

Pan Hot Springs Meadow Habitat Management Plan

**Prepared for the
Big Bear City Community Services District,
Big Bear City, San Bernardino County,
California**

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1.0 INTRODUCTION

1.1 PURPOSE

The Big Bear City Community Services District (CSD) submits this Habitat Management Plan (HMP) as part of their Public Comments on the Proposed Designation of Critical Habitat for *Poa atropurpurea*, San Bernardino Bluegrass, and *Taraxacum californicum*, California dandelion, by the U.S. Fish and Wildlife Service (FWS).

With this submittal, the CSD proposes to establish the Pan Hot Springs HMP on its properties situated at the east end of Big Bear Valley in the San Bernardino Mountains, San Bernardino County, California. The Pan Hot Springs HMP commits the CSD to conservation of approximately 40 acres of the 135 acres under CSD ownership at the southwest shore of Baldwin Lake; and includes specific measures for habitat restoration and monitoring for four Federally-listed Endangered plant species: San Bernardino bluegrass (*Poa atropurpurea*, POAT), pedate checkerbloom (*Sidalcea pedata*, SIPE), California dandelion (*Taraxacum californicum*, TACA), and slender-petalled mustard (*Thelypodium stenopetalum*, THST); and one Federally-Threatened species: ash-gray paintbrush (*Castilleja cinerea*, CACI).

Montane meadow habitat in the San Bernardino Mountains and at Pan Hot Springs supports a diverse, endemic assemblage of plants and animals. This assemblage includes the four federally-Endangered and one federally-Threatened plant species named above, as well as six additional “sensitive” plant species as listed according to the California Native Plant Society Inventory (CNPS 2007) and/or the California Department of Fish and Game’s California Natural Diversity Database (CDFG 2008). The purpose of this document is to compile information about the Pan Hot Springs meadow habitat and the rare species it supports, develop general and site-specific management directions and measures to restore rare plant habitat conditions, and establish an implementation plan and schedule for those measures. The HMP also includes specific information for the management of the five federally-listed plant species.

1.2 LEGAL REQUIREMENTS AND MANAGEMENT DIRECTION

Management direction and prescriptions of the Pan Hot Springs HMP are based on existing laws, regulation, and FWS policy. Applicable requirements and direction may be found primarily in the Federal Endangered Species Act (FESA), and in two other SBNF-adopted HMPs: the Pebble Plain Habitat Management Guide and Action Plan (USDA Forest Service 1990) and Meadow Habitat Management Guide (USDA Forest Service 2002). Other habitat management measures are incorporated in this plan from the Recovery Plan for SIPE and THST (U.S.D.I. Fish and Wildlife Service 1998).

Plants that occur in wet meadows are also protected indirectly by at least two executive orders: Executive Order 11990 Protection of Wetlands states in section 5b that “...each agency shall consider factors relevant to a proposal’s effect on the survival and quality of the wetlands.” and that among these factors are “maintenance of natural systems,

including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources...”. Wetlands are defined as “..those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.” (Federal Executive Order 1977).

1.3 NEED AND JUSTIFICATION FOR THE HABITAT MANAGEMENT PLAN

The Pan Hot Springs Habitat Management Plan has been developed by the Big Bear City Community Service District in response to the U.S. Fish and Wildlife Service Proposed Designation of Critical Habitat for *Poa atropurpurea* (San Bernardino blue grass) and *Taraxacum californicum* (California taraxacum) (USDI Fish and Wildlife Service 2007).

As a result of the botanical field surveys of the CSD properties, areas containing occupied habitat for the federal-listed species were identified; and non-sensitive areas were also identified.

An existing 10-acre deed restriction recorded by the CSD over a portion of the meadow is inadequate to provide long-term protection of Threatened and Endangered plant resources. Populations of all four Endangered meadow plant species have declined since the 1980s and early 1990s as a result of grazing, invasive introduced species, and hydrological alteration (ibid., Krantz pers. obs.).

