterfly may be in peril.

Besides wildfire and cheatgrass invasion, the current threat to pebble plain habitat in the Coxey Meadow area is from illegal off-road driving. The open flat nature of the pebble plains make them especially inviting to illegal vehicle exploration. Especially during wet periods, driving on pebble plains can result in long-term damage to the habitat due to compaction and rutting.

The life cycle phenology for this subspecies is:

Eggs laid in April and May—on *Eriogonum kennedyi* var. *kennedyi* flowers. Larvae present from May through October(?) on *Eriogonum kennedyi* var. *kennedyi* host plants.

Pupae hibernating in ground October to April. Adults emerge April and May: flying for only 4-5 days each, mating and laying eggs then dying.

Types of activities that could impact this species:

Driving on habitat at any time of year could destroy eggs (May), larvae (May through October), or pupae (in winter). Any activity that would disturb or destroy host plants (*Eriogonum kennedyi* var. *kennedyi*) or fragment the pebble plain habitat. Walking on habitat during winter—would that crush pupae?

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F-3. (Baldwin Lake) Blue Butterfly (Baldwin Lake *Euphilotes enoptes* near *dammersi ssp.*):
Host plants are *Eriogonum kennedyi* and *E.wrightii*. Adult flies predominately and regularly in May and June. Known from Doble (historic town at the north end of Baldwin Lake), Holcomb Valley, Baldwin Lake (BB). Being described. (**Pratt 1998; Emmel 1998**). SBNF Status: RARE

Eriogonum kennedyi var. *austromontanum* (ERKEA) occurs at the all of those locations. *Eriogonum kennedyi* var. *kennedyi* (ERKEK) also occurs: confusion over the taxonomy of these two varieties makes it necessary to re-check mapped locations to verify identification. ERKEK generally flowers earlier (April/May) than ERKEA (July/August). However, *Eriogonum wrightii*'s blooming period spans that of both *E. kennedyi* varieties (May through August). There is still some debate over the taxonomy of the two *E. kennedyi* varieties and it will likely be some time before it is worked out. Until then, the determination of which of the varieties are used as host plants is impossible (discussions with SBNF botanist **Scott Eliason 2001**).

Eggs are pale bluish-white, turning white. They are laid singly on host flowers. Larvae eat flowers and young fruits and are tended by ants. They do not have nests. Larvae are ivory-white with twinges of pink, a pinkish-brown dorsal striped, brown oblique subdorsal dashes, and a pinkish sub-lateral line (with pink blotches above it). Larvae may also be more lightly or darkly marked. The body is covered with whitish hairs. Pupae are uniformly pale brown. Pupae hibernate in litter. Adults feed mainly on flowers of the host. They sip nectar and mud. Adults are short-lived, flying for an extremely short period: females for 5 days and males for 4 days. Individual adults likely do not move very much—from 26 meters (males) to 35 meters (females) in their entire adult lifespan. Males patrol around the host plants during the day seeking females. The courtship consists of the male landing after the female, both sexes flutter and nudge each other, and then they mate (**Scott 1986**).

This population is facultatively multiple brooded coinciding with host response to rain. Although most adults fly in May and into June, they may have successive partial generations flying through September in wetter years (**Emmel 1998**).

The life cycle phenology for this subspecies is:

- Eggs laid mostly in May and into June—on flowers of *Eriogonum kennedyi* var. ? and *Eriogonum wrightii*.
- Larvae present from through May through October on *Eriogonum kennedyi* and *Eriogonum wrightii* host plants.
- Pupae hibernating in litter from October to April.
- Adults emerge May and June: flying for only 4-5 days each, mating and laying eggs then dying.

Types of activities that could impact this species:

- Driving on habitat at any time of year could destroy eggs (May/June), larvae (May through October), or pupae (in winter).
- Any activity that would disturb or destroy host plants (*Eriogonum kennedyi* and *E.* wrightii) or fragment the pebble plain habitat.
- Walking on habitat during winter—would that crush pupae?

[From Emmel and Emmel p.71-72 1973]

Philotes enoptes (Boisduval)

Several races of this widespread western species fly in southern California, and often are separated from sympatric *Philotes battoides* populations only by different flight periods (spring versus late summer). The two species are frequently difficult to distinguish phenotypically and the specialist generally uses difference sin the male genitalia.

(a) DAMMER'S BLUE

Philotes enoptes dammersi Comstock & Henne

Plate 8, figures 10-12

This fall-flying subspecies is found through the Mohave and Colorado Deserts. The type locality is Snow Creek, west of Palm Springs, in Riverside County. It is recorded by Langston and other lepidopterists from the San Gorgonio Pass area east to the Granite, New York, Kingston, and Clark mountains of San Bernardino County, south to San Diego County locales such as Yaqui Wells in Anza Desert, Laguna Junction, Boiling Spring and Camp Ole in the Laguna Mountains. It flies from the end of August to mid-October, and can be taken in fair abundance on its blooming host plants.

Foodplants: Eriogonum elongatum Benth., *E. wrightii* Torr. *ex.* Benth. ssp. *trachygonum* (Torr.) S. Stokes (Polygonaceae).

Early stages (text fig. 56): Described by Comstock and Henne (1965). The echinoid egg is light blue-green and the top is deeply depressed. The eggs are laid singly in the buds of blossoms of the host, and larval feeding is confined exclusively to the flower. The mature larva is ivory white, with tinges of pink. The middorsal stripe is pinkish brown, the diagonal lateral markings brown, and the low lateral line pinkish. Blotches of pink occur on each segment between this line and the more dorsal slashes. The larva is completely covered by short white hairs, giving the larva a frosted appearance. The pupa is uniform pale chestnut and lacks hairs. It is supported by a silk girdle and a caudal silk button.

(From Pratt & Emmel: *E. enoptes & E. battoides* p.211)

Euphilotes enoptes dammersi (Comstock & Henne, 1933)

TYPE LOCALITY. Snow Creek, Riverside Co., California.

DIAGNOSIS. This subspecies is characterized by the lack of blue females and a dark suffusion across the ventral side of the forewings. It usually does not fly before mid-August when *Eriogonum wrightii* and *Eriogonum elongatum* are beginning to bloom. There are some populations in the San Bernardino Mountains which belong to this subspecies morphologically but fly in the spring and use *Eriogonum kennedyi* and *Eriogonum davidsonii.*

Euphilotes enoptes dammersi can be spilt into three groups: a low desert population ranging from the San Bernardino Mountains south into Baja California, Mexico (Pratt, 1988: Table 6), an eastern Mojave population (Pratt 1988: Table 7), and a spring-flying population along the high north-eastern slopes of the San Bernardino Mountains (Pratt, 1988: Table 8). The low desert population has large adults with a broad dark suffusion. The east Mojave population is smaller with a broader orange aurora. The spring populations are associated with *Eriogonum kennedyi* or spring-blooming *Eriogonum davidsonii* but phenetically resemble the low desert population. The larvae of these spring populations resemble *E. e. dammersi* more than *E. mojave* which is found synchronically at slightly lower elevations.

The closest relative to *E. e. dammersi* is *E. e. tildeni*, with which it blends with in the Cajon Pass area. *E. e. dammersi* is the most distinctive of the *E. enoptes* subspecies. The larvae have the least number of prominent setae of all the *E. enoptes* complex and adults are the most distinct in wing morphology. Both *E. e. tildeni* and *E. e. dammersi* share larval characters and late flight periods.

F-4. (Arrastre Creek) Blue Butterfly (Arrastre Creek *Euphilotes enoptes* near *dammersi* subspecies):
Host plant is *Eriogonum wrightii*. Adult flies in spring months. Only known from Arrastre Creek (BB). Being described. **(Pratt 1998; Emmel 1998)**. SBNF Status: RARE

Eggs are pale bluish-white, turning white. They are laid singly on host flowers. Larvae eat flowers and young fruits and are tended by ants. They do not have nests. Larvae are ivory-white with twinges of pink, a pinkish-brown dorsal striped, brown oblique subdorsal dashes, and a pinkish sub-lateral line (with pink blotches above it). Larvae may also be more lightly or darkly marked. The body is covered with whitish hairs. Pupae are uniformly pale brown. Pupae hibernate in litter. Adults feed mainly on flowers of the host. They sip nectar and mud. Adults are short-lived, flying for an extremely short period: females for 5 days and males for 4 days. Individual adults likely do not move very much—from 26 meters (males) to 35 meters (females) in their entire adult lifespan. Males patrol around the host plants during the day seeking females. The courtship consists of the male landing after the female, both sexes flutter and nudge each other, and then they mate **(Scott 1986)**.

Eriogonum wrightii has an extended blooming period from May through August—so does this subspecies emerge during that entire time or just at the beginning????

The life cycle phenology for this subspecies is:

- Eggs laid mostly in ? on flowers of *Eriogonum wrightii.*
- Larvae present from through ? through ? on *Eriogonum wrightii* host plants.
- Pupae hibernating in litter from October (?) to April (?)
- Adults emerge ?: flying for only 4-5 days each, mating and laying eggs then dying.

Types of activities that could impact this species:

- Driving on habitat at any time of year could destroy eggs (?), larvae (?), or pupae (in winter).
- Any activity that would disturb or destroy host plants (*E.* wrightii) or fragment the pebble plain habitat.
- Walking on habitat during winter—would that crush pupae?

F-5. Ehrlich's Checkerspot (*Euphydras editha ehrlichi*):
Small, very orange-red subspecies of checkerspot. Food plant is *Castilleja plagiotoma* (Paintbrush). *Castilleja plagiotoma* is used for several life stages: eggs are laid on the undersides of leaves or on flowers; leaves and flowers are eaten by prediapause and postdiapause larvae. Habitat is high desert or a mixture of Joshua Tree woodland and sage scrub plant communities (with dominate plants species being *Yucca breviflora, Salazdria, Lycium, Salvia, Artemisia, Eriogonum,* and several cactus species). Ehrlich's checkerspot appears to be very narrowly distributed in the Ord Mountains near Victorville and the adjacent San Bernardino Mountains. Egg masses and larvae have only been found under limited topoclimatic condtions in sheltered northeast slope exposures. It may never be abundant **(Emmel 1998)**. **Pratt (1998)** suggested that this species may be the rarest butterfly in the San Bernardino Mountains. He has observed this subspecies near Coxey Pond (on the SBNF). SBNF Status: RARE

Larvae, pupae, and adults are somewhat poisonous to vertebrates. Eggs are greenish-yellow, later turning orangish-brown, laid in clusters of 20-350 eggs. Up to 1200 eggs per female are laid in her lifetime on the underside of hostplant leaves or on the inflorescence. Larvae spend the first three stages in loose silk webs. They eat the leaves, and occasionally flowers, and may eat the whole plant and then starve trying to find another hostplant. Larvae are black, or spotted with white or orange, or striped with white, especially on side and top; dorsal, subdorsal, and lateral spines are often orange at their base; head is black. Pupae are white or gray (some with extensive black markings) with black blotches and streaks and orange dorsal cones. The 3rd or 4th stage larvae hibernate, often under stones. Diapausing larvae have thicker and hairier skins **(Scott 1986)**.

The abundance of hostplants determines the population size. When the hostplant population is lowered during a drought year, the adults will be scarce the following year. Adults in the San Bernardino Mountains tend to be brighter orange-red than other *E. editha.* supspecies. Adults have one flight period during their lifecycle and live about one week. During that time, movements are generally short (25-193 meters; maybe up to 10 km if no host plant flowers are nearby). Males seek females all day by perching on ridgetops or by patrolling through habitat. A male sees a resting female (or pursues her until she lands), lands, nudges/pushes under her hindwings, and mates. Only virgin females emit phermones indicating their receptiveness to males; ovipostiting females are unreceptive and do not emit the phermones **(Scott 1986)**.

Historic records for the Ord Mountains (4400-4520' elevation) have adults emerging between mid-April and early May **(Emmel 1998)**. *Castilleja plagiotoma* is known from several areas about ten miles southeast of the Ord Mountains, in Pebble Plain habitat near Coxey Pond/Meadow (5640'), Coyote Flats (5800'-6120') and Little Pine Flats (5580'-5920') (SBNF Botanical records). The flight period might be slightly later than listed above for the Ord Mountains since the 1000+' difference in elevation likely results in a later flowering period for *Castilleja plagiotoma*. In summer 2000, *Castilleja plagiotoma*

was in full bloom May 27th at the Little Pine Flats pebble plain: it generally blooms from mid-May to mid-June.

The life cycle phenology for this subspecies at the Coxey Meadow/Little Pine Flats/Coyote Flats area is likely:

- Eggs hatch in late-May to late-June from leaf underside (or occasionally on the flowers) of *Castilleja plagiotoma.*
- Larvae present from through June(?) through October(?) on *Castilleja plagiotoma* host plants.
- Larvae hibernating under stones from November (?) to April (?).
- Pupae are present from late-April (?) to late-May (?)
- Adults emerge mid-May to mid-June (?): flying for a week each, mating and laying eggs then dying.

Types of activities that could impact this species:

- Driving on habitat at any time of year could destroy eggs (?), larvae (winter), or pupae (?).
- Any activity that would disturb or destroy host plants (*C. plagiotoma*) or fragment the pebble plain habitat.
- Walking on habitat during winter—would that crush hibernating larvae?

[From Baughman and Murphy p.398 1998]

***Euphydryas aditha ehrlichi* ssp. nov.**
Ehrlich's Checkerspot
Figures 1-2

This is a rather small, very orange-red subspecies. The uppersides of both wings are dominated by orange-red and yellow markings. The orange-red is a brighter tone than that found in other *Euphydryas editha* subspecies which are usually dominated by a more basic red ground color (e.g. *E. e. nubigena* and *E. e. rubricunda*). Most of the black and cream-colored markings on the upperside of the forewing are reduced. Along the dorsal margin of the forewing is a row of red spots medially bordered with black. The next row basad is crescent-shaped yellow spots which are reduced and suffused with red. The next two bands basad are black and yellow respectively. These are the only two "non-red" bands extending across the width of the entire forewing. Medial to these is a very broad orange-red band. The basal and postbasal regions are marked with a collection of strong orange-red spots with thin black borders.

Similar colorization trends characterize the hindwings. The margin of the hindwing has a full row of orange-red spots which are large and full in comparison to other subspecies. Medial tot hem are a solid streak of black and then a row of cream-colored, crescent-shaped spots separated by black. The fourth row is very broad and orange-red. At the costal margin of the basal area of the hindwing are three contiguous orange-red spots. This orange-red area contributes greatly to the overall "redder" (or orange-red) appearance of this subspecies. In most other subspecies this area is yellow or black.

The uppersides of both sexes are generally similar with males tending to have about as much black as yellow, while in females, yellow dominates black. The proportion of red is similar between sexes. The overall effect makes males appear slightly darker, but both sexes are striking in their bright red character.

The undersides of the sexes are very similar. Ventrally, both wings have red and yellow spots but very little black. The caudal half of the forewing is noticeable for its washed-out appearance across the width of the wing. Three submarginal rows of chevrons (yellow, black, and yellow again) exist, but caudal to and including cell M3 these spots are almost completely suffused with red.

FOODPLANT: *Castilleja plagiotoma* Gray (Scrophulariaceae)

TYPES: Holotype (male): California, San Bernardino Co.; Ord Mtns. at NW end of San Bernardino Mountains, W of Victorville, 4400-4520 feet. Reared from larvae collected on 30 March 1983, emerged 16 April 1983 (John F. Emmel).

PPENDIX G: Pebb

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Allotype (female): Same data as holotype. Emerged 30 April 1983. These and all other holotypes and allotypes mentioned in this article deposited in the collection of the Natural History Museum of Los Angeles County (LACMNH).

Paratypes: 3 males and 10 females. California: 5 females same data as holotype, emerged 16-19 April 1983. 3 males and 5 males captured as adults in same location as holotype 4 May 1983.

We are proud to name this striking butterfly after Professor Paul R. Ehrlich, whose studies spanning three decades have contributed so much to our understanding of the *Euphydryas*. It seems appropriate that this exciting find, this striking butterfly, should bear the name of a man who has worked tirelessly to preserve biological diversity.

Euphydryas editha is by most measures quite widespread, ranging from British Columbia south to Baja California and from the immediate Pacific Coast to the Rocky Mountains. The species, however, is highly localized and is lacking from rather broad areas within that distribution. Until the discovery of this new subspecies, *Euphydryas editha* was wholly unknown from desert regions.

The habitat of *E. editha ehrlichi* is described as high desert or better as a mixture of Joshua Tree Woodland and Sage Scrub plant communities (following Munz 1974). Dominant plants in the habitat include *Yucca brevifolia, Salazdria, Lycium, Salvia, Artemisia, Eriogonum,* and a number of cactus species. *E. editha ehrlichi* appears to be very narrowly distributed in the Ord Mountains (an extension of the northern slope of the San Bernardino Mountains near Victorville, San Bernardino County, California). In contrast, its oviposition hostplant, *Castilleja plagiotoma* (used by both prediapause and postdiapause larvae), is considerably more widespread, ranging from the San Bernardino and San Gabriel Mountains to the Piute Mountains of Kern County to San Luis Obispo and Fresno counties. Egg masses and larvae to date have only been found under limited topoclimatic conditions, in sheltered northeast slope exposures. John Emmel (personal communication) suggests that this butterfly may never be abundant.

G-7. PEBBLE PLAIN HABITAT SUMMARY

G-7-1. Pebble Plain Habitat Overview

Information on pebble plain habitat and its protection status has most recently been compiled by the USDA Forest Service (2002). A brief summary is provided here for quick reference. Pebble plain habitat is endemic to approximately 4,204 acres in the eastern San Bernardino Mountains. This habitat was first described by Jeanine Derby (1979; Derby and Wilson 1979). Floristic studies (Derby 1979) and distributional studies of rare taxa (Krantz 1978, 1980a, 1980b, 1981, 1983a, 1983b, 1987; T. Krantz, pers. comm. 1989) have been completed. Studies in genetic and species diversity (Ciano 1983; Freas 1988) and pollination biology (O'Brien 1980) have also been completed. Some conservation measures have been implemented, while others are still underway.

Species that occur in pebble plain habitat (See Table 1 of the Pebble Plain Habitat Management Guide (USDA Forest Service 2002)) are characterized by diminutive features and generally low-stature growth habits, usually not exceeding 1 dm in height. Most of the perennial species have a woody caudex, but are otherwise herbaceous. The few shrubs that occur in the habitat are also low-growing and under 0.5 m high. Several species associated with this habitat are multi-agency Threatened, Forest Service Sensitive, or Watch Listed.

Originally, pebble plain habitat was defined by the presence of oxidized clay soils with a saragosa quartzite component and the presence of the indicator species, *Eriogonum kennedyi* var. *austromontanum* and *Arenaria ursina*. However, recent surveys and analyses concluded that a broader definition for pebble plains was necessary.

Recently, a criteria set consisting of a point system was developed in order to define pebble plain habitat. This provides consistent comparable criteria, although like any classification scheme, there are likely to be some exceptions. The site must have at least four points to qualify as a pebble plain. Points are accumulated based on the following characteristics:

<u>Strong Indicators (2 points each)</u>
Clay soils
Presence of *Eriogonum kennedyi* var. *kennedyi*
Presence of *Eriogonum kennedyi* var. *austromontanum*
Presence of *Ivesia argyrocoma*
Presence of *Arenaria ursina*

<u>Weak Indicators (1 point each)</u>
Presence of *Allium parishii*
Presence of *Antennaria dimorpha*
Presence of *Arabis parishii*
Presence of *Astragalus purshii* var. *lectulus*
Presence of *Castilleja cinerea*

Presence of *Dudleya abramsii* ssp. *affinis*
Presence of *Echinocereus engelmannii*
Presence of *Erigeron aphanactis* var. *congestus*
Presence of *Eriogonum wrightii* var. *subscaposum*
Presence of *Lewisia rediviva* var. *minor*
Presence of *Mimulus purpureus*

This point system will be applied to all sites that are surveyed and will be amended in the future if necessary.

G-7-2. Habitat Response To Disturbance

The response of pebble plain habitat and associated species to disturbance regimes, such as vehicular use and fire, has been preliminarily investigated. Vehicle activity is known to degrade habitat by crushing plants and compacting the soil, thereby altering the surface hydrology. Impacts are most severe when soils are wet, as was evidenced by the 1992 vehicle trespass that occurred in the North Baldwin Lake Complex (USDA Forest Service 2002).

In 1999, the Willow Fire affected pebble plain habitat in the Little Pine Flat/Coxey Meadow area. Study plots were established in burned, partially burned, and unburned areas to determine the effects of burning in pebble plain habitat. The data show that *Eriogonum kennedyi* var. *kennedyi* had a negative response to burning. In addition, burned plots subsequently tended to resemble the surrounding non-pebble plain habitat, containing more woody vegetation, fewer native grasses, and fewer *E. kennedyi* var. *kennedyi* individuals than unburned plots (USDA Forest Service 2001).

G-7-3. Threats

Immediate threats to pebble plain habitat tend to be site specific; however, there are some general threats affecting or potentially affecting most sites. Some threats are localized in that they will not impact an entire pebble plain. Other threats are likely to affect all parts of a pebble plain equally. Specific threats to each complex are identified in the Guide. The general threats to pebble plain habitat are outlined below:

9. Unrestricted and unauthorized vehicle use or unrestricted vehicle access particularly during winter months. This activity has impacted all pebble plain complexes to varying degrees.
10. Residential development – primary threat to sites on private land.
11. Alteration of surface hydrology (generally as a result of previous threats) – the long-term effects of this impact are not known.
12. Cattle trespass – grazing, trampling, and the potential for non-native species introduction.
13. Forest encroachment – succession.
14. Invasion of exotic species.
15. Forest Service management activities.

16. Mining operations and related activities.
17. Fuelwood collection.

G-7-4. Protection status

Protection status of pebble plains varies. Some occurrences are fenced, and all have been or will be included in mineral claim withdrawals. Others continue to be threatened by road development, off-highway vehicle use, and other Forest uses.

The primary sites considered for this monitoring program are those managed by the USDA Forest Service, San Bernardino National Forest, Mountaintop Ranger District. A separate monitoring plan and management plan have been developed for CDFG lands (Barrows 1989).

G-7-5. Management Goals

1. Conserve pebble plain habitat over a broad geographic range to maintain the full range of ecological diversity and biological diversity, to minimize the risk of possible loss of key habitat or rare species due to catastrophic environmental events. Conserving this habitat throughout its geographic range will also serve to maximize genetic diversity of the associated biota and thus increase the probability that populations will adapt and persist through time.

2. Eliminate or significantly reduce continued loss and degradation of habitat.

3. Maintain or enhance ecological integrity and viability of all sites through maintenance of protective barriers and signs, management of weeds, and regular patrols.

4. Only allow uses in pebble plain areas that are compatible with the long-term conservation goals of the habitat.

5. Increase public awareness and appreciation of rare plant and animal species and habitats unique to the Big Bear region.

6. Expand pebble plain restoration techniques in the Mountaintop Ranger District Native Plant Restoration Program.

7. Protect and conserve all remaining pebble plain habitat within the Forest.

G-7-6. Information needs

Confusion exists about the morphological distinctions between *Eriogonum kennedyi* var. *austromontanum*, a federally Threatened species, and *Eriogonum kennedyi* var. *kennedyi*. The distribution information on *Eriogonum kennedyi* var. *kennedyi* is fairly well known throughout its range. Although *Eriogonum kennedyi* var. *kennedyi* also has a narrow

distribution range and appears to be associated with pebble plain habitat, this species does not have any protected status. It is highly important to assemble information on sound morphological characteristics by which to reliably identify *Eriogonum kennedyi* var. *austromontanum* as soon as possible in order to understand the distribution and status of *Eriogonum kennedyi* var. *austromontanum* and *Eriogonum kennedyi* var. *kennedyi.*

Information on pebble plain habitat distribution, ecology, and site condition has been compiled and is included in the 2002 Pebble Plain Habitat Management Guide. Habitat distribution is fairly well known.

The 1991 Pebble Plain Habitat Monitoring Plan outlined a highly-detailed and extensive regimen of plot establishment, data collection, and analysis. While detailed quantitative baseline documentation was collected in accordance with the plan, analysis and write-up of the data was never executed because of time and funding constraints. Quantitative information is needed for all pebble plain complexes in order to analyze variation in species composition and physical site characteristics throughout the geographic range of pebble plain habitat and through time. The Forest will work to obtain this information as well as other botanical and ecological information on demography, genetics, pollination biology, breeding systems, germination parameters, key pollinator-plant interactions, and key limiting factors in the life cycle of pebble plain plant species. .

The following questions should be addressed:

1. Do predictable species associations occur within pebble plain habitat and isolated *Castilleja cinerea* occurrences?
2. Are species associations correlated with microhabitat characteristics?
3. Do the rare species occur evenly, clustered, or randomly throughout individual pebble plains and isolated *Castilleja cinerea* occurrences?
4. Is percent cover or density of each of the rare species correlated with:
    a. other rare species
    b. certain species associations
    c. total vegetative cover
    d. soil texture
    e. percent cover of bare ground
    f. disturbance
    g. soil chemistry
5. What are the floristic components and physical characteristics of the Grinnell Ridge pebble plain?
6. Are there other pebble plains not yet identified?
7. Is the indicator-species criteria system reliable?

G-7-7. Monitoring Goals and Protocol

G-7-7-1. Monitoring Goals

The goals of the pebble plain monitoring program are divided into three categories:

1. Conduct effectiveness monitoring by assessing the implementation of the Pebble Plain Habitat Management Guide and LRMP direction.
2. Qualitatively document current conditions and threats at each pebble plain site.
3. Acquire baseline biological information on pebble plain habitat as described above.
4. Establish remediation if management goals are not met.

G-7-7-2. Implementation

Monitoring is aimed at determining if the actions prescribed in the 2002 Habitat Management Guide are accomplished. These actions are detailed under the site summaries for each complex. Actual initiation or completion dates will be recorded as the actions are addressed.

Ideally, sites should be visited at least annually. However, some sites face multiple threats and are relatively easy to monitor. These sites may be visited more than once per year. Other sites do not face a high degree of threat and do not require such frequent visits.

G-7-7-3. Site Monitoring

Goals and objectives for pebble plain habitat conservation are established in the 2002 Habitat Management Guide. Site monitoring is aimed at determining if the actions prescribed and implemented are achieving the goals identified in the Guide and thus are reducing or eliminating threats at each site. This monitoring will also allow us to assess which threats are most significant at each site and whether there are any threats not yet identified.

The frequency of monitoring visits will depend on the immediacy of threats at each site; however, all sites should be monitored at least once every two years. This documentation will involve completion of site evaluation forms and photo documentation.

Because the criteria to identify pebble plain habitat has only recently been established, each monitoring visit should include an assessment to determine whether the site meets the criteria. This will fulfill two objectives: 1. It will determine if the site is defined as a pebble plain based on the criteria, and 2. It will provide information on whether the criteria guidelines are sufficient as written.

Monitoring should consist of an evaluation of overall trends in each complex. Rather than pinpointing each individual occurrence, a sampling method should be used that is inclusive of the most characteristic pebble plains within each complex.

G-7-8. General Monitoring Objectives For All Complexes

This Monitoring Plan should be used in conjunction with the 2002 Pebble Plain Habitat Management Guide, which contains detailed information on the conditions, threats, and recommended actions for each complex.

The following is a summary of monitoring points that pertains to all complexes:

- Continue monitoring and maintaining protective fences, gates, barriers, and signs as needed.
- Monitor for and map all unclassified roads and access points.
- Establish photo points at representative pebble plain occurrences in each complex.
- Monitor all road closures and associated restoration/signage/etc.
- Monitor each complex for distribution and abundance of non-native species.
- Compile baseline information for all newly-acquired land parcels.
- Acquire baseline information for *Castilleja cinerea* occurrences located off of pebble plain habitat.

Site: Snow Valley Complex
Threats: Proximity to winter recreation areas (Rim Nordic Ski Area and Snow Valley Ski Area); adjacency to Highway 18; summer recreation activities (mountain biking).
Monitoring Points:

- Closely monitor summer activities at the Rim Nordic Ski Area to determine if impacts are occurring.
- Monitor effectiveness of rocks placed along the Green Valley Trail in protecting habitat.
- Monitor effectiveness of barrier placements at the Snow Valley cabins. Monitoring should focus on effects of recreational uses on *Castilleja cinerea* occurrences. *C. cinerea* is one of the three federally Threatened species for which specific management guidelines are delineated.

Site: Coxey Meadow Complex
Threats: Vehicle use, recreation
Monitoring Points:

- Monitor for the Coxey blue butterfly (*Euphilotes battoides vernalis*), Baldwin Lake blue butterfly (*Euphilotes enoptes* near *dammersi* ssp.) and Ehrlich's checkerspot butterfly (*Euphydras editha ehrlichi* ssp. nov.), and gather demographic and ecological information on these species.
- Map occurrences in T2N R1W SE ¼ section 15.
- Determine whether *Eriogonum kennedyi* var. *austromontanum* also occurs in this complex.
- Monitor for cattle trespass if the Deep Creek allotment is reopened.
- Monitoring should evaluate the effects of ripping closed roads (vs. unripped roads) on vegetation recovery.
    - Monitoring should also ensure that current activities are not impacting pebble plain habitat.

Site: Big Bear Lake Complex
Threats: Development, recreation, vehicle use
Monitoring Points:

- Check for potential turnaround impacts at the Buttercup Campground gate where Forest Road 2N99 is seasonally closed.
- Monitor restoration efforts at Snow Forest.
- Monitor status of isolated private land occurrences.

Site: Holcomb Valley Complex
Threats: Vehicle use, recreation, mining
Monitoring Points:
- Monitor for the Ehrlich's checkerspot butterfly. The host plant is *Castilleja plagiotoma*, which is known to occur in this complex.
- Monitor for unclassified roads and their closure.
- Monitor for land acquisition opportunities.

Site: Fawnskin Complex
Threats: Development, recreation
Monitoring Points:
- Obtain baseline information on the Juniper Point *Castilleja cinerea* occurrence (CC 66).
- Monitor for impacts related to unauthorized vehicle use and foot traffic along the lake.
- Obtain more information on the incidence of small patches of pebble plain within the town of Fawnskin. These areas should be mapped, and feasible methods of their preservation should be considered in coordination with the County and the CDFG.

Site: Arrastre Flats Complex
Threats: Vehicle use, mining activities
Monitoring Points:
- Monitor revegetation in road closures and ripped sections of those roads.
- Monitor success of road closures in preventing vehicular impacts to those pebble plains.

Site: Sawmill Complex
Threats: Vehicle use, recreation
Monitoring Points:
- Continue monitoring for vehicle trespass and preventative measures.
- Identify and designate sites for restoration; after restoration is initiated, monitor to determine its success.
- Monitor vehicle impacts to the Horseshoe pebble plain (occ.236).

Site: Gold Mountain Complex
Threats: Vehicle use, recreation, rock collecting
Monitoring Points:
- Monitor for further vehicle impacts to the Upper and Lower Gold Mountain pebble plains.
- Monitor success of rock barriers along Forest Road 3N69 in preventing unauthorized vehicle use.
- Monitor for potential impacts associated with the utility lines.
- Monitor the distribution and spread of *Bromus tectorum* (cheatgrass).

Site: Grinnell Ridge Pebble Plain
Threats: Recreation
Monitoring Points:
- Collect baseline information on this population. Determine floristic assemblages and soil types. Examine the population and genetic characteristics of this *Castilleja cinerea* population.
- Survey nearby areas along the ridge to determine whether similar populations occur nearby.
- Determine whether this occurrence qualifies as a pebble plain based upon the new criteria.
- Monitor for current threats (effects of trails, camping, etc.).

Little information is known about this pebble plain. Only one small area has been identified as pebble plain habitat, but it is likely that other patches occur along the ridge. Information on floristics, soil types, and current threats are necessary to better understand the quality of this habitat.

Site: North Baldwin Lake Complex
Threats: Vehicle use, recreation
Monitoring Points:
- Intensively monitor regeneration at the North Baldwin trespass site (occ. 118).
- Evaluate areas that require restoration work, and monitor all restoration.
- Monitor potential maintenance impacts associated with the Doble Trail Camp.

Site: Sugarloaf Ridge Complex
Threats: Recreation, potential for use as a helicopter landing site during fire.
Monitoring Points:
- Survey the southernmost pebble plains in this complex to obtain baseline information.
- Monitor for unauthorized vehicle use and unauthorized shooting occurrences.

Site: South Baldwin Ridge/Erwin Lake Complex
Threats: Development, vehicle use
Monitoring Points:
- Compile baseline information for pebble plain occurrences along Deadman's Ridge
- Refine GIS map polygon for the Deadman's Ridge occurrences.
- Monitor for land acquisition opportunities, such as Section 16.
- Monitor for effects of burros on pebble plain species and habitat.

Site: Broom Flat
Threats: Vehicle use, mining activities
Monitoring Points:
- Continue monitoring for burro impacts to pebble plain habitat.
- Monitor effects of trespass grazing.
- Monitor for and map unclassified roads and road closures.

- Determine the variety of *Eriogonum kennedyi* and species of *Arenaria* at the Juniper Springs Campground pebble plains (occs. 279, 280).
- Refine GIS polygon of occurrence 312.

Site: Rattlesnake Complex
Threats: Vehicle use, mining
Monitoring Points:
- Monitor for impacts from unauthorized vehicle use.
- Evaluate impacts from cattle trespass. Surveyors should count and record the number of cow pies per unit area as an indicator of cattle presence and frequency.

G-7-9. Data Collection

Upon each visit to a site, observers will note the conditions with emphasis on change. Some of this information will be gathered and recorded using the Pebble Plains Field Survey Forms; other information will be acquired if time and funding allow.

Permanent photo points will be established within each pebble plain complex to provide additional qualitative information. Photo points should be established in areas that are representative of the conditions within each complex. GPS locations and view directions will be recorded for all photo documentation.

High-priority data acquisition includes the characterization of pebble plain occurrences for which we have little information. Baseline information on the pebble plain habitat occurrences at the Grinnell Ridge complexes will be compiled through field surveys. Species occurrences at these sites will be documented, with emphasis on Threatened, Endangered, Forest Service Sensitive, and Watch List species.

Several unclassified roads have been targeted for closure in pebble plain habitat. Upon closure, these areas of habitat should be monitored to determine the effects of road closure as well as any associated restoration efforts that have taken place. This monitoring can be accomplished qualitatively by establishing photo points.

The extent and cause of damage will be identified and recorded. Any restoration efforts undertaken to repair damage should also be fully documented.

All files will be kept at the Mountaintop Ranger Station, San Bernardino National Forest.

Table 1. Flora of the pebble plains, San Bernardino Mountains. After Derby 1979, Ciano 1983, Barrows 1989, Neel 1989a, 1989b, Krantz 1989 and USFS botanical surveys in 2001. Nomenclature follows Hickman, ed. 1993. (Taken from USDA Forest Service 2002).

