SIERRA NEVADA ECOREGIONAL PLAN

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Photo Courtesy Charles Webber

The Nature Conservancy

CALIFORNIA

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A. Executive Summary

This ecoregional plan for the Sierra Nevada is presented by The Nature Conservancy of California. Following the guidelines outlined in Geography of Hope (1997), the plan identifies 573 natural areas called "portfolio sites", whose protection would ensure the long-term survival of viable, vulnerable species and natural communities in the ecoregion.

Extending 400 miles from Lake Almanor near Chico in the north to Tehachapi Pass near Bakersfield in the south, the Sierra Nevada ecoregion encompasses some 12 million acres of rugged snow-capped mountains, coniferous forests, and foothill woodlands. Eighty-three percent of the ecoregion is owned and managed by public agencies including 8 national forests, 3 national parks, and numerous state and local lands.

The Sierra Nevada ecoregion supports an impressive array of biodiversity including 356 terrestrial vertebrates, 88 vegetation communities, 66 aquatic communities, and 3,500 native plant species. Scientists estimate 17% of terrestrial vertebrate species may be at risk including bighorn sheep, willow flycatcher, spotted owl, and Yosemite toad. Key threats to biodiversity include water development, real estate development, road construction, livestock grazing, fire suppression, and timber harvest.

The ecoregional plan evaluates 289 natural communities and species as conservation targets through a series of ecological groups including aquatics; riparian; foothill woodlands; chaparral; coniferous forests; montane meadows, interior wetlands and aspen; alpine; desert woodlands and scrub; isolated rare plants; and common or widespread communities. Data sources include published literature, computer data bases, and expert interviews.

The recommended 573 portfolio sites encompass approximately 38% of the ecoregion. Over 100 sites, 20% of the portfolio, are already well-protected in national parks or in ungrazed wilderness areas. An additional 56% of portfolio sites are on other lands owned and managed by public agencies. The remaining 24% of portfolio sites are comprised of mostly private lands.

Despite the large number of portfolio sites, many are contiguous or nested together in a way that a majority, 70%, were aggregated into 24 functional units based on proximity, landscape connectivity, and ecological processes. Selection of action areas focused on these functional aggregations since they are inherently large, have a high degree of intactness, and have the greatest potential to conserve biodiversity. Probable action areas in the next five years include four in the northern Sierra (Middle or North Fork American River, Cosumnes River, Perazzo Meadows, and Sierra Valley); and two in the southern Sierra (Kaweah Foothills and Kern River).

B. Purpose

The Nature Conservancy has adopted ecoregion-based planning as the most effective way to achieve its mission: to preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. This plan follows a methodology outlined in Geography of Hope (1997) that defines a vision of conservation success at an ecoregional scale. It is based on the design of a "portfolio" of biologically outstanding sites, systematically defined to fully represent the natural communities and species of the ecoregion, in combinations that maximize efficiency.

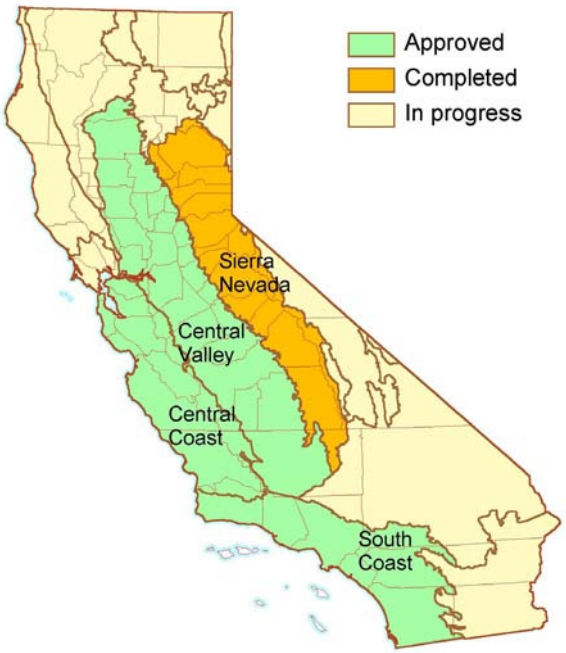


Figure 1.1 Ecoregional planning in California

The Sierra Nevada is the fourth ecoregion the Conservancy has studied in California following the South Coast, the Central Coast, and the Central Valley (Figure 1.1). With this plan, the Conservancy and our public and private partners can be confident that site by site conservation activities in the Sierra Nevada are not isolated but part of a larger, coherent design.

C. Description of Ecoregion

The Sierra Nevada Ecoregion is one of California's most scenic areas and one of the Nation's most spectacular natural wonders. A rugged mountainous area of snow-capped granite peaks, glacier-carved valleys, and dense coniferous forests, it is exemplified by places like Yosemite and Sequoia National Parks, Lake Tahoe, and 14,495 foot Mount Whitney – the highest peak in the United States outside Alaska.

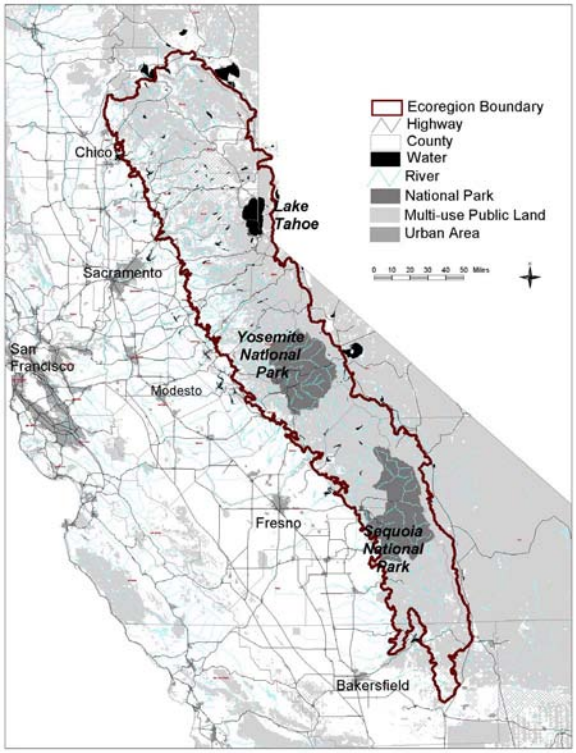


Figure 1.2: Sierra Nevada Ecoregion

The ecoregion encompasses a northwest trending mountain range extending some 400 miles from Lake Alamnor in the north to Tehachapi Pass near Bakersfield in the south (Figure 1.2). The ecoregion is 50-80

miles wide and is generally bounded by the 3,000 ft (900 m) elevation on the west and the 5,000 ft (1,500 m) elevation on the east. It is a landscape of some 12 million acres.

Larger than New Hampshire and Vermont combined, the Sierra Nevada includes portions of eighteen counties in California and two in Nevada. Eighty-three percent of the ecoregion is in public ownership including 8 national forests, 3 national parks, large areas of Bureau of Land Management (BLM) land, and numerous state and local lands.

The climate varies with elevation, ranging from rainy winters and hot dry summers in the western foothills to cold snowy winters and cool summers at higher elevations. Temperatures average 35 to 52F (2 to 11C) but fall with increasing elevation. Winter precipitation makes up to 80 to 85% of the total, much of it in the form of snow at higher elevations. The western foothills receive only 10 to 15 inches (250 to 380 mm) of rainfall per year and have a long, unbroken dry summer season. At higher elevations, the dry summer season is shorter and total precipitation rises to as much as 70 inches (1,790 mm). Prevailing west winds influence climatic conditions for the whole region creating a rain-shadow effect along the eastern slope.

The ecoregion supports an impressive amount of biological diversity. The California Wildlife Habitat Relationships (WHR) model, estimates about 356 species of terrestrial vertebrates utilize the Sierra Nevada ecoregion as a significant portion of their range. The California GAP analysis identifies 88 Holland (1986) natural vegetation communities and the Sierra Nevada Ecosystem Project (SNEP 1996) identifies 66 aquatic communities, defined by Moyle and Ellison (1991), in the ecoregion. More than 400 species of plants are thought to be endemic to the Sierra Nevada.

In general, vegetation is stratified into distinct north-south bands along the axis of the Sierra Nevada reflecting elevation and moisture gradients (Figure 1.3). The foothill zone on the west slope from about 1,000 to 3,000 ft (300 to 900 m) is comprised of broad-leaved woodlands and evergreen shrublands such as blue oak and interior live oak series. The montane zone from 2,000 to 7,000 ft (750 to 2,100 m) is characterized by coniferous forests such as ponderosa pine and mixed conifer communities. The subalpine zone ranges from 7,000 to 11,000 ft (2,100 to 3,300 m) and includes red fir, white fir, mountain hemlock, and lodgepole series. Above timberline, the alpine zone is characterized by bare rock, permanent snow fields, and low graminoid or forb species. Desert-facing slopes on the east side of the Sierra Nevada below 7,000 ft (2,000 m) are more arid and include pinyon-juniper woodlands and sagebrush communities.

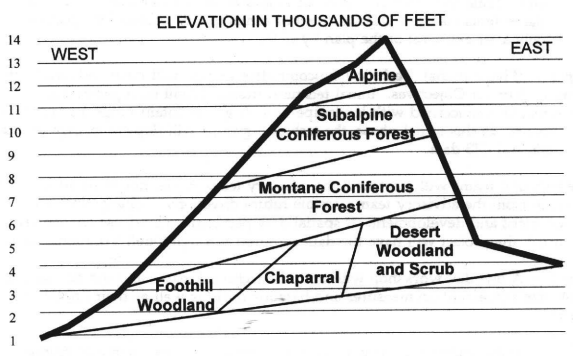


Figure 1.3: Typical cross-section of the Sierra Nevada

Common large mammals include mule and black-tailed deer, black bear, mountain lion, and coyote. Common smaller mammals include golden-mantled ground squirrel, long-eared chipmunk, and porcupine. Common birds are acorn woodpecker, Williamson's sapsucker, mountain

chickadee, and Cassin's finch. Declining wildlife species include bighorn sheep, California spotted owl, willow flycatcher, Pacific fisher, and amphibians such as yellow-legged frog and Yosemite toad.

D. Conservation Issues

Compared to other ecoregions in California, the Sierra Nevada is relatively intact. There have been few extinctions, and most species and communities occupy significant portions of their presettlement geographic extent. However, there are 6 key threats to Sierran biodiversity:

- Sixty percent of California's water supply originates in the Sierra Nevada. As a result, nearly every aquatic and riparian system in the ecoregion has been impacted by dams and diversions. SNEP (1996) called riparian and aquatic habitats the most degraded and impaired habitats in the Sierra Nevada.
- Over half the human population in the ecoregion is concentrated in the western foothills. Population growth and development pressures are expected to increase while less than 1% of habitats in this area are currently protected.
- Roads are a significant source of habitat fragmentation and disturbance in the ecoregion. Roads have been attributed to population declines of species such as pine martens, Pacific fishers, and spotted owls and to increased sediment loads in aquatic systems. The inventoried road system within national forests in the Sierra Nevada includes over 26,000 miles of roads.
- Seventy-eight percent of the vegetated land in the Sierra Nevada is estimated to be available to livestock grazing. Grazing has been directly linked to the extirpation of Least Bell's vireo from the ecoregion and the decline of other species such as willow flycatcher, great gray owl, and bighorn sheep.
- Fire suppression has altered fire regimes resulting in an increased density of young trees throughout the Sierra Nevada. Prior to 1850, highly variable fire frequencies and intensities enhanced vegetative diversity.
- Clear-cutting timber practices in the 1800s and fire suppression in the 20th century have led to losses in old forest diversity of the Sierra Nevada. Only 14% of forest lands have late-successional characteristics. Loss of old growth forest has been attributed to population declines of terrestrial vertebrate species including California spotted owl, Pacific fisher, northern goshawk, and pine marten.

E. Data Sources and Data Management

Key sources of information for this plan included heritage data from the California Department of Fish and Game Natural Diversity Data Base (NDDB), vegetation data from the California GAP analysis (GAP), numerous assessments and data from the Sierra Nevada Ecosystem Project (SNEP 1996), TNC files, literature, and expert interviews.

Perhaps the most significant source of information regarding the ecoregion was the Sierra Nevada Ecosystem Project. Completed in 1996, the $6.5 million congressionally funded study was compiled by a group of scientists, academics, and consultants assisted by staff from several federal and state agencies. Although the SNEP study area was larger than TNC's ecoregion, the core area is essentially the same. SNEP provided an assessment of current ecosystem health and four major data sets that were integrated into this plan including Aquatic Diversity Management Areas (ADMAs), Biodiversity Management Areas (BMAs), Significant Ecological Areas

(SEAs), and Areas of Late Successional Emphasis (ALSEs).