The Pan Hot Springs HMP commits the CSD to record a Restrictive Covenant (RC) over portions of their property containing Endangered and Threatened plant habitats for the purpose of developing a long-term management plan in favor of those species. The HMP establishes certain allowable uses of sensitive habitats, while disallowing others; and sets forth restoration and monitoring programs for the five listed taxa.

By their authority and approval of the terms and conditions of this HMP, the U.S. Fish and Wildlife Service agrees with the CSD position that formal designation of critical habitat of POAT and TACA habitat is unnecessary within the CSD properties under the HMP; and that the measures called for in the HMP mitigate the need to designate critical habitat within the Pan Hot Springs plan area.

Non-sensitive portions of the CSD properties within the HMP area may be proposed for development for parks, open space, environmental education, and other uses, subject to California Environmental Quality Act (CEQA) review and other State and Federal regulatory requirements.

2.0 BIOLOGICAL INFORMATION

2.1 HABITAT MANAGEMENT PLAN AREA

The Pan Hot Springs Habitat Management Plan addresses approximately 130 acres of CSD-owned properties at the southwest shore of Baldwin Lake (APN 313-131-02, 313-193-01, 313-202-03, 313-202-04 and 313-202-05). In addition, three small parcels comprising approximately 5-acres fronting on Paradise Way (313-202-03, 313-118-01, and 313-118-02) were also surveyed for presence of sensitive plants in conjunction with the field surveys of the other parcels.

2.2 METHODOLOGY

Field survey protocols for the federally-listed species were conducted in accordance with the Suitable Habitat Criteria developed in 2002 for *Sidalcea pedata*, *Taraxacum californicum*, *Poa atropurpurea*, and *Thelypodium stenopetalum*. (USDA Forest Service 2002)

Reference populations for federally-listed species were surveyed at the North Baldwin Lake Ecological Reserve and at Eagle Point in Big Bear Lake to determine the anthesis (flowering) condition of target species. All target species were readily visible, but for *Poa atropurpurea*, which was not observed at either location where the author has seen it in previous years. Despite the difficulty of reliably seeing POAT at the Pan Hot Springs site, several plants were positively identified at two locations in the meadow. A subsequent survey of those locations will be conducted to determine the extent and numbers of plants in those occurrences.

The Pan Hot Springs parcels were systematically walked by the author and two botanically-trained field assistants. All federally-listed plant species locations were recorded using a Garmin GPS (global positioning system) and points and polygon data were downloaded into a GIS (geographic information system) for the property. Photo documentation of the major occurrences was recorded in conjunction with the GPS data. The project GIS is archived at the Redlands Institute, University of Redlands.

2.3 PLANT COMMUNITIES

2.3.1 Mixed Conifer Forest

The meadows at Pan Hot Springs occur as flat or gently sloping openings situated in the mixed conifer forest that characterizes the rest of Big Bear Valley. Mixed conifer forest surrounding Pan Hot Springs is predominantly comprised of Jeffrey pines (*Pinus jeffreyi*) and western junipers (*Juniperus occidentalis australis*), but only several large trees are distributed along Highway 18 on the northern edge of the property, several more on the Paradise Way parcels and along the extreme southern property boundary, and a few small western junipers extend out into the meadow habitat to the east.

2.3.2 Montane Meadow

Montane meadow habitat is typically characterized by unique vegetation, hydrology and soil factors. Meadows at Pan Hot Springs are generally dominated by grasses, sedges, and rushes, and also support a unique assemblage of other flowering plants, including several Big Bear-area endemic species—plants confined to Big Bear and Holcomb Valleys or the San Bernardino Mountains.

Soils at Pan Hot Springs associated with the meadow habitat are characterized by blue-green clays interbedded with alluvial sand deposits, creating a poorly-drained substrate that remains saturated for many months out of the year. Evaporites (salts and minerals) collect at the surface of the saturated soils, creating salt scalds—vegetation-free areas—that tend to open up the habitat of other competing vegetation, making a niche for plants such as THST that can tolerate such harsh conditions.