Flora of the pebble plains
Achnatherum hymenoides (R. & S.) Barkworth
Achnatherum speciosum (Trin. & Rupr.) Barkworth
Allium parryi S. Watson
Androsace septentrionalis L. ssp. *subumbellata* G. Robb.
Antennaria dimorpha (Nutt.) T. & G.♣
Arabis dispar M.E. Jones
Arabis parishii S.Watson ♣
Arenaria macradenia S. Watson
Arenaria ursina Rob.♦
Artemisia nova A. Nels.
Astragalus purshii Hook. var. *lectulus* (S. Watson) M.E. Jones♣
Bouteloua gracilis (Kunth) Griffiths
Bromus tectorum L.**
Calochortus invenustus E. Greene
Calochortus kennedyi Porter
Carex douglasii Boott
Castilleja montigena Heckard (*Castilleja applegatei* Fern.)
Castilleja cinerea Gray♣
Castilleja lasiorhyncha (Gray) Chuang & Heckard
Castilleja plagiotoma Gray
Chaenactis glabriuscula DC.
Chrysothamnus viscidiflorus (Hook.) Nutt.
Collinsia childii Gray.
Collinsia parviflora Lindl.
Cordylanthus rigidus (Benth.) Jepson ssp. *setigerus* Chuang & Heckard
Cryptantha simulans Greene
Dodecatheon hendersonii Gray
Cusickiella douglasii (Gray) Rollins (*Draba douglasii* Gray var. *crockeri* (Lemmon) C.L. Hitchc.)
Dudleya abramsii Rose ssp. *affinis* K. Nakai♣
Echinocereus engelmannii (Engelm.) Lemaire *♣
Echinocereus triglochidiatus Engelm.
Elymus elymoides (Raf.) Swezey
Epilobium brachycarpum C. Presl.
Eriastrum sapphirinum (Eastw.) H. Mason
Erigeron aphanactis (Gray) Greene var. *congestus* (Greene) Cronq.♣
Eriogonum foliosum Watson
Eriogonum kennedyi Watson var. *austromontanum* Munz & I.M. Johnston♦
Eriogonum kennedyi Watson var. *kennedyi*♦
Eriogonum wrightii Benth. var. *subscaposum* Watson♣
Erodium cicutarium (L.) L'Her**
Gilia diegenesis (Munz) A.D. Grant & V. Grant
Gutierrezia sarothrae (Pursh) Britton & Rusby
Ivesia argyrocoma (Rydb.) Rydb. ♦
Juncus bryoides F.J. Herm.
Koeleria macrantha (Ledeb.) J.A. Schultes
Layia glandulosa (Hook.) Hook. and Arn.
Lewisia rediviva Pursh var. *minor* (Rydb.) Munz♣
Linanthus breviculus (Gray) Greene
Linanthus killipii Mason

Lomatium nevadense (Watson) Coult. & Rose var. *parishii* (J. Coulter & Rose) Jepson
Lupinus breweri Gray var. *grandiflorus* C.P. Smith
Lupinus lepidus Douglas var. *confertus* (Kellogg) C.P. Smith
Phlox gracilis (Hook.) Greene
Mimulus androsaceus Greene
Mimulus exiguus Gray
Mimulus purpureus Grant♣
Mimulus suksdorfii Gray
Muhlenbergia minutissima (Steud.) Swall.
Navarretia breweri (Gray) Greene
Opuntia basilaris Engelm. & J. Bigelow
Opuntia littoralis (Engelm.) Ckll.
Orobanche californica Cham. & Schldl. ssp. *feudgei* (Munz) Heckard
Phacelia curvipes Watson
Phacelia exilis (Gray) G.J. Lee
Phlox dolichantha Gray
Plagiobothrys tenellus (Nutt.) Gray
Plantago patagonica Jacq.
Poa secunda J.S. Presl. (formerly *Poa incurva* Scribn. & Will.)
Pyrrocoma uniflora (Hook.) Greene var. *gossypina* (Greene) J. Kartesz & K. Gandhi
Sagina decumbens (Elliot) T. & G. ssp. *occidentalis* (Watson) G. Crow
Selaginella watsonii Underw.
Viola douglasii Steud.
Yucca brevifolia Engelm.

* Formerly known as *Echinocereus engelmannii* (Parry) Lem. var. *munzii* (Parish) Pierce & Fosberg (Munz 1974)

** Non-native species

♣ Weak pebble plain indicator species

♦ Strong pebble plain indicator species

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PEBBLE PLAINS FIELD SURVEY FORM

Date (s) of Survey: _____
Name of Surveyor (s): _____

Pebble Plain #:_____ GPS Location: _____N _____E LMK (s):
_____
Location Description: _____
_____
Elevation:_____ ft Aspect:_____ Slope:_____

	Acnatherum hymenoides	
	Acnatherum speciosum	
	Allium parryi	
	Allophyllum sp.	
	Androsaceae septentrionalis ssp. *subumbellatum*	
	Antennaria dimorpha	
	Arabis dispar	
	Arabis parishii	
	Arenaria macrademia	
	Arenaria ursina	
	Artemisia nova	
	Astragalus purshii var. *lectulus*	
	Bouteloua gracilis	
	*Bromus tectorum**	
	Calochortus invenustus	
	Calochortus kennedyi	
	Carex douglasii	
	Castilleja applegatei ssp. *martini*	
	Castilleja cinerea	
	Castilleja lasiorhyncha	
	Castilleja plagiotoma	
	Chaenactis glabriuscula var. *diffusa*	
	Chrysothamnus viscidiflorus	
	Collinsia childii	
	Collinsia parviflora	
	Corydalanthus rigidus ssp. *setigerus*	
	Cryptantha simulans	
	Dodecatheon hendersonii	
	Draba douglasii var. *crockery*	
	Dudleya abramsii ssp. *affinis*	
	Echinocereus engelmannii	
	Echinocereus triglochidiatus var. *mohavensis*	
	Elymus elymoides	
	Epilobium paniculatum	
	Erigeron aphanactis var. *congestus*	
	Eriogonum foliosum	
	Eriogonum kennedyi var. *austromontanum*	
	Eriogonum kennedyi var. *kennedyi*	
	Eriogonum wrightii. var. *scaposum*	
	*Erodium cicutarium**	

	Gilia diegenesis	
	Gutierrezia sarothrae	
	Ivesia argyrocoma	
	Juncus bryoides	
	Koeleria macrantha	
	*Lepidium perfoliatum**	
	Lewisia rediviva var. minor	
	Linanthus breviculus	
	Linanthus killipii	
	Lomatium nevadense var. *parishii*	
	Lupinus breweri var. *grandiflorus*	
	Lupinus lepidus var. *confertus*	
	Microsteris gracilis ssp. *humilis*	
	Mimulus androsaceus	
	Mimulus exiguus	
	Mimulus purpureus	
	Mimulus suksdorfii	
	Muhlenbergia minutissima	
	Navarretia breweri	
	Opuntia basilaris	
	Opuntia littoralis	
	Orobanche californica ssp. *feudgei*	
	Phacelia curvipes	
	Phacelia exilis	
	Phlox dolicantha	
	Plagiobothrys tenellus	
	Plantago patagonica	
	Poa incurva	
	Sagina occidentalis	
	Selaginella watsonii	
	Viola douglasii	
	* = non-native species	

Vegetation Notes/Habitat Information:	
SOIL TYPE	
	Gravelly loam
	Sandy clay loam
	Very cobbly fine sandy/gravelly loam
	Loamy coarse sand
	Loamy sand
	Other
Soil/Substrate Notes:	
SITE CONDITION	
	Very Good
	Good
	Fair
	Poor
Site Notes/Visible Site Disturbance/Impacts:	

APPENDIX H. Data Standards Methodology for Surveying Rare Plant Species and Habitats on the SBNF

June 18, 2003 Draft

Purpose

- The purpose of developing data standards is to create a standardized, repeatable method of identifying, documenting, and mapping suitable and/or occupied Threatened, Endangered, Sensitive and Watch-list (TESW) plant habitat. These standards do not apply to surveys that do not involve mapping (e.g. general floristic inventories).

- In the past, documentation and mapping of occupied and suitable TES plant habitat has been inconsistent, with estimates of accuracy ranging from up to 30 meters for some polygons to approximately 1 meter for others.

- With this set of data standards, the protocol for recording narrative and spatial information about species and habitat occurrences will be standardized, utilizing GPS precision, a minimum mapping unit, and forms outlining the required narrative information for an occurrence (e.g., surveyor names, dates, number of individual plants, site condition, associated species, etc.). This standardized data set, in turn, will be incorporated into the attribute data and metadata for each polygon in the geographic information system (GIS). The information will ultimately be imported into the NRIS Rare Plant Module, currently in development.

General Protocol Guidelines

- A qualified botanist will be present for all surveys. This botanist will be familiar with all TESW species and any look-alikes that may occur in the survey area. This botanist will also be familiar with habitat definitions and suitable habitat criteria for the species that may occur in the area. These qualifications will be determined by the District Botanist or the Forest Botanist.

- At least one member of the field crew will be proficient in basic Global Positioning Systems (GPS) functions, including point, area, and line data entry into the GPS unit.

- Species occurrence will be determined based on species presence. Suitable habitat occurrence for threatened and endangered plants will be based on established suitable habitat criteria (USDA Forest Service 2002). Suitable habitat for sensitive and watch-list plants associated with a SBNF rare habitat type (e.g. pebble plain, meadow, carbonate) will be based on habitat definitions for the

associated rare habitats. Suitable habitat mapping will not be performed for sensitive and watch-list plants not associated with a defined rare habitat type.

- Unique survey protocols specified in suitable habitat criteria for listed species (USDA Forest Service 2002) will be used in conjunction with the protocols outlined in this document.

- The botanist and GPS operator will complete an Element Occurrence (EO) form to document each polygon of occupied or suitable TESW habitat.

Mapping Guidelines

- There are two (2) mapping methodologies: 1) TESW occupied habitat, and 2) suitable/rare habitat.

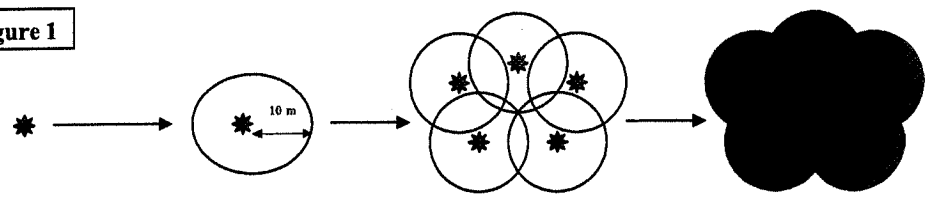
1. TESW Occupied Habitat Mapping Methodology

Occupied TESW mapping will be performed by collecting point data in the field and buffering it in GIS to create a polygon. Point data will be collected around the perimeter of the occurrence, and each point will be given a 10-meter buffer in GIS to allow for future dispersal and establishment beyond the existing boundary of the occurrence. All point buffers will subsequently be merged to form a polygon of occupied habitat.

General Mapping Steps (Figure 1):

- Point data collected with GPS (+/- 1 m accuracy) in the field
- Point data buffered in GIS – buffer around each point has 10 m radius
- Point buffers merged to create a polygon

Figure 1



1. GPS point collected in field **2. In GIS, each point given buffer with a 10 m radius** **3. All point buffers will overlap** **4. Point buffers merged to create occupied habitat polygon**

Protocol:

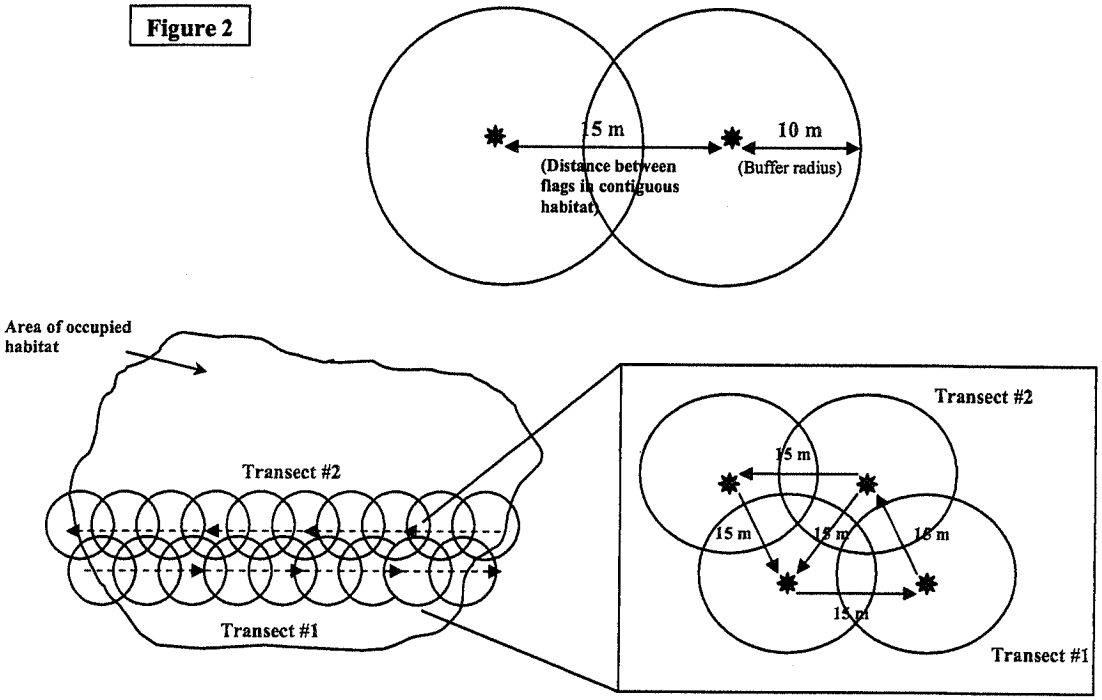
1. In the field, a botanist will identify TESW plant individuals.

2. The botanist will place a flag at the first plant he/she encounters.

3. Transects will then be performed across the occurrence. The first transect should originate from the initial flag placed at the first

plant encountered. Following one cardinal direction, the botanist will walk along the transect and place one flag every 15 m within contiguous occupied habitat (Figure 2). Each flag may represent an individual plant or a group of plants within an area of occupied habitat 20 m in diameter (based on a point buffer with a 10 m radius). A distance of 15 m between flags within contiguous occupied habitat allows for sufficient overlap of point buffers to create occupied habitat polygons in GIS. Each transect will terminate where contiguous occupied habitat is no longer present. A botanist will determine the outer edge of occupied habitat based on species absence beyond 10 m of the outermost plant found. Surveyors should walk enough transects to adequately cover the extent of the occupied habitat occurrence.

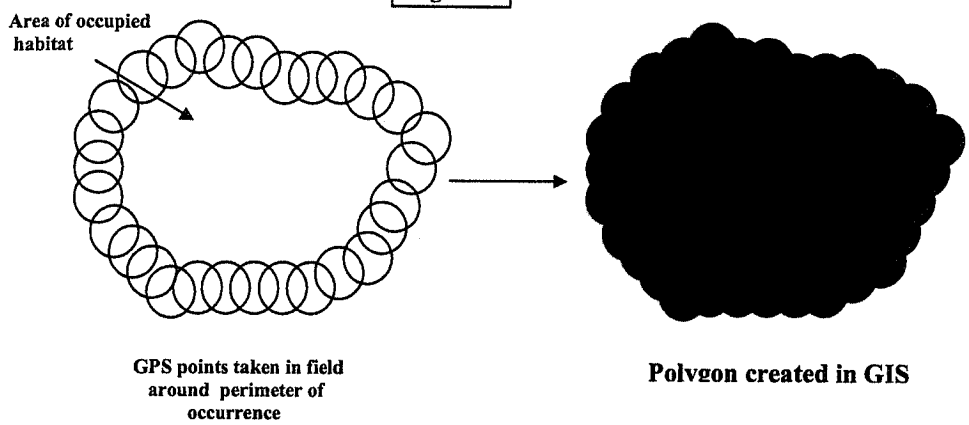
Figure 2



4. After the area of occupied contiguous habitat has been flagged, the GPS operator will proceed to record the occurrence in the unit. The outermost flags (each 15 meters apart) signify the outer boundary of the occurrence, or the perimeter. The GPS operator will collect a point at each of these outermost flags. Later in GIS, the points will be buffered and a solid polygon will be created that will include the buffered perimeter points and all the area contained within these points (Figure 3). The Element Occurrence

field survey form will clearly indicate mapping method so it can be properly entered into GIS.

Figure 3



2. Rare and Suitable TE Habitat Mapping Methodology

Rare and suitable TE habitat mapping will be performed by collecting line or area data in the field and transferring it into GIS. The line or area data will be recorded around the perimeter of the occurrence and differentially corrected in GIS to create a final polygon. Habitat features will not be buffered, because a qualified botanist will determine the boundary of suitable habitat in the field based on rare and suitable habitat definitions.

General Mapping Steps:

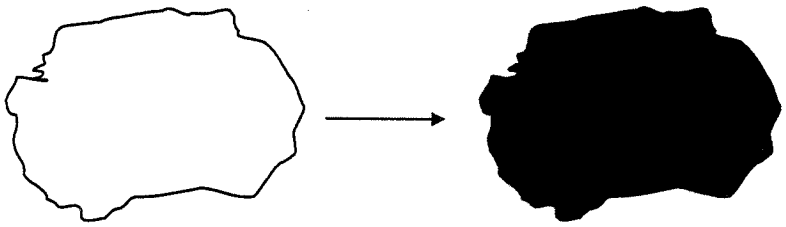
- Line or area data collected in field
- Data will not be buffered in GIS

1. In the field, a botanist will identify rare habitat or suitable habitat for TESW plant species.

2. A botanist will determine the outer edge of the habitat occurrence based on habitat definitions (if mapping rare habitat) or habitat suitability criteria (if mapping suitable habitat for listed species). This outer edge will be flagged. Because line or area data (and not point data) will be collected, the flags do not need to be equidistant or 15 meters apart. Flag placement only needs to be sufficient to delineate the boundary of the habitat occurrence.

3. When the edge of the occurrence has been delineated, the GPS recorder will collect line or area data (+/- 1 m) following the occurrence boundary (Figure 4).

Figure 4



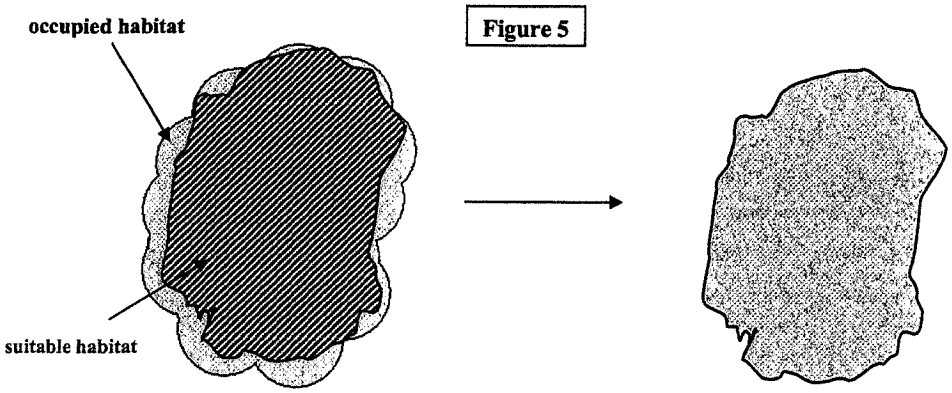
Line or area GPS data taken in field around perimeter of occurrence **Polygon created in GIS**

4. Inclusions of non-suitable habitat within an area of otherwise occupied habitat will be recorded using GPS, as above (also see below for definition of non-suitable habitat inclusion).

3. Rectification of Occupied Habitat Based on Non-Suitable Habitat

1. After GPS data is collected in the field, a GIS/GPS specialist will incorporate the information into a GIS. Occupied habitat points will be buffered and transformed into polygons. Occupied habitat polygons and suitable habitat polygons will then be overlayed.

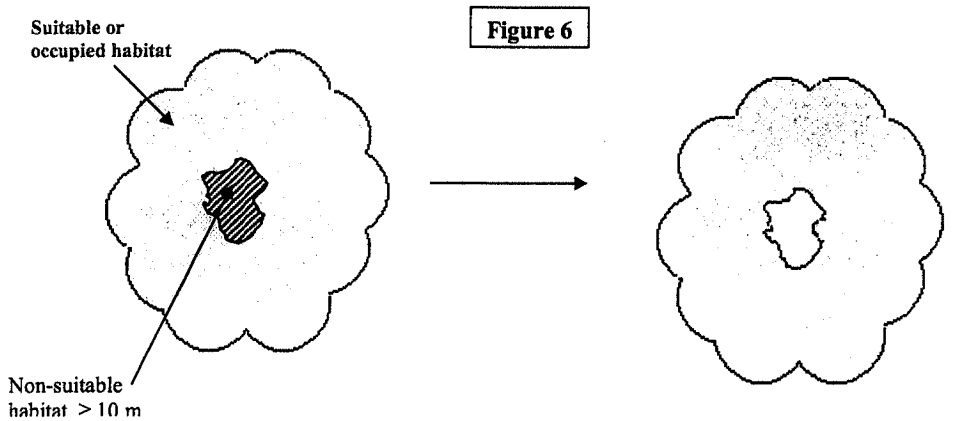
2. If, as an artifact of applying the 10 m buffer, any portion of an occupied habitat polygon extends beyond the boundary of a suitable habitat polygon mapped using the above methodology, the portion of the occupied habitat polygon outside suitable habitat will be clipped and eliminated (Figure 5).



Suitable habitat polygon overlayed on occupied habitat polygon

Rectified occupied habitat polygon after being clipped with suitable habitat polygon

3. If an inclusion of non-suitable habitat within an area of suitable or occupied habitat is longer than 10 m (the buffer radius), the area of non-suitable habitat will be clipped and eliminated from the area of suitable or occupied habitat (Figure 6).



Non-suitable habitat overlayed on suitable or occupied habitat polygon

Suitable or occupied habitat without non-suitable inclusion

4. Documentation

Field Documentation

When mapping occupied or suitable habitat for rare plants in the field, several copies of the Element Occurrence Form and a field notebook should always accompany surveyors:

Element Occurrence Form

The Element Occurrence Form was recently developed for use in the upcoming NRIS Rare Plant Module, a Microsoft Access database that will serve as the new repository of information about rare plant occurrences on federal lands. Although the Rare Plant Module is still under construction, botanists can begin to use these forms now when recording new plant occurrences. In the field, the botanist will record the information on a hard copy of the form (Attachment A). Upon return to the office, the botanist should transfer the information to the electronic Element Occurrence Form. This electronic form will then be linked to its corresponding feature in the GIS coverage for the species. The point or polygon feature and its linked Element Occurrence Form will be stored on the network until the NRIS Rare Plant Module is completed. At that time, the information will be imported into the Rare Plant Module.

Other Office Documentation

In addition to filling out the electronic Element Occurrence Form back in the office, the electronic CNDDB form should also be completed. This electronic form should be stored on the network (either in a project file or in 2670-plants/general/CNDDB_forms), and one copy should be printed out and sent to CNDDB with a map of the occurrence.

References

USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Arenaria ursina* Robinson. On file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Castilleja cinerea* Gray. On file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Eriogonum kennedyi* Watson var. *austromontanum* Munz & I.M. Johnston. On file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Astragalus albens* E. Greene. On file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Eriogonum ovalifolium* Nutt. var. *vineum* (Small) Jepson. On file at the Big Bear Ranger Station, Fawnskin, Ca.

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USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Lesquerella kingii* (S. Watson) S. Watson ssp. *bernardina* (Munz) Munz. On file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Oxytheca parishii* C. Parry var. *goodmaniana* B. Errter. On file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Sidalcea pedata* A. Gray. On file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Thelypodium stenopetalum* S. Wats. On file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Taraxacum californicum* Munz & I.M. Johnston. On file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Poa atropurpurea* Scribner. On file at the Big Bear Ranger Station, Fawnskin, Ca.

USDA Forest Service. 2003. Suitable Habitat Criteria and Survey Requirements for *Sidalcea pedata* A. Gray. On file at the Big Bear Ranger Station, Fawnskin, Ca.

Attachment E – Document titled "FOF 0112 Attachment E – CNPS policy on mitigation guidelines.pdf"

POLICY ON MITIGATION GUIDELINES REGARDING IMPACTS TO RARE, THREATENED, AND ENDANGERED PLANTS

California Native Plant Society Rare Plant Scientific Advisory Committee
(February 1991, revised April 1998)

This document is intended to guide in the assessment and mitigation of impacts to rare and endangered plants. It supports the California Native Plant Society Policy Regarding Mitigation of Impacts to Rare and Endangered Plants (Appendix A). The goals of the policy are to prevent decline of rare plants and their habitats and to ensure that effective rare plant preservation measures are implemented.

In California the right to develop land is subject to regulation by public agencies that have discretionary control over project approval. The National Environmental Policy Act of 1969 (NEPA) and the California Environmental Quality Act of 1970 (CEQA) require project applicants to disclose, consider and avoid or reduce significant project impacts to rare or endangered species. Environmental documents required under those laws contain the project disclosures and evaluations and are available for public review.

EVALUATION GUIDELINES

Before identifying mitigation options for a project, the vegetation types, rare plants and habitats, and specialized biotic resource areas must be identified and the project impacts described and assessed. The Society recommends following the Department of Fish and Game's Guidelines for Assessing Effects of Proposed Developments on Rare and Endangered Plants and Plant Communities (Appendix B). An important aspect of the evaluation is determining whether an impact is significant as defined by CEQA and NEPA. Under CEQA, for example, an significant impact is one which would produce a substantial, or potentially substantial, adverse change in the environment.

MITIGATION GUIDELINES

The Society endorses the mitigation concepts in the California Environmental Quality Act, Statutes and Guidelines (1986) because they may be applied specifically to rare plants. The types of mitigation for environmental impacts that are listed in CEQA (Section 15370) are:

(a) Avoiding the impact altogether by not taking a certain action.

(b) Minimizing impacts by limiting the degree or magnitude of the action.

(c) Rectifying the impact by repairing, rehabilitating or restoring the impacted environment.

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the project.

(e) Compensating for the impact by replacing or providing substitute resources or environments.

These mitigation measures can be applied to a variety of environmental impacts but are not always appropriate to mitigating rare plant impacts. Mitigation measures should be developed on a site-specific basis in consultation with appropriate resources agencies. Under existing laws, a project applicant or a local lead agency may have the responsibility of consulting with public regulatory agencies on matters relating to project impacts on rare species.

For rare plants, effective mitigation options that can avoid or reduce impacts may be limited. The use of more than one measure may be necessary depending upon the type of project and the factors that make plant species rare (e.g., unusual soils, microclimates, or water regimes). Each project must be individually evaluated to determine which mitigation method or methods will avoid or reduce impacts defined by CEQA or NEPA as significant to a less than significant level. Because the life history and ecological

information needed to judge whether mitigation measures are adequate is often lacking, additional biological research may be necessary prior to mitigation design and/or implementation in order to determine which measures will be most appropriate.

Of the five mitigation types in the California Environmental Quality Act, the California Native Plant Society fully supports those which avoid net reduction of population size or species viability. For most plant species this requires the protection of habitat essential to the survival of the species. In some instances, this also requires that impacts be fully avoided in order to prevent a significant impact (i.e., a net loss of plant numbers, habitat, or genetic variability essential to the future existence and recovery of the species). Alternatives such as site restoration and off-site introduction are generally unproven, and usually unsuccessful.

Avoidance:

Impacts to rare plants may be avoided by: (1) pre-project planning and design; (2) reconfiguring an existing project design; or (3) adopting the no-project alternative. Project planning and design measures to avoid impacts may include arrangement of facilities on-site to avoid sensitive features. Additional measures are almost always required to protect avoided sites from impacts associated with construction and operation of the project. Such protection can include, but is not limited to, fencing, open space or conservation easements, and transfer of development rights. See Appendix C for a brief discussion of conservation easements.

Each of the other mitigation alternatives included in the CEQA guidelines involves the acceptance of a net loss and/or use of transplantation, artificial propagation, seed transfer, or habitat restoration. The Society believes that these methods do not fully mitigate for significant impacts to rare plants and their habitats for three reasons:

(1) These alternatives compromise and ultimately negate mitigation by allowing net losses of rare plant populations and habitat. Mitigation must, according to CEQA, fully offset or reduce significant impacts to a less than significant level.

(2) Most rare plants are restricted to their known locations because they have specialized, poorly understood, habitat requirements. Creating the exact environmental conditions that these plants require may not be possible.

(3) The Society does not endorse alteration of naturally occurring plant communities through transplantation because the methodology for most rare plants is untested and therefore unreliable and because most past attempts have ultimately failed.

Although the Society does not endorse significant net losses of rare plant numbers or habitat, we recognize that where such losses are allowed or are deemed unavoidable, off-site restoration, compensation, transplantation or other salvage methods should be attempted to enhance degraded populations or provide for partial survival of the sacrificed population. Such measures also provide additional knowledge of the species' horticultural and ecological requirements. Such measures should never be performed so that an otherwise unaffected population is in any way jeopardized, for example by genetic contamination.

Mitigation alternatives other than avoidance are discussed below. These should be used alone or in combination to reduce impacts to less than significant levels. They should also be used in conjunction with monitoring and long-term management agreements.

Reducing Impacts:

The significance of impacts may be minimized by reducing the size of the project (i.e., partial avoidance) and by locating the project in the least environmentally sensitive area. Areas where impacts are avoided should be surrounded by buffer zones where impacts are absorbed, and set aside and permanently protected in conservation or open space easements. Efforts should be made to salvage portions of the population that will be lost.

Restoration:

Restoration can be used to mitigate impacts from projects approved prior to environmental regulations, or impacts allowed through a "statement of overriding considerations."

Depending upon the degree of impact, habitat restoration may be as simple as removing debris and controlling public access. In more complex situations, however, partial or total restoration of degraded habitat may require extensive revegetation, and soil protection and stabilization programs. Restoration must be tailored to the specific project site based on the habitat and species involved. General guidelines for restoration projects involving rare plants are discussed in Appendix D.

Reduction Over Time:

Impacts may be significantly reduced or eliminated by controlling public access and by fencing or staking the habitat area to prevent accidental intrusion into the site. Monitoring rare plants and habitats during all phases of a project will help ensure that construction and operation activities do not encroach on protected habitat.

When project actions have ended, restraints may or may not be removed depending on the completed project's potential for long-term impacts on the sensitive area. In most instances, control of public access to sensitive habitat sites needs to be continued beyond the construction phase of an individual project, especially in moderate and high density development areas. Public education about the value of the protected resources should also be considered for these areas.

Attempts to reduce or eliminate impacts over the life of the project should be required for all projects if the potential exists for secondary impacts due to human access; mitigation agreements that require placement of a conservation or open space easement on the mitigation site should be considered to implement this measure.

Off-site Compensation:

Compensating for the impact by protecting substitute resources or environments has been used in some instances to mitigate unavoidable impacts. In most instances off-site compensation does not fully reduce impacts to an insignificant level because a net loss of individuals or habitat that supports a natural self-sustaining rare plant population results. In spite of this, off-site compensation is a useful tool under specific circumstances where other mitigation alternatives cannot be applied or do not fully mitigate significant impacts.

Off-site compensation has been approached in several different ways, including: 1) permanent protection of an existing off-site native population; 2) permanent protection of an off-site introduced population; 3) a combination of 1) and 2); or 4) mitigation banking.

Determining habitat value for off-site compensation is difficult. The size of the acquisition will vary depending upon the type, condition, extent and rarity of the habitat and species. In any case, the acquisition and permanent protection of an alternative parcel does not alter the fact that the loss of the

initial site brings the rare habitat and species one step closer to ultimate extinction. Species preservation is greatly enhanced when plants are protected at a number of separate sites. Although the permanent protection of a vigorous, self-sustaining population of the species tends to reduce the endangerment potential of the species at that particular site, it does not necessarily fully compensate for the loss of the habitat known to support a viable population. To further reduce the endangerment potential for the species and habitat, the ratio of acquisition to loss must in most cases exceed 1:1 for any species. The ratio should be higher for rarer species, particularly for those that occupy irreplaceable habitats. In addition, enhancing off-site compensation areas (e.g., reducing grazing or OHV impacts) can help to more fully compensate for the net loss of plants at a project site.

If transfer of the threatened population is being attempted, an ecological study of the site, including an inventory of rare species, is needed to identify the feasibility of introduction. Genetic contamination can occur by mixing of populations of the rare plants and needs to be avoided, as does hybridization between the rare plant and close relatives that could occur at the introduction site. In no case are unthreatened populations to be jeopardized by the transfer of genetic material from the threatened site. If the compensation site is considered suitable, acquisition or other permanent protection efforts are required to ensure adequate long-term protection, and therefore to mitigate for a net loss of rare plants or habitat. A propagation program should be developed for the salvage and transfer of rare plant populations from the initial parcel before initiating any activities. Permits may be required from California Department of Fish and Game (DFG) or the U.S. Fish and Wildlife Service. Propagation methods for the salvaged population must be developed on a case-specific basis. The propagation program schedule must provide adequate lead time to plan and carry out transfer at the correct time of the year. In order to serve as mitigation, the transfer must be successfully completed before the project's construction activities eliminate plants or habitats. Maintenance and monitoring programs which include the collection of data to document degree of success should also be developed for the compensation site to ensure the transplanted population is self-sufficient and thereby demonstrate success.

MITIGATION IMPLEMENTATION

The mitigation design, implementation techniques and reporting procedures must be clearly documented. Responsibilities of the landowner/applicant, contractors, and agencies, and criteria that define successful mitigation, should be placed in writing to prevent later confusion or disagreement. The DFG Plant Conservation Program has prepared a mitigation plan annotated outline that includes the basic information needed to develop a mitigation plan for State-listed plant species that would be acceptable to the DFG. This document discusses important considerations in designing appropriate mitigation and monitoring plans and establishing appropriate performance criteria, and should be consulted when developing mitigation for impacts to any rare plant species.

Mitigation agreements entered into as a condition of a discretionary permit must contain assurances of implementation, monitoring and maintenance. Permits for development generally require a mitigation plan prior to approval. Project construction is sometimes completed before mitigation is fully implemented, especially where restoration or revegetation is involved. In these and related instances mitigation commitments should be guaranteed by a negotiable performance security. The amount of the negotiable security should be large enough to complete the mitigation and to purchase other rare plant habitat in the event the applicant fails to successfully complete the work in accordance with the approved mitigation agreement.

Clear criteria should be included in the mitigation agreement to define the conditions under which the mitigation measures are to be considered complete or successful, so that the performance security may be returned. Any mitigation effort requiring manipulation of plants or of habitats should be monitored for success or failure for a minimum of five years before relinquishing the performance security. The duration of the evaluation period must be based on the biological constraints of the species involved.