The planning team also contacted over 90 resource experts and held 10 interviews with representatives from the National Forest Service, the National Park Service, Bureau of Land Management, California Native Plant Society, and numerous local experts (See Section 3.).

Compilation, evaluation, and management of information from these sources was facilitated by the use of a geographic information system (GIS). The team used ArcView GIS 3.1. Many data sets were available in digital form including NDDB, GAP, and SNEP. Information collected from expert interviews and literature was digitized by the planning team. Tabular data regarding conservation targets, quality, and source of information was compiled in Excel spreadsheets that were linked to the GIS.

F. Conservation Targets

To achieve the goal of representing all vulnerable yet viable native species and all viable natural communities in the portfolio, the planning team focused on the following species and communities as conservation targets:

1. endangered, threatened, or declining vegetation communities as defined by the NDDB and other experts – this includes all G1-G3 communities
2. threatened or special concern aquatic communities as defined in SNEP (1996).
3. endangered, threatened, or declining terrestrial vertebrate and aquatic species as defined by the NDDB and other experts – this includes all G1-G3 species or T1-T3 subspecies
4. rare plant species as defined by NDDB and other experts – this includes all G1-G3 species or T1-T3 subspecies

NDDB ranks are defined by a global "G" distribution and, if applicable, a "T" subspecies distribution. Ranks are assigned as follows:

- G1,T1 = less than 6 known viable occurrences, 1,000 individuals, or 2,000 acres
- G2,T2 = 6-20 known occurrences, 1,000-3,000 individuals, or 2,000-10,000 acres
- G3, T3 = 21-100 known occurrences, 3,00-10,000 individuals, or 10,000-50,000 acres

Common or widespread natural communities, those ranked G4-G5, were considered secondary targets and were evaluated in a separate analysis using a computer model designed by Frank Davis at U.C. Santa Barbara. The results of this analysis were used to verify the completeness of the functional aggregations as part of implementing portfolio conservation strategies (See Section 2.J).

Using the criteria described above, 289 conservation targets were identified for the Sierra Nevada Ecoregion (See Appendix I) comprised of the following:

51 natural communities
21 aquatic communities
61 terrestrial vertebrates
156 plant species

G. Conservation Goals

Conservation goals were established to ensure representation of multiple viable occurrences of target species and communities across the ecoregion. Conservation goals were also stratified to capture the geographic variation of target species and communities.

Minimum conservation goals for terrestrial target species were based primarily on

global rank and viability. Where possible, quality ranks for occurrences of target species were used to determine viability. If quality ranking was unknown, the team relied on population size, trend, threats, or expert opinion to ascertain occurrence viability. Conservation goals were assigned as follows:

- G1- all viable occurrences
- G2 – 75% viable occurrences or at least 3 occurrences per subregion, whichever is greater
- G3-G5 – 50% of all viable occurrences, or at least 3 occurrences per subregion, whichever is greater

Conservation goals for target vegetation communities were determined by sorting each type based on both distribution and pattern. Distribution criteria included the following four categories:

1. Endemic – restricted to ecoregion
2. Limited – found two or three ecoregions
3. Widespread – found in more than three ecoregions
4. Peripheral – main distribution is outside ecoregion

Target communities were also categorized according to their average patch size in the ecoregion as mapped by GAP. Communities were sorted based into the following patterns:

1. Small patch – less than 1,500 acres
2. Large patch – 1,500 to 3,000 acres
3. Matrix – greater than 3,000 acres

Using the criteria described above, minimum conservation goals for target vegetation communities were established (Table 1.1). Since most vegetation types in the Sierra Nevada still occupy their pre-settlement geographic extent, conservation goals for target communities were defined as a percentage of the total current distribution as mapped by GAP. Goals were set highest for endemic small patch communities and decreased with greater distribution and patch size (See Appendix II for specific conservation goals of the target communities). Overall, conservation goals were set high to compensate for the coarse level of resolution in the Holland (1986) classification system used by GAP.

Table 1.1: Minimum Conservation Goals for Vegetation Communities

Endemic small patch	70% or at least 3 per subregion
Endemic large patch	60%
Endemic matrix	40%
Limited small patch	50% or at least 3 per subregion
Limited large patch	40%
Limited matrix	30%
Widespread small patch	40% or at least 3 per subregion
Widespread large patch	30%
Widespread matrix	20%
Peripheral	10%

Most small patch communities were inadequately mapped by GAP. Therefore, goals for these communities were based on the total number of occurrences identified by expert workshops and other sources in addition to GAP. A minimum of 3 occurrences per subregion was considered the conservation goal in such circumstances.

Conservation goals for aquatic conservation targets were based primarily on geographic representation. For these species and communities, the goal was at least 2 occurrences per subregion.

As noted, conservation goals were stratified across the ecoregion. In the Sierra Nevada, natural communities change gradually with latitude. Only 50% of the species associated

with coniferous forests in the southern Sierra Nevada are found in the northern Sierra. The team chose a stratification scheme based on Jepson (1993). The ecoregion was divided into three subregions each with an eastside and westside component - generally defined by the Sierra Nevada crest (Figure 1.4). The northern subregion extends from the ecoregion boundary south to the Calaveras River and Carson River watersheds. The central subregion extends south to the San Joaquin River and upper Owens River watersheds.

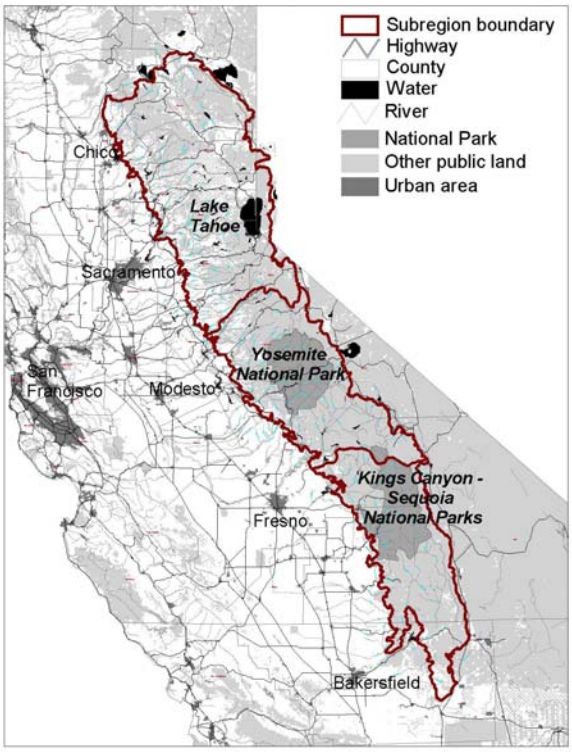


Figure 1.4: Sierra Nevada Subregions

H. Portfolio Assembly

Selection of portfolio sites was achieved through a five step process:

1. Assign targets to ecological groups. Portfolio assembly was organized around ecologically related groups each with a separately designed portfolio. Where possible, conservation targets were assigned to one of the following eight groups: aquatic; riparian; foothill woodland; chaparral; montane and subalpine coniferous forests; interior wetlands, montane meadows and aspen; alpine; and desert woodland or scrub. Detailed portfolio assembly descriptions are provided in Section 2 of this report. Some target species, particularly isolated rare plants and wide-ranging animals, do not fit this model and were evaluated in separate analyses after the other portfolios had been designed. Organizing portfolio assembly around ecological groups allowed the team to incorporate measures of the systems and processes that are critical for site conservation.

2. Identify potential sites for each ecological group. Locations supporting conservation targets and meeting minimum criteria, as specified for each group, were considered potential sites. Site boundaries were determined by the extent of target communities or by approximation such as soil type. Site boundaries are considered as placeholders and will likely be refined in site-level conservation planning.

3. Rank sites for target and landscape quality. All potential sites for an ecological group were sorted into subregions and evaluated for the quality of the target occurrences. Potential sites were also ranked for landscape attributes that reflect the quality of the site as part of a naturally functioning ecosystem. Landscape attributes varied from system to system but generally included measures of size, integrity,

and land management. Site ranking score sheets are located in Appendix IV.

4. Select sites with irreplaceable values and high ranks to meet target goals. Within each subregion, portfolio sites for an ecological group were selected by choosing sites with irreplaceable values first then selecting from sites with high ranking landscape scores. The number of sites selected was guided by representation and efficiency with the minimum number of sites determined by the conservation goals for each target.

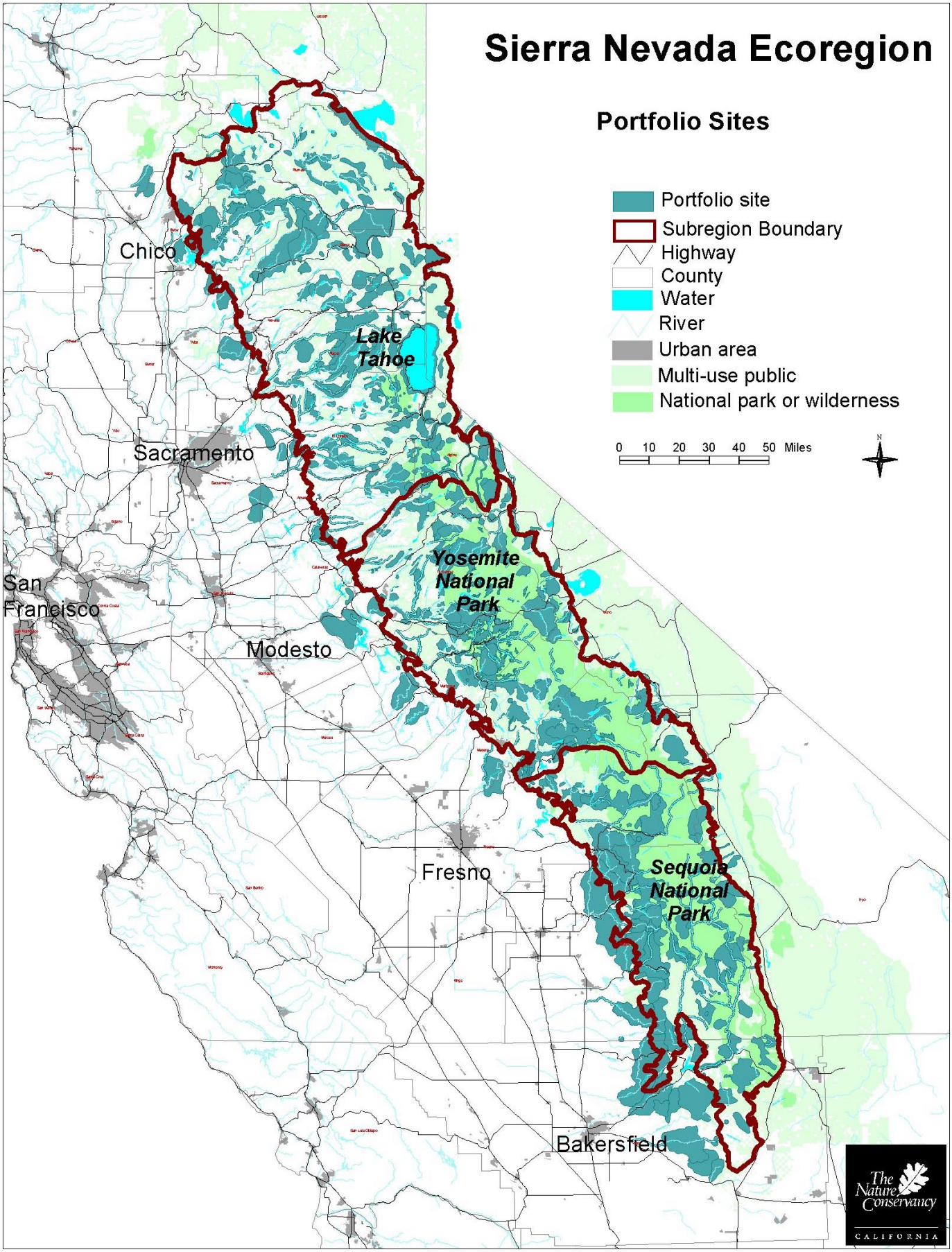
5. Combine portfolio sites from each group and add sites to capture missed targets. The portfolios of the eight ecological groups were then combined into one portfolio for the entire ecoregion. These portfolio sites were compared with data regarding conservation targets not captured in the ecological groups, such as isolated rare plants, and new sites were added as necessary to meet conservation goals for these targets.