2.3.3 Uplands

Upland habitats on Pan Hot Springs are situated slightly above the meadows and are characterized by coarser, well-drained sandy soils, resulting in drier soil conditions and more xerophytic vegetation. Upland habitats within the HMP area are characterized by Great Basin sagebrush (*Artemisia tridentata*) and rabbitbrush (*Chrysothamnus nauseosus* and *C. viscidiflorus*), with a distinctive association of upland herbs and grasses.

2.3.4 Marshlands

The geothermal springs for which the area is named come to the surface in several small ponds, lined with emergent aquatic vegetation, such as tules (*Scirpus acutus*) and wiregrass (*Juncus balticus*)—comprising a very rare montane marsh habitat. Perennial surface water in the ponds supports a number of unusual species, such as arrow grass (*Triglochin maritima*) and duckweed (*Lemna minima*); and provides habitat for nesting waterfowl, red-winged blackbirds, and other wetland wildlife species.

Scattered Scouler’s willows (*Salix scouleriana*) occur along the tributary drainage into Baldwin Lake from the west, but these are sparse and do not constitute a riparian habitat much different from the meadow habitat.

2.4 THREATENED, ENDANGERED, AND SPECIAL-STATUS SPECIES

Pan Hot Springs meadow habitat supports four federally-Endangered plant species and one federally-Threatened plant species, as well as six other Special Status species (Table 1). Associated plant species and current threats are described below for each species.

Known occurrences of the four federally-Endangered species are restricted to the upper Santa Ana River drainage (Mountaintop Ranger District and part of the Front Country Ranger District) with the exception of San Bernardino bluegrass, which also occurs on the Cleveland National Forest. All four species were probably locally common when the large Big Bear meadow occupied the area now covered by Big Bear Lake. Riparian corridors probably connected smaller meadows occupied by the species. Water extractions, past grazing practices, mining, the inundation of Big Bear Lake, and urban

development have all resulted in a significant cumulative loss of meadow habitat. Sites supporting these federally-Endangered meadow plants are now isolated and disconnected.

Similarly, occurrences of ash-grey paintbrush are most often associated with pebble plains—a relictual alpine plant community found only in Big Bear and Holcomb Valleys, but it also is occasionally found in meadow habitats. Pebble plains habitat is limited to about 514 acres on public land and another 32 acres on private land (SBNF 1990). Pebble plains are threatened primarily by continuing residential development in Big Bear Valley, and off-road vehicle recreation.

Six other Special Status species were identified on the Pan Hot Springs parcels. These are species of limited distribution, but which are somewhat more widely distributed, or for which there is not enough information to support listing as Threatened or Endangered according to the FESA. Individual species accounts are provided below.

2.4.1 Ash-gray paintbrush (*Castilleja cinerea*)

Ash-gray paintbrush is a federally-listed Threatened species. It is hemi-parasitic, that is, it is a partial root parasite on other plants, most commonly associated with Kennedy's buckwheat (*Eriogonum kennedyi* spp.) on pebble plains habitat, but also occasionally on Wright's matting buckwheat (*Eriogonum wrightii subscaposum*), or one of several *Artemisia* species (Krantz 1983).

Ash-gray paintbrush is distributed in four small upland occurrences and several individuals in meadow habitat on the Pan Hot Springs parcels. Two of these occur in the Basin sagebrush habitat along Highway 18 at the northern edge of the property on soils resembling pebble plains habitat, and with several other associated species typically found on pebble plains (*Arabis parishii*, *Astragalus purshii lectulus*, *Poa secunda*, et alus). In these two occurrences, CACI is primarily associated with Wright's matting buckwheat.

A third occurrence exists at the extreme southern portion of the CSD properties in a small swale situated within sagebrush habitat. This occurrence is associated with *Artemisia tridentata* and *A. ludoviciana*. A fourth occurrence is confined to three plants associated with *Artemisia tridentata*, situated on parcel APN 313-202-03 (Paradise Way Minor Subdivision of parcel).