MAINTENANCE AND MONITORING IMPLEMENTATION

Maintenance and monitoring of rare plant populations and habitats are essential even where these are "protected" by mitigation measures. Monitoring enables project applicants and regulatory agencies to document compliance with mitigation agreements. Monitoring also enables scientists to gather valuable knowledge on the effectiveness of rare plant mitigation methods. The financial responsibility for monitoring and maintenance of rare plant populations and habitat is typically that of the project applicant. In all cases, monitoring should be conducted by an experienced botanist. Maintenance responsibilities must be clearly stated in contractual agreements to eliminate any confusion during future maintenance and monitoring.

Maintenance must consider the ecological needs of the species and habitat and the types of mitigation used. Where undisturbed habitat is set aside, maintenance may consist of little more than controlling public access, maintaining fences, or periodic weed removal. Restoration and revegetation programs may require more complex maintenance programs. For example, invasive non-native plants may require specialized control measures to keep them from spreading; herbivores may also need to be controlled to protect the native vegetation.

Monitoring programs must be developed to meet the needs of the specific mitigation program. For example, it may be necessary to monitor the progress of construction activities, if these activities have the potential to damage rare plant habitat. Monitoring of restoration and revegetation projects is essential to document success or failure and identify areas where additional work is needed. Monitoring undisturbed sites that have been set aside and are not likely to suffer direct or cumulative impacts may require only periodic visits to determine if easement violations have occurred. Requirements to correct violations should be described in the conservation easement or mitigation agreement.

In the past, mitigation for many approved projects was not properly implemented and agencies failed to enforce compliance by project developers. To rectify this, legislation passed in 1989 (AB 3180, Cortese) amended CEQA by adding section 21081.6 to allow California agencies to require monitoring of mitigation measures that were defined for a given project. The features to be monitored must be outlined in a formal monitoring plan which must be sufficient to identify failures in mitigation throughout the life of the project, not just during the construction phase. Agencies can enforce compliance with monitoring plans through several means, including specifying penalties for failure to meet monitoring obligations, through the use of existing police power such as fines or restraining orders, and/or by requiring a performance security of the project applicant.

Monitoring a conservation easement is the responsibility of the easement holder, whether this is a nonprofit organization or a public agency. The easement holder is also responsible for seeking redress for violations of the conservation easement contract.

CONCLUSION

The Society supports project alternatives that completely avoid significant project impacts to rare and endangered plant species and their habitats. In cases where other mitigation alternatives are approved, mitigation plans should be designed based on the specific requirements of the species and habitat involved. Although the current limited understanding of the ecological requirements for most rare species makes this task difficult, the use of preliminary ecological studies in mitigation planning will help to develop successful mitigation programs. Emphasis must be placed on conserving not only the rare plant but its habitat. The increased awareness of the need for solutions to problems of human impact on the environment and endangered species is encouraging. This awareness and concern has led to the participation of many agencies, conservation organizations, and concerned individuals in an effort to develop the criteria needed for rare plant protection. The California Native Plant Society has dedicated itself to helping realize this goal, and is always available to assist private individuals, local governments, public agencies and others in designing truly effective mitigation measures. Some of the references cited

in the bibliography contain information relating to studies of specific rare plants and mitigation implementations for specific development projects.

ACKNOWLEDGEMENTS

The CNPS Mitigation Policy and Guidelines were produced through the dedicated effort of many individuals. Special thanks go to Betty Guggolz for her lead role in the production of this document and her patient endurance of innumerable modifications to the text. Others who contributed valuable advice, criticism and support were: Ken Berg, Roxanne Bittman, Fredrica Bowcutt, Susan Cochrane, Charlice Danielsen, Phyllis Faber, Jack Guggolz, James Jokerst, Tim Messick, Mary Meyer, James Nelson, Thomas Oberbauer, David Schonum, Teresa Sholars, Mark Skinner, James Payne Smith, Joan Vilms, Laurie Wickenheiser, and Vernal Yadon.

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California Native Plant Society
1722 J Street, Suite 17
Sacramento, CA 95814
(916) 447-2677

APPENDIX A

POLICY REGARDING MITIGATION OF IMPACTS TO RARE AND ENDANGERED PLANTS

Adopted by the CNPS Board of Directors: June 6, 1987

The policy of the California Native Plant Society is that all potential direct, indirect, and cumulative impacts to rare, threatened, or endangered plants and their habitats must be assessed and that appropriate measures be implemented to prevent such impacts resulting from projects. The policy of the Society is also that environmental documents and mitigation plans be based on complete, accurate and current scientific information. Viability of rare, threatened, or endangered plants and their habitats takes precedence over economic or political expediency. Because of the tremendous diversity of rare plant habitats in California, and the dependence of rare plants on their local habitats, it is imperative that mitigation measures be developed on a site specific basis. Local environmental conditions, species biology, land use patterns and other factors must be incorporated into the design of mitigation plans.

The goals of this policy are to prevent the decline of rare plants and their habitats and to ensure that effective rare plant preservation measures are implemented.

Of the mitigation measures listed in the California Environmental Quality Act, the Society fully endorses only that of avoiding the impact. Measures to minimize, to rectify, or to reduce or eliminate the impact over time are recognized by the Society as partial mitigation. The Society does not recognize off-site compensation as mitigation.

Guidelines for project review and evaluation of mitigation proposals are available from the California Native Plant Society. The Rare Plant Scientific Advisory Committee will revise the guidelines periodically so that they are easily used with the California Environmental Quality Act and other current legislation.

California Native Plant Society
1722 J Street, Suite 17
Sacramento, CA 95814
(916) 447-2677

APPENDIX B

GUIDELINES FOR ASSESSING THE EFFECTS OF PROPOSED DEVELOPMENTS ON RARE, THREATENED, AND ENDANGERED PLANTS AND PLANT COMMUNITIES

State of California
THE RESOURCES AGENCY
Department of Fish and Game
May 4, 1984
Revised August 15, 1997

The following recommendations are intended to help those who prepare and review environmental documents determine when a botanical survey is needed, who should be considered qualified to conduct such surveys, how field surveys should be conducted, and what information should be contained in the survey report. The Department may recommend that lead agencies not accept the results of surveys that are not conducted according to these guidelines.

1. Botanical surveys that are conducted to determine the environmental effects of a proposed development should be directed to all rare, threatened, and endangered plants and plant communities. Rare, threatened, and endangered plants are not necessarily limited to those species which have been "listed" by state and federal agencies but should include any species that, based on all available data, can be shown to be rare, threatened, and/or endangered under the following definitions:

   A species, subspecies, or variety of plant is "endangered" when the prospects of its survival and reproduction are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, or disease. A plant is "threatened" when it is likely to become endangered in the foreseeable future in the absence of protection measures. A plant is "rare" when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens.

   Rare plant communities are those communities that are of highly limited distribution. These communities may or may not contain rare, threatened, or endangered species. The most current version of the California Natural Diversity Database's List of California Terrestrial Natural Communities may be used as a guide to the names and status of communities.

2. It is appropriate to conduct a botanical field survey to determine if, or the extent that, rare, threatened, or endangered plants will be affected by a proposed project when:

   a. Based on an initial biological assessment, natural vegetation occurs on the site and it is unknown if rare, threatened, or endangered plants or habitats occur on the site; or

   b. Rare plants have historically been identified on the project site, but adequate information for impact assessment is lacking.

3. Botanical consultants should possess the following qualifications:

   a. Experience conducting floristic field surveys;

   b. Knowledge of plant taxonomy and plant ecology;

   c. Familiarity with the plants of the area, including rare, threatened, and endangered species; and

   d. Familiarity with the appropriate state and federal statutes related to plants and plant collecting.

4. Field surveys should be conducted in a manner that will locate any rare, threatened, or endangered species that may be present. Specifically, rare, threatened, or endangered plant surveys should be:

   a. Conducted in the field at the proper time of year when rare, threatened, or endangered species are both evident and identifiable. Usually, this is when the plants are flowering.

      Additionally, field surveys should be conducted with sufficient number of visits spaced throughout the growing season to accomplish a floristic survey of the site (see 4.b.).

      When rare, threatened, or endangered plants are known to occur in the type(s) of habitat present in the project area, nearby accessible occurrences of the plants (reference sites) should be observed to determine that the species are identifiable at the time of the survey.

   b. Floristic in nature. A complete species list should be included in every botanical survey report.

   c. Conducted in a manner that is consistent with conservation ethics. Collections of rare, threatened, or endangered species, or suspected rare, threatened, or endangered species (voucher specimens) should be made only when such actions would not jeopardize the continued existence of the population and in accordance with applicable state and federal permit requirements. A collecting permit from the Plant Conservation Program of DFG is required for collection of state-listed plant species. Voucher specimens should be deposited at recognized public herbaria for future reference. Photography should be used to document plant identification and habitat whenever possible, but especially when the population cannot withstand collection of voucher specimens.

   d. Conducted using systematic field techniques in all habitats of the site to ensure a thorough coverage of potential impact areas.

   e. Well documented. When a rare, threatened, or endangered plant (or rare plant community) is located, a California Native Species (or Community) Field Survey Form or equivalent written form, accompanied by a copy of the appropriate portion of a 72 minute topographic map with the occurrence mapped, should be completed and submitted to the Natural Diversity Data Base.

5. Reports of botanical field surveys should be included in or with environmental assessments, negative declarations and mitigated negative declarations, EIR's, and EIS's, and should contain the following information:

   a. Project description, including a detailed map of the project location and study area.

   b. A written description of biological setting referencing the community nomenclature used and a vegetation map.

   c. Detailed description of survey methodology.

   d. Dates of field surveys and total person-hours spent on field surveys.

   e. Results of field survey (including detailed maps).

   f. An assessment of potential impacts.

   g. Discussion of the importance of rare, threatened, or endangered plant populations with consideration of nearby populations and total species distribution.

h. Recommended measures to avoid impacts.

i. List of all species occurring on the project site.

j. Description of reference site(s) visited and phenological development of rare or endangered plant(s).

k. Copies of all California Native Species Field Survey Forms or Natural Community Field Survey Forms.

l. Name of field investigator(s).

m. References cited, persons contacted, herbaria visited, and disposition of voucher specimens.

APPENDIX C

CONSERVATION EASEMENTS

Open Space or Conservation Easements have been used in a number of jurisdictions throughout California. In open space or conservation easements the landowner transfers the rights to develop a parcel to a conservation organization or public agency. The legal basis for this action is found in Government Code Section 51050 et seq., particularly Section 51083.5 which describes the granting of easements to nonprofit organizations. Easements granted to an impartial third party, interested organization, or resource agency are the only secure types. Those granted to a local public jurisdiction can be eliminated or modified with a majority vote.

Determining the appropriate size of an easement is difficult. It must be large enough to support, in perpetuity, a biologically secure, reproducing population with an adequate buffer zone. The proposed land use surrounding the easement and current and future land uses of the conservation or open space easement area must also be taken into consideration. A land use or management plan that accounts for the type of rare plant habitat and the biology of the resident species needs to be developed for easement areas. The design of the protection area boundaries and management plan must be scientifically based, utilizing baseline studies and species biology information.

Conservation and open space easement contracts should include a legal description of the easement parcel, the purpose of the easement and describe the specific resources or conditions being protected by the easement. The contract should also include the rights of the grantee, the grantors rights and uses, restrictions of undesirable activities, and a general restriction of all uses inconsistent with the purposes of the easement. Language should be included that states that the conditions of the easement contract are binding not only on the grantor, but also on his heirs, assigns, and all other successors and interests so that the term of the easement runs with the land in perpetuity.

Conservation easement contracts should also include: (1) specific restrictions to protect the site from land use change, introduction of nonnative plant species and public access; and (2) the right of the grantee to enforce compliance with the terms of the easement and to require restoration of the habitat at the grantor's expense should damage to the habitat result from violation of the agreement by the grantor.

Maintenance and monitoring agreements and guideline documents for the conservation easement should be incorporated into the easement contract.

California Native Plant Society
1722 J Street, Suite 17
Sacramento, CA 95814
(916) 447-2677

APPENDIX D

BRIEF GUIDELINES FOR RESTORATION PROJECTS

General guidelines for restoration projects are as follows:

1. Prior to the development of a restoration program, the goals of the completed project must be established and a course of action developed to achieve that goal.

2. Pre-impact site conditions should be determined. Clues to this may be found in remnants of the existing habitat, in herbarium research, and from botanists who have collected in the area in the past. Local historical files or societies may be a source of information if the site is near an urban area.

3. Other site factors which may require study are land contours, soil types, erosion control, topsoil protection, and pre-impact hydrologic patterns.

4. An ecological study of the species being considered for reintroduction is necessary, including their total distribution, other habitat sites, associated species and pollinators.

5. Revegetation methodology research may include propagation techniques, material sources, propagule collection and preparation, planting densities, seedling protection, weed and invasive exotics control, site protection, public access and many other factors. The present knowledge of propagation requirements for rare plants is so limited that all efforts to propagate and reintroduce them in the wild should be carried out under the direct supervision of a specialist well versed in the cultural requirements of the genus.

6. A maintenance and monitoring program should also be included in the development of restoration/revegetation plans, and should utilize consistently documented data to further augment the existing knowledge of the species and to develop criteria for other revegetation projects.

California Native Plant Society
1722 J Street, Suite 17
Sacramento, CA 95814
(916) 447-2677

APPENDIX E

DEFINITIONS

The following definitions are used in this document:

Maintenance: the process of ensuring that rare plants and their habitats remain viable and in good condition.

Mitigation: actions taken to avoid or reduce significant adverse impacts. Impacts are less than significant if no net loss of population size or habitat quality results.

Mitigation banking: A large preserve or open space which individual developers buy into at a predetermined compensation ratio to satisfy their mitigation debt. Mitigation banking focuses mitigation efforts into significant amounts of habitat rather than permitting establishment of many smaller and less significant or less defensible preserves or open space areas.

Monitoring: periodic assessment of the status of a plant population or habitat to determine its condition and reveal trends in vigor and viability; should be conducted in a scientific and standardized fashion.

Off-site Compensation: preservation in perpetuity of alternate sites containing similar habitat types and species to offset or "compensate" for unavoidable losses. The ratio of acquisition to loss should be greater than one to one for any species. In lieu of this, an equitable sum of money may be paid for the purchase of an alternate site.

Preservation: the maintenance and protection of rare plants and habitats at levels that existed prior to the commencement of a project.

Rare Species: for the purpose of this policy, and to avoid undue repetition, the word "rare" is used to include "rare", "threatened", and "endangered" plant species as defined in Section 3(4)(15) of The Federal Endangered Species Act of 1973, and The California Environmental Quality Act Guidelines, Section 15380 (1986). The latter section is reproduced below:

(b) A species of plant is:

(1) "Endangered" when its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors; or

(2) "Rare" when either:

(A) Although not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or

(B) The species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered "threatened" as that term is used in the Federal Endangered Species Act.

(c) A species of plant shall be presumed to be rare or endangered if it is listed in:

(1) Sections 670.2 or 670.5, Title 14, California Administrative Code; or

(2) Title 50, Code of Federal Regulations, Section 17.11 or 17.12 pursuant to the Federal Endangered Species Act as threatened or endangered; or

(d) A species not included in any listing identified in subsection (c) shall nevertheless be considered to be rare or endangered if the species can be shown to meet the criteria in subsection (b).

Division 2, Chapter 1.5 of the California Fish and Game Code (California Endangered Species Act Section 2067) defines a "threatened" species as a native species or subspecies of a plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts required in this chapter.

Transfer of Development Rights (TDR): Under this process, an applicant may gain density bonuses in designated development areas if rare plant populations and habitat are left in permanent open space. This alternative also requires an organized plan by a local agency identifying those areas to be left undisturbed and those that may be used by the applicant for density increases in return for protecting the areas to be left undisturbed. Protection in perpetuity is a necessary requirement of TDR proposals that are implemented to protect rare plant populations. TDR is being used increasingly as a mitigation tool for on-site rare plant protection.

Unavoidable significant impacts: impacts resulting from a "statement of overriding considerations" where the public benefits of a project have been determined to outweigh the significance of the environmental impact, or where an emergency situation or natural disaster may destroy, or has destroyed rare plant habitat and species.

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1722 J Street, Suite 17
Sacramento, CA 95814
(916) 447-2677

APPENDIX F

CNPS RARE PLANT LISTS (Skinner and Pavlik, 1994)

The California Native Plant Society currently tracks 1742 plant species, subspecies, and varieties as rare in California. They are assigned to one of five "lists" in an effort to categorize their degree of rarity.

List 1A: Plants Presumed Extinct in California

The 37 plants of List 1A are presumed extinct because they have not been seen or collected in the wild in California for many years. Although most of them are restricted to California, a few are found in other states as well. In many cases, repeated attempts have been made to rediscover these plants by visiting known historical locations. Even after such diligent searching, CNPS is constrained against saying that they are extinct, since for most of them rediscovery remains a distinct possibility. Note that care should be taken to distinguish between "extinct" and "extirpated." A plant is extirpated if it has been locally eliminated, but it may exist in abundance elsewhere in its range.

All of the plants constituting List 1A meet the definitions of Sec. 1901, Chapter 10 (Native Plant Protection Act [NPPA]) or Secs. 2062 and 2067 (California Endangered Species Act [CESA]) of the California Department of Fish and Game Code, and are eligible for state. Should these taxa be rediscovered, it is mandatory that they be fully considered during preparation of environmental documents relating to the California Environmental Quality Act (CEQA).

List 1B: Plants Rare, Threatened or Endangered in California and Elsewhere

The 857 plants of List 1B are rare throughout their range. All but a few are endemic to California. All of them are judged to be vulnerable under present circumstances or to have a high potential for becoming so because of their limited or vulnerable habitat, their low numbers of individuals per population (even though they may be wide ranging), or their limited number of populations. Most of the plants of List 1B have declined significantly since the arrival of non-indigenous humanity in California.

All of the plants constituting List 1B meet the definitions of Sec. 1901, Chapter 10 (NPPA) or Secs. 2062 and 2067 (CESA) of the California Department of Fish and Game Code, and are eligible for state listing. It is mandatory that they be fully considered during preparation of environmental documents relating to CEQA.

List 2: Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere

Except for being common beyond the boundaries of California, the 272 plants of List 2 would have appeared on List 1B. From the federal perspective, plants common in other states or countries are not eligible for consideration under the provisions of the Endangered Species Act. Until 1979, a similar policy was followed in California. However, after the passage of the NPPA, plants were considered for protection without regard to their distribution outside the state.

All of the plants constituting List 2 meet the definitions of Sec. 1901, Chapter 10 (NPPA) or Secs. 2062 and 2067 (CESA) of the California Department of Fish and Game Code, and are eligible for state listing. It is mandatory that they be fully considered during preparation of environmental documents relating to CEQA.

List 3: Plants About Which We Need More Information -- A Review List

The 47 plants that comprise List 3 are united by one common theme -- CNPS lacks the necessary information to assign them to one of the other lists or to reject them. Nearly all of the plants remaining on

List 3 are taxonomically problematic. Data regarding distribution, endangerment, ecology, and taxonomic validity will be gratefully received by CNPS.

Some of the plants constituting List 3 meet the definitions of Sec. 1901, Chapter 10 (NPPA) or Secs. 2062 and 2067 (CESA) of the California Department of Fish and Game Code, and are eligible for state listing. CNPS recommends that List 3 plants be evaluated for consideration during preparation of environmental documents relating to CEQA.

List 4: Plants of Limited Distribution -- A Watch List

The 532 plants in this category are of limited distribution or infrequent throughout a broader area in California, and their vulnerability or susceptibility to threat appears low at this time. While CNPS cannot call these plants "rare" from a statewide perspective, they are uncommon enough that their status should be monitored regularly. Should the degree of endangerment or rarity of a List 4 plant change, we will transfer it to a more appropriate list.

Very few of the plants constituting List 4 meet the definitions of Sec. 1901, Chapter 10 NPPA) or Secs. 2062 and 2067 (CESA) of the California Department of Fish and Game Code, and few, if any, are eligible for state listing. Nevertheless, many of them are significant locally, and CNPS recommends that List 4 plants be evaluated for consideration during preparation of environmental documents relating to CEQA. This may be particularly appropriate for the type locality of a List 4 plant, for populations at the periphery of a species' range or in areas where the taxon is especially uncommon or has sustained heavy losses, or for populations exhibiting unusual morphology or occurring on unusual substrates.

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1722 J Street, Suite 17
Sacramento, CA 95814
(916) 447-2677

Attachment F – Document titled "FOF 0112 Attachment F – Castle Glen conditions review 2001.pdf"

16 September 2001

RECEIVED
OCT 1 9 2001
PLANNING DIVISION

Subject: Review of Biological Conditions of Approval, Eagle Mountain Estates, Tract No. 12488 City of Big Bear Lake, California

ATTN: Mr. Michael Rafferty, representing
Eagle Mountain Estates
P.O. Box 317
Big Bear City, CA 92314

Timothy P. Krantz, Ph.D.
University of Redlands
1200 East Colton Avenue, Duke Hall
Redlands, CA 92373-0999

Dear Mr. Rafferty:

Please find detailed below a report on a field inspection and review of Conditions of Approval Nos. 48-50, with regard to fencing and removal of bald eagle perch trees; and Nos. 51-53 regarding rare plant habitat. The field inspection was completed on September 8 and 9, 2001.

Bald Eagle Habitat

As mitigation for critical wintering bald eagle habitat, Tract 12488 recorded Lot A, situated along the south side of Big Bear Boulevard. Lot A includes key bald eagle perching habitat, where bald eagles regularly perch in large trees overlooking foraging habitat in Stanfield Pond. Typical perch trees are large Jeffrey pines, greater than 24 inches in diameter-at-breast height (1.5m above ground), with dead-topped crowns or "windows" (gaps between large limbs) that provide a vantage over the foraging area. Most perch trees are greater than 150-200 years old or more, and many represent hazards to houses or structures built near them in that they may lose large limbs or topple, threatening life and property.

For this reason, Condition 48 requires a review of lots adjacent to Lot A to determine if any potential perch trees may be disturbed by construction of dwelling units. Conditions 49 and 50 require that perch trees that must be removed shall be replaced by tree trimming (topping or removing limbs to create platforms or windows), or with artificial structures, to create suitable replacement perch trees in Lot A.

For the purpose of this review, Lots on cul-de-sacs adjoining Lot A off of Eagle Lake Place (157-162), Windsong Place (163-168), Eagle Ridge Drive (155, 156, 169-172), Morningstar Place (179-183), and Fallen Leaf Road (187-193), were inspected with regard to compliance with Conditions 48-50. These lots were also reviewed regarding the requirement to fence and sign the rear lot lines adjoining Lot A in order to keep

residents from walking, sledding, or otherwise entering the bald eagle preserve during winter months when the bald eagles are present (November-April). The above-enumerated lots were inspected with a particular view toward likely buildable areas within each lot, and the capability of avoidance of eagle perch trees on the lot, if at all practical.

Findings Regarding Bald Eagle Perch Tree Habitat

Lots 158, 159, and 160 all contain large perch trees. Most of these are toward the back (lower) portion of the lots, or toward the sides of lots, such that the likely building pads and driveway access can avoid any perch trees. A large, entirely dead snag is situated near the rear lot lines of 164-165 that may have to be removed for hazard reduction. Another large snag is situated near the front of lots 164-165, and will probably have to be removed. These trees were counted as two (2) perch trees requiring replacement.

Lots 166, 167, and 170 all contain large suitable perch trees toward the back of those lots. In particular, lot 166 contains a significant perch tree immediately up from the sewer line and easement. This tree should be avoided and any structures maintained far enough away such that the tree will not represent a potential safety hazard and will not need to be removed.

Lots 179 and 180 contain clusters of large trees (> 24"dbh) toward the back lot lines. Building pads and driveway access on these lots should be delineated, and the building inspector shall review these to determine if any trees greater than 24"dbh will be removed, requiring perch tree replacement per Conditions 49-50. Lot 181 contains four large perch trees near the front center portion of the lot, and two near the back lot line. The two trees toward the back should be avoided. The other four near the front of the lot are situated near where the parking structure/building pad are likely to be located, and these four (4) trees were deemed "likely to be impacted," and were therefore counted as requiring replacement.

Lots 189-192 all contain large suitable perch trees toward their back lot lines. Particularly, lot 189 contains three significant perch trees just the other side of the sewer easement, and two very large Jeffrey pines situated toward the rear-eastern portion of the lot. These two trees should be avoided.

Regarding the requirement to fence the rear lot lines, the purpose for fencing along the backyards of lots adjoining Lot A is to keep people in the residential lots from walking, sledding, or other access into the wintering bald eagle habitat. Of particular concern are Lots on cul-de-sacs adjoining Lot A off of Eagle Lake Place (157-162), Windsong Place (163-168), Eagle Ridge Drive (155, 156, 169-172), Morningstar Place (179-183), and Fallen Leaf Road (187-193). These lots back onto the most heavily used wintering bald eagle habitat.

A fence along the rear lot lines would present a clear delineation of where private lots end, and the bald eagle reserve begins. A two-rail lodgepole fence would represent a

clear delineation of property boundaries, while not being visually obtrusive. An alternative that may be considered would be to individually post the center, rear lot lines of every lot adjoining Lot A with signs, noting that all access between November 1 and April 1 is strictly prohibited. The reserve manager (presently the Natural Heritage Foundation) would have to maintain the signs and patrol Lot A much more vigorously if this mitigation alternative is selected. In either case, the fence or the lot lines must be clearly posted, signed, and these conditions enforced.

An educational program to inform lot owners about the unique wintering bald eagle habitat in their backyards, and of the need to keep the area free of disturbance during the winter season would be helpful to obtain homeowners' compliance with these conditions.

Summary of Review of Bald Eagle Conditions

A total of 6 trees were identified that will require replacement (two on Lots 164-165, and four on Lot 181). Such replacement may be accomplished by retaining a professional tree service, under the direction of a biological monitor, to trim and/or limb six trees in Lot A to improve their functionality for perching bald eagles.

Upon review of the residential lots adjoining Lot A, two mitigation alternatives were identified regarding fencing the property lines. The existing condition of approval requires fencing to be installed and maintained by the reserve manager along the rear lot lines of Lots 158-160, 165-172, 180-182, and Lots 188-190. The alternative would be to post the middle of rear lot lines with signs clearly stating that the land behind the sign is closed to public access from November 1—April 1 for protection of wintering bald eagle habitat, and that no trespass during this period will be strictly enforced. The latter alternative must be accompanied by much more vigilant patrolling by the stewardship entity. In this case, it is strongly recommended that an alternative land manager than the Natural Heritage Foundation be identified and retained to accomplish this task. The Natural Heritage Foundation has not maintained the existing fence along Big Bear Boulevard, nor have they maintained their other holdings in Big Bear Valley (Eagle Point, Sugarloaf Pebble Plain). If the land steward entity does not fulfill its obligations regarding preserve management, then another entity should be identified that will do so.

Rare Plant Habitat

Conditions 51-53 of Tract 12488 address requirements for fencing and maintenance, and conveyance of surface hydrology through a drainage easement and rare plant habitat. The rare plant habitat is comprised of species associated with pebble plains and vernal springs plant communities. Both of these plant communities are associated with clay soils that predate the uplift of the north block of the San Bernardino Mountains. As the ridge that comprises the Eagle Mountain Estates has been uplifted, the clay soils have persisted on bench tops and re-aggregated toward the center of the drainage. The rare plant habitat runs from near what is now the crest of Starlight Circle, draining between Lots 97-98, and running northwest between Lots 120-121, through Lots 199 and 100,

between 118-119, 104-105, 177-178, and thence draining across the rear lot lines of 173-176 on the southwest bank and 178-180 along the northeast bank of the drainage. A sewer main has been installed along the drainage easement through the middle of this lower section of lots, and then extending up along the west side of the easement, bypassing most of the rare plant habitat, then running back up the middle of the two branches of the drainage easement between Lots 120 and 100 through prime pebble plain habitat.

In November, 1997, three species associated with the pebble plains habitat on site were listed as Threatened under the auspices of the U.S. Endangered Species Act. These species are the Bear Valley sandwort (*Arenaria ursina*), ashy-grey paintbrush (*Castilleja cinerea*), and Kennedy's buckwheat (*Eriogonum kennedyi austromontanum*). In addition, other Species of Concern known to occur on site with the listed species include Parish's rock-cress (*Arabis parishii*), rattails (*Ivesia argyrocoma*), eye-strain and purple monkeyflower (*Mimulus exiguus* and *M. purpureus*), and yellow owl's-clover (*Orthocarpus lasiorhynchus*).

Fencing of the drainage and rare plant easement is to be installed along both sides of the easement, 25 feet on either side of centerline of the drainage. The purpose of the fencing is two-fold: to clearly delineate the easement as "not a buildable area" for lots enumerated above, and to ensure that structures are not built in the floodway of the easement. With relatively impervious clay soils and new road surfaces, the drainage easement filled to near capacity of culverts on a recent thunderstorm just a week prior to this survey. A lot owner commented that after several hours of rain, the creek had risen nearly a foot and was floating 75-pound hay bales, placed in the drainage for erosion control.

Findings Regarding Rare Plant Habitat

Because of the recent listing of the three pebble plains species as Threatened, the modification of mitigation measures concerning those species, as adopted in the original conditions of approval of Tract 12488, may require consultation under Section 7 of the Federal Endangered Species Act. The California Environmental Quality Act (CEQA) also considers potential impacts of a project on federally-listed species as mandatory findings of signficance (§15065), possibly re-initiating CEQA review in order to change adopted conditions of approval.

The rare plant habitat was inspected in the field. Dr. Krantz and several biological technicians walked the entire length of the drainage easement and rare plant habitat on September 8, 2001; and Dr. Krantz walked the site with Dr. Kate Kramer, Department of Fish and Game botanist on September 9, 2001. All three threatened pebble plains species were positively identified, together with other perennial species. Annual species, such as *Mimulus purpureus* or *Orthocarpus lasiorhynchus*, were not visible at this time of year, but are presumed extant because suitable habitat still exists along sections of the drainage easement.

The lower portion of the drainage easement below Eagle Ridge Drive and Morningstar Place has been almost entirely destroyed by the installation of a sewer main down the middle of the creek. Nonetheless, even along this section rare plant species persist along the edges of the easement, extending onto Lots 177 and 178. The sewer line runs beneath Eagle Ridge Drive and then up the west side of the drainage easement, leaving good vernal springs and pebble plain habitat intact on Lot 104. Approximately one half of Lot 104 is constrained by the rare plant and drainage easement. The easement continues to the south between Lots 118-119. Approximately one third of Lot 119 is constrained by the 25-feet from centerline fencing requirement.

Extending under Golden Oak Road, the easement forks into two branches, the southerly branch running from Golden Oak up along the west side of Lot 120 and east side of 121, while the east branch extends up between Lots 120, 101, and 100. The sewer main runs straight between Lots 120 and 100, taking an additional ten-feet width of the buildable area of Lot 100. This leaves Lot 100 effectively divided into two triangular buildable areas of approximately 3000s.f. and 2,600s.f., respectively. Lot 120 is also highly constrained, the only possible access being a narrow area between the two forks of the drainage easement and the sewer main. The remaining buildable area contains high quality pebble plain habitat with all three threatened species present. The pebble plain habitat reaches its greatest extent between these two lots, extending slightly onto Lot 101 within the drainage easement across the western 500s.f. of the lot.

Following the south branch of the drainage easement, the easement runs from Lot 120 through a corner of Lot F, the ridgeline open space lot, then back between Lots 97 and 98, containing good quality pebble plain habitat throughout this area. Access to Lot 97 is constrained to the south half of the frontage on Starlight Circle road and by the steepness of the slope toward the drainage easement, leaving just slightly more than half of the lot as buildable area after front and sideyard building setbacks are considered. Lot 98 is less constrained, being situated on the corner between Starlight Circle and Fallen Leaf Road. The small portion of the south branch extension under Starlight Circle between Lots 90-91 contains no rare plant habitat, and that portion of the easement and fencing requirement may be waived.

The east branch of the drainage easement extends from Lot 100, under Fallen Leaf Road, through Lot 199. The drainage easement runs through the western half of the Lot 199, leaving a 30-feet wide unbuildable area between the easement and the street frontage. The remaining buildable area in the eastern half of Lot 199 is approximately 50 feet wide at the frontage on Starlight Circle, narrowing to twenty feet at the rear of the lot, constrained by the sideyard setback and the 10-feet sewer easement across the rear lot line.

Summary of Review of Rare Plant Conditions

Field inspection of the drainage easement and rare plant habitat mitigation requirements confirmed the presence of three Federal-threatened species and several candidate species of rare plants on the site. The installation of the sewer main has resulted in the loss of

occupied habitat in the lower portion of the easement below Eagle Ridge Drive, and has eliminated some high quality pebble plain habitat with all three threatened species on Lots 100 and 120. Lots 100, 120 and 199 are severely constrained between the drainage/rare plant habitat easements, sewer easements, and required building setbacks, such that they may not be buildable. Approximately half of Lot 104 is similarly constrained, and about 40% of Lots 119 and 177 are restricted by the drainage and sewer easements.

Despite the impacts of the sewer main installation and road construction, the remaining rare plant habitat is in good condition. Because of this fact, and the subsequent listing of the three pebble plains plant species as Threatened under the Federal Endangered Species Act, it is the recommendation of this review that the fencing requirement be retained and implemented as per adopted conditions of approval. Fencing of the drainage easement is necessary in order to delineate the non-buildable easement from the buildable remainder portions of affected lots for the dual purpose of rare plant conservation, as well as flood control. A two-rail lodgepole fence is recommended that would clearly demark the drainage easement, yet not represent an aesthetic impact to adjacent lot owners.

This concludes my report on the field inspection of Eagle Mountain Estates Tract 12488 and recommendations regarding Conditions of Approval concerning bald eagle and rare plant habitats on site. I would be glad to answer any further questions or make clarifications regarding these results at my numbers listed below.

Thank you for this opportunity to be of service to you in this matter.

Sincerely,

Tim Krantz

Timothy P. Krantz

****

Dr. Timothy P. Krantz
University of Redlands
1200 East Colton Avenue, Duke Hall
Redlands, California 92373-0999

Direct line: (909) 335-5149
Executive Assistant: (909) 335-5268
FAX: (909) 307-6952
Cell: (909) 732-3880
krantz@uor.edu

Attachment G – Document titled "FOF 0112 Attachment G – tom brown statement.pdf"

I was in attendance in the audience at the TRT meeting for the Big Bear Lake DWP in April, 2010. It was discussed at that meeting that Bear Valley Mutual wanted to meet with DWP to discuss the DWP lower wells regarding the interconnect between the wells and the lake water. It was further discussed how lake water could be going into the wells. Steve Foulkes, DWP Board President, said that he agreed that probably water from the lake could be infiltrating the low lying wells.