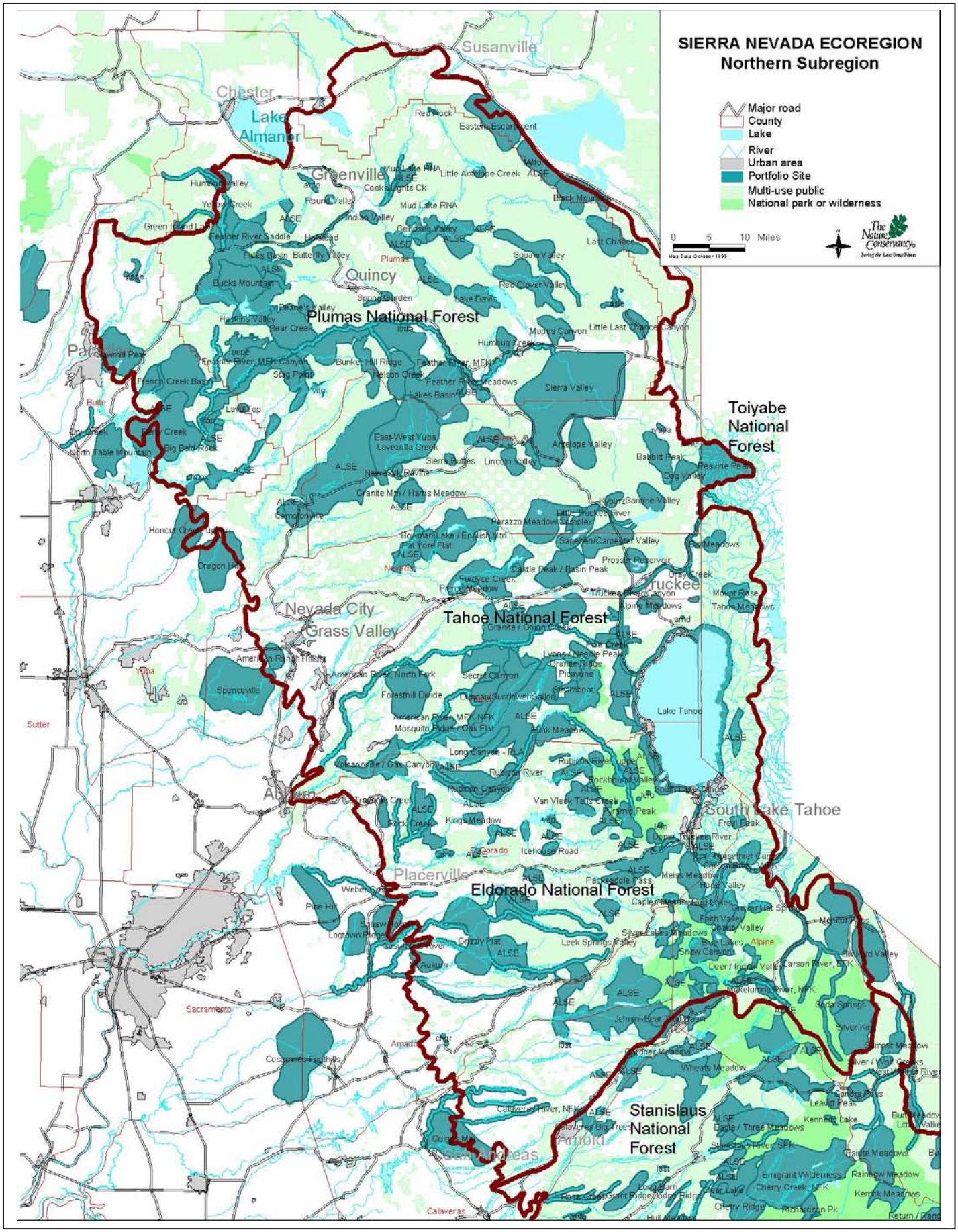
Although, previous ecoregional plans in California have not specified conservation goals for common and widespread communities, planning teams have been confident these targets could be adequately protected in the site conservation planning phase. To test this hypothesis, the Sierra Nevada team invited Frank Davis of U.C. Santa Barbara to develop a tool for clustering areas around portfolio sites to meet conservation goals for common and widespread communities. The team used Spexan, a multi-objective computer model, to test a variety of spatial alternatives in the northern subregion. The process is discussed in more detail in Section 2.J.

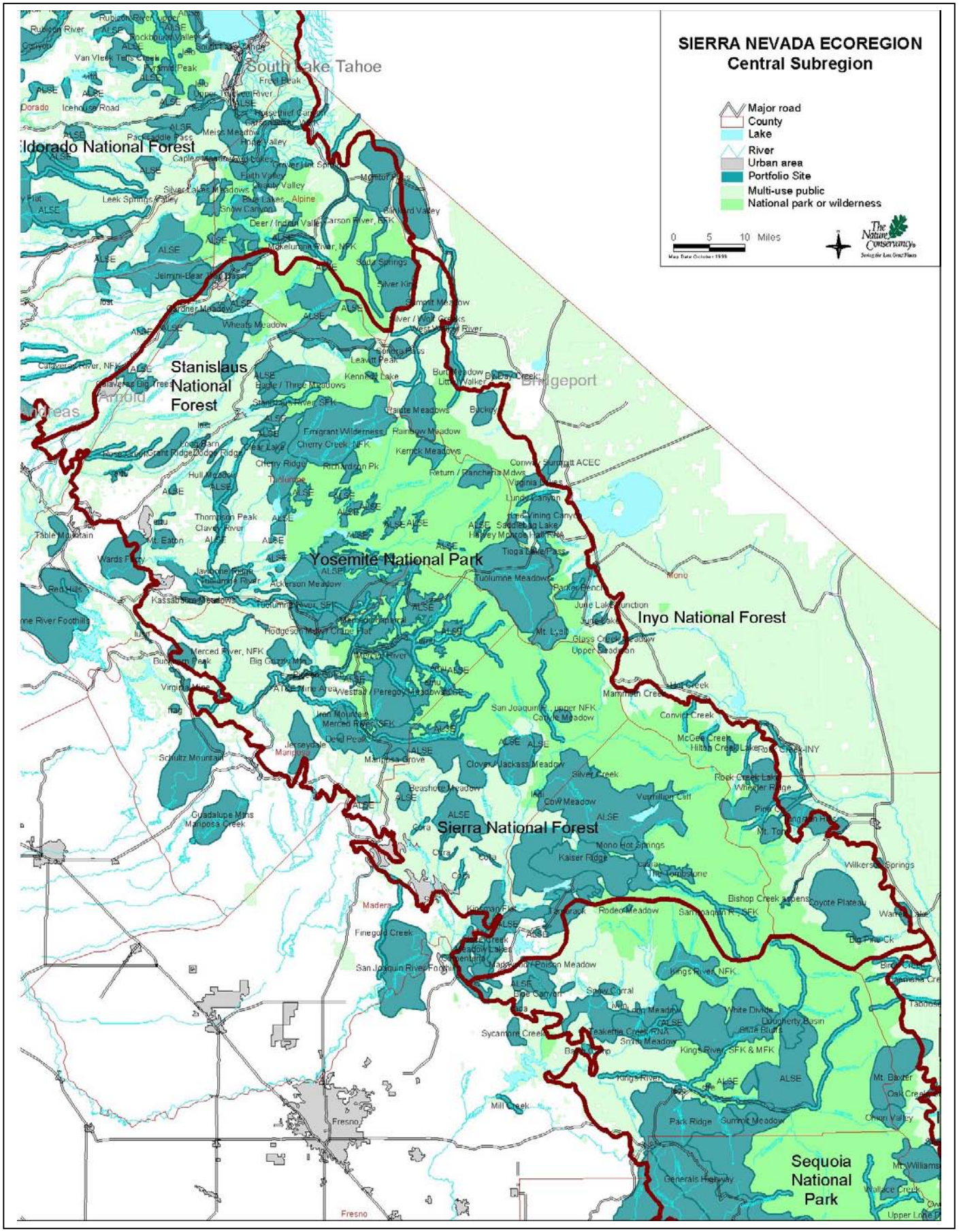
Results indicated that conservation goals for common and widespread communities could be achieved by clustering additional lands around portfolio sites. The spatial pattern of the computer selected lands yielded results comparable to the functional aggregation of portfolio sites that is typically done as part of selecting action areas for site conservation planning. Therefore, rather than specific portfolio sites for common and widespread communities, the Sierra Nevada team recommends conservation of these targets in the functional aggregations described in Section 1.K.

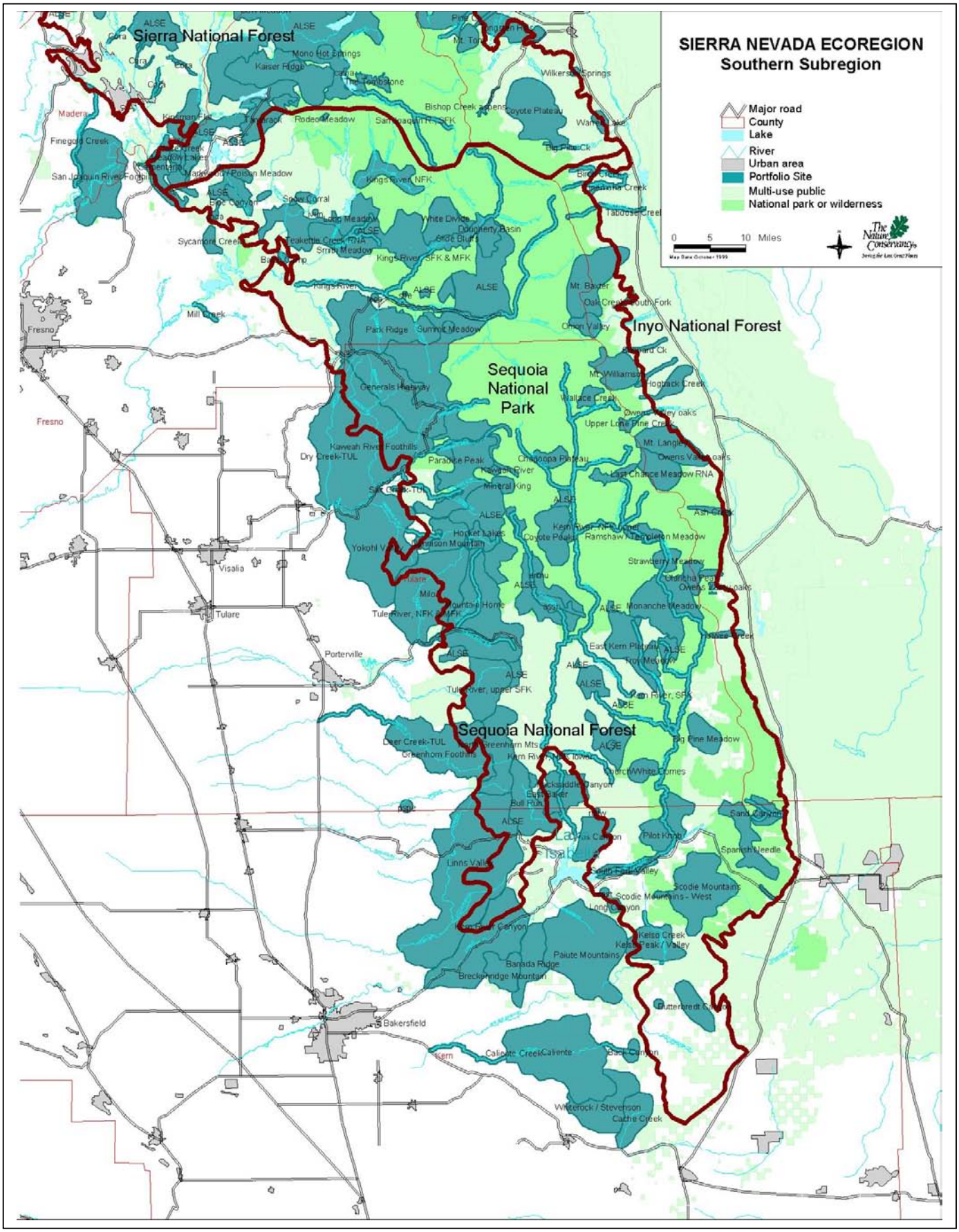
I. Portfolio Results

Portfolio assembly for the Sierra Nevada ecoregion resulted in 573 sites (33 of these are actually in the foothills of the Central Valley Ecoregion but were finalized as part of this plan) - (Figures 1.5-8). These sites capture multiple examples of all 289 conservation targets. They range in size from small (less than 1,000 acres) sites with a single conservation target to large landscape-scale (greater than 10,000 acres) sites with multiple conservation targets. Overall, the portfolio sites encompass 38% of the ecoregion.