Several other individual plants were observed within meadow habitat, together with other endangered meadow species. These plants are mostly associated with *Artemisia ludoviciana*.

2.4.2 San Bernardino bluegrass (*Poa atropurpurea*)

San Bernardino bluegrass is found in the Big Bear/Baldwin Lake watershed and Holcomb Valley. It also occurs on the Cleveland National Forest in the Palomar, Laguna and Cuyamaca Mountains, but is not known to occur in between. There are 21 known occurrences of this species in these areas (CDFG 2007). San Bernardino bluegrass occurs in wet and dry meadows, generally on loamy alluvial or sandy loam soil, but

occasionally on soil containing small rocky inclusions. This species occurs between 6,750 and 7,600 feet in the San Bernardino Mountains. San Bernardino bluegrass is the first species of *Poa* to flower (Krantz 1981). Associated species include *Poa pratensis*, *Sidalcea pedata*, *Elymus elymoides*, *Artemisia ludoviciana*, *Castilleja cinerea*, *Muhlenbergia rigens*, *Muhlenbergia richardsonii*, and *Ranunculus californicus*. San Bernardino bluegrass is threatened by habitat fragmentation and loss from development of private sites, off-road vehicle activities, and hydrological alteration.

Before undertaking the field survey of the Pan Hot Springs property, reference populations of known POAT locations at North Baldwin Lake and Eagle Point were examined to determine the flowering status of the species. POAT was not observed to be up in either or the reference locations, indicating that a survey for this species would not be reliable at this time. However, several POAT plants were positively identified in the Pan Hot Springs meadow at two widely separate locations, indicating positive presence of the species; and the need to undertake a subsequent survey at a later time of season.

2.4.3 Pedate checkermallow (*Sidalcea pedata*)

Pedate checkermallow is endemic to the Big Bear/Baldwin Lake watersheds of the San Bernardino Mountains. Six occurrences of this species are known from the SBNF. Pedate checkermallow occurs in vernal moist meadows and sparsely vegetated drier meadows between 5,250-8,200 feet (Krantz 1979). Soils are typically mesic to moist and undisturbed. The plant is generally not found in swales that are densely vegetated by rushes and sedges, as these areas are too wet. However, SIPE is considered to be an obligate wetlands indicator (U.S.D.I. Fish and Wildlife Service 1998). Associated species include *Achillea millefolium*, *Elymus trachycaulus* ssp. *trachycaulus*, *Lupinus confertus*, *Potentilla gracilis*, *Deschampsia cespitosa* ssp. *cespitosa*, *Taraxacum californicum*, *Poa pratensis*, and several other grasses. The primary threat to pedate checkermallow is loss of remaining habitat on private land. Threats on SBNF land include unauthorized off-highway vehicle use, dispersed recreation (through trampling and alteration of meadow hydrology), and various other projects in or near occupied habitat. On private lands, intensive grazing, OHV use, alteration of natural hydrology and development are all threats.

At Pan Hot Springs, pedate checkermallow is somewhat widely distributed across about 10 acres of habitat. A known occurrence of about a dozen plants on the northeasterly parcel (313-202-03) was no longer extant, apparently succumbing to an extensive invasion of wheatgrass (*Elymus elymoides*) and perhaps to increasing drought in the last decade.