_____ Date: 4-11-12

Tom Brown

Attachment H – Document titled "FOF 0112 Attachment H – Pebble Plain Habitat Management Guide 1990

PEBBLE PLAIN
HABITAT MANAGEMENT GUIDE
AND ACTION PLAN

Prepared Through
a
Challenge Cost Share Agreement

Between

The U.S.D.A. Forest Service,
Pacific Southwest Region
San Bernardino National Forest

and

The Nature Conservancy,
California Field Office

PEBBLE PLAIN HABITAT MANAGEMENT GUIDE AND ACTION PLAN

Prepared By:

Maile Neel — Date: May 3, 1990

Maile Neel
Assistant Forest Botanist

Katherine Barrows — Date: May 7, 1990

Katherine Barrows
Botanical Consultant,
The Nature Conservancy

Recommended By:

Steve Loe — Date: May 18, 1990

Steve Loe
Forest Biologist

Responsible Officials:

Rebecca Aus — Date: 5/7/90

Rebecca Aus
District Ranger,
Big Bear Ranger District

Charles H. Irby — Date: 5/25/90

Charles H. Irby
Forest Supervisor

This Guide supercedes all similar guides bearing earlier dates.
It is subject to change as new information becomes available.

PEBBLE PLAIN HABITAT MANAGEMENT GUIDE SUMMARY AND ACTION PLAN

Purpose

Pebble plain habitat is found only on the Big Bear Ranger District, San Bernardino National Forest and adjacent private lands. In addition to being being limited in distribution, this habitat supports 8 sensitive plant species. The Forest Service is responsible for the long-term conservation of these species and their habitat on National Forest land. This Pebble Plain Habitat Management Guide provides management direction necessary for meeting this responsibility. The purpose of this portion of the Guide is to provide a general habitat distribution map, summarize the management goals for pebble plain habitat, detail an action plan for meeting these goals and define restrictions for working in or around pebble plain habitat. Information on the significance and biology of the habitat, maps of specific habitat occurrences as well as technical information on sensitive plant species can be found in the Guide itself.

Habitat Management Goals and Actions

Management goals include protecting pebble plain occurrences over a broad geographic range, reducing habitat loss and fragmentation, maintaining site viability and encouraging compatible uses. Actions proposed in the Guide will protect and enhance habitat by eliminating or limiting site specific threats. Protection efforts also focus on interpreting the unique pebble plain habitat. Site specific threats and recommendations are summarized in the attached table and are explained more thoroughly in the Guide under each site.

General Restrictions Applying to all Pebble Plain Sites

1. Vehicles, including emergency vehicles, are not allowed on pebble plains, unless approved by the District Ranger.
2. Special use permits will not be issued if impacts to pebble plain habitat will result.
3. Collection of sensitive plant species is prohibited except through permit from the Regional Forester.
4. Pebble plain habitat will not be used in any way during emergency activities including fire camp, vehicle or helitac staging areas or fuel break construction unless approved by the District Ranger.
5. Ground disturbing activities will be evaluated on a case by case basis and will be limited to those which can be mitigated. One of the persons listed below will be contacted prior to ground disturbance in known or suspected pebble plain habitat.

Monitoring

Qualitative and quantitative monitoring provide a means of determining the adequacy of the goals and to what degree the goals are being met. Monitoring procedures are detailed the Pebble Plain Monitoring Plan on file at the Big Bear Ranger Station and the Office of the Supervisor of the San Bernardino National Forest.

Guide Update

This Summary and Action Plan will be reviewed and updated annually to document accomplishments and changes in status of habitat occurrences or of contact personnel. The Guide itself will be updated as necessary to reflect new information based on the results of monitoring and other research. If it has not been updated before, the Guide will be reviewed no later than 1995.

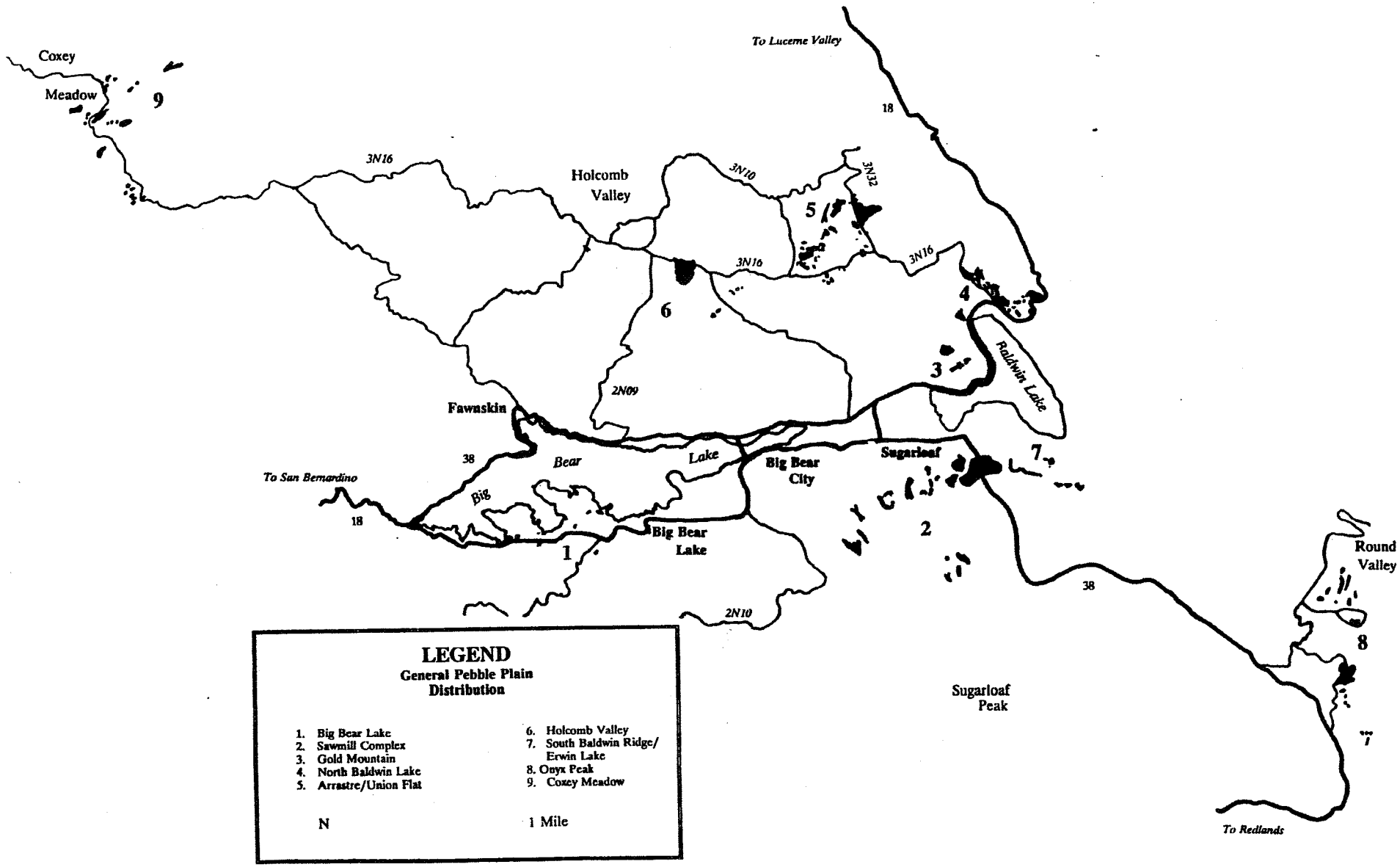
Contacts

In case of emergency, or if there is any question about potential conflicts between pebble plain habitat and activities funded, authorized or carried out by the Forest Service, contact any of the following:

Supervisors Office
Forest Botanist - Melody Lardner, 383-5540
Forest Biologist - Steve Loe, 383-5609

The Nature Conservancy, Big Bear Valley Preserve
Preserve Caretaker - John Stephenson 866-9423

Big Bear Ranger District, 866-3437
District Ranger - Rebecca Aus
Resource Officer - Cindy Dimmel
Wildlife Biologist - Robin Butler
Assistant Forest Botanist - Maile Neel


Coxey
Meadow
9
3N16
Holcomb
Valley
3N10
3N32
To Lucerne Valley
18
5
3N16
3N16
4
6
3
Baldwin Lake
2N09
Fawnskin
38
Bear
Lake
Big Bear
City
Sugarloaf
7
To San Bernardino
Big
18
1
Big Bear
Lake
2
Round
Valley
38
2N10
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General Pebble Plain
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2. Sawmill Complex
3. Gold Mountain
4. North Baldwin Lake
5. Arrastre/Union Flat
6. Holcomb Valley
7. South Baldwin Ridge/
Erwin Lake
8. Onyx Peak
9. Coxey Meadow
N
1 Mile

Table 1. Summary of tasks that need to be accomplished to achieve the management goals defined in this guide. When recommended actions involve cooperation with other agencies and organizations, they are listed under "Participating Agencies" as follows: USFS = U.S. Forest Service; TNC = The Nature Conservancy; CDFG = California Department of Fish and Game; FBBVP = Friends of the Big Bear Valley Preserve.

MANAGEMENT GOAL Action	Estimated Cost	Priority	Participating Agencies	Completion Target	Completion Actual
Protect a Range of Pebble Plain Occurrences to Reduce Habitat Loss and Fragmentation					
1. Protect the Horseshoe pebble plain via Landowner Contact Agreement (TNC) on private land and closure of unautorized route on National Forest land.	$1000	2	TNC USFS	1991	
2. Investigate acquisition of private land ("cemetary parcels") at North Baldwin Lake.	$ 500	1	CDFG TNC	1990	
3. Assess the feasibility of acquiring private land at Erwin Lake ("Hamilton Ranch").	$ 500	2	USFS CDFG	1990	
4. Determine feasibility of mineral withdrawal for each population site.	$ 250	3	USFS	1990-1991	
5. Conduct Botanical Investigations of purple monkeyflower, ashy grey paintbrush, Munz's hedgehog, and eyestrain monkeyflower.	$2500 each	1	USFS CDFG? TNC	1990-1996	
6. Refine mapping and determine status of pebble plain species at Onyx Ridge/Broom Flat and Coxey Meadow	$ 500	3	USFS	1992	
Maintain Site Viability					
1. Complete habitat protection project at Upper Sugarloaf to eliminate impacts from vehicle use.	$5000	1	USFS CDFG	1990	
2. Modify walk-through or reroute trail at Sawmill to discourage motorcycle and burro trespass.	$ 750	2	USFS	1990-1991	

Table 1. Continued.

MANAGEMENT GOAL Action	Estimated Cost	Priority	Participating Agencies	Completion Target	Completion Actual
Maintain Site Viability (continued)					
3. Secure South Baldwin Ridge pebble plains through either year round or seasonal closure of the access road or through obscuring access to the habitat itself.	$1000	2	USFS	1991	
4. Install barriers along 3N16 to protect Upper Holcomb Valley sites.	$ 750	2	USFS	1991	
5. Control damage from unauthorized vehicle use by stripfencing at Coxey Meadow.	$ 750	3	USFS	1991	
6. Continue quantitative monitoring annually as prescribed in the monitoring plan.	$2000 per year	1	USFS TNC	ongoing	
7. Increase regular patrol of pebble plain and other sensitive plant habitat. This will also serve as qualitative monitoring.	$ 750 per year	2	USFS	1991	
8. Maintain existing closures.	$ 750 per year	1	USFS	ongoing	
9. Assess need for and feasibility of revegetating Upper Sugarloaf pebble plains. Implement revegetation plan.	$ 5000	3	USFS	1991 1993	
10. Remove *Bromus tectorum* from Sawmill pebble plain.	$ 500	2	USFS TNC	1990 ongoing	
11. Initiate monitoring of burro use and impacts.	$1000	2	USFS TNC	1990 ongoing	
Encourage Compatible Uses and Discontinue Incompatible Uses					
1. Assist Lands and Minerals personnel in revision of common variety mineral permits to eliminate impacts to the Gold Mountain pebble plains.	$ 500	1	USFS	1990	

Table 1. Continued.

MANAGEMENT GOAL Action	Estimated Cost	Priority	Participating Agencies	Completion Target	Completion Actual
Encourage Compatible Uses and Discontinue Incompatible Uses (continued)					
2. Complete a self-guiding interpretive nature trail and brochure for North Baldwin Lake.	$ 750	1	USFS TNC CDFG FBBVP	1990	
3. Complete a self-guiding nature trail and brochure for Arrastre Flat.	$ 750	2	USFS FBBVP	1991	
4. Work with emergency response agencies and organizations to develop appropriate emergency access routes around all areas of pebble plain habitat.	$ 500	3	USFS CDFG	1990	
5. Work with utility companies to eliminate impacts to sensitive plant habitat during maintenance and emergency repair activities.	$ 500	3	USFS CDFG	1990	
6. Work with Lands and Minerals personnel to control annual assessment work on mineral claims to ensure that pebble plains are not impacted.	$ 500	4	USFS	ongoing	

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INTRODUCTION

PURPOSE

The pebble plains (previously known as pavement plains) are recognized as a unique plant community within the Big Bear Ranger District of the San Bernardino National Forest. In addition to being limited in distribution, this community supports eight Forest Service sensitive plant species. The purpose of this document is to compile information known about the community and the sensitive species it supports, provide site status summaries, develop general and site specific management direction, and establish an implementation schedule. Management direction and prescriptions are based on existing general legislation, policies in the Forest Service Manual and direction and standards and guidelines in the Forest Land and Resource Management Plan (LRMP; SBNF 1989). This document is not a decision document and thus is not subject to National Environmental Policy Act (NEPA) regulations. The NEPA process will be followed on a project by project basis.

AUTHORITY, POLICY AND DIRECTION

Because of its limited distribution and associated sensitive species, the pebble plain community is considered a community of special concern (SBNF 1989). It is recognized that National Forest lands will become increasingly important in supporting such communities as private lands become more intensively developed. In addition, increasing pressure will be placed on National Forest land as the human population in southern California grows. However, the Forest Service feels strongly that habitat on privately owned land should also be conserved by state, county and city governments. Federal legislation, policy and direction pertinent to the conservation of this habitat and the species it supports are outlined below.

The Resources Planning Act, as amended by the National Forest Management Act (NFMA), provides statutory direction for managing the Forest System. Section 6 (g) contains the diversity provision. This act states that distinct biological communities or ecosystems that are unique, rare or highly productive warrant management attention.

The Endangered Species Act provides authority for the Forest Service Threatened, Endangered and Sensitive Species Program. Section 2 of the Act declares that "all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the act". Section 5 of the act directs the Secretary of Agriculture to establish a program to conserve fish, wildlife and plants. Section 7 directs Federal departments and agencies to ensure that actions authorized, funded or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species, or result in the destruction or adverse modification of their critical habitats. In order to comply with this act and NFMA, the Forest Service developed the Sensitive Species Program described below.

Title 2600 of the Forest Service Manual (FSM) "Wildlife, Fish and Sensitive Plant Habitat Management" contains Chapter 2670 - "Threatened, Endangered and Sensitive Plants and Animals". This chapter provides direction for the Forest Service to assure that National Forest lands are managed to maintain viable populations of all native plant and animal species. A viable population consists of the number of individuals of a species necessary to perpetuate that species' existence in a natural, genetically stable, self-sustaining condition. It also defines sensitive species as those species that are in need of special management consideration to prevent their decline.

Generally, the objective of the Threatened, Endangered and Sensitive Plant and Animal Program for formally listed species is to manage National Forest System habitats and activities for threatened and endangered species to achieve recovery objectives such that listing is no longer necessary. Objectives for sensitive species are to prevent subsequent listing and maintain viable populations. Development and implementation of management goals and objectives for populations and/or habitat is essential. Species management guides, biological and administrative action documents containing the information and guidance necessary for successful management of a species through time, are developed for this purpose. More specific information on this program can be found in FSM 2670.

Management direction and objectives for all native species including those listed as threatened, endangered or sensitive in the LRMP (SBNF 1989) mirror those in FSM 2670. Specific standards and guidelines from the LRMP for pebble plains can be found under "Status, Threats and Management Actions" in this guide.

NEED AND JUSTIFICATION FOR HABITAT MANAGEMENT GUIDE

A habitat management guide was developed rather than a species management guide because pebble plain habitat supports eight Forest Service sensitive species. It is most cost effective and biologically reasonable to combine a management plan for all of these species where they occur together rather than write individual plans for each species. Ultimately, species conservation is contingent on conservation of the habitat on which they depend.

The intent of this document is not to eliminate protection for sensitive species where they occur off the pebble plains. All known information on the range and distribution of each species and their responses to disturbance has been compiled here in order to further protection goals. Activities that impact these species off of pebble plain habitat will be evaluated as necessary through the National Environmental Policy Act process as required by NEPA and Forest Service Manual 2670.

BIOLOGICAL INFORMATION

HABITAT DESCRIPTION AND DISTRIBUTION

Pebble plain habitat is found only within a 92 square mile area within the Big Bear Ranger District (Figure 1) and is delineated by unique vegetation associations, soil characteristics and climatic factors (Derby 1979a, 1979b Krantz 1981). This habitat is found between 6,000 feet and 7,500 feet elevation (Krantz 1981) and generally lies in areas of less than 25 inches of annual precipitation, though precipitation varies from site to site and precipitation records for individual sites are not available.

Pebble plains are treeless openings in the forest that have been called "islands of endemism" (Krantz 1983). This expression refers to the small, isolated concentrations of endemic plants (i.e. plant restricted in geographic range) that occur within a "sea" of conifer forest. Recognition of the pebble plains and associated habitats as unique and distinct from the surrounding conifer forest and woodland is relatively recent. Floristic and phytosociologic studies (Derby 1979a, 1979b) of the habitat and distributional studies of rare taxa (Krantz 1979, 1980, 1981, 1983) have been completed within the last ten years.

Forty-five plant species are known to comprise the pebble plains flora (Table 1; Derby 1979a, Ciano 1983, Barrows 1988, Neel 1989a and Krantz 1989). Many of these species are relatively restricted in range and distribution (i.e. endemic), while others represent disjunct occurrences of species more common either north or south of the San Bernardino Mountains. The surface of undisturbed pebble plain habitat is composed of between 31% and 38% living vegetation, 15% litter, 45%-47% rock pavement and 0.89%-12% bare soil (Derby 1979, Barrows 1988).

Derby (1979) included three centrally located pebble plains in her quantitative description of the phytosociology of this community. One half of the perennial species occurring on one pebble plain occurred on the other two pebble plains sampled, though the importance of a given species varied between sites. *Arenaria ursina*, *Eriogonum kennedyi* ssp. *austromontanum* and *Poa incurva* consistently ranked among the five highest importance values on each site sampled. Derby (1979) chose the former two species to be indicator species for this habitat because they were endemic to the San Bernardino Mountains in addition to being important at all sites sampled.

Subsequent work by Krantz (1983) revealed that habitat fitting the general physical description of the pebble plains at the east and west ends of the range did not support both *A. ursina* and *E. k.* ssp. *austromontanum*. These sites, Coxey Meadow and Onyx Peak, support other species associated with the pebble plains. At that time, conservation was focused on the more centrally located habitat occurrences that supported the highest densities of endemic species and/or the most "classic" examples of pebble plain. Because of this, little attention has been given to the atypical outlying occurrences. It is appropriate now to refine the description of the community, possibly emphasizing physical or edaphic factors and the form of the vegetation in combination with floristics.

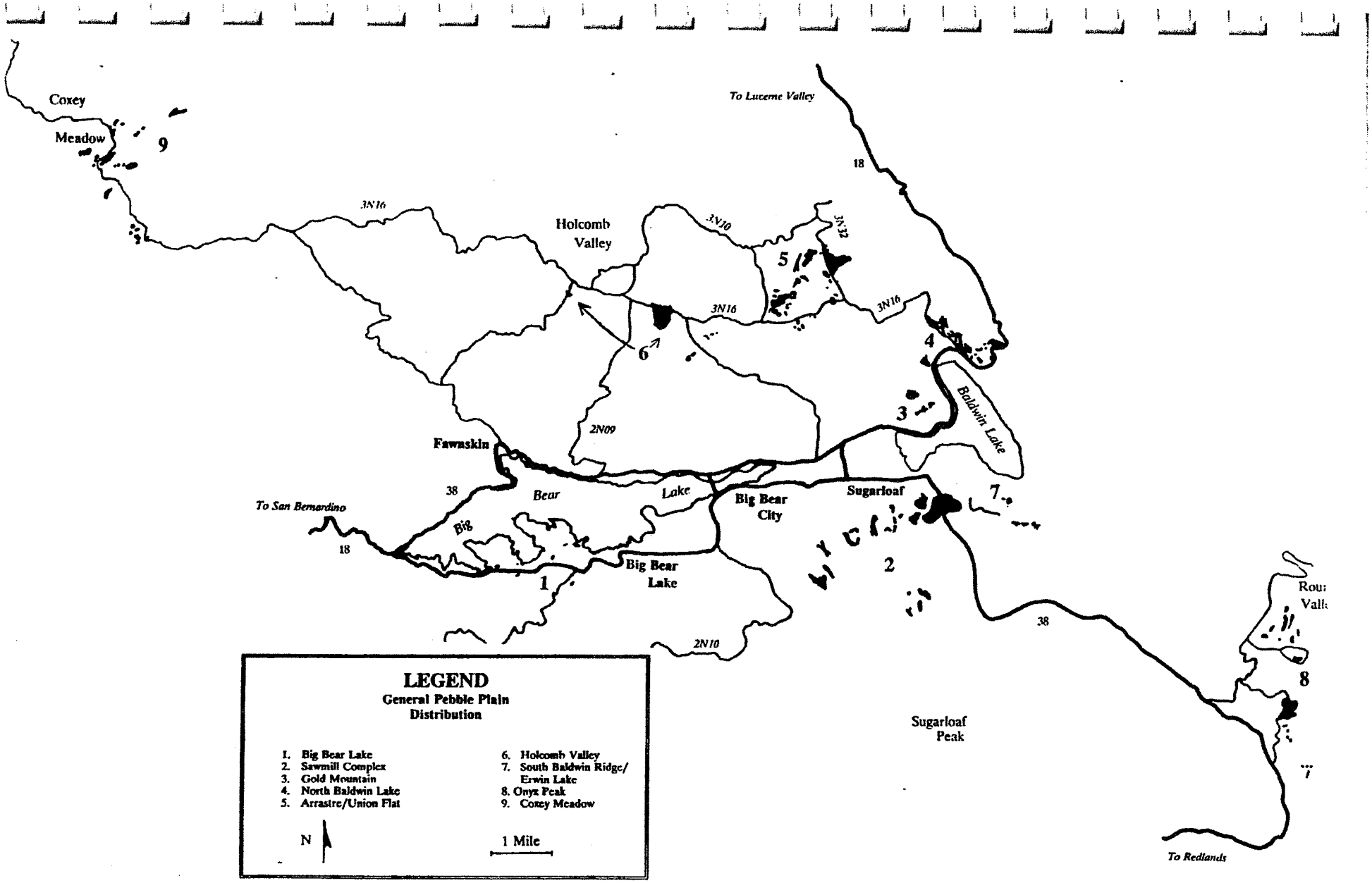

Coxey
Meadow
9
To Luceme Valley
18
3N16
Holcomb
Valley
3N10
3N32
5
3N16
3N16
6
4
3
Baldwin Lake
2N09
Fawnskin
38
Bear
Lake
Big Bear
City
Sugarloaf
7
To San Bernardino
18
Big
1
Big Bear
Lake
2
2N10
38
Sugarloaf
Peak
8
7
To Redlands
LEGEND
General Pebble Plain
Distribution
1. Big Bear Lake
2. Sawmill Complex
3. Gold Mountain
4. North Baldwin Lake
5. Arrastre/Union Flat
6. Holcomb Valley
7. South Baldwin Ridge/
Erwin Lake
8. Onyx Peak
9. Coxey Meadow
N
1 Mile

Table 1. Flora of the pebble plains, San Bernardino Mountains. After Derby 1979, Ciano 1983, Barrows 1988 Neel 1989a and Krantz 1989.

Perennial Species N = 25 or 53%
Allium fimbriatum Wats. var. *fimbriatum*
Antennaria dimorpha (Nutt.) T. & G.
Arabis parishii Wats.
Arenaria ursina Rob.
Artemisia nova A. Nels.
Astragalus purshii Dougl. var. *lectulus* Jones
Bouteloua gracilis (Wild. ex HBK) Lag.
Castilleja cinerea Gray
Draba douglasii Gray var. *crockeri* (Lemmon) C.L. Hitchcock
Dudleya abramsii Rose
Echinocereus engelmannii (Parry) Lem. var. *munzii* (Parish) Pierce & Fosberg
Echinocereus triglochidiatus Engelm. var. *mojavensis* (Engelm. & Bigel.) L.Benson.
Erigeron aphanactis (Gray) Greene var. *congestus* (Greene) Cronq.
Eriogonum kennedyi Port. ex Wats. ssp. *austromontanum* (M. & J.) Stokes
Eriogonum kennedyi Port. ex Wats. ssp. *kennedyi*
Ivesia argyrocoma (Rydb.) Rydb.
Lewisia rediviva Pursh var. *minor* (Rydb.) Munz
Lomatium nevadense (Wats.) Coult. & Rose var. *parishii* Jeps.
Opuntia littoralis (Engelm.) Ckll. var. *piercei* (Fosberg) Benson & Walkington
Poa incurva Scribn. & Will.
Selaginella watsonii Underw.
Sitanion hystrix (Nutt.) J.G. Sm.
Stipa x *Oryzopsis hymenoides* R. & S. Ricker
Viola douglasii Steud.
Yucca brevifolia Engelm. in Wats. var. *brevifolia*

Annual Species N = 22 or 47%
Allophyllum sp.
Androsace septentrionalis L.
Bromus tectorum L.
Chaenactis glabriuscula DC. var. *diffusa* Maguire
Collinsia childii Parry ex Gray
Collinsia parviflora Dougl. ex Lindl.
Cryptantha simulans Greene
Epilobium paniculatum Nutt. ex T. & G.
Erodium cicutarium (L.) L'Her
Gilia diegensis (Munz) A.& B. Grant
Linanthus breviculus (Gray) Greene
Linanthus killipii Mason
Microsteris gracilis (Hook.) Greene ssp. *humilis* (Greene) V. Grant
Mimulus androsaceus Curran ex Greene
Mimulus exiguus Gray
Mimulus purpureus Grant
Mimulus suksdorfii Gray
Muhlenbergia minutissima (Steud.) Swall.
Navarretia breweri (Gray) Greene
Plagiobothrys tenellus (Nutt.) Gray
Plantago purshii R. & S. var. *oblonga* (Morris) Shinners
Sagina occidentalis Wats.

Typical forest tree species surrounding pebble plains include *Pinus jeffreyi*, *Pinus monophylla* and *Juniperus occidentalis* ssp. *australis*. Tree establishment on the plains is thought to be inhibited by high clay content in the soil (Derby 1979). Extreme diurnal and seasonal variation in soil temperature and reduced soil moisture are likely factors that help to create the special conditions to which the endemic species have adapted, or at least that they can tolerate. However, trees appear capable of becoming established occasionally. Once established, trees alter the surrounding microhabitat by increasing leaf litter and shading and probably by reducing temperature extremes. Derby (1979a) found lower densities of *Arenaria ursina*, *Castilleja cinerea* and *Eriogonum kennedyi* ssp. *austromontanum* where leaf litter was abundant under trees. The number of tree and shrub seedlings were also increased under the canopy of overstory trees.

Plants of the pebble plains show several physical adaptations to their harsh environment. Included are prostrate growth habit, high reflectivity of the vegetative parts and leaf succulence. Of course, not all pebble plains plants show all adaptations. This assemblage of cushion plants seems to occur wherever the proper physical conditions are present. This distribution may be similar to that of plants endemic to serpentine soils which are not so much adapted to require the ultramafic soils, but instead are able to tolerate the unusual mineral composition of the soils that most species cannot. Serpentine endemics are not, however, able to compete with more vigorous vegetation off the serpentine. In the same way, it is thought that pebble plain species are not able to survive in the shade or where heavy litter layer builds up.

Acreage

Pre-European pebble plain acreages are not known, however it is estimated that about 700 acres of habitat might have existed (Krantz 1988; pers. comm.). Most of this acreage was lost to inundation of Big Bear Lake, subsequent urbanization of the valley and more recently, vehicle activity. National Forest land supports approximately 514 acres and private land supports approximately 31.6 acres of the remaining relatively undegraded habitat. Approximately 10 acres of habitat on private land is protected by either the California Department of Fish and Game (CDFG) or The Nature Conservancy (TNC). Acreage of pebble plains on National Forest land represents approximately 0.30% of the total acreage of the Big Bear Ranger District (using the figure 130,700 acres; this does not include private inholdings on the district).

Sensitive Species and Genetic Diversity

The pebble plains naturally occur as fragmented patches of habitat. Distributions and abundances of rare species vary on different pebble plains. Table 2 summarizes the California Native Plant Society status, California Natural Diversity Data Base rank (CNDDB), U.S. Fish and Wildlife Service status and Forest Service status as well as the distribution of all sensitive species associated with the pebble plains. Information on the biology and distribution of individual species is compiled in Appendix B.

Quantitative data on species composition are available only from Sawmill, Arrastre Flat, Union Flat, Van Dusen and Gold Mountain (Derby 1979, Ciano 1983, Barrows 1988). Derby (1979) found that actual importance values of species varied between sites. However, *Arenaria ursina* and *Eriogonum kennedyi* ssp. *austromontanum* consistently ranked highly at all sites sampled. Ciano (1983) examined species variability on pebble plains in relation to island biogeographic theory. She found that species diversity was negatively correlated with distance from other pebble plains and positively correlated with size of the pebble plain; thus larger pebble plains located closer to other pebble plains had more higher species diversity.

Little information on genetic diversity of populations within or between pebble plains is available. Ciano (1983) examined the genetic variability of *Arenaria ursina* populations and the possible factors regulating genetic diversity within and between pebble plains at Sawmill, Arrastre Flat and Gold Mountain. Her findings indicate a high degree of genetic variability for six populations of *Arenaria ursina*; polymorphic loci were present in 57% to 86% of the individuals in the different populations. Curiously, genetic variability was lower in larger pebble plains, contrary to what one might expect. Overall, Ciano's (1983) data suggest that little differentiation has occurred between these habitat islands. Similar quantitative information is not available for other pebble plain species or sites.

A study of the pollination biology and genetic variability of *Ivesia argyrocoma*, *Eriogonum kennedyi* ssp. *austromontanum* and *Castilleja cinerea* is being carried out by the Center for Conservation Biology (Freas 1988). Preliminary results indicate that little genetic material is exchanged between pebble plain patches. In

Table 2. Rare plant species associated with pebble plain habitat, with their California Native Plant Society status, USFWS status, CNDDB rank and USFS status and distribution. A complete key to the codes in the table can be found in Appendix A as well as in Smith and Berg (1988).

Species Name	CNPS List and R-E-D Codes	USFWS Status	CNDDB Rank	USFS Status	Species Distribution 1	2	3
Arabis parishii Parish's rock cress	1B; 2-2-3	C2	G2S2.1	S	x		
Arenaria ursina Bear Valley sandwort	1B; 2-2-3	C1	G2S2.1	S	x		
Castilleja cinerea Ashy-gray paintbrush	1B; 2-2-3	C2	G2S2.2	S		x	
Echinocereus engelmannii var. *munzii* Munz's hedgehog cactus	4; 1-2-2	C2	G5T2S2.2	S			x
Eriogonum kennedyi ssp. *austromontanum* Kennedy's buckwheat	1B; 2-2-3	C2	G4T1S1.1	S	x		
Ivesia argyrocoma Silver-haired Ivesia	1B; 1-2-2	C2	G3S3.2				x
Linanthus killipii Baldwin Lake Linanthus	1B; 2-3-3	C2	G2S2.2	S	x		
Mimulus exiguus Eyestrain monkey flower	1B; 2-2-2	C2	G2S2.2	S			x
Mimulus purpureus ssp. *purpureus* Purple monkey flower	1B; 2-3-3	C2	G3T2S2.2	S	x		

fact, observed pollen transfer distances were less than four meters. There is still the possibility that extremely infrequent pollen dispersal between pebble plains does occur. The significance of this occasional gene flow is not known. Seed dispersal of pebble plain species also appears to be limited. Seed traps monitored between August and November of 1988 did not capture seeds of pebble plains species at distances greater than five meters from a pebble plain edge. However, seed traps do not estimate dispersal by animal vectors, thus seed movement by animals has not been addressed. Electrophoretic data from this study are not yet available. However, preliminary data indicate that no population differentiation will be found in *Eriogonum kennedyi* ssp. *austromontanum*. Perhaps this lack of differentiation is a result of strong consistent selective pressures maintaining similarities at least on the centrally located pebble plains that have been sampled.

Species most commonly associated with the pebble plain community also occur in small patches in openings in the forest between pebble plains. The role of these fragmented occurrences in gene flow between plains is not known but may be significant. For this reason, careful evaluation of impacts to these occurrences is critical.

Response to Disturbance

The responses of the pebble plains and associated species to specific management treatments have not been investigated systematically nor thoroughly. In general, the physiognomy of the pebble plains and the high percentage of rock substrate suggest that fire has not been an important factor in shaping this community. Fuels are limited and discontinuous and probably would not carry most wildfires, thus the pebble plains may act as natural fuelbreaks. However, the introduction of annual grasses, such as *Bromus tectorum*, on the pebble plains might cause a fire to spread more readily.

Where a wildfire swept through habitat occupied by *Arenaria ursina* and *Eriogonum kennedyi* ssp *kennedyi* at Onyx Ridge, *Arenaria ursina* showed a vigorous response with resprouting and fruiting by many plants. On the contrary, *Eriogonum kennedyi* showed neither resprouting from burned plants nor seedling germination after fire (Krantz 1981). The response to fire of other rare species has not been observed or described.

Wild burros roam the Big Bear basin and are known to forage in and around pebble plain and wet meadow habitats. The effects of burro grazing and trampling are not known. Burros are seen frequently in the fall and winter at North Baldwin. Hoof prints in wet clay soils and browsed plants have been noted. Burros have also been observed regularly on the Gold Mountain and Sawmill Complex pebble plains. Unfortunately, observations have not been systematically made or recorded so use levels and potential impacts cannot be assessed at this time.

Impacts from vehicles and from foot trampling are also of concern. Vehicles can cause considerable damage to this habitat and all pebble plains have at least some degree of road development. Wheels of vehicles catch clumps of *Eriogonum kennedyi* ssp. *austromontanum* and pull them out of the ground. Plants may also be ground down under repeated vehicle use. Some pebble plains (eg. Upper Sugarloaf) have been completely devegetated. During the wet season, vehicles create deep ruts that both directly disturb vegetation and change water flow patterns over the pebble plains potentially indirectly affecting larger areas. Recovery of pebble plains plant species has been good on slightly disturbed road beds. It remains to be seen how well natural regeneration will occur on more severely disturbed areas.