Sierra Nevada Ecoregion
Portfolio Sites
Portfolio site
Subregion Boundary
Highway
County
Water
River
Urban area
Multi-use public
National park or wilderness
0 10 20 30 40 50 Miles
N
Chico
Lake Tahoe
Sacramento
San Francisco
Yosemite National Park
Modesto
Fresno
Sequoia National Park
Bakersfield
The Nature Conservancy
CALIFORNIA


SIERRA NEVADA ECOREGION
Northern Subregion
Major road
County
Lake
River
Urban area
Portfolio Site
Multi-use public
National park or wilderness
0 5 10 Miles
The Nature Conservancy
Susanville
Chester
Lake Almanor
Greenville
Quincy
Plumas National Forest
Toiyabe National Forest
Tahoe National Forest
Eldorado National Forest
Stanislaus National Forest
Truckee
Nevada City
Grass Valley
Placerville
South Lake Tahoe
Lake Tahoe
Sacramento
Sutter
Calaveras


SIERRA NEVADA ECOREGION
Central Subregion
Major road
County
Lake
River
Urban area
Portfolio Site
Multi-use public
National park or wilderness
0 5 10 Miles
The Nature Conservancy
Eldorado National Forest
Stanislaus National Forest
Yosemite National Park
Inyo National Forest
Sierra National Forest
Sequoia National Park
South Lake Tahoe
Bridgeport
Arnold
Fresno
Mono


SIERRA NEVADA ECOREGION
Southern Subregion
Major road
County
Lake
River
Urban area
Portfolio Site
Multi-use public
National park or wilderness
0 5 10 Miles
Sierra National Forest
Sequoia National Park
Inyo National Forest
Sequoia National Forest
Fresno
Visalia
Tulare
Porterville
Bakersfield

J. Evaluation of Conservation Lands

Although 83% of the ecoregion is in some form of public ownership, the extent to which these lands contribute to the conservation of the portfolio varies. In general, the distribution of portfolio sites by agency is proportional to the amount of land managed by each in the ecoregion (Table 1.2).

Table 1.2 Portfolio Results by Agency

USFS	350 sites (61%)
NPS	55 sites (10%)
BLM / Other	30 sites (5%)
Private	138 sites (24%)

Most public lands in the Sierra Nevada are not managed specifically for conservation of biological diversity. To determine which portfolio sites are currently adequately conserved, all lands were classified into three categories using criteria similar to the GAP Analysis portion of SNEP. The following three categories were identified:

- Class 1: public or private land formally designated for conservation of native biodiversity and within which economic activities such as development, grazing, and timber harvest are precluded. Examples include national parks, ungrazed wilderness areas, USFS research natural areas, some state parks, and private reserves.
- Classes 2-4: public lands not specifically designated for the conservation of native biological diversity and subject to multiple use mandates.
- Class 5: private lands potentially available for development.

Approximately twenty-two percent of the ecoregion is managed as Class 1 land and more than 100 sites, 20% of the portfolio, are already well protected on these lands. An additional 56% of portfolio sites are on Class 2-4 lands owned and managed by various public agencies. The remaining 24% of portfolio sites are comprised of predominantly private lands.

The majority of Class 1 lands are concentrated in the central and southern subregions resulting in few protected areas in the northern subregion (Figure 1.9). The protection status of portfolio sites follows this pattern with many sites already protected on Class 1 lands in the central and southern subregions and few in the north. Similarly, private lands are concentrated in the western foothills and in the northern subregion resulting in more portfolio sites dominated by private lands in these areas.

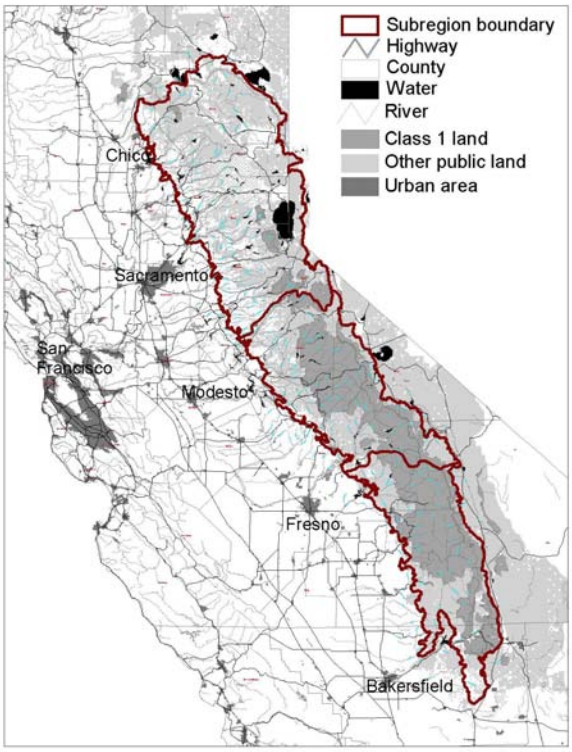


Figure 1.9: Class 1 Land in the Sierra Nevada

K. Functional Aggregations

Ambitious conservation and stratification goals resulted in a large number of portfolio sites. To effectively develop conservation

strategies, many sites were aggregated into larger functional units based on spatial proximity, landscape connectivity, and ecological processes. Twenty-four functional aggregations were identified in the Sierra Nevada ecoregion capturing approximately 70% of all portfolio sites (Figure 1.10). These aggregations are inherently large, have a high degree of intactness, and have the greatest potential to conserve biodiversity at all scales.

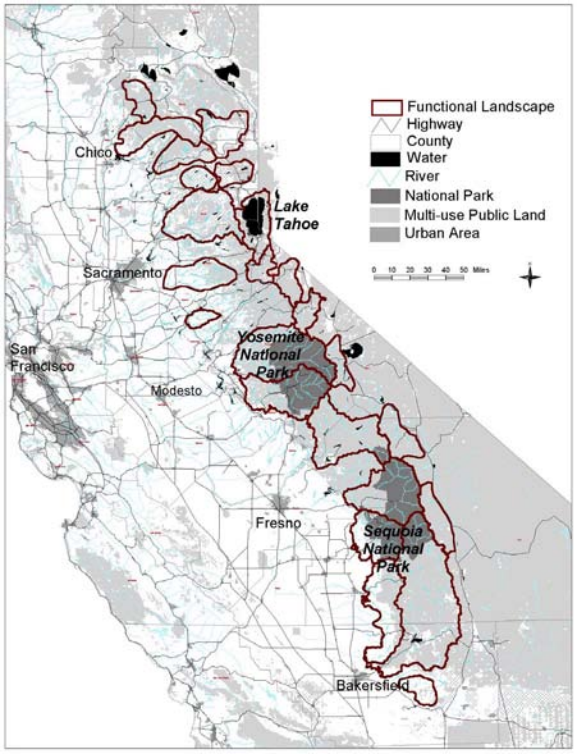


Figure 1.10 Functional Aggregations

These functional aggregations also represent the places where common and widespread communities could be protected through site conservation planning. Results of the Spexan analysis for the northern subregion confirmed that conservation goals for such communities could be achieved in these functional aggregations (See Section 2.J).

L. Selecting Action Areas

To determine where conservation action by TNC was most needed in the Sierra Nevada Ecoregion, each functional aggregation was evaluated using four principles: conservation value, complementarity, threat, and opportunity. Each principle was ranked on a scale of high, medium, low, or unknown according to the following guidelines:

- Conservation value refers to the number, scale and diversity, and health of targets at each functional landscape. Preference was given to landscapes with both terrestrial and aquatic targets, targets at multiple scales, and target richness.
- Complementarity is a measure of how different the landscape is from existing conservation areas. Priority was given to landscapes with targets underrepresented in the existing conservation areas.
- Threats is a measure the severity and immediacy of actions that may destroy or degrade targets.
- Opportunities refers to the availability of conservation partners, availability of resources and funding, and the degree of complexity or cost-effectiveness.

All functional aggregations were prioritized over a twenty-year time frame based on the combined ranking of the four principles. Results are summarized in Table 1.3. Probable action areas in the next five years include four in the northern subregion (American River, MFK; Cosumnes River; Perazzo Meadows; and Sierra Valley), and two in the southern subregion (Kaweah Foothills and Kern River).

Table 1.3
Sierra Nevada Ecoregion – Action Area Selection

FUNCTIONAL LANDSCAPE	CONSERVATION VALUE	COMPLEMENTARITY	THREATS	FEASIBILITY	ACTION YEAR
NORTHERN SUBREGION					
American River, MFK (Duncan / Sunflower, Granite / Onion Creek, Secret Canyon, Long Canyon- PLA, Granite Ridge, Picayune, Lyons/Needle, Steamboat, ALSE)	HIGH	HIGH Tahoe NF Wilderness Private, some checkerboard	HIGH Auburn dam	MEDIUM Placer Legacy Wild and Scenic PCWA powerhouses	5
Cosumnes (Squaw Hollow, Logtown Ridge, Mt. Aukum, Grizzly Flat)	MEDIUM	HIGH El Dorado NF, BLM, Private	HIGH Development	HIGH TNC Project area ARC active	5
Lake Tahoe (Upper Truckee, Freel Pk., Grass Lake, Meiss Mdw., *arrid, lelo*, ALSE)	MEDIUM	MEDIUM Tahoe Basin NF, Private	HIGH Declining water quality & forest health, Development	HIGH Feinstein Bill	10
Perazzo Meadows (Little Truckee River, Sagehen/ Carpenter, Independence Creek, Secret Meadow, Kyburz)	HIGH	HIGH Tahoe NF, Private	HIGH Development Grazing	UNKNOWN	5
Sierra Valley (Antelope Valley, Dark Canyon Red Clover / Squaw Valley)	HIGH	HIGH Private Plumas NF	HIGH Development Agriculture	HIGH SBC Willing landowner	5
Bowman-Fordyce (Pat Yore Flat, Bowman Lake, English	MEDIUM	MEDIUM Tahoe NF	LOW	HIGH PG&E FERC land PG&E watershed	20

Table 1.3
Sierra Nevada Ecoregion – Action Area Selection

FUNCTIONAL LANDSCAPE	CONSERVATION VALUE	COMPLEMENTARITY	THREATS	FEASIBILITY	ACTION YEAR
Mtn., Fordyce Cr., Pierce Mdw., ALSE)				NCCA project	
Bucks Lake (Bucks Mountain, Fales Basin, Haskins Valley, Feather River Saddle, Silver Creek-Plumas, Humbug Valley, Yellow Cr., ALSE, *arco*)	MEDIUM	LOW Plumas NF, Wilderness Private	MEDIUM	HIGH PG&E FERC land	20
Carson Iceberg (Faith / Hope / Charity Valleys, Carson R. WFK, Red Lakes, Mokelumne River NFK, Sunset Lakes, Snow Canyon, Squaw Valley Meadows, Deer / Indian Valley, Blue Lakes)	MEDIUM	LOW Toiyabe NF, El Dorado NF, Wilderness Private	LOW	HIGH Class 1 land PG&E FERC land PG&E watershed	20
Carson River, EFK (Silver King, Monitor Pass, Soda Spgs)	HIGH	MEDIUM Toiyabe NF Wilderness	MEDIUM	UNKNOWN	10
Feather River, MFK (Bear Creek, Stag Point, Feather River Mdws, Bunker Hill, Nelson Cr., Lake Basin, French Cr. Basin, Chino Cr., Berry Cr., ALSE, *pepe*)	HIGH	HIGH Plumas NF Private	HIGH Development Grazing Timber harvest	UKNOWN	10

Table 1.3
Sierra Nevada Ecoregion – Action Area Selection

FUNCTIONAL LANDSCAPE	CONSERVATION VALUE	COMPLEMENTARITY	THREATS	FEASIBILITY	ACTION YEAR
North Yuba (Lavezolla Creek, East West Yuba, NY Ravine, Lincoln Valley, Granite Mtn., Harris Mdw., Camptonville, ALSE)	HIGH	HIGH Plumas NF, Tahoe NF, State Park	MEDIUM QLG proposal	UNKNOWN	10
Calaveras, NFK (Quiggs Mtn.)	MEDIUM	HIGH Private, some BLM	MEDIUM	UNKNOWN	10
CENTRAL SUBREGION					
Merced River (Tioga Pass, Merced NFK and SFK, Trumbell Pk., Devil Pk., ATE Mine, Mariposa Grove, Westfall/Peregoy Meadows, Richardson, ALSE)	HIGH	LOW Yosemite NP, Stanislaus NF, Sierra NF, Private	LOW National Park	HIGH National Park	10
Tuolumne River (Clavey River, Ackerson Mdw., Abernathy Mdw., Jawbone Ridge, Kassabaum Mdw., Tuolumne R. SFK, Tuolumne River Canyon, Cherry Ridge, Emigrant Wilderness, Tuolumne Mdws.,	HIGH	LOW Stanislaus NF	HIGH Potential dam	MEDIUM W/S designation TRT	10