2.4.4 California Dandelion (*Taraxacum californicum*)

California dandelion, also endemic the San Bernardino Mountains, has a distribution that includes Big Bear/Baldwin Lake watersheds and Holcomb Valley, as well as parts of the Upper Santa Ana River watershed. Thirty-eight occurrences of the species are known from the SBNF, although several of these are limited to less than 20 individuals. California dandelion occurs in wet to mesic meadows and swales, often along the fringes of wet meadows between 5,300 and 9,000 feet. Occupied sites tend to be relatively flat

and may occur along perennial streams. Associated species include *Juncus mexicanus*, *Carex subfusca*, *Elymus trachycaulus* ssp. *trachycaulus*, *Mimulus suksdorfii*, *Horkelia rydbergii*, and *Geranium richardsonii*. Threats to California dandelion on private land include loss of remaining habitat, intensive grazing, invasion of weedy European dandelions, and alteration of natural hydrology. Threats on SBNF land include unauthorized recreational vehicle use, dispersed recreation (through trampling and alteration of meadow hydrology), and various other projects in or near occupied habitat. Genetic pollution and competition from the non-native European dandelion, *Taraxacum officinale*, is a threat to California dandelion on all lands.

California dandelions occur at two widely separate sites on Pan Hot Springs, a northern occurrence of about six plants, and a central-southerly occurrence of about another six plants. Historically, direct grazing of TACA flowering stems by horses and cattle were observed on the Pan Hot Springs parcel by the author in the mid-1980s. European dandelions evolved with grazing pressure, and they have the capability of re-sprouting flowers at ground level after grazing or lawn mowing. TACA does not do this. Flowering stems are simply removed and not replaced; and leaves are more succulent and erect and are readily cropped to the ground. Thus, grazing and urban mowed lawns favor the European dandelion over the California dandelion. Several hundred weedy European dandelions were removed during the field survey.

Ironically, now that grazing has been removed from the Pan Hot Springs parcels, the consequent expansion of non-native ryegrass now threatens to overwhelm the few California dandelion plants that remain.

2.4.5 Slender-petaled mustard (*Thelypodium stenopetalum*)

Slender-petaled mustard is endemic to the Big Bear/Baldwin Lake watersheds and the Holcomb Valley area of the San Bernardino Mountains. *Thelypodium stenopetalum* occurs on alkaline flats, lakeshores, and in vernal moist meadows between 6,200 and 7,200 feet (Krantz 1980). The plant is extant at only six discrete populations. Slender-petaled mustard is usually found in drier portions of meadows within sagebrush scrub (*Artemisia tridentata*) or along meadow margins. Associated species include *Carex athrostachya*, *Iris missouriensis*, *Distichlis spicata*, *Poa atropurpurea*, and *Taraxacum californicum*. THST is a host plant for the caterpillar of the rare Andrew's marble butterfly (*Euchloe hyantis andrewsii*). The main threat to slender-petaled mustard is development and loss of remaining habitat on private land. Threats on SBNF land include unauthorized recreational vehicle use, alteration of meadow hydrology, and various other projects in or near occupied habitat.

Slender-petaled mustard is widely distributed across about 20 acres of meadow habitat at Pan Hot Springs. It is particularly abundant in highly alkaline areas where salt accumulations preclude other meadow vegetation and grasses. One colony comprising about 8 acres of occupied habitat (APN 313-131-02 and 313-202-03) was estimated to contain several thousand individuals, making that the most populous THST occurrence on the planet. THST is also well established in the sagebrush-meadow edge at the western portion of 313-202-03, extending toward the east and around the south side of

the springs, together with pedate checkermallow and widely scattered California dandelions.

Grazing of THST inflorescences was observed at Pan Hot Springs in the mid-1980s by the author. Similar to the pedate checkermallow and California dandelion, the greatest threat to THST at this location seems to be the invasion of introduced ryegrass as a result of exclusion of grazing over the past decade. Introduced ryegrass (*Elymus intermedia* X *elymoides*), broadcast in meadows by cattlemen to augment pasture in the 1960-70s, now occupies 50% of available meadow habitat to the near-exclusion of most other meadow species. Ryegrass has overtaken most of the meadow habitat and even much of the sagebrush, its dense leafy thatch of the previous season creating a thick thatch that seedlings cannot push off.