Community Ranking

The CNDDB ranks plant communities based on their rarity and the threats they face in a manner similar to the ranking of species which are described in Appendix A. Pebble plain habitat is ranked G2S2.1. This rank indicates a high level or rarity and endangerment, with between 6 and 20 extant sites with a high degree of threat at each. However, the G2S2 ranking indicates that there are more than 2000 extant acres of habitat; because less than 1000 acres remain, pebble plain habitat actually warrants a G1S1 ranking. Because a number of habitat occurrences are basically protected, the threat ranking could justifiably be reduced to 2, provided protective measures are maintained.

Each pebble plain complex is assigned an occurrence number to enable tracking of specific occurrences. The numbers used in this document are sequence of three sets of digits. The first set refers to the forest

number, which for the San Bernardino National Forest is 12. The second set corresponds to the CNDDB community code, while the third set refers to the occurrence number. These occurrence numbers do not correspond to individual species occurrence numbers because most of the sensitive species that occur on pebble plains also have occurrences off of pebble plains.

Geology and Soils

The San Bernardino Mountains are part of the Transverse Ranges Geomorphic Province of California. The compression that caused the uplift of the mountains most likely began a minimum of 6.2 million years ago. The uplift of the mountains is occurring as a result of the San Andreas fault is pushing the Pacific Plate against the Mojave crustal block. Diblee (1975) provided evidence that the Mojave crustal block was probably on the desert floor during the late Tertiary and early Quaternary.

Pebble plains have formed in areas where shallow clay deposits occur in association with saragosa quartzite cobbles or gravels. The red color and the structure of the clay soils indicates they were formed during a warmer, wetter period and/or over an extremely long period of time. Basalt lava flows deposited over these clays and quartzite gravels in various places provide evidence for ages of at least 6-7 million years, at the time of and before the uplift of the mountains. These deposits also seem to be homologous with deposits that were once extensive in what is today the Mojave Desert (Sadler 1989; pers. comm.).

These clay soils and quartzite fragments probably once occurred over much of the mountain range, however they apparently eroded away as the mountains were uplifted or have been buried by more recent deposits. The soils of pebble plains such as the Sawmill Complex and Nelson Ridge appear to be relictual surface examples of these deposits. The soils of other pebble plains, such as Arrastre Flat and the base of South Baldwin Ridge near Erwin Lake, more likely represent redeposition of the original deposits.

The clay deposits belong primarily to the Deep Morical, Hodgson family complex and are deep, well drained soils formed from weathered granitic and metamorphic rock. They are composed of clay with intermixed angular fragments of Saragosa quartzite. These soils have an extremely slow infiltration rate, and thus have a high runoff potential. Because of the flat terrain and the impermeability of the clay soil, water tends to pool on the surface. However, once water has infiltrated the surface, it drains readily but not rapidly. The erosion hazard of Hodgson Family soils is moderate, as rainfall and slopes are moderate. However, vehicle passage in wet conditions increases soil puddling or breakdown in natural soil aggregates (structure), and severe rutting from tires may occur.

The quartzite cobbles appear to have been deposited at various times and under various circumstances; however, they were most likely deposited primarily before the uplift of the mountains, and certainly before the present topography was realized. Quartzite cobbles continue to be deposited today from Gold Mountain, near Delamar Mountain and from Sugarloaf Ridge near Onyx Summit. While they occur at every pebble plain site, these cobbles are distributed differently throughout the soil column at different sites (Sadler 1989; pers. comm). Through frost heave and alternative wet dry cycles, cobbles are forced to the surface of a pebble plain, creating the "pebble" or "pavement" part of the pebble plains (Derby 1979, Krantz 1987). These cobbles also show varying degrees of rounding or angularity. Sadler (1989; pers. comm.) has correlated the degree of rounding with distance from the original source. Present day drainage patterns cannot explain the distribution of quartzite cobbles. Sadler (1989; pers. comm.) has spent a considerable amount of time reconstructing ancient drainage patterns that have been disrupted through faulting and uplift of the mountains to explain quartzite deposit patterns. The story is still incomplete and is worthy of further research.

ASSOCIATED HABITATS

Two other habitats are generally associated with the pebble plains. Both have characteristic species and physical characteristics by which they are delineated. These habitats and their characteristic species are:

1. Vernal Wet Meadows - *Sidalcea pedata*, *Thelypodium stenopetalum*, *Poa atropurpurea* and *Taraxacum californicum*.

2. Vernal Annuals (associated with annual creeks) - *Mimulus exiguus*, *Orthocarpus lasiorhynchus* and *Mimulus purpureus*.

STATUS, THREATS AND MANAGEMENT RECOMMENDATIONS

HISTORIC AND PRESENT USES

Big Bear Valley was first entered by Europeans in the mid 1800's. Soon after, gold was discovered and towns such as Belleville and Doble grew in response to the mining activities. The mines were not sufficiently rich to support these communities over the long-term and they were abandoned. Intensive sheep and cattle grazing occurred from the late 1860's to the 1940's. During the same time, Big Bear became popular as a resort and remains so today. Site specific histories are described under each site summary.

Increasing human pressure has resulted in the loss and degradation of unique plant and animal habitat. In response, the Big Bear Valley Preserve has been established at 15 target areas where significant occurrences of habitats such as pebble plain, vernal annual and wet meadow, and perch and roost sites for Bald Eagles remain. Eight preserve target areas support pebble plain habitat. Six of these are partially or wholly managed by the Forest Service in cooperation with TNC through a Memorandum of Understanding (1989). The other sites are managed by the Nature Conservancy through a Cooperative Management Agreement with CDFG (North Baldwin Lake), a Landowner Contact Agreement (Metcalf Bay), a conservation easement (Castle Glen), and an informal agreement with landowners (Eagle Point). In addition, a five-acre parcel at Sugarloaf is owned by The Nature Conservancy; this site was established as a "biota bank" for off-site mitigation of development in the Big Bear Valley.

Pebble plain habitat occurs in both the Big Bear and Back Country Management Areas as designated by the San Bernardino National Forest land and Resource Management Plan (SBNF 1989). Six of the pebble plains lie within the Holcomb Valley/North Baldwin Lake Special Interest Area. Three pebble plains lie within Wildlife Management Emphasis Zones, two within Recreation Management Emphasis Zones, one within a Range/Wildlife Management Emphasis Zone, two within Wildlife/Watershed Management Emphasis Zone and one within a Custodial Management Emphasis Zone.

THREATS

Proximal threats to pebble plain habitat tend to be site specific, however there are some general threats affecting or potentially affecting most sites. Some threats to pebble plain habitat are localized in that they will not impact an entire pebble plain equally. Other threats are likely to affect all parts of a pebble plain equally. The general threats to pebble plain habitat are outlined below:

1. Off-Highway-Vehicle (OHV) use or unrestricted vehicle access, particularly during winter months. This activity has impacted all pebble plain sites to varying degrees.
2. Urbanization - primary threat to sites on private land.
3. Alteration of surface hydrology (generally as a result of previous threats). The long term effects of this threat are not known.
4. Burros - whether wild burro grazing and trampling is a threat and to what degree is not known.
5. Forest encroachment - succession.
6. Invasion of exotic species.
7. Forest Service management activities.
8. Mining operations.
9. Fuelwood harvest.
10. Global climate change.

The Management Plan for the Big Bear Burro Territory (1982) established a feral burro territory of approximately 35,000 acres in the Big Bear area. The Territory Management Plan calls for maintenance of a populations of approximately 60 adults. The herd is protected under the Wild Free-Roaming Horse and Burro Act (16 U.S.C. 1331-1340 1971). The Gold Mountain, North Baldwin, Sawmill and South Baldwin Ridge complexes lie within the burro territory and/or use areas.

The threat of global climate change is potentially the most serious threat in that it could entirely negate short-term habitat improvement or protection projects. More extreme variation in weather patterns can be expected to be common in the near future if climate change models are accurate. The severe drought being experienced at this time may be an indication of future conditions. Little is known of the potential effects of climate change on natural communities in general and nothing is known of potential effects on

pebble plain habitat specifically. Many pebble plain species appear to be drought adapted, at least in morphological features and their ability to survive extended dry periods. However, the ability to reproduce successfully in drought years, such as 1989, appears to be limited (Neel 1989). Because the Forest Service has no way to manage a changing climate and because little is known of the potential effects of this threat, it is not discussed in further detail in this document. It is however considered to be important and the pebble plain monitoring program is being designed in part to track potential vegetation changes over time.

GENERAL HABITAT GOALS

The goals detailed here have been developed directly from the San Bernardino National Forest Land and Resource Management Plan (SBNF 1989). Forest-wide standards and guidelines from the LRMP for pebble plain habitat include maintenance of genetic and geographic diversity and viable populations of species supported by pebble plain habitat. The LRMP also provides direction to establish refugia that best represent the pebble plain endemics and other sensitive plant species associated with pebble plains. Baldwin Lake, Gold Mountain, Arrastre Flat and Holcomb Valley are specifically mentioned as refugia sites.

The Forest LRMP (SBNF 1989) encourages land ownership adjustments to acquire lands with important habitat for threatened, endangered or sensitive species. Minerals withdrawals are to be considered when mining would potentially conflict with management direction. Direction to reestablish threatened, endangered or sensitive species in historic or suitable habitat is also provided (SBNF 1989).

Forest-wide standards and guidelines also state the Forest will close roads and trails immediately when use is causing or is likely to cause unacceptable effects. These effects include damage to threatened, endangered and sensitive plant and wildlife habitat and the inability to protect adjacent resources.

General goals for all pebble plains that will ensure meeting Forest management direction and standards and guidelines are outlined below.

1. Conserve pebble plain habitat over a broad geographic range to spread the risk of possible loss of habitat due to catastrophic events. Conserving this habitat throughout its geographic range will also serve to maximize genetic diversity and thus the increase the probability that populations will have the potential to adapt to changing environmental conditions.
2. Eliminate or reduce continued fragmentation of habitat.
3. Maintain or enhance viability of sites.
4. Encourage uses in pebble plain areas that are compatible with the long-term conservation of the habitat. This action will increase public awareness and appreciation of sensitive species and habitats.

The following activities are not permitted on or near pebble plain habitat. Adherence to these restrictions will help to meet the goals outlined above.

1. Vehicles, including emergency vehicles, are not allowed on pebble plains, unless approved by the District Ranger.
2. Special use permits will not be issued if impacts to pebble plain habitat will result.
3. Collection of sensitive plant species is prohibited except through permit from the Regional Forester.
4. Pebble plain habitat will not be used in any way during emergency activities including fire camp, vehicle or helitac staging areas or fuel break construction unless approved by the District Ranger.
5. Ground disturbing activities will be evaluated on a case by case basis and will be limited to those which can be mitigated. One of the persons listed below will be contacted prior to ground disturbance in known or suspected pebble plain habitat.

Implementation of the following actions, which are applicable at all or several pebble plain sites, will also help to meet the goals described above:

1. Work with the emergency response organizations to develop agreeable emergency routes into all areas of pebble plain habitat.
2. Work with utility companies to ensure that impacts resulting from maintenance and emergency repairs are avoided or kept to a minimum.
3. Increase regular patrol of sensitive plant areas including pebble plains. Many of these habitat areas are already in regularly patrolled areas so this would not require much additional effort on the part

of the Fire Prevention Technicians and other Level II or Level IV trained personnel. It will require some time to familiarize field personnel with the areas of concern and Forest Service direction and responsibilities in threatened, endangered and sensitive species protection. Each patrol person maintains a handbook on the enforcement issues in their unit. A section on sensitive species will be added to these handbooks.

4. Limit fuelwood harvest around pebble plain habitat. For the most part fuelwood harvest does not impact pebble plain habitat. However, pebble plains are susceptible to vehicle trespass because the forest and understory surrounding them tend to be sparse, thus providing no vegetative barriers. Fuelwood harvest around the perimeter of pebble plains or in the areas of vehicle closure that would serve to further reduce vegetative cover will be avoided.
5. Control assessment work on mining claims to avoid damage to pebble plain habitat. Mineral rights have been claimed on or near several pebble plains including the National Forest at lands adjacent to the Starland Tract and at South Baldwin Ridge and North Baldwin Lake. Upon receipt of Notices of Intent to Operate or Operating Plans, the validity each claim will be checked as required in the Land and Resource Management Plan (SBNF 1989).
6. Evaluate the feasibility of withdrawal from mineral entry for each pebble plain occurrence.
7. When they are needed, construct access routes supporting resource and recreation activities around and away from pebble plain habitat.

SITE SUMMARIES

The occurrences described below are based on field reconnaissance and have been mapped using a combination of 1:10,000 air photos and 1:24,000 orthographic photos. Acreages were estimated using a dot grid on 1:24,000 topographic quadrangles. Acreages are included in the text and are summarized in Table 3.

Habitat occurrence numbers are based on Krantz (1981, 1983) but have been altered slightly. Here occurrences are based on isolation, both spatial and elevational. Occurrences of different pebble plains are combined into complexes when there is no appreciable separation. Pebble plains within complexes presumably have comparable origins. Some complexes are clearly clustered and isolated from other complexes, making their delineation clear cut. In other cases the inclusion of some outlying plains into a complex is admittedly somewhat arbitrary. Differing management status and land ownership within complexes is noted.

Big Bear Lake Complex (USFS; Private; TNC; Occurrence 12-1576-1).

Site: This occurrence is represented by a series of habitat fragments remaining on vacant lots in the City of Big Bear Lake (Figure 2 & 3). Specific sites include Aspen Glen, Metcalf Bay (Presbyterian Conference Center), Eagle Point and Castle Glen.

Meadows at Eagle Point support a scattering of *Castilleja cinerea* however, *Eriogonum kennedyi* ssp. *austromontanum* and *Arenaria ursina* are lacking. A small fragment of habitat remains on a lot on Eagle Point. The occurrence at Castle Glen includes several small, scattered pebble plains adjacent to a small drainage. *Arenaria ursina*, *Arabis parishii* and *Castilleja cinerea* are present.

Acreage: Approximately 2.5 acres of habitat remain in this complex. Extirpation of unknown acreage has resulted from creation of Big Bear Lake Reservoir and the subsequent development of its shoreline.

Protection Status: Aspen Glen, the only site in this complex managed by the USFS, is small, relatively degraded and lacks *E. k.* ssp. *austromontanum*. It lies along the hiking and horse trail that leads east from Aspen Glen Picnic Area. In 1988 horse traffic from the Magic Mountain Stables increased the width of the trail here. This use was restricted to a narrower path to eliminate further damage.

Castle Glen is protected through a Conservation Easement by Big Bear Properties, Inc. and is managed by The Nature Conservancy. Limited damage by vehicles occurred prior to protection.

Threats: Primary threats to this complex include development of unprotected private sites, trampling from horses and hikers, natural chance extirpation of small habitat fragments and the effects of genetic drift on these small, isolated populations. Due to the isolated and fragmented nature of this complex, long-term conservation of these sites is not a high probability.

Table 3. Summary of acreage, ownership and general status of pebble plain occurrences. O.P. = other private.

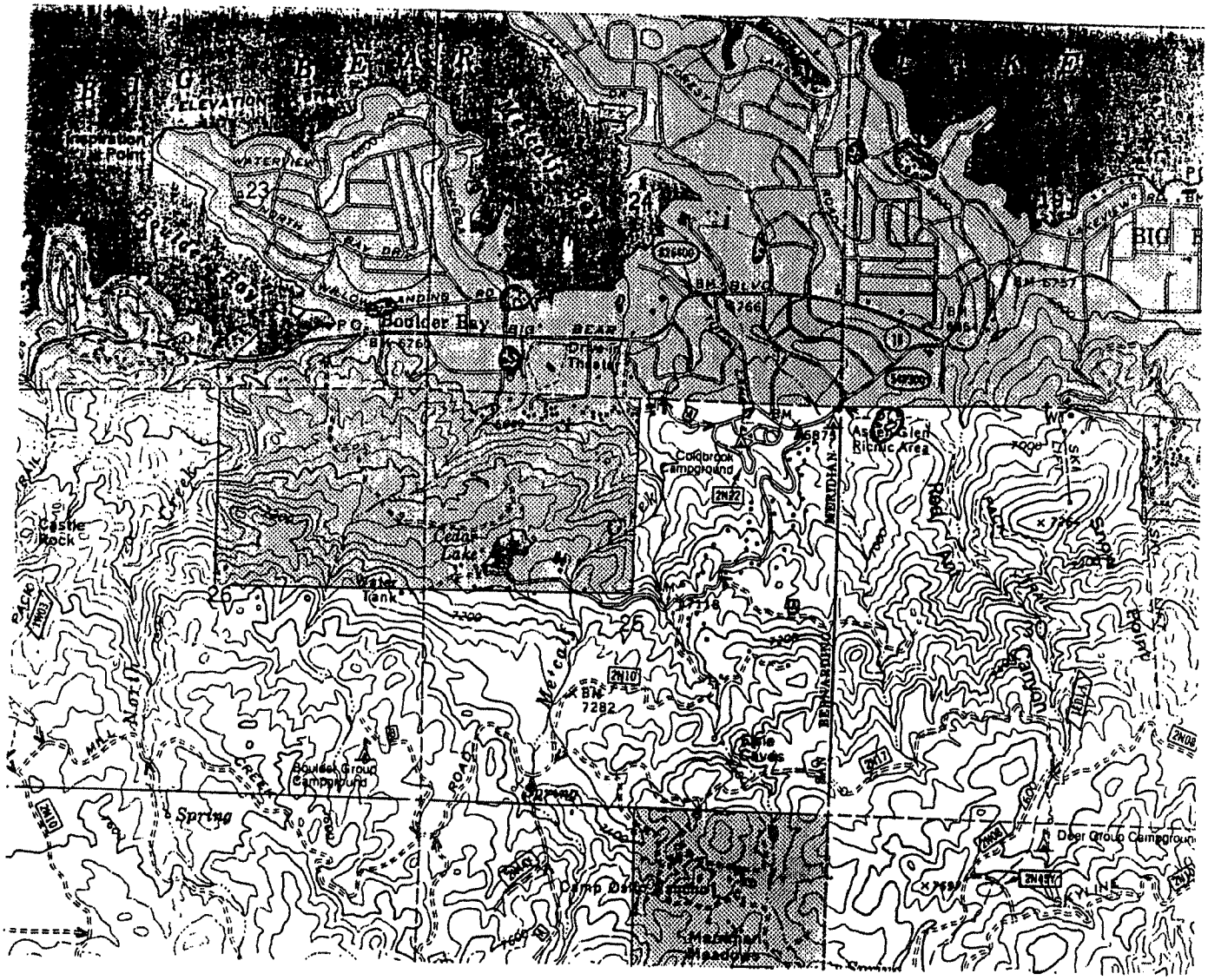
SITE	STATUS & CONDITION	PROTECTION STATUS	ACREAGE USFS	TNC	CDFG	O.P.	THREATS
BIG BEAR LAKE							
Aspen Glen	Small, degraded	Unprotected	0.5	-	-	-	Recreation
Metcalf	Very degraded	Protected by TNC Landowner agreement	-	0.5	-	-	Recreation
Castle Glen	Slight disturbance	Protected by TNC	0.5	-	-	-	Vehicle trespass
Miscellaneous		Unprotected	-	-	-	1.0	
Total			0.5	1.0	-	1.0	
SAWMILL COMPLEX							
Sawmill	Slight disturbance	Fenced perimeter	10.2	-	-	-	Occasional motorcycles
Upper Sugarloaf	Declining	Protection in progress	8.7	-	-	-	OHV use
Lower Sugarloaf	Slight disturbance	Fenced perimeter	-	5.8	-	-	None
Horseshoe	Declining	Unprotected	4.3	-	-	7.2	OHV use
Other		Good Landowner Contact site					
Total Extirpated			1.5			298.9	
Total Extant			21.7	5.8	-	7.2	

Table 3. Continued.

SITE	STATUS & CONDITION	PROTECTION STATUS	ACREAGE USFS	TNC	CDFG	O.P.	THREATS
GOLD MOUNTAIN							
Upper	Good condition	Protected by road closures	14.5	-	-	-	Vehicle trespass
Lower	Good condition	Protected by road closures	8.7	-	-	-	Vehicle trespass
Total			23.2	-	-	-	
NORTH BALDWIN LAKE							
Mojave View	Good condition	Protected by road closures	8.0	-	-	-	Burros?
Saddle	Limited vehicle damage, tracks	Fenced	5.0	-	-	-	Old roads
Knoll	Old roads, utility lines/road	Fenced	15.0	-	-	2.0	Burros?
Others	Good condition	Fenced	50.8	-	1.5	-	Burros? Mining
Total			78.8	-	1.5	2.0	
HOLCOMB VALLEY							
Upper	Disturbed by pine plantings, vehicles campground	Unprotected	58.0	-	-	-	Vehicles in winter, mining
Lower	Impacted by vehicle damage	Fenced	1.5	-	-	-	Mining
Van Dusen	Good condition	Protected due to isolated location	25.0	-	-	-	None known
Total			84.5	-	-	-	

Table 3. Continued.

SITE	STATUS & CONDITION	PROTECTION STATUS	ACREAGE USFS	TNC	CDFG	O.P.	THREATS
ARRASTRE/UNION FLAT							
Arrastre Flat -High	Damaged by roads	Protected by road closures	53.6	-	-	-	Vehicle trespass
Arrastre Flat -Low	Same as above	Same as above	8.7	-	-	-	"
Union Flat -High	Mostly undisturbed Some roads	Protected by road closures	63.8	-	-	-	Vehicle trespass
Union Flat -Low	Same as above	Same as above	24.7	-	-	-	"
Starland	Good condition	Fenced	1.5	1.5	-	-	Mining
Total			152.3	1.5	-	-	
SOUTH BALDWIN RIDGE/ ERWIN LAKE							
Ridge	Limited vehicle damage	Unprotected	3.0	-	-	-	Vehicle access Mining
Toe of Slope	Undisturbed	Unprotected	3.0	-	-	11.6	Development
Total			6.0	-	-	11.6	
ONYX RIDGE	Relatively Undisturbed? Not well known	Unprotected	75.4	-	-	-	Not known
COXEY MEADOW	Not well known	Unprotected	72.5	-	-	-	Vehicle access

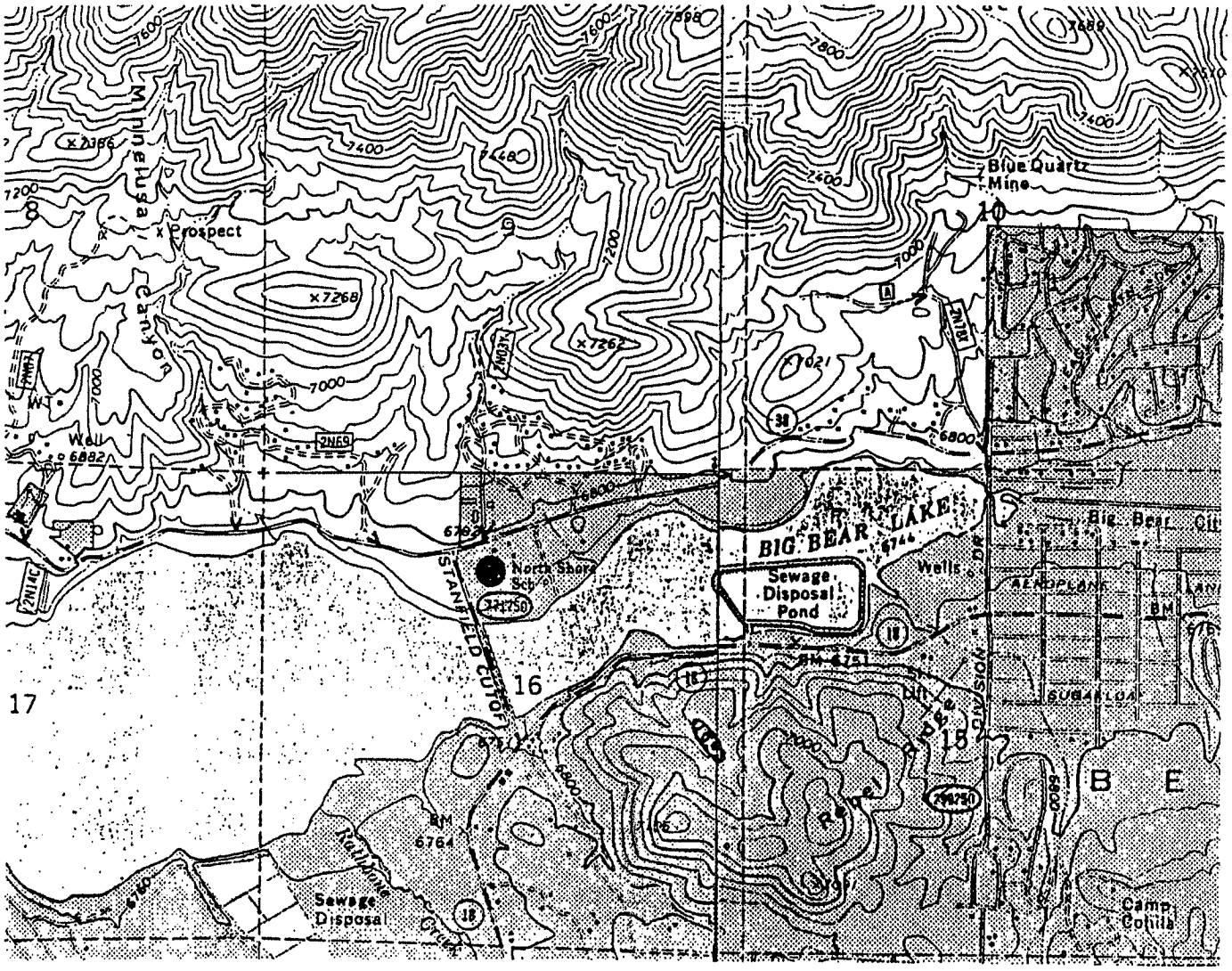


LEGEND

Pebble Plain Habitat

1 mile = 2 5/8 inches

Figure 2. Big Bear Lake, Occurrence 12-1576-1, western portion.



N

LEGEND

Pebble Plain Habitat

1 mile = 2 5/8 inches

Figure 3. Big Bear Lake, Occurrence 12-1576-1, eastern portion.

Action Needed: Because of the low probability of long-term conservation of the Aspen Glen site and its relatively low quality habitat, this site is a low priority for management and protection. However, continued monitoring of Magic Mountain stable activity to prevent further habitat degradation is warranted.

Management Emphasis: The Aspen Glen site is in a Recreation Management Emphasis Zone.

Sawmill Complex (USFS; TNC; Private; Occurrence 12-1576-2).

Site: Included in this complex of pebble plains are Sawmill, Horseshoe, Sugarloaf, Upper Sugarloaf and a series of patches that extend eastward past Highway 38 (Figure 4).

Acreage: Approximately 298 acres of habitat were essentially extirpated by development while 5.8 acres were lost due to vehicle impacts. Approximately 38 acres of viable habitat remain today.

Protection Status: The Sawmill pebble plain was completely fenced in September 1987. Walk-throughs at the north and south ends of the closure maintain access to a partially devegetated vehicle track which bisects the plain. This track is an extremely popular walking trail used by local residents. Access to this trail was maintained to encourage interpretation of the pebble plain habitat and to allow for public enjoyment. The impact of occasional foot travel on the existing path has been considered acceptable. Signs reading "Critical Rare Plant Habitat. No Vehicles" were installed in August 1989 at both walk-throughs to advise the public of the nature of the closure.

The Horseshoe pebble plain remains unprotected and is declining due to unrestricted vehicle access along and off the road that bisects the habitat. This site is partially on National Forest land and partially on private land. The open terrain and dual ownership make this site difficult to adequately protect without cooperation of the landowner.

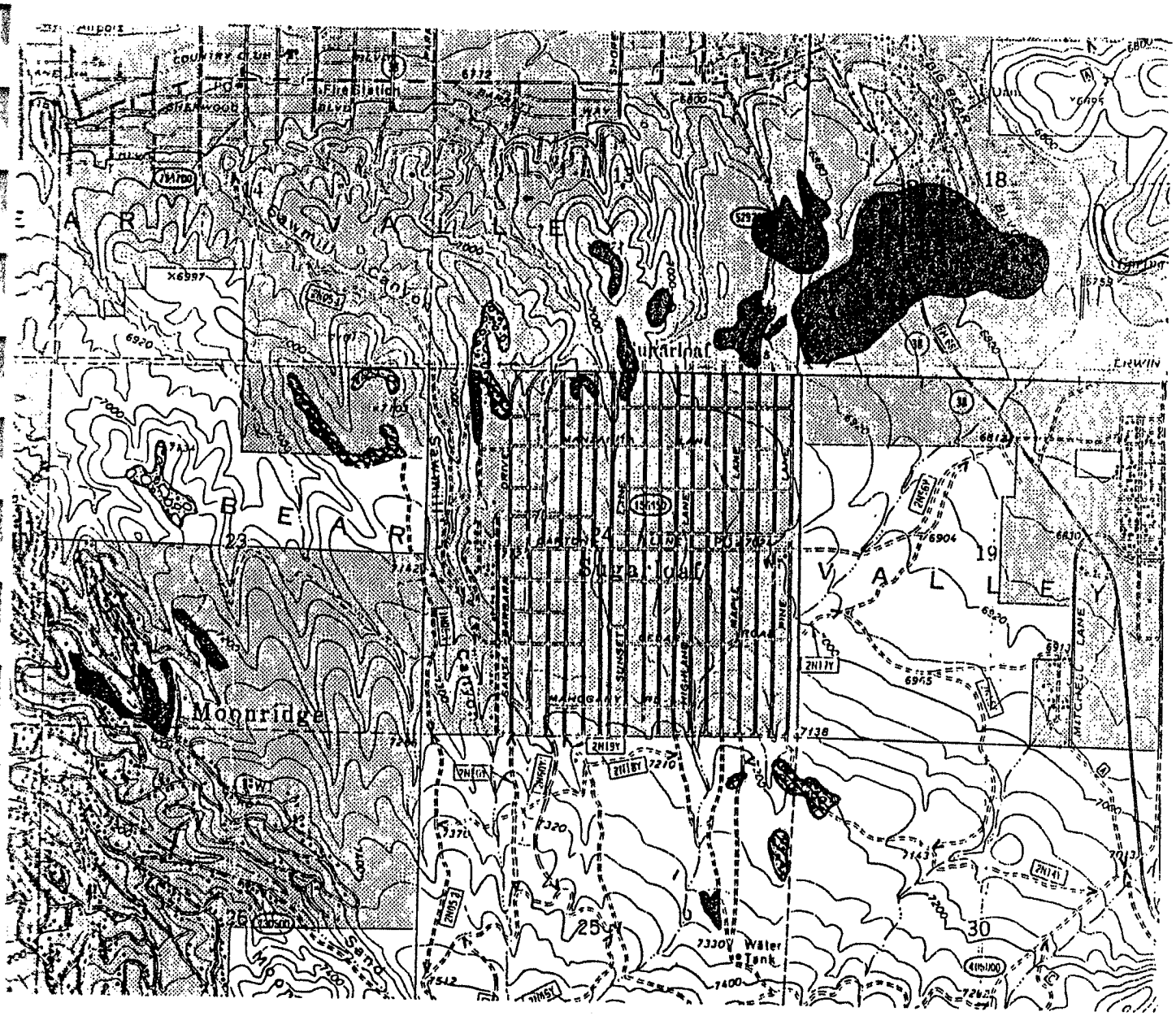
An additional 10 acres of pebble plain habitat to the northwest of Sugarloaf, not adjacent to National Forest land, was dedicated partly in fee and partly in conservation easement to The Nature Conservancy as an off-site mitigation or "biota bank" in 1982. This property was initially fenced in 1986 to prevent unrestricted access along a road bisecting the pebble plain. Fencing was completed in 1988. There is a walk-through at the southern end of the parcel that provides access for walkers and inadvertently for burros.

The USFS managed Upper Sugarloaf pebble plains are located immediately south of the town of Sugarloaf and remain unprotected. Access to the area for woodcutting and other recreational activities has resulted in an intricate network of unauthorized roads. One pebble plain (termed the "Deveg" pebble plain) is completely devegetated as a result of heavy vehicle use. *Eriogonum kennedyi* ssp. *austromontanum* and other pebble plain species are now found only around the margins of this plain. Other pebble plains in this immediate area are severely impacted and are declining.

Threats: The pebble plains here are threatened by development, vehicle use, burro trampling and grazing and invasion of exotic cheat grass (*Bromus tectorum*). Illegal vehicle use is a threat at all sites, even at the relatively protected Sawmill pebble plain where trespass into the closed area continues to be a problem.

Action Needed: Walk-throughs will be reconstructed at Sawmill Pebble plain to restrict vehicle access. This reconstruction should also eliminate burro access. If vehicle trespass continues to be a problem even after the walk-throughs are reconstructed, trail closure or relocation around sensitive habitat will be considered. Non-street legal vehicles are prohibited in this area at all times and street legal vehicles are allowed only on authorized roads. Regular patrolling of this site would increase public awareness and encourage compliance with posted regulations.

A habitat protection project funded cooperatively by the USFS and the CDFG at Upper Sugarloaf is in progress. After this project is completed, the feasibility of revegetating the Deveg Pebble Plain should be evaluated. This site would be a good place to experiment with revegetation of disturbed pebble plains because it is almost entirely denuded of vegetation with only a few *Eriogonum kennedyi* ssp. *austromontanum* individuals remaining around the edges. An experimental design incorporating different treatments, including no manipulation, could provide information on rates of natural reestablishment and on the feasibility of revegetating other partially disturbed pebble plains.



LEGEND

Pebble Plain Habitat - extant

Pebble Plain Habitat - declining

Pebble Plain Habitat - extirpated

1 mile = 2.5 inches

Figure 4. Sawmill Complex, Occurrence 12-1576-2. A = Sawmill, B = Horseshoe and C = "Deveg".

The Horseshoe pebble plain could be protected by restricting vehicle access to the habitat. The Forest Service alone can protect only half of the habitat. A landowner contact agreement initiated by The Nature Conservancy that would enable closure of the unauthorized vehicle route through the habitat would be logical to enable protection of the entire site.

Bromus tectorum is very limited on the Sawmill Pebble Plain, and eradication will be attempted in spring of 1990. However because abundant sources for reinvasion are present, chances of successful eradication are low. The distribution of this weed on the Sawmill pebble plain will be carefully monitored.

Management Emphasis: This pebble plain complex lies both within Watershed/Wildlife (Upper Sugarloaf) and Custodial (Horseshoe, Sawmill) Management Emphasis Zones.

Gold Mountain (USFS Occurrence 12-1576-3).