Table 1.3
Sierra Nevada Ecoregion – Action Area Selection

FUNCTIONAL LANDSCAPE	CONSERVATION VALUE	COMPLEMENTARITY	THREATS	FEASIBILITY	ACTION YEAR
ALSE)					
Bishop Foothills (Coyote Plateau, Rock Cr., Wheeler Ridge, Pine Cr., Mt. Tom, Warren Lake)	HIGH	LOW Inyo NF	UNKNOWN	UNKNOWN	20
San Joaquin River (Clover / Jackass Meadow, Kaiser Ridge, San Joaquin, SFK; Tamarack; Mono Hot Springs; Jose Cr., Kinsman Flat; Jose Cr.; Carpenteria)	MEDIUM	LOW Sierra NF Wilderness Private	MEDIUM Timber harvest? SoCal Edison hydro?	UNKNOWN	20
Walker River, West (Rainbow Mdw., Paiute mdw., Sonora Pass, Silver-Wolf Cr. ,Little Walker, Burt Mdw.)	MEDIUM	MEDIUM Toiyabe NF Private	UNKNOWN	UNKNOWN	10
Yosemite East (Lee Vining, Virginia Lakes, Lundy Can., Mt. Lyell, Parker Bench, June Lakes, Glass Cr. Mdws.)	MEDIUM	LOW Yosemite NP Inyo NF	LOW	UNKNOWN	20
SOUTHERN SUBREGION					
Kaweah River Foothills (Kaweah River, Generals Highway, Paradise Peak, Mineral King, Yokohl Valley)	HIGH	HIGH Private Seq/King NP, Sierra NF	MEDIUM Gravel mining Development	HIGH Class 1 land Willing landowner (Dofflmeyer, Davis)	5

Table 1.3
Sierra Nevada Ecoregion – Action Area Selection

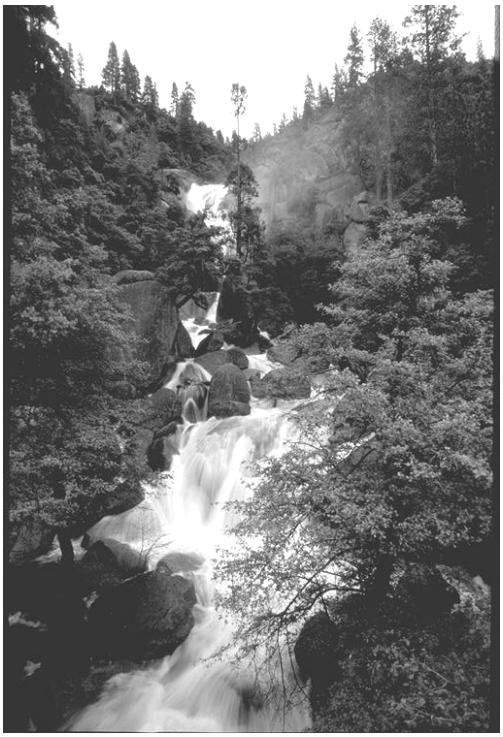
FUNCTIONAL LANDSCAPE	CONSERVATION VALUE	COMPLEMENTARITY	THREATS	FEASIBILITY	ACTION YEAR
Kern River (Kern R. SFK and NFK, Kelso Creek, South Fork Valley, Pilot Knob, Church/White Domes, Mananche Meadow, Troy Meadows, East Kern Plateau, Strawberry Meadow, Ramshaw / Templeton Meadow, Packsaddle, Baker Point, Cyrus Canyon, Bull Run Scodie Mountain, Spanish Needle, Sand Canyon)	HIGH	MEDIUM Seq/King NP Sequoia NF Wilderness BLM Private	MEDIUM Grazing	HIGH Onyx Ranch Class 1 land	5
Greenhorn Foothills (Linns Valley, North GreenHorn, Tule River, NFK & MFK Milo, Mtn. Home)	MEDIUM	HIGH Private Sequoia NF	MEDIUM Development	UNKNOWN	10
Mt. Whitney (Mt. Baxter, Onion Valley, Mt. Williamson, Shepard Cr., Hogback Cr., Owens Valley Oaks, Upper Lone Pine Cr., Last Chance Meadow)	MEDIUM	LOW Inyo NF LADWP Private	MEDIUM Water development	UNKNOWN	20
Caliente	MEDIUM	HIGH	UNKNOWN	UNKNOWN	20

Table 1.3
Sierra Nevada Ecoregion – Action Area Selection

FUNCTIONAL LANDSCAPE	CONSERVATION VALUE	COMPLEMENTARITY	THREATS	FEASIBILITY	ACTION YEAR
(Caliente Cr., Back Canyon, Whiterock)		Private BLM			
Kings River (Park Ridge, Summit Mdw., White Divide, Slide Bluffs, Dougherty Basin, ALSE)	HIGH	LOW Seq/King NP, Sierra NF	LOW	UNKNOWN Class 1 land	20

2. ANALYSIS AND RESULTS BY ECOLOGICAL GROUP

A. AQUATIC SYSTEMS

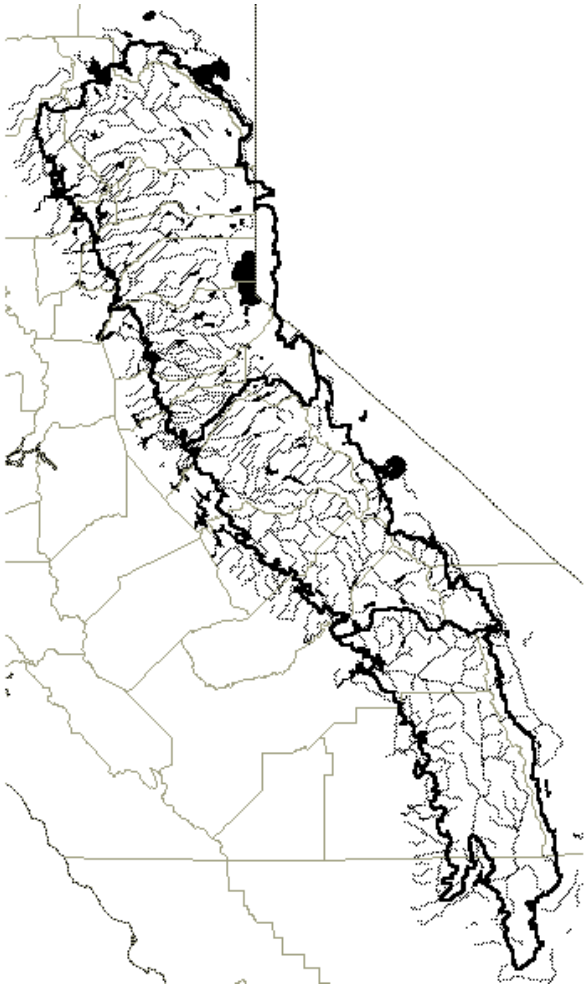


DESCRIPTION

Sixty percent of California's water supply originates in the Sierra Nevada. Dams and diversions throughout most of the ecoregion have profoundly altered stream-flow patterns and water temperatures, with significant impacts to aquatic biodiversity. Historically, most high Sierra streams and lakes were fishless. Introduction of non-native fish (primarily trout) to these waters has greatly altered aquatic ecosystems through impacts on amphibians and invertebrate assemblages. According to SNEP (1996), aquatic systems are the most altered and impaired habitats of the Sierra Nevada.

Unlike most aquatic systems in California, 50% of precipitation in the high Sierra arrives in the form of snow. The rivers that extend up into snow country have a prolonged spring runoff, which results in elevated baseflows throughout the drier summer months.

The crest of the Sierra Nevada divides the ecoregion into two major aquatic provinces. On the west side of the Sierra Nevada, all streams eventually flow into the Central Valley by way of the Sacramento, San Joaquin, and Tulare drainages. Streams on the east side flow into the Great Basin, by way of the Lahonton, Mono, and Owens drainages.



According to the aquatic classification system proposed by Moyle and Ellison (1991), there are sixty-six aquatic habitat types in the Sierra Nevada ecoregion. These habitats range from low order mountain streams to higher order foothill rivers and include large lake systems to small unusual

springs for both east and west side drainages. A few of the conservation targets, such as Yosemite toad and mountain yellow-legged frog, manage to straddle the Sierra and are found in both east and west side drainage's. Almost all of the targets species and communities, however, are completely restricted to either the Central Valley or Great Basin drainage.

CONSERVATION ISSUES

- SNEP identified one aquatic community type, Owens Lake, as extirpated, 14 as threatened, 33 of special concern, and only 18 as secure (SNEP Vol. II pp 953-973).
- Thirty-seven taxa of fish are native to the ecoregion, 8 of which are endemic. Five native Sierran fish taxa are listed as threatened or endangered species, 10 are considered species of special concern, and four may be declining (SNEP Vol. II pp. 953-973).
- Thirty native amphibian taxa are endemic to the Sierra Nevada, 12 (47%) are in need of protection (SNEP Vol. II pp. 921-944). Exotic species have had a profound negative effect on the native amphibian and invertebrate fauna of the Sierra Nevada. Other stresses include disease, drought, and agricultural chemicals drifting up from the San Joaquin Valley.
- Dams are distributed throughout the Sierra Nevada, disrupting stream flows critical for proper functioning of many ecological processes and serve as impassible barriers to native fish, amphibians, and invertebrates (SNEP Vol. II p. 964). At lower to middle elevations, dams have had the greatest detrimental impact on biotic diversity. In addition to the major dams located along the foothills, there are more than 200 smaller dams over 25 feet high and many others that are even smaller that are scattered throughout the Sierra Nevada (FSEEE 1998).
- On the westside, anadromous fish have been excluded from approximately 90% of their historic breeding habitat by dams. Historically, westside streams provided habitat for steelhead, Pacific lamprey, and spring, fall, and late fall runs of chinook salmon. Only the fall-run chinook can reach spawning areas by breeding below the dams.
- Although impacts from water diversion and withdrawal are often more subtle than those from major dams, they threaten the aquatic ecosystem. Water diversion can seriously reduce the baseflow in streams and excessive ground water pumping can lower the water table and dry up the springs which support many unique communities and species. The effects of such activities are especially pronounced on the east side of the Sierra where the flow of the Owens River has been dramatically reduced and the Owens Lake has dried up completely.
- Cattle grazing can be extremely damaging to riparian areas, stream habitats, and water quality (e.g., Chaney et al. 1990; SNEP Vol. III pp. 901-972). Cattle are one of the main contributors to the decline in native trout species and represent the most significant threat to the invertebrate species that inhabit springs (SNEP Vol. II pp. 987-1008).
- Of all the forestry activities, road construction has perhaps the greatest negative impact on the aquatic system (FSEEE 1998). Greater abundance of roads in a watershed is correlated with lower integrity of native stream biota (SNEP Vol. II pp. 975-986). Dirt roads and failed culverts can greatly increase the amount of sediment that enters streams. Poorly designed or maintained road systems literally become extensions

of the stream network (Montgomery 1994). A third of the roads in the ecoregion are eroding rapidly (Clifton 1992).

- Approximately 30 species of exotic fishes have now invaded the Sierra Nevada, including large portions of the high country (above approximately 5,900 ft) that were originally fishless. Through extensive stocking efforts, approximately 63% of lakes over one hectare in size (approximately 4,000 lakes) now have one or more species of exotic trout.
- The long-term effects of hydraulic mining, habitat disruption and use of toxic compounds (mercury, in particular), still plague many Sierra Nevada stream systems. In the central Sierra, along the western slope, suction gold mining continues to impact the habitat (FSEEE 1998**).**

SITE IDENTIFICATION

A total of 113 potential sites were identified by evaluating conservation target data from SNEP (1996), Pacific Rivers Council (PRC) (1998), Draft Owens Basin Wetland and Aquatic Species Recovery Plan (USFWS 1996**),** expert opinion, and other reports and literature.

Conservation targets included highly ranked species (G3S3 or higher) and aquatic habitats identified as threatened or of special concern by SNEP (1996 Vol. II p. 946) (Table 2A.1). Conservation targets were selected for both the Central Valley drainages and the Great Basin drainages.