In one area, several THST plants could be observed in the dead stems of a sagebrush plant, the sagebrush itself apparently succumbed to the grass by not being able to produce new seedlings through the matted thatch

Table 1: Endangered and Threatened Meadow Plant Species. The Federal and State status, California Native Plant Society status, and CNDDDB rank are shown (CNPS 2007; CDFG 2002).

Species	Federal Status	California Status	CNPS; R-E-D List; CNDDDB
<i>Castilleja cinerea</i>	Threatened	None	1B; 2-2-3; G2S2.2
<i>Poa atropurpurea</i>	Endangered	None	1B; 2-2-3; G2S2.2
<i>Sidalcea pedata</i>	Endangered	Endangered	1B; 3-3-3; G1S1.1
<i>Taraxacum californicum</i>	Endangered	None	1B; 3-2-3; G2S2.1
<i>Thelypodium stenopetalum</i>	Endangered	Endangered	1B; 3-3-3; G1S1.1

CNPS R-E-D Code:

Rarity

- 1: Rare, but sufficient numbers and distribution that the potential for extinction is presently low.
- 2: Occurrence confined to several populations or 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.

Endangerment

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

Distribution

- 1: More or less widespread outside California.
- 2: Rare outside California.
- 3: Endemic to California (*i.e.* does not occur outside California)

CNDDDB Rank

- S1:** Fewer than six occurrences or fewer than 1000 individuals or less than 2000 acres
- S1.1:** Very threatened
- S1.2:** Threatened
- S1.3:** No current threats known
- S2:** 6-20 occurrences or 1000-3000 individuals or 2000-10000 acres (decimal suffixes same as above)
- S3:** 21-100 occurrences or 3000-10000 individuals or 10000-50000 acres (decimal suffixes same as above)
- S4:** Apparently secure in California; this rank is clearly lower than S3, but factors exist to cause some concern, *i.e.*, there is some threat or somewhat narrow habitat. No threat rank
- S5:** Demonstrably secure or ineradicable in California. No threat rank.

3.0 BIOLOGICAL THREATS

3.1 DEVELOPMENT ACTIVITIES

The CSD has developed preliminary plans for a community park. The first phase of the community park is to be created on the approximately 5-acre property on the east side of Paradise Way. This area is characterized by upland vegetation of Basin sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus nauseosus* and *C. viscidiflorus*), with several western junipers and Jeffrey pines.

The CSD has identified several other parcels for future development of a second phase of park construction, potentially including playing fields for soccer or baseball. Any development of facilities on other parcels in the plan area will be situated to avoid special-status species to the fullest extent possible; and will still have to undergo a CEQA review process and other regulatory agency requirements.

Another effect of residential development in the surrounding neighborhoods is the proliferation of European dandelions in lawns. European dandelions thrive in lawns, as any homeowner knows, the more one mows, the more they respond with low-growing plants that flower at lawn level. The lawn at the Latter Day Saints church immediately west of the Pan Hot Springs parcels is a good example, with hundreds or even thousands of European dandelions in just the tiny parking lot sod areas, producing seeds that are wind-dispersed into the adjacent meadow habitats.

3.2 LIVESTOCK GRAZING

The Pan Hot Springs area has experienced a long grazing history for more than a century. Direct impacts of grazing by horses, cattle and feral burros were documented by the author on the property and on other properties around Baldwin Lake in the mid-1980s. Slender-petaled mustard and California dandelion were both observed to be particularly vulnerable (and palatable) to livestock, the animals often biting off the flowering stems of the plants repeatedly during the short blooming season, essentially eliminating that individual from reproducing. For THST, a biennial that flowers in the second year and then dies, this was a lethal combination.

Indirect impacts of grazing animals were observed by trampling during periods when the ground was saturated or moist. Hooves would leave deep depressions of several inches in the wet clay soils, resulting in physical damage to tap-roots and seedlings. Secondary impacts of grazing include selection of grazing-resistant non-native species, such as European dandelion, in which the plants respond to grazing pressure by producing more flowers at ground level.