Site: These pebble plains lie on a bench on the southwest flank of Gold Mountain overlooking Baldwin Lake (Figure 5).

Acreage: This site is composed of two separate pebble plains termed Upper and Lower Gold Mountain comprising a total of approximately 23 acres of habitat.

Protection Status: Forest Road 3N69 and unauthorized vehicle routes passed through both the upper and lower pebble plains. The forest road was relocated and the unauthorized routes were closed in the summer of 1988 with funds from the California Green Sticker Program. Vehicle trespass continued to be a problem through spring of 1989. Extra barriers were placed throughout the summer to reduce this problem. Additionally, this area was closed to woodcutting in the fall of 1989.

Threats: Compaction and erosion from unrestricted vehicle use due to four wheel drive, woodcutting and rock collecting (common variety minerals) activity are concerns for this occurrence. Burros frequent this area and are often seen on the pebble plains. Evidence of mining activity can also be found around the pebble plains in this area.

This area is difficult to access and is not regularly patrolled. Trespass into the area closed to vehicles is common and is rarely, if ever, controlled.

Action Needed: Monitoring and enforcement of the recent wood cutting closure through increased patrol of this area is critical for ensuring the success of the existing habitat protection project.

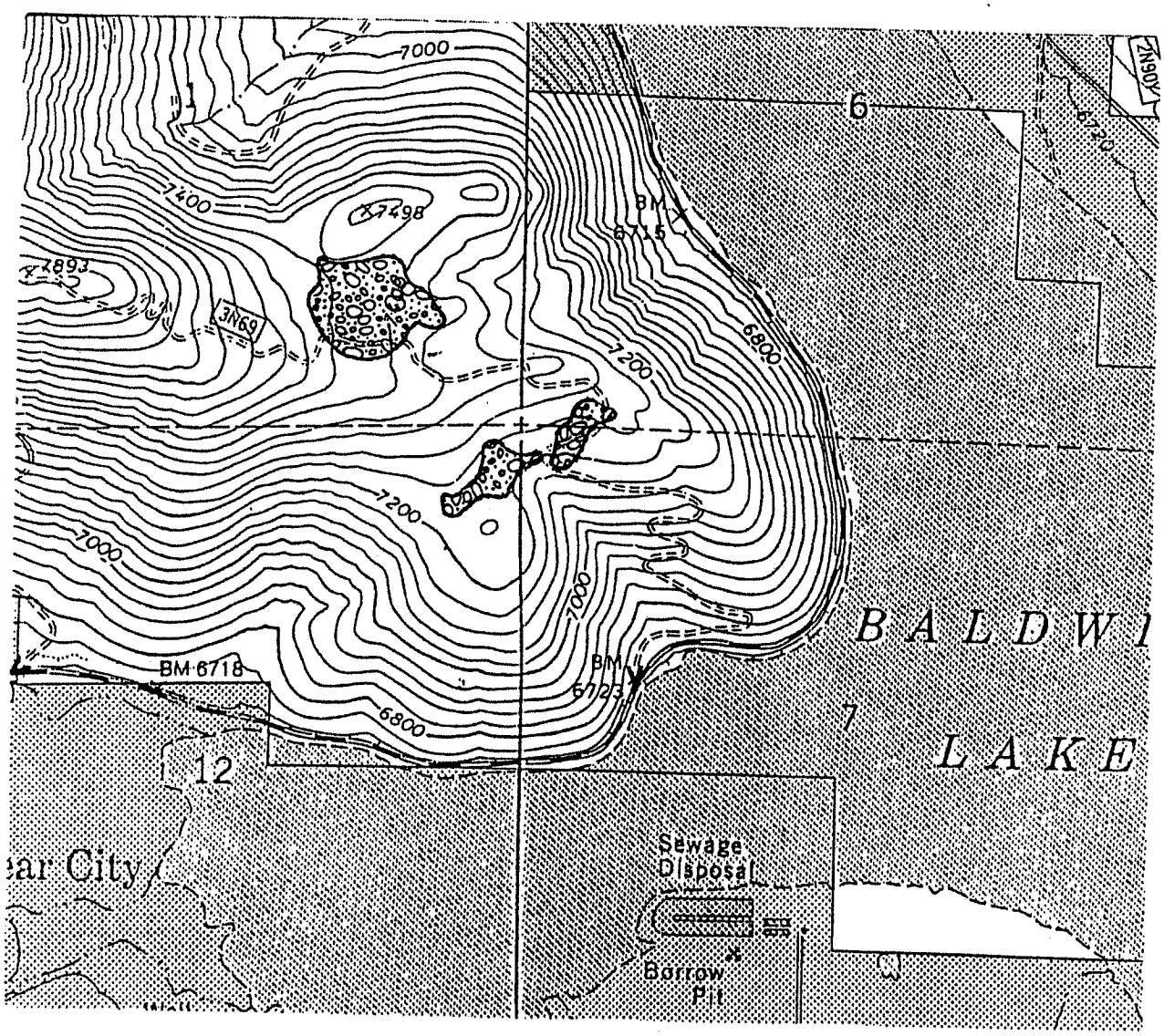
Common variety mineral activities need to be limited to designated quarries and areas accessible only from authorized roads. Revision of the permitting procedure for common variety minerals is needed and was initiated in fall 1989. If significant trespass into the closure continues, winter closure of Forest Road 3N69 will be considered to provide reliable protection for this habitat during the most vulnerable season.

Continued closure of newly created unauthorized routes will be necessary to maintain the existing closure.

Management Emphasis: These pebble plains lie within the North Baldwin Lake/Holcomb Valley Special Interest Area. They are also within a Wildlife Management Emphasis Zone.

North Baldwin Lake (USFS, CDFG, TNC; Occurrence 12-1576-4).

Site: This area supports several large pebble plains over a 2.5 square mile area (Figure 6) and is the focus of cooperative management of sensitive resources by the Forest Service, TNC and CDFG. TNC purchased 320 acres at this site to protect pebble plain and wet meadow habitat. Part of this property was exchanged to the Forest Service and part of it was sold to the CDFG in 1986 with the understanding that these lands will continue to be managed for the conservation of the unique habitats they support. A separate management plan has been written for the CDFG owned lands in this area which will soon be designated as an Ecological Reserve. A detailed history of this site can be found in the CDFG plan (Barrows 1989).



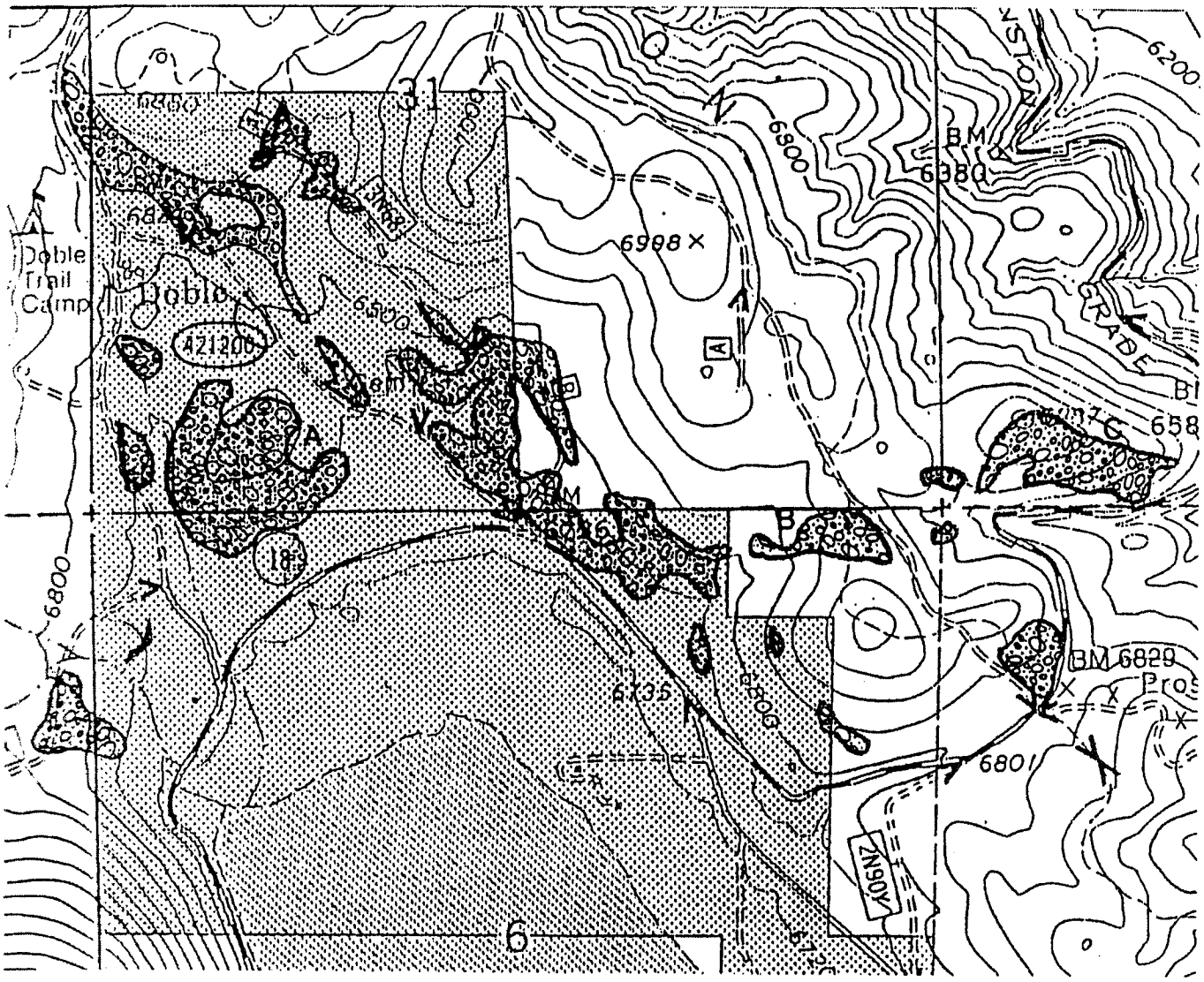
LEGEND

Pebble Plain Habitat

1 mile = 4 inches

N

Figure 5. Gold Mountain, Occurrence 12-1576-3



LEGEND

Pebble Plain Habitat

1 mile = 5 1/4 inches

N

Figure 6. North Baldwin Lake, Occurrence 12-1576-4. A = The Knoll, B = The Saddle, C = Mojave View.

Southern California Edison (SCE) and Bear Valley Electric Company (BVEC; formerly Southern California Water and Electric) own and operate 33 kilovolt overhead power lines through this area. Access roads for repair and maintenance of these lines are present. The "Ute" line, owned by SCE, also runs through the area but does not significantly impact pebble plain habitat. A portion of the BVEC system crosses the "Knoll" pebble plain and vehicle use for repair and maintenance of this line is a constant source of disturbance to the pebble plains.

A self-guided nature trail is being developed in conjunction with the California Department of Fish and Game and TNC. A visitor center is being built by the Friends of the Big Bear Valley Preserve, TNC and the CDFG.

Acreage: Approximately 82 acres of pebble plain habitat are found in this complex.

Protection Status: Most of the pebble plain and wet meadow habitat has been fenced on both sides of Holcomb Valley road and along most of the frontage of Highway 18.

Nelson Ridge supports several pebble plains including the northeastern most one, Mojave View. Until 1988, Forest Road 3N65 traversed the ridge between Highway 18 and Holcomb Valley Road; many spur roads accessed the entire North Baldwin area east of the Holcomb Valley Road from here. Vehicle trespass into TNC owned property was a significant problem. Forest Road 3N65 is now closed to public vehicle use; a gate at the east end provides emergency access. The west end of the road was closed by personnel from the County landfill in 1987, however, trespass still occurs through the land fill itself.

Threats: Vehicle trespass, mining activity, development and burros remain as threats at this site. Impacts from maintenance and improvement of the utility lines in the area are of concern.

A private inholding of three parcels remains between the Knoll pebble plain and Highway 18. This property supports both wet meadow and pebble plain habitat. This pebble plain habitat would be vulnerable to direct losses if this parcel were to be graded or developed. In addition to direct impacts, meadow habitat owned by CDFG could be impacted indirectly if drainage patterns on the inholding parcels were altered. Also, the entire North Baldwin area west of Holcomb Valley Road is accessible through this property and thus is vulnerable to continued vehicle disturbance.

Action Needed: Every effort will be made to acquire or assist in the acquisition of the inholding parcels to protect the integrity of the unique plants and habitat in the area. In the meantime, fencing or other barriers along the National Forest boundary, between sections 6 and 31 would significantly reduce the vulnerability to vehicle trespass from Highway 18 through this property.

The brochure for the interpretive trail is in progress and will be completed by March 1990. The trail will be completed soon after. An interpretive display will be developed for the Horse House interpretive center. This display will include a map of the Big Bear area featuring wildlife and plant viewing areas, especially the preserve target areas. Photographs and interpretive text will accompany the map. This display will be funded through the Eyes on Wildlife Program.

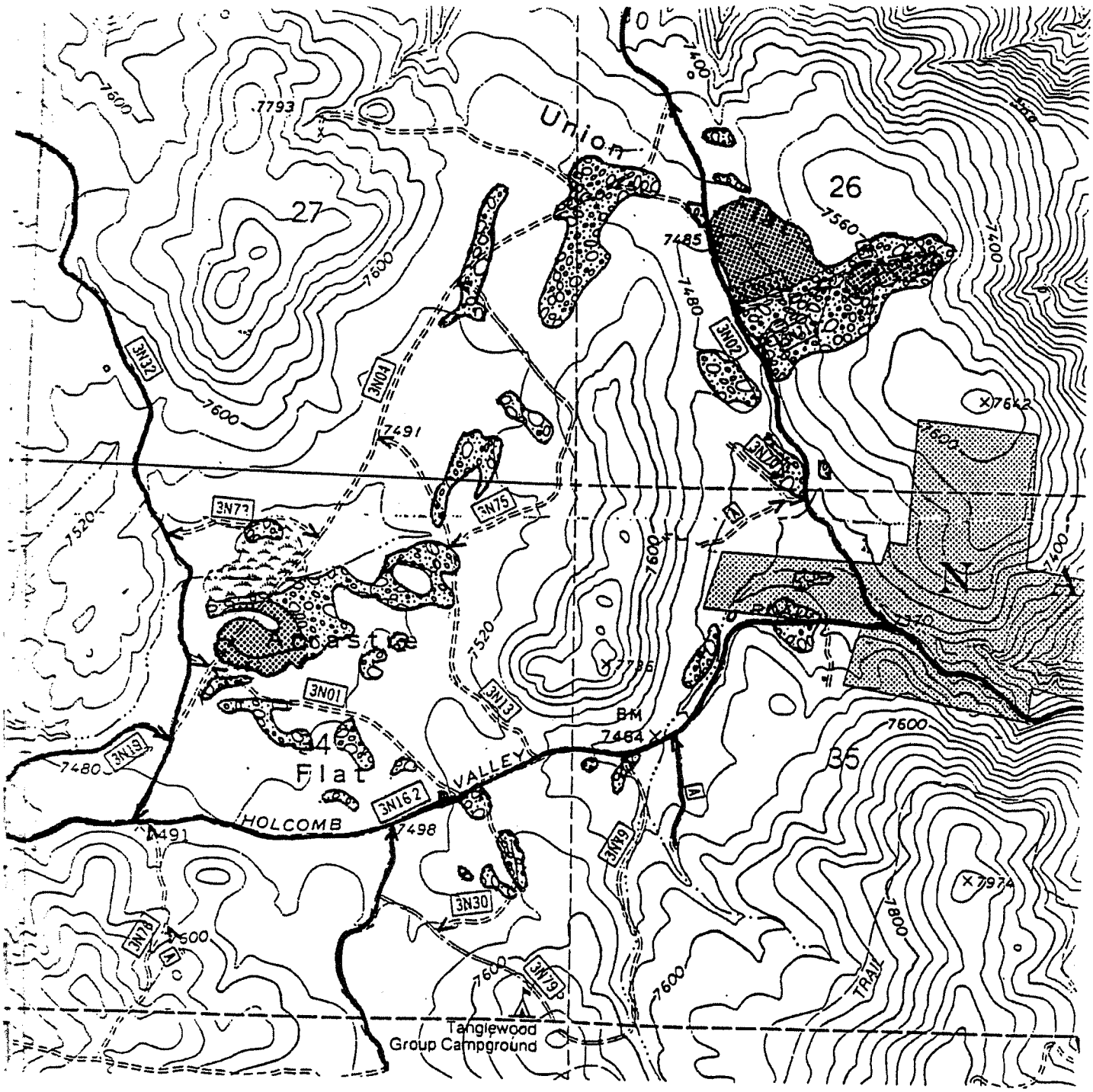
Monitoring of burro use levels and impacts resulting from this use is needed.

Management Emphasis: This pebble plain complex lies within the North Baldwin Lake/Holcomb Valley Special Interest Area. It also lies within a Wildlife Management Emphasis Zone.

Arrastre Flat/Union Flat (USFS; Occurrence 12-155).

Site: The occurrence is a large scattered complex of habitat ranging from high quality (i.e. high densities of cushion plants that characterize the pebble plains) to low quality (i.e. high densities of Great Basin sagebrush or with scattered juniper trees; Figure 7). Small patches of pebble plain habitat are scattered throughout the forest in the area and it is too difficult to accurately map each fragment. Figure 8 shows the area supporting small habitat patches in addition to the more continuous habitat.

Acreage: The approximately 154 acres of pebble plain here form the largest extant habitat complex.



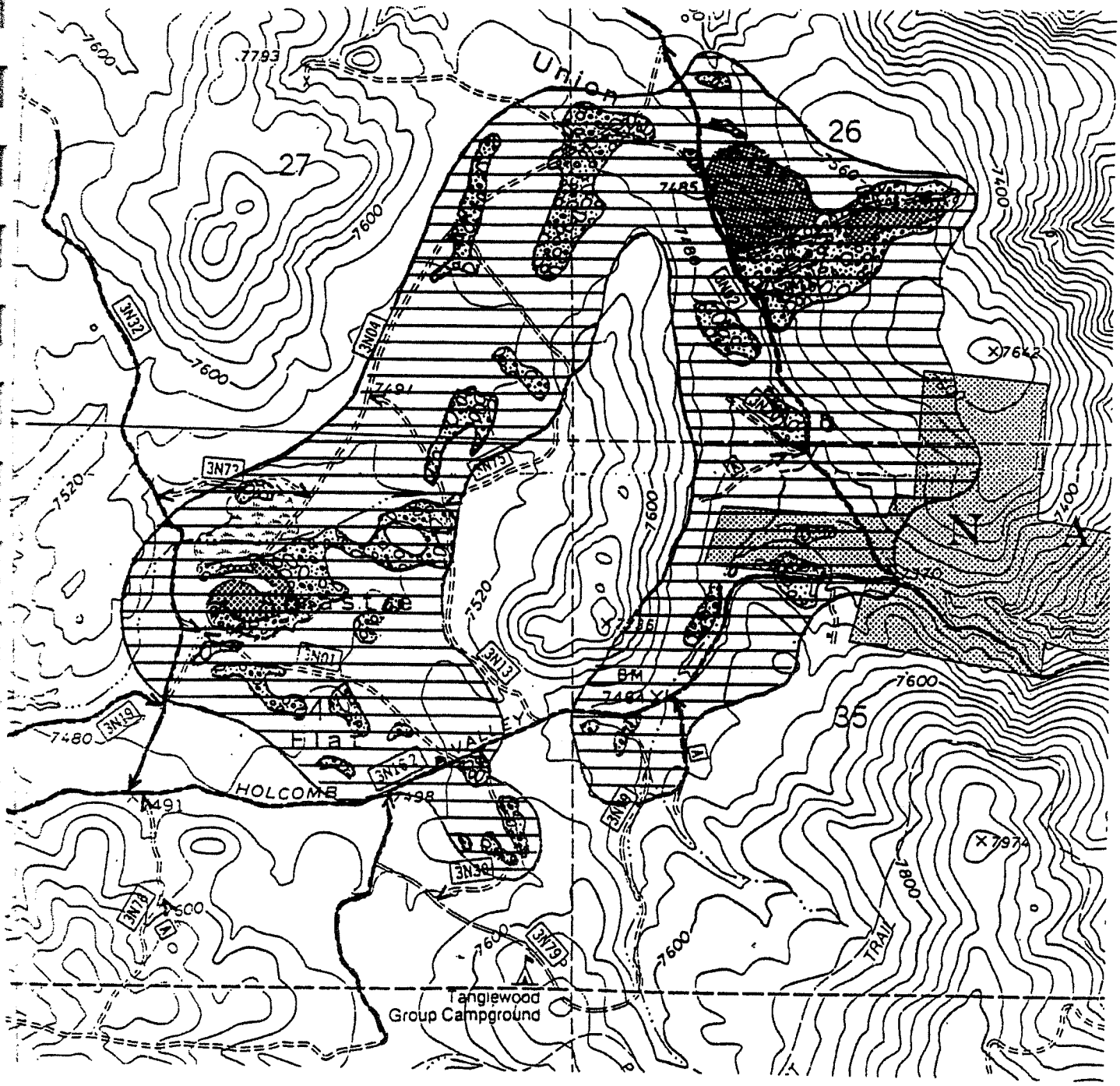
LEGEND

- Pebble Plain Habitat - high quality
- Pebble Plain Habitat - low quality
- Meadow Habitat
- Roads open to vehicle use

1 mile = 4 inches

N

Figure 7. Arrastre Flat/Union Flat, Occurrence 12-1576-5.



LEGEND

- Pebble Plain Habitat - high quality
- Pebble Plain Habitat - low quality
- Meadow Habitat
- Area Supporting Scattered Pebble Plain Patches
- Roads open to vehicle use

1 mile = 4 inches

N

Figure 8. Arrastre Flat/Union Flat, Occurrence 12-1576-5, showing areas in which pebble plain fragments are scattered throughout the forest.

Protection Status: Habitat here has been impacted by illegal vehicle activity and unrestricted access to the pebble plains. A temporary, winter closure of roads providing access to these pebble plains was instituted in 1987. Permanent closure and rerouting of these roads was completed in winter 1988. Monitoring of the recovery of this habitat from disturbance was initiated in 1989. Decal signs mounted on 1/4 inch steel set in concrete have been positioned at key locations. The signs read, "Help us conserve this sensitive plant habitat. Careful foot travel welcome but please, no vehicles".

After fencing, some roads in this area were ripped to discourage vehicle trespass around fences by removing visual evidence of passable roads. In addition, ripping reduces compaction and it was thought that this might enhance vegetation recovery. Initial observations indicate that ripping enhances erosion and may encourage invasion by exotic species. However, monitoring data (Neel 1989a) did not show significant differences between frequency of introduced species on ripped versus unripped roads.

The pebble plains at Union Flat are relatively undisturbed, though several Forest system roads crossed the largest pebble plain. Occasional vehicle tracks can also be found on the pebble plains here. Closure of the system roads crossing habitat was completed during the winter of 1988.

Threats: Vehicle trespass into the closure is a continuing threat at this site. This vehicle activity appears to be related to woodcutting. Some habitat in this area is under mining claim and thus is threatened by potential ground disturbance related to mining activities.

Action Needed: The existing closure needs to be patrolled and enforced. Continued fencing will be necessary where new unauthorized routes are started. All existing fences need to be maintained.

The possibility of establishing an interpretive trail here will be evaluated. The existing roads provide a potential trail route so that no habitat disturbance would be necessary.

Water bars will be installed to control erosion on ripped roads as necessary.

Management Emphasis: This pebble plain complex lies within the North Baldwin Lake/Holcomb Valley Special Interest Area. It also lies within a Recreation Management Emphasis Zone.

Holcomb Valley (USFS; Occurrence 12-1576-6).

Site: This occurrence includes Upper Holcomb Valley, Van Dusen (Figure 9) and Lower Holcomb Valley (Figure 10) pebble plains. The Upper Holcomb Valley site is unusual in that it supports more trees and is not as open as many other sites. It may represent a later stage of successional forest encroachment onto the pebble plains.

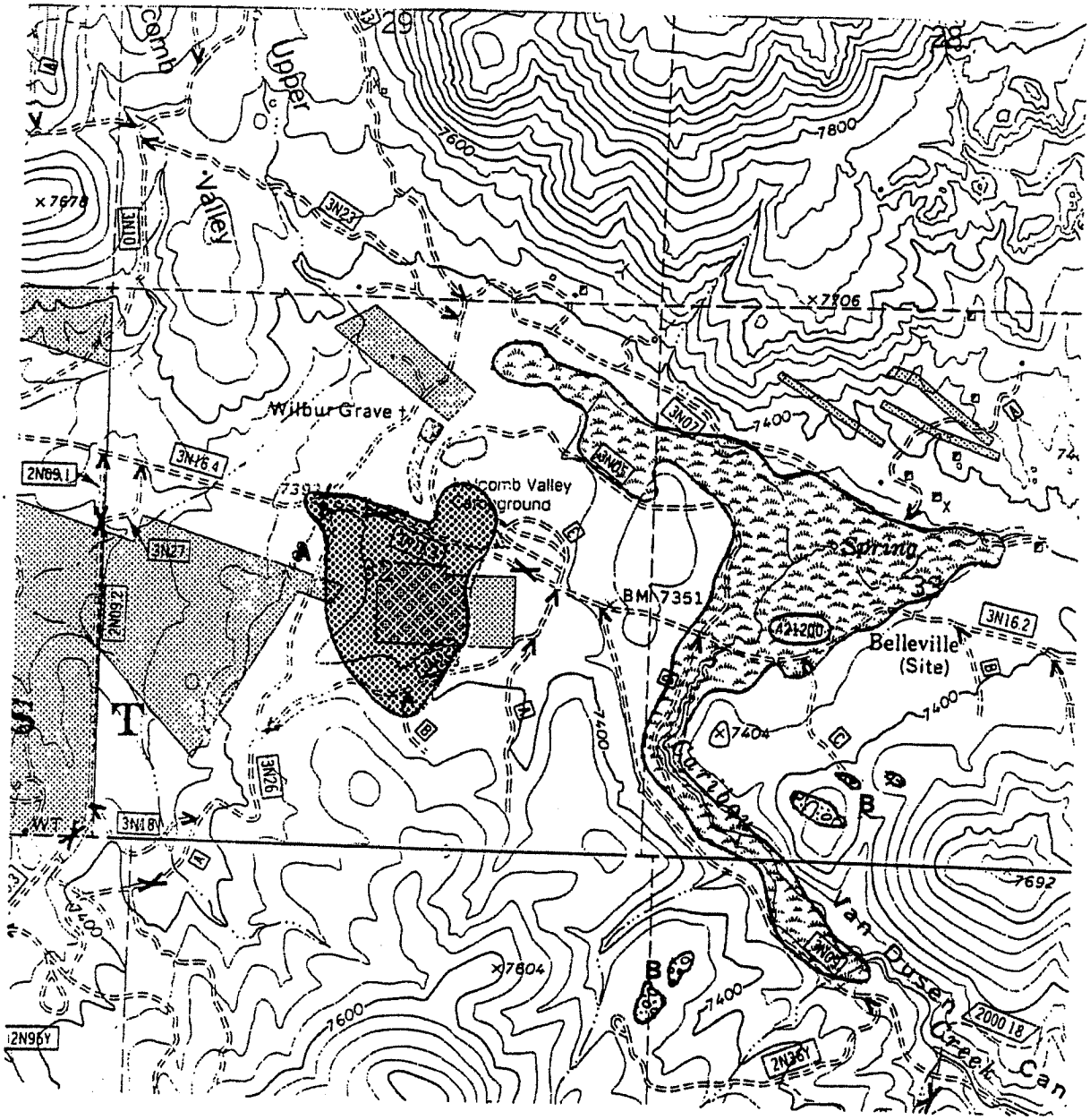
Acreage: Approximately 58 acres of low quality pebble plain habitat is present at Upper Holcomb Valley. 1.5 acres of pebble plain habitat remain in Lower Holcomb Valley and 25 acres are found in the Van Dusen area.

Protection Status: The unprotected Upper Holcomb Valley site has been impacted by silvicultural treatments, campground development and vehicle damage, particularly during the wet season.

Lower Holcomb Valley is essentially protected. This site was heavily impacted by vehicle activity prior to protection. The section of Forest Road 3N12 that passes through this area is extremely slick and muddy after rain or snow. It became a popular wet season play area. Consequently, the road became increasingly wide, and vehicles often did not stay on the roads. This site was fenced as off-site mitigation for destruction of habitat of *Arabis parishii* by Pleuss-Staufer, California (PSC) in 1987. The fencing has controlled heavy vehicle activity.

The Van Dusen pebble plains are relatively undisturbed and relatively well protected simply due to their location.

Threats: There is a low point in the road where Forest Road 3N16 intersects the Upper Holcomb Valley pebble plain. Water accumulates in this low point in the winter. Vehicles pull onto the pebble plain to avoid this puddle and cause the widening of the road onto the pebble plain. The low spot was partially built up in 1988 with material from PSC's Claudia limestone quarry.



LEGEND

Pebble Plain Habitat - high quality

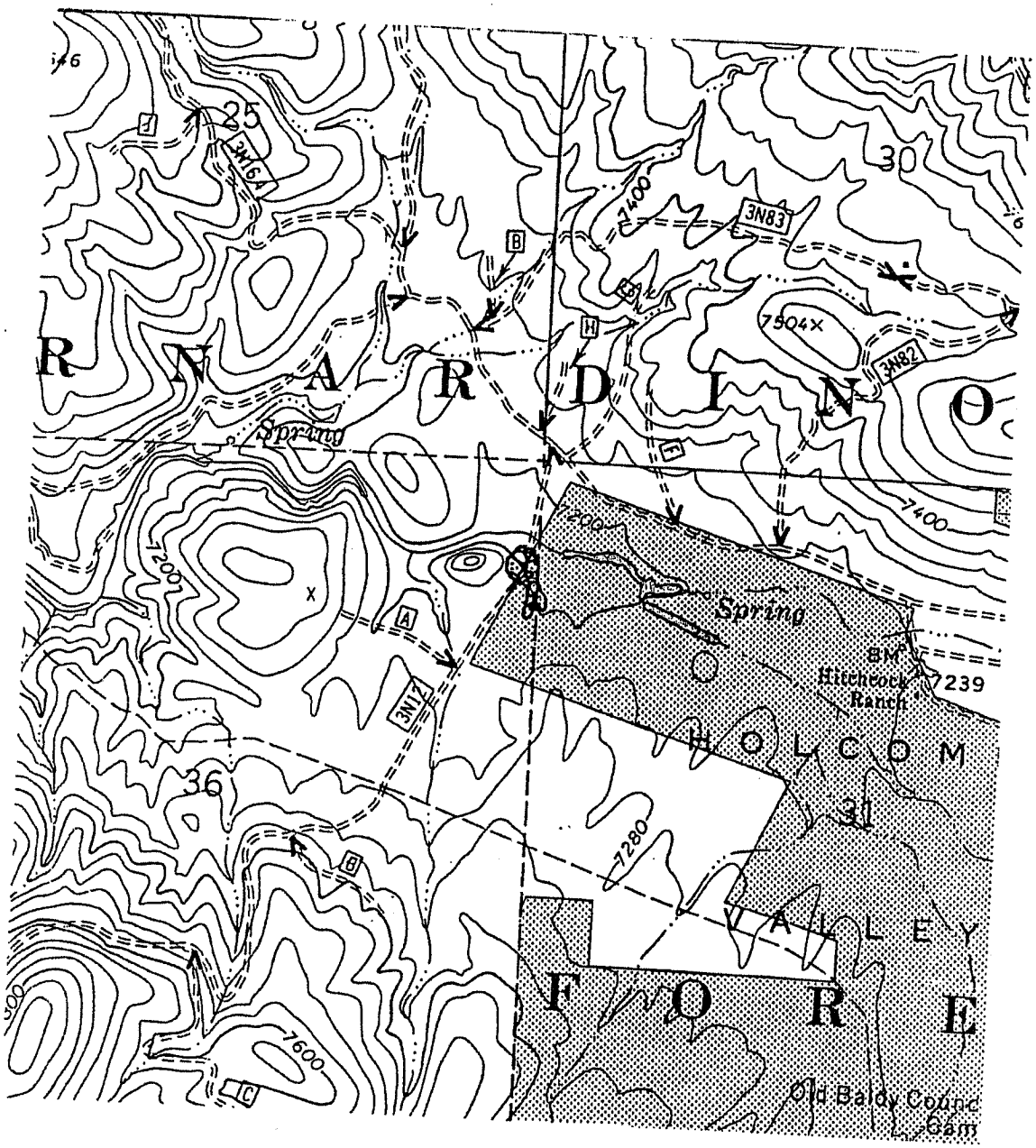
Pebble Plain Habitat - low quality

Meadow Habitat

1 mile = 3 1/4 inches

N

Figure 9. Holcomb Valley, Occurrence 12-1576-6, Upper Holcomb Valley. A = Upper Holcomb Valley, B = Van Dusen.



LEGEND

Pebble Plain Habitat

1 mile = 4 inches

N

Figure 10. Holcomb Valley, Occurrence 12-1576-6, Lower Holcomb Valley.

PSC has a well within the fenced area immediately north of the Lower Holcomb pebble plain. Use of this well was proposed by PSC in 1987. Activation of the well was contrary to the use of this site as mitigation for a previous project and this use was discouraged at that time. However, future activation of this well remains as a threat. Additionally, a deposit of high grade limestone exists immediately west of this pebble plain. Quarrying of this limestone would likely result in the extirpation of this site.

Action Needed: Upper Holcomb Valley could be protected by fencing along the south side of Forest Road 3N16 where it passes through the habitat and closing Forest Road 3N25. An analysis of closing or relocatin 3N25 should be completed. Fencing would prevent continued widening of the road here and would not affect legal recreational vehicle activities. Existing fences need to be maintained at Lower Holcomb Valley.

The Van Dusen site will be patrolled and qualitatively monitored regularly to document any decline in condition early so impacts and decline in condition can be prevented immediately.

Management Emphasis: Holcomb Valley lies within the North Baldwin Lake/Holcomb Valley Special Interest Area. It also lies within a Recreation Management Emphasis Zone.

South Baldwin Ridge/Erwin Lake (USFS; Private; 12-1576-7).

Site: The relatively undisturbed pebble plain on South Baldwin Ridge supports the largest and densest population of *Echinocereus engelmannii* var. *munzii* (Figure 11).

Pebble plain habitat is also found around the toe of the slope of South Baldwin Ridge near Erwin Lake. This clay deposit is thought to represent a redeposition of clay that eroded from higher on the ridge. There are significant habitat occurrences on the adjacent privately owned Hamilton Ranch. This ranch is currently up for auction as a destination resort.

Acreage: Approximately three acres of pebble plain are found on South Baldwin Ridge. Approximately 15 additional acres are found on National Forest and private land at the toe of the slope.