Although several of the salamanders are not strictly aquatic, they are included in the analysis because they are restricted to moist sites within the watersheds. Chinook salmon were not considered because occurrences were limited to historical accounts. Only rare invertebrate species with well-known distributions were included as targets.

Table 2A.1 Aquatic Conservation Targets

CENTRAL VALLEY DRAINAGE CONSERVATION TARGETS	ELEMENT RANK
Communities	
Dystrophic lake/pond	SC
Spring	SC
Hot springs outflow	SC
Meadow stream	SC
Foothill/valley ephemeral stream	SC
Foothill/canyon ephemeral stream	SC
Hardhead/pikeminnow stream	SC
Pikeminnow/sucker stream	SC
California roach stream	SC
Hitch stream	T
Kern golden trout stream	SC
Animals	
California red-legged frog	G4T2T3S2S3
Foothill yellow-legged frog	G3S2S3
Mountain yellow-legged frog	G5S2S3
Yosemite toad	G2G3S2S3
Mount Lyell salamander	G3G4S3S4
Limestone salamander	G1S1
Relictual slender salamander	G2?S2?
Tehachapi slender salamander	G2S2
Breckenridge Mountain slender salamander	G1S1
Kern Canyon slender salamander	G2S2
Yellow-blotched salamander	G5T2T3S2S3
Western pond turtle	G4S3
San Joaquin roach	G5T3?QS3?
Red Hills roach	G5T1?S1?
Hardhead	G3S3
Hitch	G5T2?

Pacific lamprey	G5S5
Kern brook lamprey	G1S1S2
Winter steelhead	G5S2
Little Kern golden trout	G5T2S2
Volcano Creek golden trout	G5T1S1
Kern River rainbow trout	G5T1T2S1S2
GREAT BASIN DRAINAGE CONSERVATION TARGETS	ELEMENT RANK
Communities	
Spring	SC
Meadow stream	SC
Alpine lake/pond	SC
Trout headwater	SC
Cutthroat trout/paiute sculpin stream	SC
Sucker/dace/redside/trout stream	SC
Sucker/dace/redside stream	SC
Whitefish/trout/sucker stream	SC
Lake Tahoe	T
Tui chub stream	T
Speckled dace stream	SC
Great Basin scrub snowmelt stream	SC
Animals	
Mountain yellow-legged frog	G5S2S3
Yosemite toad	G2G3S2S3
Northern leopard frog	G5S2
Owens Valley web-toed salamander	G2?S2?
Lahonton cutthroat trout	G4T2S2
Paiute cutthroat trout	G4T1T2S1S2
Mountain sucker	G5S2S3
Lahonton lake tui chub	G4T3S1S2
Owens speckled dace	G5T1T2QS1S2
Cold Spring caddisfly	G1S1
Lake Tahoe benthic stonefly	G1S1
Stygobromus tahoensis	G1S1
Stygobromus lacicolus	G1S1

SC=Special Concern (SNEP 1996) ; T=Threatened (SNEP 1996)

The purpose of both the SNEP (1996) and PRC (1998) studies was to establish a network of high-quality and high-priority watersheds for long-term sustainability of aquatic systems. SNEP and PRC identified significant watersheds, known as Aquatic Diversity Management Areas (ADMA) and Aquatic Diversity Areas (ADA), respectively, which are rich in aquatic biodiversity, dominated by native aquatic species and communities, and governed by a natural hydrologic regime. Additional smaller watersheds or other aquatic areas that contain important communities, species, or are unusually pristine, were designated as Critical Refuges. The PRC study, which followed the SNEP study, evaluated the ADMAs adding and subtracting sites from the SNEP list.

SITE RANKING

Potential sites were stratified across the hydrological basins within the three main subregions. Each site was then assigned a biological richness score and where possible, a site quality score (see Appendix 3).

Biological Richness

Scores were based on the presence (1 point) or the absence (0 point) of a target species or community at the site. If the target species or community occurrence was questionable at a location, it was recorded as a 0.

Site Quality

Site quality was based on two watershed analyses from SNEP (1996) – Index of Biotic Integrity (IBI) and Overall Quality Rating.

- Index of Biotic Integrity (IBI) is a measure of the biological health of the Sierra Nevada watersheds. It is a standardized watershed score based on

six metrics: ranid frogs, native fishes, native fish assemblages, stream fish abundance, anadromous fish, and trout distribution. A score of 80 to 100 means that the aquatic communities are in very good to excellent condition, 60 to 79 means good condition, 40 to 59 indicates fair condition, and 39 or less means poor condition. Scores were only available for flowing water sites identified by SNEP (1996).

- The Overall Quality Rating calculates a score based on the condition of the watershed. The watershed score ranges from 1 to 3. A value of 1 indicates nearly pristine conditions, with native species mostly intact. A score of 2 means some disruption, but the site is still in fair to excellent condition and potentially restorable back to 1. A rating of 3 means irreversible change, often due to urban development or a dam, though the site can still appear natural and be important to some native species. Scores are only available for flowing water sites as identified in SNEP (1996).

PORTFOLIO ASSEMBLY

Selection of aquatic portfolio sites was guided by the following conservation goal: a minimum of two examples of each conservation target per subregion. For species which have experienced the most rapid decline in distribution, two examples might prove inadequate. Therefore, an attempt was made to include five sites per subsection for the mountain yellow-legged frog, Yosemite toad, California red-legged frog, and Lahonton cutthroat trout.

Sites were selected in the following manner:

- All sites that were listed as <u>both</u> a SNEP ADMA and a PRC ADA were included in the portfolio. These sites form the core upon which the rest of the aquatic portfolio was designed.
- All sites with an Index of Biotic Integrity score of very good to excellent condition (80 or above) were included in the portfolio.
- All sites with an average Overall Quality Rating in the top quintile (2.3 or less) were included in the portfolio to encompass the most intact and pristine sites.
- If necessary, additional sites were added to the portfolio to insure complete representation of all conservation targets.

RESULTS

A total of 56 aquatic sites were included in the portfolio (Table 2A.2). Thirty-eight of these were from Central Valley drainages, and 18 were from Great Basin drainages. A total of 28 PRC Critical Refuge sites were included within the watersheds of streams or rivers already within the portfolio and thus were not listed separately **.**

Based on current data, the Aquatics portfolio represents the full geographic and ecological range of aquatic habitats across the Sierra Nevada ecoregion.

Of the Central Valley drainages, the following are particularly notable: Cosumnes River, North Fork of the Calaveras River, Clavey River (Tuolumne River tributary), Merced River, Kings River, Kaweah River, and Kern River. Of the Great Basin drainages, Tahoe Basin, East Fork of the Carson River, and West Walker River, are highly significant.

Although the Great Basin drainages were included here, the sites were selected in context of the Sierra Nevada ecoregion. A more thorough analysis will be conducted

through Great Basin ecoregional planning and will include such unique areas as the Owens River and Mono Lake, which border the eastside of the Sierra Nevada range and are Great Basin in nature.

Table 2A.2 Aquatic Portfolio Sites

SITE NAME	PORTFOLIO ATTRIBUTE
CENTRAL VALLEY, NORTHERN SUBREGION DRAINAGES	
Yellow Creek	• Dystrophic pond • Overall Quality Rating of 2.1-2.5
Chino Creek	• One of only two sites for California red-legged frog in ecoregion.
Middle Fork Feather River	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (foothill/valley ephemeral stream, spring, meadow stream, hardhead/pikeminnow stream, pikeminnow/sucker stream) and species (hardhead, foothill yellow-legged frog, mountain yellow-legged frog).
East West Yuba (includes Lavezzola Creek (ADA) and two Critical Refuges: Pauley Creek and New York Ravine)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Good concentration of aquatic communities (spring, meadow stream) and target species (foothill yellow-legged frog, mountain yellow-legged frog, Western pond turtle). • Unique rare caddisfly assemblage (long tailed caddisfly, spiny rhyacophilan caddisfly, golden horned caddisfly) in New York Ravine. • Overall Quality Rating of 2.3.
North Fork American River	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Good concentration of aquatic communities (foothill/valley ephemeral stream, spring) and species (hardhead, foothill yellow-legged frog, mountain yellow-legged frog). The native fish fauna is essentially intact. • Overall Quality Rating of 2.3.
Upper Rubicon River	• Mt. Lyell salamander site.
Rock Creek	• Good site for Western pond turtle. • Good Index of Biotic Integrity Score (78).
Weber Creek	• One of only two sites for California red-legged frog in ecoregion.

SITE NAME	PORTFOLIO ATTRIBUTE
Cosumnes River (includes four Critical Refuges: Stump Spring, Jackass Canyon Spring, Bendorf Stream/Spring, Camp Creek).	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (foothill/valley ephemeral stream, spring, meadow stream, California roach stream, hardhead/pikeminnow stream, pikeminnow/sucker stream) and species (hardhead, Pacific lamprey, winter steelhead, foothill yellow-legged frog, mountain yellow-legged frog, Western pond turtle). • Unique invertebrate assemblage, with more than 300 species of aquatic insects known, including several rare stoneflies.
North Fork Mokelumne River (includes four Critical Refuges: Blue Lakes, Wheeler Lake, Sunset Lakes, Highland Lakes).	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (dystrophic lake, spring, meadow stream) and species (Yosemite toad, foothill yellow-legged frog, mountain yellow-legged frog, Mt. Lyell salamander, Western pond turtle). • Overall Quality Rating of 2.3.
North Fork Calaveras River	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (foothill/valley ephemeral stream, hardhead pikeminnow stream, pikeminnow/sucker stream, California roach stream) and target species (San Joaquin roach, hardhead, foothill yellow-legged frog, Western pond turtle). • Very good Index of Biotic Integrity score (80).
CENTRAL VALLEY, CENTRAL SUBREGION DRAINAGES	
Rose Creek	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Good concentration of target aquatic communities (foothill/valley ephemeral stream, California roach stream) and species (San Joaquin roach, foothill yellow-legged frog, Western pond turtle).
South Fork Stanislaus River (includes one Critical Refuge: Three Meadows)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Good concentration of aquatic communities (spring, meadow stream) and target species (foothill yellow-legged frog, mountain yellow-legged frog, Yosemite toad, Mt. Lyell salamander). • Overall Quality Rating of 2.1-2.4.
Emigrant Wilderness	• Good site for Yosemite toad.

SITE NAME	PORTFOLIO ATTRIBUTE
Clavey River (includes two Critical Refuges, Bell Meadows and Bourland Meadows)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Good concentration of aquatic communities (spring, pikeminnow/sucker stream) and target species (San Joaquin roach, hardhead, mountain yellow-legged frog, foothill yellow-legged frog, Western pond turtle, limestone salamander). • Excellent Index of Biotic Integrity Score (92), one of the most pristine drainages in California. • Overall Quality Rating of 2.
Six Bit Gulch	• Only known occurrence of Red Hills roach.
South Fork Tuolumne River	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Includes pikeminnow/sucker stream community and a good concentration of target species (San Joaquin roach, hardhead, mountain yellow-legged frog, Yosemite toad). • Overall Quality Rating of 2.3.
Merced River (includes four Critical Refuges: Hell Hollow Canyon, Lyle Fork, AT&E Mine, Glacier Point meadows)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (foothill/valley ephemeral stream, foothill/canyon ephemeral stream, spring, meadow stream, hot springs outflow, hardhead pikeminnow stream, California roach stream) and species (San Joaquin roach, hardhead, foothill yellow-legged frog, mountain yellow-legged frog, Yosemite toad, limestone salamander, Mt. Lyell salamander, Western pond turtle). • One of two known sites for limestone salamander.
Tuolumne Meadow	• Good site for Yosemite toad.
Mariposa Creek	• One of the few examples of a hitch stream community in ecoregion.
Finegold Creek (includes one Critical Refuge: Little Finegold Creek)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Includes target communities (springs, pikeminnow/sucker stream, foothill/canyon ephemeral stream community) and species (Western pond turtle). • Little Finegold creek is one of the few examples of a hitch stream community in ecoregion.
Jose Creek	• One of the few remaining foothill yellow-legged frog sites south of Hwy. 50.
Upper North Fork San Joaquin River	• Excellent Index of Biotic Integrity value (92). Virtually undisturbed watershed. • Mountain yellow-legged frog site.
Clover/Jackass Meadow	• Good site for Yosemite toad.