3.3 INTRODUCED SPECIES

Several introduced species represent serious management problems for meadow habitat management. The case of the European dandelion has already been discussed. Ironically, with the removal of livestock by the CSD in the last decade, the introduced ryegrass (*Elymus* species) that was initially brought in to enhance forage values has

invaded the meadowlands, completely burying the native species with a thick mat of dead leaves in the winter months, then re-sprouting and overtaking the shorter-statured endangered plant species in the spring and early summer.

An entire occurrence of pedate checkermallow has been extirpated from the meadow edge on the northern CSD properties since the early 1990s by a dense invasion of ryegrass. Individual endangered plants of all four species were observed to “seek refuge” under sagebrush stems, where seedlings were not buried in ryegrass thatch, the area immediately around the bushes being completely overtaken by the thick grass. In some places, THST seedlings were observed to be abundant underneath grass thatch, but were unable to mechanically push through the detritus.

3.4 HYDROLOGICAL ALTERATION

Perhaps the most serious threat to the meadow habitat is the alteration of surface and groundwater hydrological conditions, upon which the entire meadow and wetland ecosystem is dependent.

Pan Hot Springs has been sustained by a natural geothermally-associated upwelling of groundwater since prehistoric times. The site was a central location for local Native Americans, with a rich oral history of the springs and the surrounding area.

In recent times, the original Pan Hot Springs resort was constructed west of the springs; and over a period of years from the 1970s through the -80s the extraction well for the resort over-pumped the groundwater to the degree that the primary and secondary springs dried out and actually began to show evidence of surface subsidence (large surface cracks), indicating that the groundwater aquifer was being depleted.

As a result of the Big Bear earthquake in 1992, the Pan Hot Springs resort was destroyed, the pools were filled in, and the water extraction was terminated; and within a few years the springs had refilled and remain full today.

4.0 CONSERVATION INSTRUMENT AND RELATION TO THE HABITAT MANAGEMENT PLAN

4.1 RECORDATION INSTRUMENT

The CSD proposes to establish the Habitat Management Plan Area on approximately 40 acres of meadow habitat under its control in the Pan Hot Springs area. Ten acres of this habitat were previously set aside as mitigation for impacts to meadow habitat in Shay Creek south of Baldwin Lake in 1990. The ten-acre rare plant preserve was recorded by means of a simple deed restriction, but no management or monitoring programs were established; and no further actions with regard to management of sensitive resources have been undertaken.

Based upon other failed deed restrictions elsewhere in Big Bear Valley, the Department of Fish and Game wrote that, “the Department does not consider deed restrictions to be an adequate mechanism to achieve permanent protection and effect recovery of listed species... [They] lack adequate safeguards to ensure sites are protected and managed over the long term. No responsible agency or management authority “holds” a deed restriction, and no one is responsible for the day to day operation... Management issues at [deed restricted sites] include a lack of a responsible managing entity and lack of management funding.” (CDFG 1997)

For these reasons, this HMP calls for the recordation of a Restrictive Covenant (RC) to be recorded over approximately 40 acres of habitat under CSD fee title ownership. An RC is a hybrid legal document which has some similar characteristics to both a simple deed restriction and a Conservation Easement. The RC is very similar to a Conservation Easement, except that the Responsible Agency for day to day management and operation will be the CSD, who will also continue to hold the fee title interest as well. The RC instrument will be designated to include all existing federal-Endangered plant habitat, as presently identified in the HMP. The RC shall also include areas essential to the maintenance of existing hydrological conditions.

4.2 RELATION TO THE HABITAT MANAGEMENT PLAN

The RC shall refer to the HMP to provide management direction and monitoring of federal-Endangered plants on the property. Management objectives and implementation measures shall be clearly stated, and allowed and disallowed uses of the property shall be detailed therein.