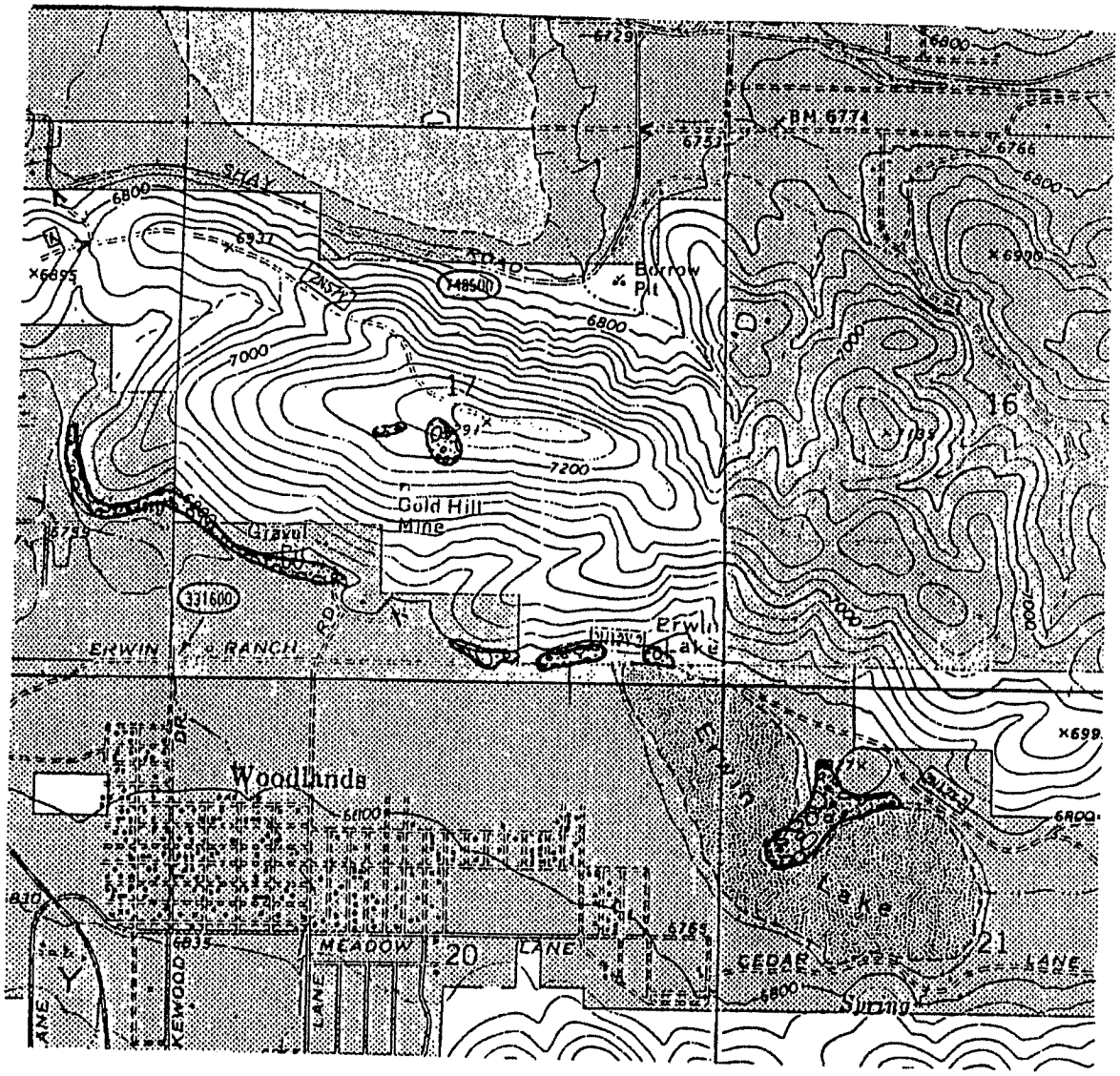
Protection Status: This site is unprotected but the road accessing the ridge is steep and rocky, thus limiting the number of people able to access the area. Limited vehicle activity is evident on the pebble plain. This area is closed to dead and down fuelwood cutting,

Threats: Vehicle damage is a threat to habitat on South Baldwin Ridge; illegal wood-cutting in the area is obvious and new vehicle tracks and cut pinyon trees were noted in the summer of 1989. Burros are commonly seen in this area. Cheat grass, *Bromus tectorum*, is more abundant at this site than any other. Evidence of gold mining activity can be seen around the pebble plains and on the western end of the plains on the ridge.

Habitat on the Hamilton Ranch is closed to public access and is thus protected from vehicle damage, but it is threatened by development.

Action Needed: Protection of this site is important because of its relatively pristine state. Winter closure of the road accessing the ridge would reduce impacts to the habitat on the slope during the most critical time when the clay soils are wet. Access to the pebble plain from the road is not extremely obvious, though there is a vehicle path. It would be possible to strip fence along this stretch to keep vehicles on the road. However, fencing might draw attention to this access point. Blocking the access with natural barriers would likely be the best solution, as they would draw less attention to the site. Trees or shrubs planted in the vehicle path would work if they could be protected long enough for sufficient growth to block vehicle access. A tree spade would be able to place trees of sufficient size to provide immediate protection. However, the soil may be too rocky here to use this equipment. Large boulders have been successful at other sites. However, there is no source for boulders close to this site and the road would be difficult for a loader to negotiate.

Acquisition of the Hamilton Ranch would substantially contribute to the protection of pebble plain and wet meadow habitat. If acquisition is not at all possible, a landowner contact with the owners of the ranch should be initiated.

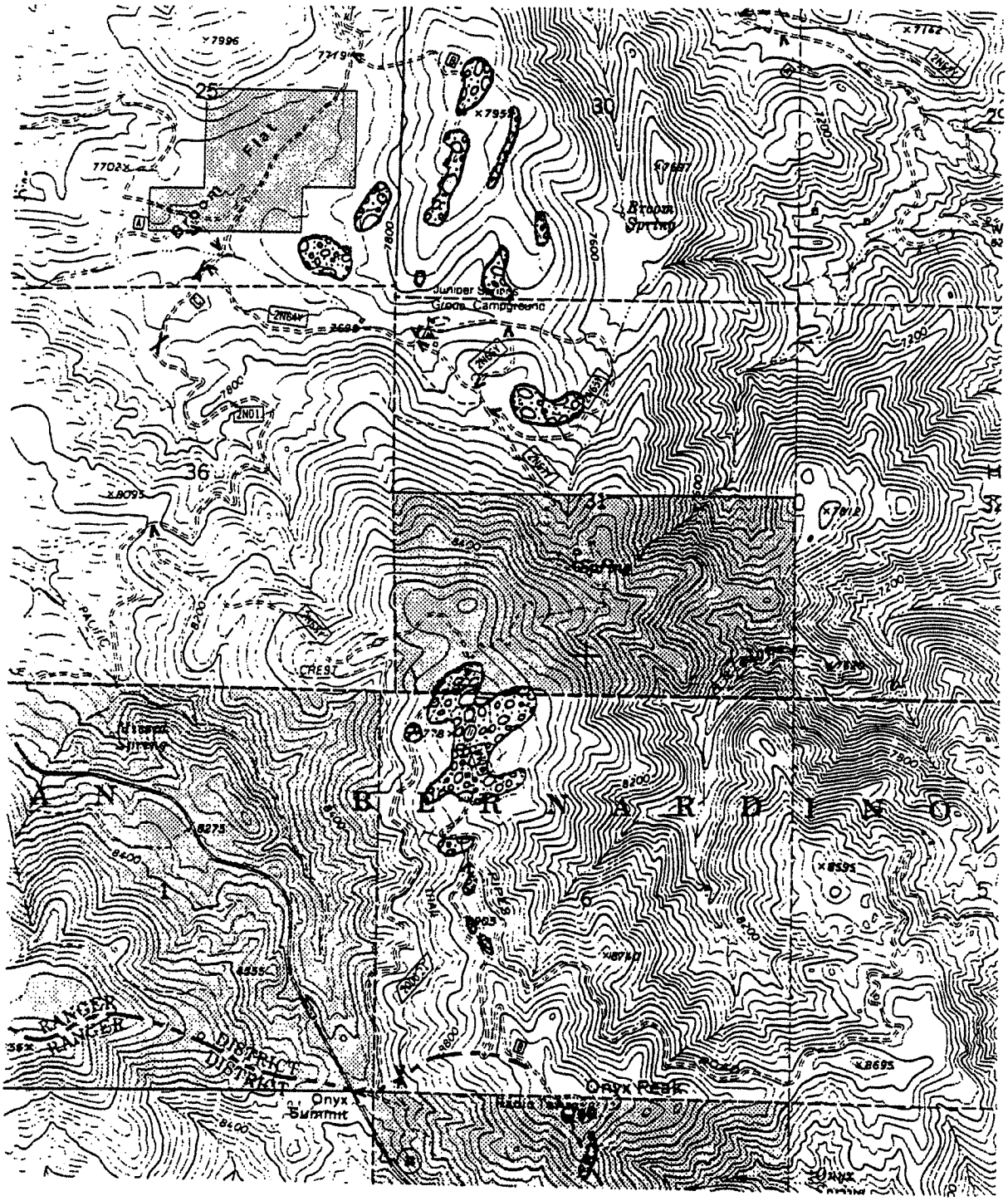


LEGEND

Pebble Plain Habitat

1 mile = 3 1/4 inches

Figure 11. South Baldwin Ridge, Occurrence 12-1576-7.



LEGEND

Pebble Plain Habitat

1 mile = 2 5/8 inches

N

Figure 12. Onyx Ridge/Broom Flat, Occurrence 12-1576-8

Management Emphasis: The pebble plains on the ridge lie at the southern boundary of the North Baldwin Lake/Holcomb Valley Special Interest Area. The complex at the toe of the slope is outside of the Special Interest Area. The entire complex on National Forest land lies within a Wildlife Management Emphasis Zone.

Onyx Ridge/Broom Flat (USFS 12-1576-8).

Site: This semi-wooded clay bed, composed of sparse scattered occurrences extending along Onyx Ridge to the hills east of Broom Flat, is difficult to define (Figure 12). *Arenaria ursina* is at its highest elevation here and it occurs at lower densities than at other sites. Krantz (1989 pers. comm.) questions the identity of *Arenaria ursina* at this occurrence and it needs to be checked. *Eriogonum kennedyi* is morphologically confused here and individuals are not clearly assignable to either variety.

This occurrence is relatively undisturbed though a fire in June 1950 burned habitat on the north slope of Heartbreak Ridge. It supports the southeastern-most occurrences of *Arabis parishii* and *Castilleja cinerea*. However, densities and abundances of the rare pebble plain species are much lower at this site.

Acreage: This complex supports approximately 75 acres of habitat.

Protection Status: This site is unprotected.

Threats: Threats at this site are not clearly known but likely include burro grazing and trampling and vehicle activity.

Action Needed: Because little is known about the status of these occurrences, action recommendations are limited to refinement of our knowledge of the distribution of the habitat and of species occurrences on these pebble plains.

Management Emphasis: This area lies within a Watershed/Wildlife Management Emphasis Zone.

Coxey Meadow (USFS 12-1576-9).

Site: The clay deposits here do not support either *Arenaria ursina* or *Eriogonum kennedyi* ssp *austromontanum* (Figure 13). They do however support populations of *Arabis parishii*, *Echinocereus engelmannii* var. *munzii*, *Eriogonum kennedyi* ssp. *kennedyi* and *Ivesia argyrocoma*. These deposits are isolated geologically from the main group of pebble plains by an intrusion of quartz monzonite rock.

This site is the western-most occurrence of the physical characteristics of pebble plain habitat. The Coxey area is considered significant because these discrete occurrences are disjunct from the other occurrences. Relatively little is known about this occurrence and due to its lack of indicator species, it has been a low priority. This judgement needs to be reevaluated.

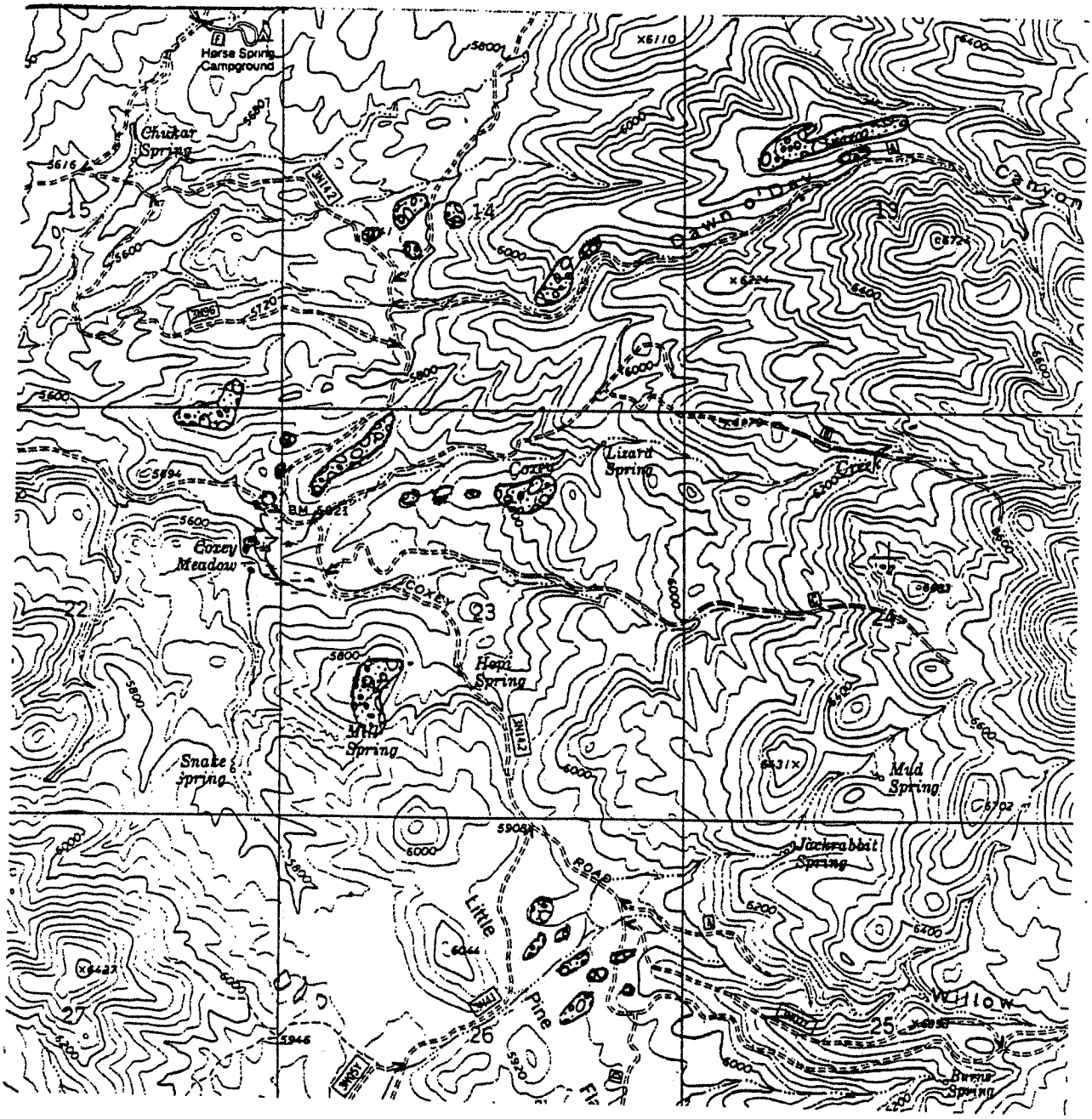
Acreage: This complex supports approximately 73 acres of habitat.

Protection Status: This site is unprotected

Threats: Vehicle damage to pebble plain habitat at this site is evident. This site is within the Deep Creek grazing allotment. The extent to which cattle grazing is a threat is unknown.

Action Needed: Improved mapping and description of the vegetative composition at this site are necessary. Vehicle damage at this site could easily be controlled by fencing or placement of other barriers along the short section of the road through this sensitive area.

Management Emphasis: This area lies within a Wildlife Management Emphasis Zone.



LEGEND

Pebble Plain Habitat

1 mile = 2 5/8 inches

N

Figure 13. Coxey Meadow, Occurrence 12-1576-9.

MONITORING

A monitoring plan for pebble plain habitat has been developed in a separate document (Barrows and Neel in progress). Data collection began in 1988 and continued through the 1989 field season (Barrows 1988, Neel 1989a, 1989b). Please see the monitoring plan for specific sampling design and procedures and monitoring reports for results and conclusions.

ACTION PLAN AND IMPLEMENTATION SCHEDULE

Table 4 summarizes the actions needed to achieve the management goals described in this plan. Each job is given a priority rank from 1 to 3, with 1 being the highest priority. Priorities have been established based on a combination of threat to the resource, the quality of habitat at the site, the complexity of the task and funding availability as well as other district and forest sensitive species priorities. The year in which each action is expected to be accomplished is also provided. Some of the recommended actions involve cooperation with other agencies and organizations, agencies and groups that need to be involved are listed under "Participating Agencies"; initials given refer to the participants as follows: USFS = U.S. Forest Service; TNC = The Nature Conservancy; CDFG = California Department of Fish and Game; FBBVP = Friends of the Big Bear Valley Preserve.

FUTURE STUDY NEEDS

The purpose of this section is to identify information needed to better understand the pebble plains community and thus to contribute to knowledge of their significance and to provide information for their management. These needs are not as critical as those identified in the table above. No specific funding has been identified, nor have timetables for completion been established.

1. Compare the soil characteristics and geology of each pebble plain site to determine relative ages of deposition and sources of material.

2. Determine the impacts of burro grazing and trampling on pebble plain habitat. This could be combined with an identical quantification of these impacts on wet meadow habitat that supports *Thelypodium stenopetalum* and *Sidalcea pedata*.

3. There is a need for objectively raking pebble plain occurrences. This ranking could be done by comparing species and species association diversities within and among pebble plain occurrences. Preliminary analysis of monitoring data indicate that there are distinct species assemblages within pebble plain habitat. Ordination and classification as well as comparison of species diversities within and between pebble plain occurrences would help to quantify these differences and provide a basis for assessing the significance of each pebble plain occurrence.

4. Assess the feasibility of revegetating disturbed pebble plains.

FUNDING SOURCES/ALTERNATIVES

- The California Green Sticker fund administered by the California Department of Parks and Recreation will possibly support monitoring and or increased patrols where green sticker vehicles are involved.
- The California Department of Fish and Game administers Environmental License Plate Funds for habitat improvement projects.
- Eyes on Wildlife money is available for interpretive exhibits relating to wildlife and plants.
- Challenge Cost Share projects with The Nature Conservancy or other conservation groups will continue to be a source of funding and or labor for completion of our annual monitoring program.
- Range Betterment money could be used for the study on burro impacts.
- Timber Receipts and K-V money is available for habitat improvement related to timber sales and timber stand improvement.

Table 4. Summary of tasks that need to be accomplished to achieve the management goals defined in this guide. When recommended actions involve cooperation with other agencies and organizations, they are listed under "Participating Agencies" as follows: USFS = U.S. Forest Service; TNC = The Nature Conservancy; CDFG = California Department of Fish and Game; FBBVP = Friends of the Big Bear Valley Preserve.

MANAGEMENT GOAL Action	Estimated Cost	Priority	Participating Agencies	Completion Target	Completion Actual
Protect a Range of Pebble Plain Occurrences to Reduce Habitat Loss and Fragmentation					
1. Protect the Horseshoe pebble plain via Landowner Contact Agreement (TNC) on private land and closure of unautorized route on National Forest land.	$1000	2	TNC USFS	1991	
2. Investigate acquisition of private land ("cemetary parcels") at North Baldwin Lake.	$ 500	1	CDFG TNC	1990	
3. Assess the feasibility of acquiring private land at Erwin Lake ("Hamilton Ranch").	$ 500	2	USFS CDFG	1990	
4. Determine feasibility of mineral withdrawal for each population site.	$ 250	3	USFS	1990-1991	
5. Conduct Botanical Investigations of purple monkeyflower, ashy grey paintbrush, Munz's hedgehog, and eyestrain monkeyflower.	$2500 each	1	USFS CDFG? TNC	1990-1996	
6. Refine mapping and determine status of pebble plain species at Onyx Ridge/Broom Flat and Coxey Meadow	$ 500	3	USFS	1992	
Maintain Site Viability					
1. Complete habitat protection project at Upper Sugarloaf to eliminate impacts from vehicle use.	$5000	1	USFS CDFG	1990	
2. Modify walk-through or reroute trail at Sawmill to discourage motorcycle and burro trespass.	$ 750	2	USFS	1990-1991	

Table 4. Continued.

MANAGEMENT GOAL Action	Estimated Cost	Priority	Participating Agencies	Completion Target	Completion Actual
Maintain Site Viability (continued)					
3. Secure South Baldwin Ridge pebble plains through either year round or seasonal closure of the access road or through obscuring access to the habitat itself.	$1000	2	USFS	1991	
4. Install barriers along 3N16 to protect Upper Holcomb Valley sites.	$ 750	2	USFS	1991	
5. Control damage from unauthorized vehicle use by stripfencing at Coxey Meadow.	$ 750	3	USFS	1991	
6. Continue quantitative monitoring annually as prescribed in the monitoring plan.	$2000 per year	1	USFS TNC	ongoing	
7. Increase regular patrol of pebble plain and other sensitive plant habitat. This will also serve as qualitative monitoring.	$ 750 per year	2	USFS	1991	
8. Maintain existing closures.	$ 750 per year	1	USFS	ongoing	
9. Assess need for and feasibility of revegetating Upper Sugarloaf pebble plains. Implement revegetation plan.	$ 5000	3	USFS	1991 1993	
10. Remove *Bromus tectorum* from Sawmill pebble plain.	$ 500	2	USFS TNC	1990 ongoing	
11. Initiate monitoring of burro use and impacts.	$1000	2	USFS TNC	1990 ongoing	
Encourage Compatible Uses and Discontinue Incompatible Uses					
1. Assist Lands and Minerals personnel in revision of common variety mineral permits to eliminate impacts to the Gold Mountain pebble plains.	$ 500	1	USFS	1990	

Table 4. Continued.

MANAGEMENT GOAL Action	Estimated Cost	Priority	Participating Agencies	Completion Target	Completion Actual
Encourage Compatible Uses and Discontinue Incompatible Uses (continued)					
2. Complete a self-guiding interpretive nature trail and brochure for North Baldwin Lake.	$ 750	1	USFS TNC CDFG FBBVP	1990	
3. Complete a self-guiding nature trail and brochure for Arrastre Flat.	$ 750	2	USFS FBBVP	1991	
4. Work with emergency response agencies and organizations to develop appropriate emergency access routes around all areas of pebble plain habitat.	$ 500	3	USFS CDFG	1990	
5. Work with utility companies to eliminate impacts to sensitive plant habitat during maintenance and emergency repair activities.	$ 500	3	USFS CDFG	1990	
6. Work with Lands and Minerals personnel to control annual assessment work on mineral claims to ensure that pebble plains are not impacted.	$ 500	4	USFS	ongoing	

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APPENDIXES

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APPENDIX A: Key to Table 2.

CNPS Lists and Codes:

List 1B - Plants rare, threatened or endangered in California and elsewhere.
List 2 - Plants rare, threatened or endangered in California, but more common elsewhere.
List 3 - Plants about which we need more information - a review list.
List 4 - Plants of limited distribution - a watch list.

R (Rarity)

1 - Rare but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time.
2 - Occurrence confined to several populations or to one extended population.
3 - Occurrence limited to one or a few highly restricted populations, or present in such small numbers that it is seldom reported.

E (Endangerment)

1 - Not endangered.
2 - Endangered in a portion of its range.
3 - Endangered throughout its range.

D (Distribution)

1 - More or less widespread outside California.
2 - Rare outside California.
3 - Endemic to California.

USFWS Status:

C2 - Threat and/or distribution data are insufficient to support federal listing.
C3c -Too widespread and/or not threatened.

CNDDB Codes:

Global Rank (G) is the overall condition of a species throughout its global range.

G1 = less than 6 occurrences or less than 1,000 individuals or less than 2,000 acres.
G2 = 6-20 occurrences or 1,000-3,000 individuals or 10,000-50,000 acres.
G3 = 21-100 occurrences or 3,000-10,000 individuals or 10,000-50,000 acres.
G4 = Greater than 100 occurrences or greater than 10,000 individuals or greater than 50,000 acres.
G5 = Population demonstrably secure to ineradicable due to being commonly found in the world.

State Rank (S) is the condition of the species within the state border. Rankings S1-S5 follow those listed above for global rankings.

Relative threats are associated with both the global and state population rankings as follows

G#.1 or S#.1 - very threatened.
G#.2 or S#.2 - threatened.
G#.3 or S#.3 - no current threats known.

S4 and S5 rankings do not have threat descriptions.

USFS Status:

S = USFS Sensitive Species List.

Species Distribution:

1 = Endemic to Big Bear and Holcomb Valleys.
2 = Endemic to the San Bernardino Mountains.
3 = Nearly endemic to Southern California but with one or two other occurrences.

APPENDIX B: Sensitive Species Accounts.

Sources for the species accounts presented in the following pages include Munz (1974), Abrams (1941 & 1951) and various botanical investigations and status reports as cited in each species account, as well as observations of the authors.

Populations of sensitive species are assigned numbers to enable tracking of specific populations. The numbers used in this document for species occurrences are taken from the Botanical Investigation for the particular species. Species for which no Botanical Investigation has been completed are not assigned population numbers. The population number is a sequence of three sets of digits. The first set refers to the forest number, which for the San Bernardino National Forest is 12. The second set corresponds to the CNDDB species code, while the third set refers to the occurrence number. Where possible the Forest Service occurrence number corresponds to the CNDDB occurrence number. Where they do not correspond, reconciliation is necessary.

When a Botanical Investigation has not been completed the general range of a species is described and the reader is referenced to the CNDDB records for that species. For species that do not have complete or accurate Data Base records, known occurrences are listed. These lists are not to be taken as a complete list of occurrences for a species.

Arabis parishii Wats. Parish's rock cress; dwarf rock cress
Brassicaceae

Nomenclature and Taxonomy

There are no synonyms for this taxon

Taxon Code: ARPA

The type specimen was collected in June, 1887 in Bear Valley, San Bernardino Mountains (Parish # 1790).

Description

A densely tufted perennial from a much-branched caudex; stems slender, simple, densely pubescent below with dendritic hairs, less so above, 2-12 cm high; basal leaves numerous, linear-oblanceolate, entire, acute, short-petioled, hoary with fine dendritic hairs, 5-15 mm long 1-2 mm wide; cauline leaves few, linear, entire, sessile, not auricled or petioled, hoary, 5-10 mm long, 1-2 mm wide; pedicels erect, slightly green or purplish 3-4 mm long; petals purple or lavender with white base, 8-12 mm long, spatulate, tapering to a very narrow claw; siliques ascending, glabrous, nerved to the middle or above, acuminate, 1-2 cm long, 2-3 mm wide; style filiform, 4-8 mm long; seeds elliptical to suborbicular, narrowly winged, 1-1.5 mm wide, imperfectly uniseriate.

Look-alikes

A. parishii most closely resembles *A. johnstonii* of the San Jacinto Mountains but differs in its longer style, shorter siliques and narrowly, not broadly winged seeds. In addition, the ranges of these two restricted species do not overlap. The range of *A. dispar* does overlap that of *A. parishii* but they can be distinguished by the larger leaves and fruits, generally larger habit and sessile stigma of *A. dispar*.

Population Occurrence Numbers

The fourteen populations of *A. parishii* listed below are known from a Botanical Investigation by Krantz (1978). A complete description of each occurrence and a list of herbarium records can be found in that investigation.

12-PDBRA061C0-1	Onyx Peak	12-PDBRA061C0-8	North Baldwin Lake
12-PDBRA061C0-2	Sugarloaf Ridge	12-PDBRA061C0-9	Arrastre Flat
12-PDBRA061C0-3	Broom Flat	12-PDBRA061C0-10	Burnt Flat
12-PDBRA061C0-4	Gocke Valley	12-PDBRA061C0-11	Holcomb Valley
12-PDBRA061C0-5	Erwin Lake	12-PDBRA061C0-12	North
12-PDBRA061C0-6	Sawmill	12-PDBRA061C0-13	Coxey Meadow
12-PDBRA061C0-7	Gold Mountain	12-PDBRA061C0-14	Big Bear Lake

Phenology

A. parishii blooms between April and June. It is usually among the earliest perennials to flower on the pebble plains. This taxon also flowers in response to late summer thunder showers.

Distribution and Ecological Requirements

This species grows on alluvial soils between 5,800 and 9,950 feet in elevation in the eastern San Bernardino Mountains from the Coxey Meadow area to the north side of Onyx Peak. It is not limited to pebble plain habitat, however most of the populations are either on or associated with clay soils of pebble plains. Occurrences are known from calcium carbonate substrates. However it does not appear to grow on quartz monzonite or gneiss substrates. Sites usually have slopes less than 15 degrees and have less than 40%

overstory vegetation cover. *A. parishii* appears to occur on variable sites and to be more tolerant of differing environmental conditions than other pebble plain species.

Remnant patches of *A. parishii* habitat in the Coyote Flat and Little Pine Flat Type Conversions indicate that this species can tolerate certain types of disturbance. These areas were both burned and seeded. The seeds of perennial grasses have been fairly unsuccessful on the patches of clay soil where the *Arabis* thrives. *A. parishii* was also found fruiting vigorously three years after the Coyote Fire of 1975 where it was growing with fire followers *Turricula parryi* and *Malacothamnus* sp. Fuel break construction resulting in a lot ground disturbance is not as favorable for this taxon (Krantz 1978).

Species Variability

Though no quantitative data are available, observations of this species indicate a low level of morphological variability.

References

Bennett 1979, Krantz 1978, Munz 1974

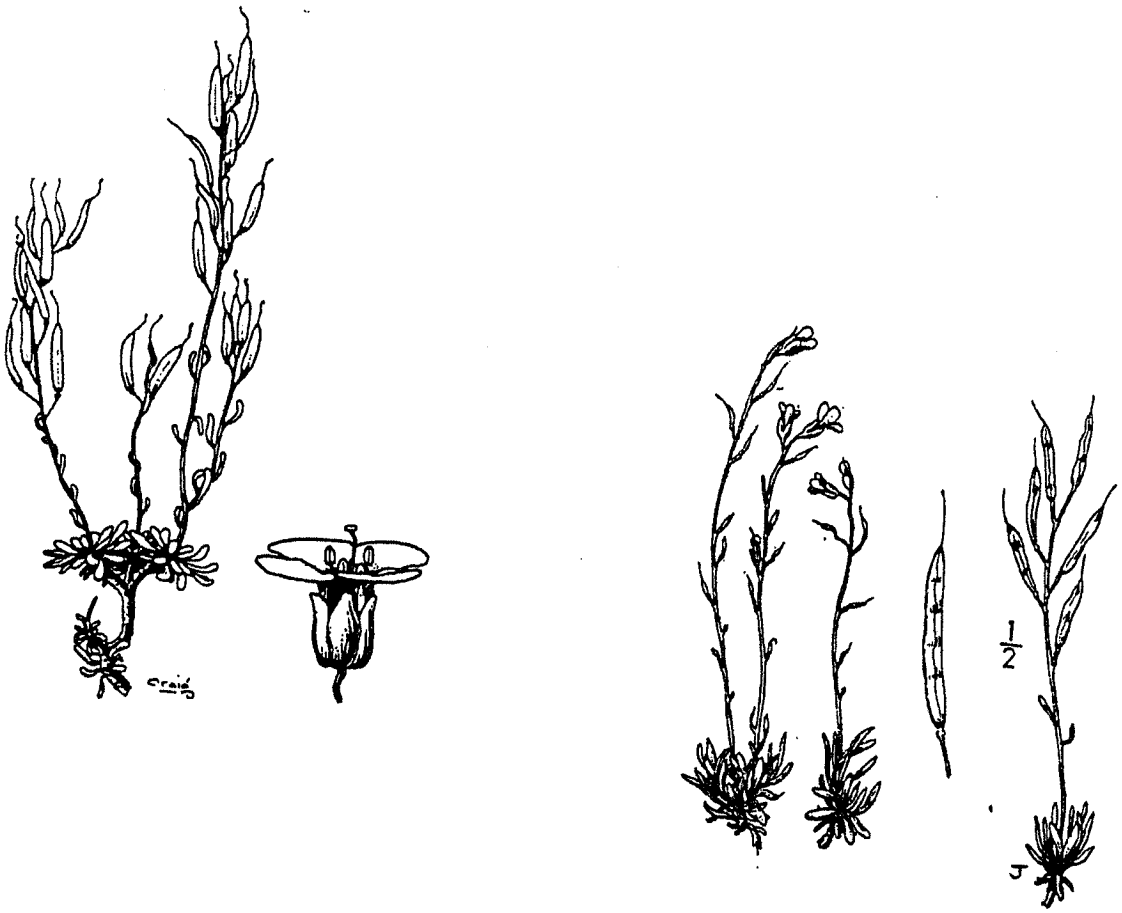

Figure 14. *Arabis parishii* from Munz (1974; left) and Abrams (1941; right).

Arenaria ursina Robinson - Bear Valley sandwort
Caryophyllaceae

Nomenclature and Taxonomy

Arenaria capillaris Poiret var. *ursina* (Robinson) Robinson (1897) in Gray.

Taxon Code: ARUR

The type specimen was collected from Bear Valley in the San Bernardino Mountains in August 1882 (Parish and Parish # 1490, RSA-102339).

Description

Caespitose perennial, the caudex densely branched, woody, the crown rarely more that 3 cm high, the flowering branches erect or ascending, 4-15 cm high, glandular puberulent above; leaves opposite, 4-12 mm long; rigid, straight, subulate, ciliate, dark green, drying straw colored; inflorescence a loosely flowered cyme; pedicels 4-12 mm long; sepals 5, 3-4 mm long, ovate, with scarious margins; petals 5, white, 4-5 mm long, ovate-oblong, rounded or somewhat notched at apex; fruit a capsule, 3-5 mm long seeds brown, reticulated, ca. 1.2 mm long.

Look-alikes

Several other species of *Arenaria* are known from the San Bernardino Mountains, however they are all easily distinguishable from *A. ursina*. *Arenaria macradenia* is a woody perennial like *A. ursina*. It is readily differentiated by the longer leaves (2-5 cm) and generally larger habit. *A. confusa*, reported from "damp places near meadows", thus differing in habitat, has wider leaves which are not pungent at the tips. *A. nuttallii* ssp. *gracilis* is reported from granitic gravel slopes and the entire plant is glandular pubescent. The petals of *A. nuttallii* ssp. *gracilis* are also shorter than the sepals; the sepals are distinctly one-nerved. In *A. rubella*, the petals are shorter than the sepals and the sepals are distinctly three-nerved.