SITE NAME	PORTFOLIO ATTRIBUTE
Mono Hot Springs	• One of the few hot springs outflow communities in ecoregion.
CENTRAL VALLEY, SOUTHERN SUBREGION DRAINAGES	
Balch Camp	• Important site for relictual slender salamander.
Sycamore Creek	• One of the few sites for Kern brook lamprey. • Good site for Western pond turtle.
Rancheria Creek	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Includes meadow stream. • Excellent Index of Biotic Integrity Score (92). One of the most pristine drainages in Sierra.
North Fork Kings River	• Important site for Yosemite toad. • Mountain yellow-legged frog.
San Joaquin, South Fork (Includes Evolution Basin & Goddard Valley)	• Important site for Yosemite toad.
South and Middle Fork Kings River (includes one Critical Refuge: Mill Flat Creek)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (foothill/valley ephemeral stream, foothill /canyon ephemeral stream, spring, meadow stream, hardhead/pikeminnow stream, pikeminnow/sucker stream, California roach stream) and species (San Joaquin roach, hardhead, Kern brook lamprey, foothill yellow-legged frog, mountain yellow-legged frog, Mount Lyell salamander, Western pond turtle). • Very good Index of Biotic Integrity Score (80).
Kings River (from Pine Flat Reservoir to about 12 miles upstream)	• Critical Refuge for Kern brook lamprey.
South Fork Kaweah River (Includes one Critical Refuge: Blossom Lakes)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (foothill/valley ephemeral stream, foothill /canyon ephemeral stream, spring, meadow stream, hardhead/pikeminnow stream, pikeminnow/sucker stream, California roach stream) and species (San Joaquin roach, hardhead, Mt. Lyell salamander, yellow-blotched salamander). • Overall Quality Rating of 2.1-2.5.

SITE NAME	PORTFOLIO ATTRIBUTE
Deer Creek	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (foothill/valley ephemeral stream, foothill /canyon ephemeral stream, spring, hot springs outflow, meadow stream, hardhead/pikeminnow stream, pikeminnow/sucker stream, California roach stream) and an important site for the San Joaquin roach
Kern River Canyon	• Only site in ecoregion for Kern Canyon slender salamander.
North Fork Kern River (Includes three Critical Refuges: Golden Trout and Volcano Creeks, Little Kern River)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (foothill/valley ephemeral stream, foothill/canyon ephemeral stream, spring, hot springs outflow, meadow stream, Kern golden trout stream, pikeminnow/sucker stream, hardhead/pikeminnow stream) and species (Little Kern golden trout, California/Volcano Creek golden trout, Kern River rainbow trout, hardhead, mountain yellow-legged frog, Kern Canyon slender salamander, Tehachapi slender salamanders).
South Fork Kern River (Includes two Critical Refuges: Trout Creek, Fish Creek above Monache Meadows)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (foothill/valley ephemeral stream, foothill/canyon ephemeral stream, spring, hot springs outflow, meadow stream, Kern golden trout stream, hardhead/pikeminnow stream, pikeminnow/sucker stream) and species (Kern River rainbow trout, California/Volcano Creek golden trout, Kern Canyon slender salamander, mountain yellow-legged frog, foothill yellow-legged frog, Western pond turtle).
Breckenridge Mountain	• Only known site for Breckinridge slender salamander. Possibly extirpated. • Yellow-blotched salamander
Caliente Creek	• Important site for Tehachapi slender salamander and yellow-blotched salamander.

SITE NAME	PORTFOLIO ATTRIBUTE
GREAT BASIN, NORTHERN SUBREGION DRAINAGES	
Little Truckee River (includes Perazzo Meadows complex, Sagehen Creek)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (spring, meadow stream, alpine lake/pond, trout headwater, cutthroat trout/paiute sculpin stream, sucker/dace/redside/trout stream, sucker/dace/redside stream, whitefish/trout/sucker stream) and species (Lahonton cutthroat trout, mountain sucker, mountain yellow-legged frog, Cold Spring caddisfly). • Only known site for Cold Spring caddisfly.
Lake Tahoe	• Lake Tahoe is a unique ecosystem, encompassing the a target aquatic community (Lake Tahoe) and target species (Lahonton lake tui chub, mountain sucker). • Only known site for three rare invertebrates: Lake Tahoe benthic stonefly, *Stygobromus tahoensis*, *Stygobromus lacicolus.*
Upper Truckee River (Includes one Critical Refuge: Deep Canyon Creek)	• Good concentration of target aquatic communities (spring, meadow stream, cutthroat trout/paiute sculpin stream, trout headwater, sucker/dace/redside/trout stream, Tui chub stream, speckled dace stream, whitefish/trout/sucker stream) and species (Lahonton cutthroat trout, northern leopard frog).
Lower Truckee River (Includes Gray Creek and Pole Creek)	• Important site for Lahonton cutthroat trout and mountain yellow-legged frog • Tui chub stream
East Fork Carson River (Includes six Critical Refuges: Silver King, Corral valley, Coyote, East fork above Carson Falls, Murray Canyon, and Poison Flat creeks)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (spring, meadow stream, trout headwater, cutthroat trout/paiute sculpin stream, whitefish/cutthroat trout/sucker stream, Great Basin scrub snowmelt stream) and species (paiute cutthroat trout, Lahonton cutthroat trout, mountain sucker, mountain yellow-legged frog, Yosemite toad. • One of last refuges for paiute cutthroat trout, including the original drainage.

SITE NAME	PORTFOLIO ATTRIBUTE
GREAT BASIN, CENTRAL SUBREGION DRAINAGES	
West Walker River (Includes two Critical Refuges: Wolf and Silver Creeks)	• SNEP & Pacific Rivers Council Aquatic Diversity Area. Excellent concentration of target aquatic communities (spring, meadow stream, alpine lake pond, Great Basin scrub snowmelt stream, trout headwaters, cutthroat trout/paiute sculpin stream, whitefish/trout/sucker stream) and species (Lahonton cutthroat trout, mountain sucker, Yosemite toad, mountain yellow-legged frog).
By-Day Creek	• Important Lahonton cutthroat trout site, where it is still in its indigenous drainage.
Dry Creek	• Important site for mountain yellow-legged frog
Glass Creek	• Important site for Yosemite toad.
Dead Man's Creek	• One of only three sites in ecoregion for northern leopard frog.
Rock Creek – INY (Birchim Canyon)	• Largest extant population of Owens speckled dace.
Convict Creek	• A Pacific Rivers Council Aquatic Diversity Area and Owens Basin Recovery Plan site. Excellent concentration of target aquatic communities (meadow stream, alpine lake/pond, Great Basin scrub snowmelt stream) and species (mountain yellow-legged frog, Yosemite toad).
Schoolhouse Creek	• One of the three sites in ecoregion for northern leopard frog.
GREAT BASIN, SOUTHERN SUBREGION DRAINAGES*	
Hogback Creek	• Spring community site.
Upper Lone Pine Creek	• One of only two sites for Owens Valley web-toed salamanders. Also slender salamander site.
Ash Creek	• Diverse amphibian complex.
Haiwee Creek	• Diverse amphibian complex.
Olancha Creek	• Diverse amphibian complex.

* More information is needed in order to finalize the portfolio selection of aquatic sites in the southern subregion of the Great Basin drainages.

NEXT STEPS

Though the most up-to-date and complete data sources were used, it is apparent that knowledge gaps exist for species and community occurrences. Even where site information is most complete, such as the SNEP and Owens Basin sites, a better understanding is needed of where important species, particularly native fish and amphibian and invertebrates are located.

Invertebrate studies about the distribution and abundance of most species is necessary, as they represent a large portion of aquatic biodiversity and exhibit a high level of endemism of the Sierra. Due to the size of the proposed ADMAs, it is realistic to expect that most of the aquatic

invertebrate species will be represented in one or more of the watersheds. However, special isolated habitats such as springs, seeps, and headwater streams often contain rare and endemic species.

More information is needed for aquatic sites in the southern subregion of the Great Basin drainages to complete portfolio design.

Future iterations of the portfolio may benefit from the findings of an on-going study by Roland Knapp study which will examine the effect of exotic fish removal from mountain lakes for the mountain yellow legged frog population.

B. RIPARIAN

DESCRIPTION

Riparian areas are ecologically productive zones at the interface of aquatic and terrestrial systems; bordering rivers, streams, and other aquatic features such as lakes, springs, or seeps. These narrow riparian corridors are widespread within the Sierra Nevada ecoregion though limited in total distribution. The Sierra Nevada riparian communities comprise only between 0.1 to 1% of the total area (Kondolf et al. 1987, SNEP Vol. II pp. 671-690) but are significant for a much larger percentage of wildlife species. According to SNEP (1996), aquatic/riparian systems are the most altered and impaired habitats of the Sierra Nevada.

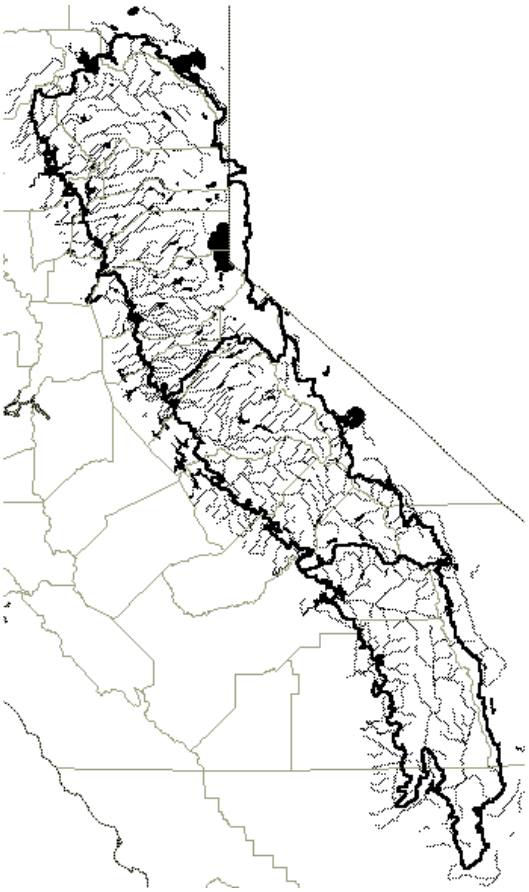
Riparian communities act as important corridors within mountain areas, linking diverse vegetation types that are otherwise stratified by elevation. Because of high levels of moisture, a cool microclimate, and disturbances associated with flooding, riparian vegetation tends to be broad-leaved, winter-deciduous, fast growing, short-lived, and flood-tolerant (SNEP Vol. III pp. 201-274). Species distributions are largely based on elevation with less distinct transitions than surrounding upland vegetation. The lowest elevation zone, predominantly in the foothills, contains such species as Western sycamore (*Platanus racemosa*), California box elder (*Acer negundo californicum*), Fremont cottonwood (*Populus fremontii*), Oregon ash (*Fraxinus latifolia*), and tree willows such as arroyo willow (*Salix lasiolepis*) and sandbar willow (*S. hindsiana*).

Common mid-elevation riparian species include black cottonwood (*Populus trichocarpa*), big-leaf maple (*Acer macrophylum*), mountain alder (*Alnus tenuifolia*), and numerous mid-elevation willows such as lemmon willow (*S. lasiolepis*) and Eastwood willow (*S. eastwoodiae*). Some eastern slopes at this elevation contain water birch (*Betula occidentalis*).

The higher elevations on both the west side and east side of the Sierran crest are dominated by quaking aspen (*Populus tremuloides).* At the highest elevations, shrub willows, less dense and more hardy than their lowland relatives, dominate. These include alpine willow (*S. petrophila*), snow willow (*S. nivalis*), and mono willow (*S. monica*) (Schoenherr 1992).

Distribution also varies depending on latitude, aspect, local geology, and topography. Steep narrow canyons may only have thin strips of riparian vegetation established in the shallow, coarser soils while glacial valleys, broad flats, and meadows have more extensive streamside vegetation with higher plant diversity,

including herbaceous cover (SNEP Vol. III pp. 201-274; Bay Institute 1998).