The CSD plans to coordinate funding efforts in order to sustain the HMP for the first ten year management period, including seeking grant funding and partnerships with other stakeholders who will be invited to participate in the HMP. The CSD has already started discussions with representatives of the San Manuel Band of Serrano Mission Indians, based at San Manuel in Highland, California and the San Bernardino National Forest. Another possible stakeholder includes the owner of the present-day resort property, Mr. Ray Bowling, whose property and well-head extend to the primary geothermal pond in the middle of the HMP area.

5.0 HABITAT MANAGEMENT ALTERNATIVES

5.1 GOALS AND OBJECTIVES

The basic goals of the HMP are to conserve and improve the habitat of the plan area in support of the five federally-listed plant species occurring there, and other special-status plants and wildlife in the meadow ecosystem.

5.2 ESTABLISH QUANTITATIVE BASELINE DATA

The first objective of the HMP implementation is to establish accurate baseline data regarding the distribution, abundance, and habitat conditions within the plan area. These measures should include a thorough field reconnaissance of the property and establishment of permanent transects and monitoring programs in accordance with FWS protocols for the endangered species.

These baseline data shall include establishment of a ground- and surface-water monitoring program.

5.3 RESTORATION PROGRAMS

Restoration and habitat enhancement goals shall be established for each endangered species, as appropriate. Restoration plan alternatives shall be developed by the stewardship entity, with measurable performance criteria to evaluate the restoration actions. Among the restoration programs that may be considered and undertaken are the following alternatives.

5.3.1 Non-native Dandelion Control

Programs to remove the European dandelion from the HMP area and adjacent properties can be easily and cost-effectively implemented through volunteer “weeding” parties conducted by area schools or other organizations, under the supervision of a botanical authority who can discern the differences between the California and European dandelions.

5.3.2 Reduction of Invasive Ryegrass

With the removal of livestock from the HMP area, non-native ryegrass has overtaken as much as 50% of the meadow habitat to the exclusion of most other species. Several alternatives to reduce ryegrass may be tested in portions of the HMP area and, if documented as successful, these measures may be implemented more widely. One alternative in this regard would be implementation of controlled burns to remove the ryegrass thatch. Such burns could be done on a small scale during seasons of low fire hazard; and then carefully monitored to observe the effects on endangered species. Another alternative could include seasonally-restricted, low-intensity grazing to remove the grass. Such grazing prescriptions would have to be limited to late summer or fall when soils are dry and flowering and seed set are completed for sensitive species.

5.3.3 Restoration and Enhancement of Ponds

Several of the ponds have been trampled by livestock and much of the aquatic vegetation has been eliminated or disturbed. Revegetation with aquatic vegetation from the primary ponds may be used to restore these secondary ponds to promote greater ecological functionality. As with the dandelion project above, pond restoration activities would lend themselves to local school or volunteer participation.

5.4 ENVIRONMENTAL EDUCATION AND INTERPRETIVE PROGRAMS

Environmental education is essential in order to promote long-term understanding and appreciation of the value of the unique biological resources found at Pan Hot Springs. Development of construction of interpretive materials, trails, boardwalks, and other outdoor education programs should be a foundation of any HMP for the area. The University of Redlands Environmental Studies Program offers environmental design studios each semester. These are GIS-facilitated resource management and planning clinics in which the further development and articulation of a park plan would provide an excellent studio subject. The training of natural history docents from the schools and other members of the community will encourage local area involvement, and further community outreach.

The participation of the Serrano Indian Nation in the development of a cultural history program would present a unique opportunity to interpret the Pan Hot Springs resources.

6.0 HABITAT MANAGEMENT PLAN IMPLEMENTATION

Assuming Board approval, the CSD plans to implement the HMP over the next 5 years. Establishment of baseline data and coordinating educational activities with other entities discussed earlier can begin upon adoption of the HMP. The development of the restoration programs are expected to take place over the next few years. Implementation of the restoration programs and the recordation of the Restrictive Covenant will be coordinated with the CEQA process for Phase 1 and Phase 2 of the CSD's park projects.

7.0 REFERENCES

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