Population Occurrence Numbers

The seven populations of *A. ursina* listed below are known from a Botanical Investigation by Krantz (1981). A complete description of each occurrence and a list of herbarium records can be found in that investigation.

12-PDCAR040R0-1	Big Bear Lake	12-PDCAR040R0-5	Arrastre-Union Flat
12-PDCAR040R0-2	Sawmill	12-PDCAR040R0-6	Holcomb Valley
12-PDCAR040R0-3	Gold Mountain	12-PDCAR040R0-7	Onyx Ridge (w/o ERKEA-2)
12-PDCAR040R0-4	North Baldwin Lake		

Phenology

Blooms June - July, occasionally responding to summer rains and blooming also from August - September.

Distribution and Ecological Requirements

A. ursina is known from the mountain slopes and ridge tops to the northeast and south of Big Bear Lake. More specifically it is found on dry hills and pebble plains in jeffrey pine forest or pinyon-juniper woodland around Holcomb Valley, Baldwin Lake, on the northeast slopes of Sugarloaf Mountain and on Onyx Ridge. Elevation ranges between 6000 and 9000 feet.

This species appears to have a high degree of microhabitat preference. For example, on the "Knoll" pebble plain at North Baldwin Lake, this species occurs only in scattered patches on north facing slopes.

Similar patchiness has been observed at Arrastre Flat and Mojave View although the habitat parameters that account for this distribution have not been determined.

This taxon is almost always found in association with either subspecies of *Eriogonum kennedyi*. This species is considered to have the second most restricted range of the pebble plains "endemics", having a slightly wider elevational range than *Eriogonum kennedyi* ssp. *austromontanum* and appearing to tolerate more shaded or north aspect situations (Krantz 1981).

Species Variability

No quantitative data have been collected on the morphological characteristics of this species. However, casual observations suggest that variability is low.

References

Barrows 1988, Krantz 1981, Munz 1974

Figure 15. *Arenaria ursina* from Abrams (1941).

Castilleja cinerea Gray - Ashy-grey paintbrush
Scrophulariaceae

Nomenclature and Taxonomy

There are no synonyms for this plant.

Taxon Code: CACI-2

The type specimen was collected in Bear Valley by Abrams (1951).

Description

Perennial with few to many ascending to decumbent stems, 1-2 dm long from woody root-crown; leaves short-linear (1-2 cm), entire or the upper with a pair of small lobes, grayish and whitish hairs, the leaves densely clothed; inflorescence a greenish yellow (or reddish-orange tinged) spike; bracts and calyces shaggy-hairy on lower half, the lobes and apex covered with distinctive, minutely spiculate, yellowish hairs; bracts 1-2 cm long, broadly rounded with 1-2 pairs of lobes; calyx 15 mm long tubular with 4 narrow lobes of about equal length (5-8 mm); corolla 15-17 mm long, tubular below and 2-lipped at the apex, the lower lip with 3 short greenish, incurved lobes that are about as long as the pointed upper lip (galea); stamens 4, the anthers in 2 pairs within the folded upper lip; stigma hemispheric, often slightly bilobed, protruding from tip of galea; fruit a many-seeded capsule, ca 5 mm long; seed about 1 mm long with a brown, reticulate seed coat.

Look-alikes

This species is easily distinguishable from other species of *Castilleja* in the area by the yellow color of the spike and the equal length of the calyx lobes. One species of *Orthocarpus* (*O. lasiorhynchus*) is present in the area but is readily distinguished by its annual habit and the three conspicuous yellow pouches of its corolla.

Population Occurrence Numbers

No Botanical Investigation has been completed for this species. The California Natural Diversity Data Base lists two occurrences, one on the north shore of Baldwin Lake and one at Cienega Seca near Onyx Peak. The CNDDB code for this taxon is PDSCR0D0H0.

Other known occurrences include Snow Valley, Aspen Glen, Metcalf Bay, Eagle Point, Sawmill, Sugarloaf Peak, Erwin Lake, South Baldwin Lake Ridge, Pan Hot Springs, North Baldwin Lake/Nelson Ridge, Gold Mountain, Arrastre Flat and Holcomb Valley (Upper and Lower) and near South Fork Meadows near the Santa Ana River.

Phenology

Blooms from May to August, but principally in June and July. Phenology varies considerably from early blooming on the eastern pebble plains to later blooming on the western sites.

Distribution and Ecological Requirements

Little information is available on the ecological requirements of this taxon. It is found in patches in the eastern end of the San Bernardino Mountains from Snow Valley and Fish Camp eastward to Onyx Peak (approximately 15 miles) and from South Fork Meadows northward to Holcomb Valley (approximately 12 miles). Elevations range from 5900-9800 feet.

Its occurrence is not strictly limited to the pebble plains as it may be found on clay soils associated with the plains. Like other "endemics" it is patchily distributed within a pebble plain. In a study of microhabitat differences at Sawmill pebble plain, Derby (1979) found this species to be more common on northwest

exposures; this taxon was absent from sample plots on southwest exposures. It was also not present in sample plots in the understory of western juniper trees though it occurred at low densities in open areas of the pebble plain.

Species Variability

This species is highly variable in inflorescence color, both within and among sites. For example, at Sawmill inflorescences vary from a bright greenish yellow to a rather dull crimson red as a result of varying levels of anthocyanin pigments. Similar variation in flower color can be seen at other sites. A general trend is seen going from north to south, yellow inflorescences appear to be more frequent to the north while red inflorescences are more frequent to the south. Inflorescence size also appears to decrease from north to south. Individuals from Sugarloaf Ridge with shorter uniformly maroon bracts and reduced inflorescences have been distinguished as *C. c.* forma *rubra* by Krantz (1989 pers. comm.), however, nothing formal has been published on this designation.

References

Heckard 1980, Munz 1974

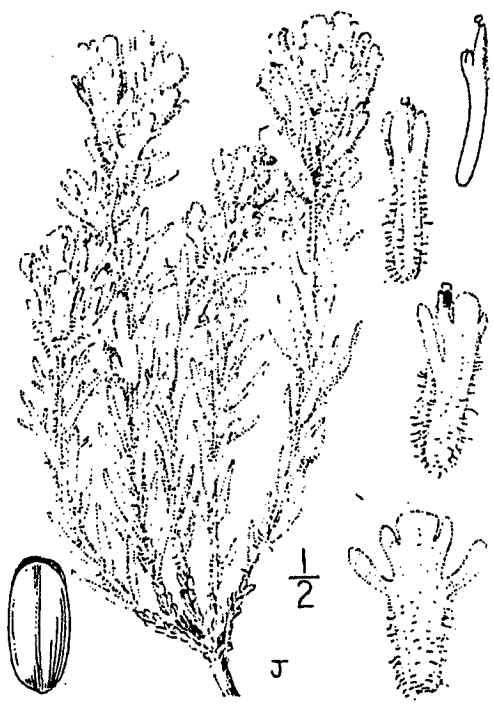

Figure 16. *Castilleja cinerea* from Abrams (1951).

Echinocereus engelmannii (Parry) Lem. var. *munzii* (Parish) Pierce and Fosberg - Munz's hedgehog cactus - Cactaceae

Nomenclature and Taxonomy

Echinocereus engelmannii var. *munzii* was first described as *Cereus munzii* by Parish (1926). It has been switched between specific and varietal status by various authors. Taylor (1985) keeps it as variety *munzii* within the species *E. engelmannii*. In the forthcoming Jepson Manual, it will maintain the varietal status (Anderson pers. comm. 1989).

Taxon Code: ECENM

The type specimen was collected at 4600 feet elevation, two miles below Kenworthy, Thomas Valley, San Jacinto Mountains, Riverside County, California by Munz and Johnston (#5570) on May 21, 1922.

Description

Perennial; caespitose, stems 1-100 forming open to compact clusters; central spines 4, radial spines 10-12+, spines at first pink, pale gray to tannish in age, sometimes reddish brown to black; lower deflexed flattened central spine 2-2.5 cm long, curving and twisted, other central spines half as long; flowers crimson magenta, fruit red, spiny.

Look-alikes

E. e. var. *munzii* can be distinguished from the sympatric *E. triglochidiatus* var. *mojavensis* using the following characters

CHARACTER	ECENM	ECTRM
Central Spines	4, flattened	1, mostly terete
Flower Color	pink-magenta	true red
Habit	small clonal clumps	Large (100+) mounding clonal clumps assoc. with rock outcrops

E. e. var. *munzii* can be distinguished from *E. e.* var. *engelmannii* by examining the spine patterns of the taxa. The upper three central spines of *E. e.* var. *engelmannii* are as long, or nearly as long as the lowest central spine while the lower central spine of *E. e.* var. *munzii* is twice as long as the upper three central spines. The columns of the desert variety are also much taller and the mature spines tend to be darker. *E. e.* var. *engelmannii* also occurs at lower elevations.

Population Occurrence Numbers

No Botanical Investigation has been completed for this species. The California Natural Diversity Data Base does not track this species. General occurrences are described below under Distribution and Ecological Requirements. The CNDDB code for this taxon is PDCAC06036.

Phenology

This species blooms from late June through July in the San Bernardino Mountains and in late May to June in the San Jacinto Mountains. In dry years, blooming may be very limited.

Distribution and Ecological Requirements

This taxon is found between 4500 and 7000 feet elevation in the San Bernardino and San Jacinto Mountains and between 3200 and 4500 feet in the Laguna Mountains of southern California, and in the

Sierra de Juarez Mountains in northern Baja California, Norte. While the distribution is fairly broad, occurrences within this range are relatively restricted. In general, the habitat is characterized by rocky openings on clay soil within pinyon woodland, at the lower edge of yellow pine forest, or at edges of chaparral and grassland. Observations of the chaparral occurrences indicate that *E. e.* var. *munzii* may occur where there is some protection from fire.

The highest densities of this taxon in the San Bernardino Mountains are found on the South Baldwin Ridge (Figure 11) and Mojave View pebble plains (Figure 6). Much less dense occurrences are found at North Baldwin. These are the eastern-most pebble plains and they presumably receive the greatest desert influence. Scattered individuals may be found on flats and south facing ridges in eastern Bear valley, near Coxey Meadow in Gocke Valley and in Lone Valley.

Species Variability

Preliminary observations indicate that *E. e.* var. *munzii* is fairly variable in vegetative morphology and flower color. Most individuals in the San Bernardino Mountains are low to the ground, and have few clones per individual. Spines tend to be long and twisting and so dense as to occlude the green flesh of the column. However, individuals can be found with taller columns and with fewer shorter spines that are not so dense. In the San Jacinto and Laguna Mountains, individuals have many columns per individual and the spines tend to be short and straight. Flower color ranges from deep magenta to light pink and reportedly even to yellow (Pierce and Fosberg 1933).

References

Anderson 1989, Munz 1974, Neel 1989b, Taylor 1985

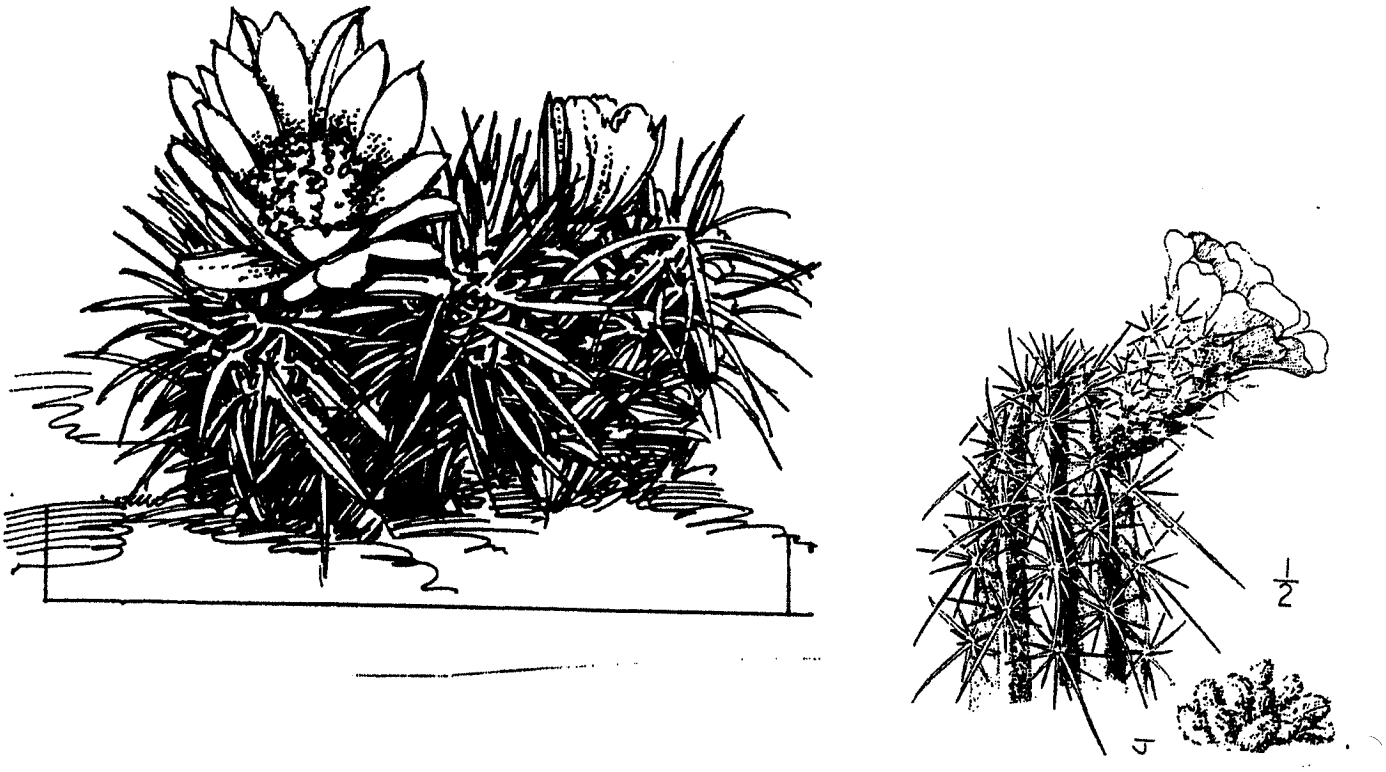

Figure 17. *Echinocereus engelmannii* var. *munzii* by Jacques Devaud (1989, left) and from Abrams (1951 right). Note that the Abrams figure more closely resembles the specimens in the San Jacinto Mountains.

Eriogonum kennedyi Porter ex Wats. ssp. *austromontanum* (M.& J.) Stokes - Kennedy's southern mountain buckwheat - Polygonaceae

Nomenclature and Taxonomy

The species *Eriogonum kennedyi* includes a complex group of infra-specific taxa distributed in the Sierra Nevada, the San Gabriel and San Bernardino Mountains of California. See Munz (1974) or Krantz 1981 for a complete discussion.

Taxon Code: ERKEA-2

The type specimen was collected in Big Bear Valley, San Bernardino Mountains, on dry ground near the lake on July 4, 1920 (Harwood 4369; POM 9162).

Description

Perennial with a branched, woody caudex, forming loose leafy mats; leaves oblanceolate, blades 6-12 mm long, often sheathing up the stem; flowering stems scape-like, wiry, floccose, 8-15 cm long; inflorescence capitate 4-8 mm across; involucres few, sparsely tomentose to glabrous, turbinate, angled, 2.5-4 mm long; calyx glabrous, white with reddish-brown mid-ribs 2-3 mm long, oblong-obovate, gradually contracted into a cuneate base; achenes 3.5-4 mm long.

Look-alikes

Eriogonum kennedyi ssp. *austromontanum* and *E. k.* ssp. *kennedyi* overlap in range and habitat and are difficult to distinguish. Characters used by Reveal (1979) are as follows:

E. k. austromontanum	*E. k. kennedyi*
Leaves 6-12 mm long	Leaves 2-4 mm long
Leaves loosely matted	Leaves forming dense mats
Flowering July - September	Flowering April - June
Achenes 3.5-4 mm long	Achenes ca. 2 mm long

Krantz (1981) felt that leaf length was the most reliable character.

Eriogonum wrightii ssp. *subscaposum* also resembles *E. k.* ssp. *austromontanum* in that it has loosely matted leaves. However, the branched inflorescence of *E. w.* ssp. *subscaposum* is an obvious key difference. In addition, *E. w.* ssp. *subscaposum* occurs more frequently in the understory of the yellow pine forest. There is a possibility that the two species hybridize occasionally, especially along the ecotone between the pebble plain habitat and the forest.

Population Occurrence Numbers

The six populations of *E. e.* ssp. *austromontanum* listed below are from a Botanical Investigation by Krantz (1981). A complete description of each occurrence and a list of herbarium records can be found in that investigation.

12-POPGN083B2-1	Big Bear Lake	12-POPGN083B2-5	Arrastre-Union Flat
12-POPGN083B2-2	Sawmill	12-POPGN083B2-6	Holcomb Valley
12-POPGN083B2-3	Gold Mountain		
12-POPGN083B2-4	North Baldwin Lake		

Phenology

This species blooms from July through September.

Distribution and Ecological Requirements

This species is one of two indicators for the pebble plain community as used by Derby (1979). Typically it is the most common species present on a pebble plain. However, it has the most limited range of the endemic taxa. It occurs between 6300 and 7500 feet elevation. It is restricted to dense clay soils, usually with a pavement of saragosa quartzite pebbles. The taxon does occur on the margins of "pure" pebble plain habitat as well. For example, at North Baldwin Lake, *Eriogonum kennedyi* ssp. *austromontanum* occurs on clay soils on the east side of Highway 18 in an area dominated by sagebrush with no "pavement".

Species Variability

E. k. ssp. *austromontanum* appears to be extremely variable. However, part of this may be due to confusion with *E. k.* ssp. *kennedyi*. According to Krantz (1981) there is a clinal gradient from *E. K.* ssp. *austromontanum* in the south and west to *E. k.* ssp. *kennedyi* in the north and east, with *E. k.* ssp. *kennedyi* occurring on drier sites. This morphological gradient may follow the rainfall gradient in the valley. *E. k.* ssp. *austromontanum* is best represented by plants at Arrastre Flat and Sawmill where the morphology is relatively homogeneous.

References

Krantz 1981, Munz 1974

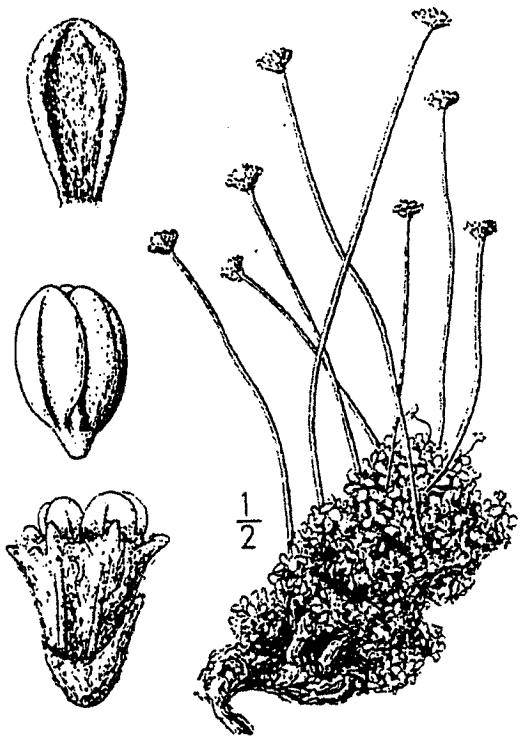

Figure 18. *Eriogonum kennedyi* ssp. *austromontanum* from Abrams (1941).

Ivesia argyrocoma (Rydb.) Rydberg - fuzzy rat tails, silver haired Ivesia
Rosaceae

Nomenclature and Taxonomy

Horkelia argyrocoma Rydb., *Potentilla argyrocoma* M. & J.

Taxon Code: IVAR

The type specimen of this species is from Bear Valley.

Description

A slender-stemmed perennial from a heavy caudex; stems mostly decumbent, silky-villous, 1-2 dm long; basal leaves 3-10 cm long, with densely imbricate leaflets, to 3 mm long, silky pubescent; cyme dense becoming open in age; flower-tube turbinate to campanulate, 2.5-3.5 mm wide; sepals lanceolate-acuminate, 4 mm long, exceeding the oblong or lanceolate bractlets, petals white, obovate, exceeding the calyx; stamens 20; pistils 4-8.

Look-alikes

Another species of *Ivesia*, *I. santolinoides*, also occurs in the San Bernardino Mountains. However, this species has not been observed growing in areas inhabited by *I. argyrocoma*. It occurs on dry gravelly slopes and ridges, 6,500-9,000 feet and differs in that its sepals are less than 2 mm long and it has only one pistil. *I. argyrocoma* has larger sepals and 1-15 pistils.

Population Occurrence Numbers

No Botanical Investigation has been completed for this species and no population numbers have been assigned. However, this species is known from the following locations:

Metcalf Bay	Eagle Point	Arrastre Flat
Sawmill	North Baldwin Lake	Union Flat
Gold Mountain	Mojave View	Lower Holcomb Valley
Snow Forest	Upper Holcomb Valley	

The CNDDB code for this taxon is PDR0S0X020.

Phenology

This species blooms between June and August.

Distribution and Ecological Requirements

Little is known about the habitat or ecological requirements of the silver-haired ivesia. The species is known to occur in Big Bear and Holcomb Valleys of the San Bernardino Mountains and from one location in the Sierra San Pedro Martir of Baja, California. It is associated with pebble plains, but is not restricted to this habitat. In addition it is not uniformly distributed within a given pebble plain. For example, sampling in undisturbed pebble plain habitat during the 1988 monitoring season found this species to be present in very low numbers at Union Flat but common at Arrastre flat and at Sawmill (Barrows 1988). Preliminary analysis of these data from Arrastre Flat using Two Way Indicator Species Analysis (TWINSPAN), showed that the two transects sampled classified out separately based on presence of *Ivesia argyrocoma* alone. No data is available to characterize its microhabitat preferences.

This taxon does exhibit tolerance of disturbance. At all pebble plains where sampling was done on roads, it appears to be an early colonizer of recovering disturbance. The species is well represented for

example on old roads at the south end of Arrastre Flat. In the 1989 monitoring season, flowering plants of this species were found to be significantly more common on unripped roads than ripped roads at Arrastre Flat (Neel 1989a). This may indicate that this taxon does not tolerate severe disturbance or that it takes longer to recolonize disturbed areas. It has also been observed at other locations where pebble plain habitat has been disturbed. At Snow Forest, it was found growing on the upper margins of the beginner ski slope, formerly a pebble plain. Plants were also found on a recently disturbed and devegetated area near Hitchcock Ranch on the margins of a pebble plain.

Species Variability

No information is available.

References

Abrams 1944, Barrows 1988, Bennett 1979, Krantz 1983, Munz 1974, Neel 1989a

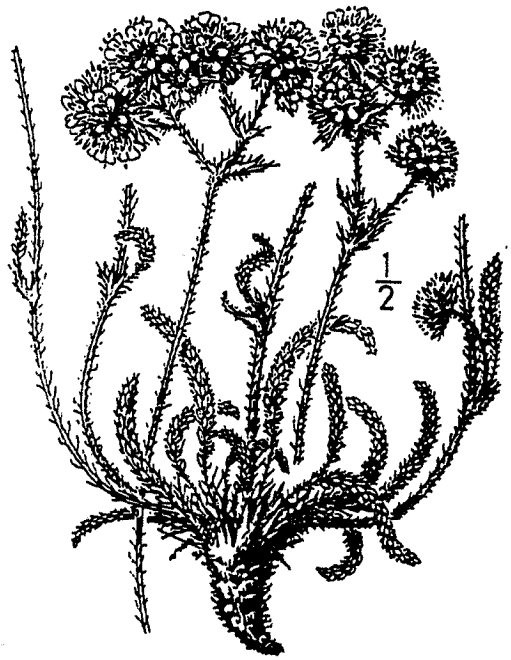

Figure 19. *Ivesia Argyrocoma* from Abrams (1941).

Linanthus killipii H.L. Mason (1948) - The Baldwin Lake Linanthus
Polemoniaceae

Nomenclature and Taxonomy

Linanthus concinnus in Jepson (1943).

Taxon Code: LIKI

The type specimen for this taxon was collected at Cactus Flat in the San Bernardino Mountains on 13 June 1941 (Killip 3643; US-1828544). A paratype was collected from Baldwin Lake on 30 May 1926 (Peirson 6748).

Description

Erect annual, 3-5 cm high, stems simple or occasionally branched above the base, the basal internodes congested, the upper ones usually more than 1 cm long, puberulent to somewhat floccose at the nodes; cotyledons sessile, ovate, narrowly perfoliate; leaves palmately 5-7 cleft into linear lobes, 3-10 mm long; flowers sessile in 2-7 flowered congested cymules; calyx ca. 6 mm long, the sinuses connected to half their length with a broad white hyaline membrane extending onto the lobes; corolla 8-15 mm long, funnelform, the tube yellow, 4-5 mm long, the lobes cream-white, rhombic-ovate, denticulate or entire, with an elongate spot near the base; stamens inserted on the throat, filaments glabrous, equalling the throat; stigma exceeding anthers, lobes 1-1.5 mm long; fruit a capsule of 3 several seeded locules; seeds ellipsoid, reddish-brown.

Look-alikes

The Baldwin Lake Linanthus cannot be confused with any other sympatric species. It is usually associated with *L. breviculus* but is readily distinguished by its short tube; the 10 mm long tube of *L. breviculus* much exceeds the calyx. At Broom Flat, *L. killipii* occurs with *L. breviculus* and *L dianthiflorus* ssp. *farinosus* but the corollas of the latter are pink to lilac and the plant has simple linear leaves.

Population Occurrence Numbers

The four major populations of this species outlined below are from a Botanical Investigation by Krantz (1980). A complete description of each occurrence and a list of herbarium records can be found in that investigation. The CNDDB lists 22 occurrences for this species. However, many of these occurrences are duplicates and thus are not accurate.

12-PDPLM090N0-1	North Baldwin Lake	12-PDPLM090N0-3	Sawmill
12-PDPLM090N0-2	Erwin lake	12-PDPLM090N0-4	Broom Flat

Phenology

This taxon blooms between May and June. In some years, it may be present in very low numbers or not at all, depending on rainfall.

Distribution and Ecological Requirements

Linanthus killipii grows between 5500 and 8000 feet on rockier edges of open pebble plains. It is often found on clay soils, but is sometimes found on granitic gravelly soils with a clay component. Slopes range between 0 and 15 percent with a generally southerly aspect. This species is most often found in openings within or on edges of a pinyon woodland or sagebrush meadow community where competition from annuals is low. It is usually sympatric with *Linanthus breviculus* and *Chorizanthe watsonii*.

Species Variability

No quantitative information is available.

References

Krantz 1980, Munz 1974

Figure 20. *Linanthus killipii* from Abrams (1951).

Mimulus exiguus Gray - eye-strain monkeyflower, San Bernardino Mts. monkeyflower - Scrophulariaceae

Nomenclature and Taxonomy

There are no synonyms for this species

Taxon Code: MIEX

The type specimen was collected in 1884 in Baja California, Norte, at Hansen's Ranch, 6000 feet elevation (Orcutt 1198, Gray Herbarium).

Description

A low annual, minutely glandular-puberulent, with slender, erect stems, 3-10 cm high, usually diffusely openly branched, reddish throughout; leaves few, linear to spatulate or elliptic, 3-6 mm long, 1-2 mm wide, entire or distally obscurely blunt-toothed, nearly veinless, sessile; pedicels filiform, 15-20 mm long; calyx campanulate, 2-2.5 mm long, very weakly angled, scarcely sulcate, much distended by the capsule in fruit and completely filled and slightly surpassed by it, calyx lobes equal, ovate, about 0.5 mm long, acutish, not ciliate; corolla funnel-form, reddish-purple, 2-3 mm long, little exerted, the minute lobes scarcely opening (the flower presumably self-pollinating); anthers glabrous, the upper pair of stamens almost as long as the corolla; style and stigma glabrous, often slightly longer than the corolla, stigma deep pink, entire; capsule ovate, acute, 3 mm long, tardily apically dehiscent; seeds minute, yellowish, faintly reticulate.

Look-alikes

Several other diminutive *Mimulus* species from Section Peridanthus may occur with *M. exiguus*. *M. purpureus* can be distinguished by its dimorphic corolla and its generally larger size. *M. androsaceus* has 4-8 mm corollas and each corolla lobe is cuneately notched at the tip. In addition, the corolla throat is more developed in *M. androsaceus*. *M. rubellus* has a yellow to reddish corolla measuring 7-9 mm and *M. suksdorfii* has a yellow corolla. *M. exiguus* is recognizable by its minute corolla, 2-2.5 mm long, and its exserted capsule.

Population Occurrence Numbers

There has been no Botanical Investigation for this species. Twenty occurrences are recorded by the CNDDB; these can be referred to in the data base printouts available in the District Office of the Big Bear Ranger District or the Supervisor's Office. However, many of these occurrences appear to be duplicates and 12 occurrences are more likely (Krantz 1989, pers. comm.). The CNDDB code for this taxon is PDSCR1B140.

Phenology

This taxon flowers between May and July. It has also been observed to flower in August and September following heavy summer rains (Krantz 1989, pers. comm.).

Distribution and Ecological Requirements

This taxon occurs in the Sierra de Juarez of Baja California, Norte in the vicinity of Laguna Hansen. Specifically it occurs in a vernal creek just inside the boundary of the Parque Nacional Constitucion de 1857. Other populations occur in the San Bernardino Mountains of California in Holcomb and Bear Valleys. The elevational range is 6000 to 7400 feet. Most often this species grows in vernally wet areas, but it also occurs on wetter portions of pebble plains.

Little is known about the ecological requirements of this taxon. However, observations indicate that the eyestrain monkey flower may tolerate some limited disturbance. Munz describes its habitat as moist

disturbed places. For example, at Castle Glen, a Nature Conservancy site, plants were observed in the tire ruts of a road which crosses the drainage in which these plants occur. This species appears to favor the lowest, wettest portions of a drainage. Some disturbance of the soil by frost heave or stream flow may be an important component of this plant's habitat.

Species Variability

No quantitative data are available

References

Bennett 1980, Munz 1974

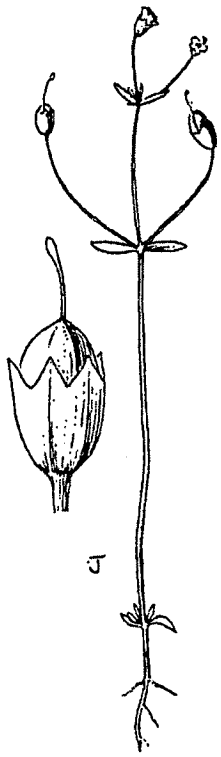

Figure 21. *Mimulus exiguus* from Abrams (1951)

Mimulus purpureus Grant - purple monkeyflower
Scrophulariaceae

Nomenclature and Taxonomy

There are no synonyms for this taxon.

Taxon Code: MIPU

The type specimen for this species was collected in Bear Valley.

Description

Glandular pubescent annual 3-7 cm tall, simple or with few basal branches; leaves opposite, lance-oblong, obtuse, obscurely 3-5 veined, subentire, 1-1.5 cm long, pedicels 3-4.5 cm long; calyx 6-8 mm long, slightly angled, the lobes round-ovate, corolla red purple, 12-15 mm long, the narrow throat scarcely rigid, glabrous, the lobes round emarginate, the upper two arched ascending and shorter than the three lower reflexed-spreading ones; anthers glabrous, red purple; stigma ciliate fringed; caps. ca 6 mm long, dehiscing through the apex.

Look-alikes

This species can be confused with *Mimulus palmeri* and *Mimulus androsaceus*. *M. palmeri* is not sympatric with *M. purpureus* and differs in that the corolla is more funnelform-rotate and the lobes are not dimorphic. *M. purpureus* plants are usually taller and branched above the base. The corolla of *M. androsaceus* is markedly shorter than that of *M. purpureus* and there are raised purple spots on the lower lip of the corolla of the former species. The stigma of *M. androsaceus* is not ciliate. In addition, *M. androsaceus* has prominent leaf veins while those of *M. purpureus* are obscure.

Population Occurrence Numbers

No Botanical Investigation has been completed for this taxon. The CNDDB lists 30 occurrences. Two of these occurrences have been extirpated (Stanfield Cutoff and Grout Bay occurrences) and eight more are misidentifications of *Mimulus palmeri*. Thus, there are 20 valid occurrences tracked by the CNDDB. The CNDDB code for this taxon is PDSCR1B2B2.

Phenology

This species blooms between May and June.

Distribution and Ecological Requirements

Little information on the habitat or ecological requirements of this species is available. It is known from moist sandy places in yellow pine forest between the elevations of 6700 and 7500 feet according to Munz. It is restricted to Big Bear and Holcomb Valleys where it occurs on the edges of pebble plain habitat and in openings in yellow pine forest.

We have no precise location information from within this range. Where this taxon grows in forest openings, it appears to be in areas of low needle litter;, however, there are no data available to support that observation. It appears to tolerate some levels of disturbance, but again, no quantitative information is available.

Species Variability

No quantitative data are available.

References

Krantz 1980, Munz 1974.

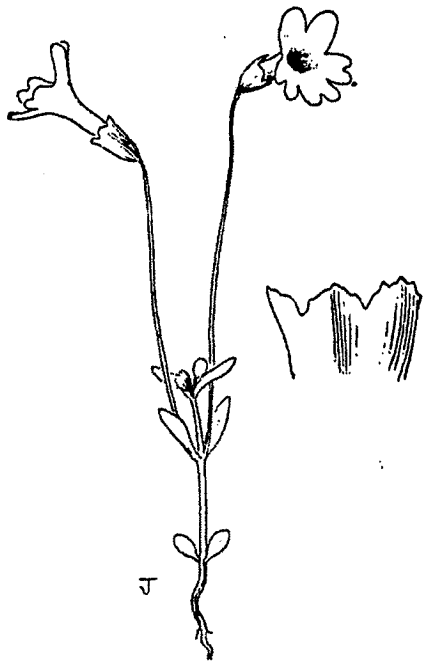

Figure 22 *Mimulus purpureus* from Abrams (1951).

APPENDIX C: Agencies and persons reviewing or providing input on this plan.

U.S. Forest Service
- Lisa Croft, Forest Botanist Cleveland National Forest
- Cindy Dimmel, Resource Officer, Big Bear Ranger District
- Melody Lardner, Forest Botanist San Bernardino National Forest
- Jim Shevock, Regional Botanist

The Nature Conservancy
- Leslie Friedman
- Marlyce Myers
- John Stephenson

Kathy Freas, Research Scientist, Center for Conservation Biology
Tim Krantz, Principle Consultant, Bio-Tech Environmental Planning Consultants

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