CONSERVATION ISSUES

Biological

- Riparian habitats are among the most productive and diverse habitats (Naiman et al 1993). The dynamic nature and structure of riparian habitats are influenced by channel pattern, channel morphology, and slope; flow timing, duration, and magnitude; flooding patterns; sediment transport; and streamflow-groundwater interactions (Leopold 1994).
- Riparian and aquatic systems are closely interconnected. Riparian areas are of ecological importance to aquatic communities in that they help to maintain the energy, water, temperature, and nutrient balance of the aquatic system.
- Approximately 17% (49 species) of mammals, birds, reptiles, and amphibians whose principal or entire range falls within the Sierra Nevada depend on riparian areas, primarily because of higher plant/insect forage, cover, structural features, and water availability (SNEP Vol. II pp. 709-734). Of these, roughly 12 are at risk.
- Riparian areas function as critical migratory corridors and dispersal routes for Sierran flora and fauna (SNEP Vol. III pp. 201-274; Vol. II pp. 709-734).
- Nearly all 21 species of native salamanders and nine species of native frogs and toads found in the Sierra Nevada spend a significant portion of their life cycles in riparian areas. Of these, 12 require protection (SNEP Vol. II pp. 921-944). Declines in frog populations in the high elevations have been steady and widespread (USDA 1998).
- Density and diversity of birds, particularly migratory birds, tends to be much higher in riparian areas than adjacent uplands (SNEP Vol. III pp. 201-274). Changes in the riparian areas along rivers of the Sierra Nevada have been associated with decreased bird populations, including yellow warbler and yellow-breasted chat (SNEP Vol. III pp. 201-274).
- Swainson's thrush, historically common in the Sierra Nevada, has experienced severe population declines within this ecoregion, primarily as a result of strong breeding site fidelity and riparian habitat degradation (Stefani 1998). Swainson's thrush, of all the birds, has the second highest probability of being extirpated from the ecoregion in the near future behind the willow flycatcher (USDA 1996). (Willow flycatcher is included as a target species in the interior wetland, meadow, and aspen section.)
- Brown-headed cowbirds impact riparian-associated birds in the Sierra Nevada by parasitizing nests in riparian habitats, particularly those of their preferred host

– the yellow warbler. Extirpation of least Bell's vireo (G2T2S2, FE, SE) from the Sierra Nevada is believed to be related to brown-headed cowbird expansion (SNEP Vol. III pp. 201-274) as well as loss of riparian habitat (SNEP Vol. II pp. 709-734).

- The Harlequin duck historically bred within the Sierra Nevada along high elevation, fast-flowing streams. Currently a candidate for Federal listing and critically imperiled in California, this species is believed to no longer breed in-state, due to logging, road construction, recreation, hydro-development, and other types of mountain disturbances (Laymon unpublished).
- Seventeen percent of 3,500 Sierra Nevada vascular plant species occur in riparian areas (SNEP Vol. II pp. 671-680, 691-734).

Human Impacts

- Water management projects, from dams and ditches to pipelines and flumes, are currently the primary threats to riparian vegetation within the Sierra Nevada. Such activities result in the elimination of continuous riparian corridors (SNEP Vol. II pp. 1009-1032). An aerial photography analysis in conjunction with SNEP (Vol. II pp. 1009-1103) indicates that of the 130 watersheds studied, 93% had obvious gaps (>0.5 km) in their riparian corridor which was largely attributed to hydro-development. Only three rivers greater than 100 miles long flow freely (Clavey, Middle Fork Cosumnes, and South Fork Merced Rivers).
- Roads result in direct destruction and fragmentation of riparian corridors as well as sedimentation and hydrologic flow alterations. A recent SNEP analysis found that road impacts on streams, based on a 100 m wide zone of influence, are highest in the eastern Sierra Nevada and lowest in the north (north of Interstate 80). In most Sierra watersheds (80%), 8 to 21% of stream reaches may be affected by nearby roads (SNEP Vol. II pp. 1009-1032).
- Excessive livestock grazing in riparian areas can reduce cover, degrade aquatic habitat, increase bank erosion and channel widening, decrease the water table, and lead to increased water temperatures and sedimentation. Foothill riparian areas are believed to have been particularly impacted by overgrazing (SNEP Vol. III pp. 201-274).
- Riparian habitat along the west slope is one of most endangered habitats from development, especially impacting lowland riparian communities (SNEP Vol. II pp. 709-734). For instance, 73% of Great Valley cottonwood riparian falls on private lands while montane riparian communities, such as montane black cottonwood and montane riparian scrub, are better represented on public land (approximately 60%) (SNEP Vol. II pp. 671-690).
- Invasion of exotic plant species has particularly impacted the foothills and Owens Valley riparian systems (SNEP Vol. II pp. 1203). Kentucky bluegrass, tamarisk, bull thistle, Canadian thistle, scotch broom, medusa head, Himalayan blackberry, and Tree-of-Heaven have invaded riparian areas and are outcompeting native plants.

SITE IDENTIFICATION

A total of 82 potential riparian sites were identified in the Sierra Nevada ecoregion using data from the California Rivers Assessment (CARA) 1997, expert opinion, NDDB, GAP vegetation data, and SNEP. CARA, a cooperative database project that evaluates and compiles information on California's river resources, conducted a state-wide study that scored riparian resources. Rivers that were ranked as "outstanding" or "substantial" for riparian

resources by CARA were considered potential sites.

Because riparian habitats are limited in extent, all riparian communities regardless of heritage rank were included as conservation targets. A total of 11 natural community were identified, including 2 general categories – lowland riparian and montane riparian. (Table 2B.1)

The selection of wildlife and plant targets was based on NDDB (species ranking G3S3 or higher), SNEP, Partners In Flight (PIF) global and ecoregional rankings, and expert interviews (Table 2B.1). A general target category for neotropical migrant birds was included because of similar habitat needs and significant declines many members of this guild have experienced in recent years. Riparian-associated herpetofauna are addressed in the Aquatics section.

Threatened and rare riparian-associated plants were selected as targets if they co-occurred with a target riparian community. Additional rare riparian-associated occurrences were addressed in a separate Isolated Botanical and Ensemble Analysis.

Table 2B.1 Riparian Conservation Targets

Conservation Targets	**Element Rank**
NATURAL COMMUNITIES	
Lowland riparian	
Sycamore alluvial woodland	G1S1.1
Great Valley cottonwood riparian	G2S2.1
Modoc-Great Basin Cottonwood-Willow Riparian Forest	G3S2.1
Modoc-Great Basin riparian scrub	G3S2.1
White alder riparian forest	G4S4
Montane riparian	
Montane black cottonwood riparian forest	G4S3.2
Aspen riparian forest	G4S3.2
Montane riparian scrub	G4S4
Waterbirch/western birch riparian scrub	G?S?
SPECIES	
Western yellow-billed cuckoo	G5T2T3 S1
Sierra Nevada mountain beaver	G5T3?S3 ?
Black swift	G4S2
Harlequin duck	G5S2
Swainson's thrush	G5S4
Neotropical migrants	Variable
ASSOCIATED PLANTS	
Erigeron multiceps	G1S1.2
Mimulus shevockii	G1S1.2
Rorippa subumbellata	G1S1.1
Lewisia serrata	G2S2.2
Solidago gigantea	G5S1.2
Sphenopholis obtusata	G5S1.2
Stellaria obtusa	G5S2.3

SITE RANKING

Each site was examined for presence and absence of conservation targets. Sites were then given a landscape score based on four attributes: watershed integrity, natural flow regime, length/continuity of riparian corridor, and proximity/connectivity to other significant sites. (Appendix III). Sites that corresponded with an Aquatic Portfolio site were not assigned a landscape score (see Portfolio Assembly). Scores were assigned as follows:

1. Watershed integrity – Scores were based on the Watershed Suitability Index (WSI) as part of Biodiversity Management Area Selection (BMAS) system (SNEP 1996). BMAS includes measures of road density, population density, and ownership

patterns. Watershed scores were divided into three levels with lower scores reflecting higher integrity: 1.0 = lowest third, 0.5 = middle third, 0 = highest third. Riparian areas straddling two categories were given the lower score if more than 25% of the site fell within the less suitable category. Many of the eastside sites, those that fall along the aspect line, were not included in this study and thus could not receive a watershed integrity score.

2. Natural flow regime – Natural ecological processes maintain recruitment, succession, and persistence of riparian systems, influencing erosion/deposition, water availability, and flood disturbance. Using 1:250,000 USGS maps, the natural flow regime was based on the presence of major diversions, flumes, or dams. No major hydrologic alteration upstream of or within site = 1.0; small hydrologic alteration = 0.5; major hydrologic alteration = 0.
3. Length/Continuity – Longer, more continuous riparian systems are believed to provide higher quality habitat for movement of Sierran flora and fauna. For this reason, length and continuity of riparian habitat were assessed for each site. The score for this attribute contained two components, length and continuity, determined using Arcview GIS and 1:250,000 USGS maps. Length was calculated by using the average length of potential sites (12,000 m). Sites longer than 12,000 m = 0.5 and sites shorter than 12,000 m = 0. Continuity was based on assumed vegetation gaps due to roads, railroads, reservoirs, or other major development features. Sites with few development impacts = 0.5; sites with more severe development (e.g., numerous road crossings, major roads adjacent to and along the riparian area, reservoir) = 0. These two components were summed for a range of scores from 0 to 1.
4. Proximity/connectivity to other significant sites. Sites overlapping with or encompassing another significant site = 1.0; adjacent to other portfolio site or other declining community = 0.5; isolated site = 0.

Scored sites were separated into two categories: those with and those without watershed integrity scores. Based on the sum of their landscape attributes, sites within the top 50% were assigned as Tier 1, while those within the lower 50% became Tier 2.

PORTFOLIO ASSEMBLY

Minimum portfolio assembly goals were based on global rank and distribution relative to the ecoregion. For natural communities ranking G1G2 or S1S2, all known sites were sought for inclusion. One community ranked G3S3, water birch riparian scrub, had sufficient mapped information to base a portfolio goal of 50%. For the remaining target communities, available spatial data was limited and thus a minimum of six stratified sites per subregion was considered the portfolio assembly goal, if possible.

For all target wildlife species ranked G1G2, T1T2, or G3T3 endemics, the portfolio assembly goals included capturing all known occurrences associated with identified riparian sites. For species ranked G3 or lower, six stratified sites per subregion were captured, where possible.

Portfolio sites were selected in the following order:

1. Potential sites that correspond with Aquatic Portfolio sites were accepted as riparian portfolio sites. Due to the mutually dependent relationship between

riparian and aquatic habitats and the influence riparian areas have on their aquatic counterparts, protecting riparian features associated with aquatic systems is essential for long-term health of both systems.

2. Sites were added to the portfolio to fulfill conservation goals for all target natural communities and species.
   - Sites with more restricted natural community types were evaluated before widespread community types. High-quality occurrences, unique areas, and sites containing rare riparian-associated plants were given priority. Where possible, Tier 1 sites were selected before Tier 2 sites.
   - Sites supporting target species (G3S3 or higher) were added to meet goals.
   - Broad category riparian sites were added to complement the developing portfolio, capturing geographic diversity and the full elevation gradient.
3. Where necessary, additional sites were added from the Aquatics Portfolio, SNEP, and CARA to complete geographic representation.

RESULTS

A total of 61 riparian sites were selected for the portfolio (Table 2B.2). Of these, 28 are dual Aquatic/Riparian Portfolio sites (24 were immediately accepted while four more filled gaps in riparian representation).

The resulting portfolio of riparian sites covers a range of habitats from lowland foothill to montane riparian. On the westside, significant riparian occurs along the Kern River, Kaweah River, and Kings River in the southern subregion; the Merced River in the central subregion; and the Consumnes River, North Fork of the American River, and Middle Fork of the Feather River in the northern subregion.

On the eastside, streams tend to be shorter due to higher gradients but still act as important linkages among elevation zones and as refugia for migratory birds emerging from the desert. Key eastside rivers for migratory birds include those along Sand and Butterbredt Canyon.

A significant gap in the riparian portfolio occurred on the westside of the central subregion where dams and development have had a significant impact on the riparian habitat. To fill the gaps in this subregion, four aquatic sites were added: Clavey River, Jose Creek, North Fork of the San Joaquin, and South Fork of the Stanislaus River.

In the central and southern subregion, much of the montane riparian falls on Class 1 land, and thus the lowland riparian in these subregions are in most need of protection. Due to the limited extent of Class 1 land in the northern subregion, both montane and lowland riparian are in need of protection. The following portfolio sites identified in this analysis update lowland riparian in the Central Valley portfolio: Dry Creek, Mill Creek, Dry Creek (TUL), and Kern River Canyon.

It is important to note that all aquatic portfolio sites, regardless of known riparian targets, most likely contribute to riparian representation in the portfolio.

Table 2B.2 Riparian Portfolio Sites

SITE NAME	PORTFOLIO ATTRIBUTE
NORTHERN SUBREGION	
American River, North Fork	• High-quality riparian resource – CARA

SITE NAME	PORTFOLIO ATTRIBUTE
	• One of two Harlequin duck sites in ecoregion • Neotropical migrants (yellow warbler) • Aquatic Portfolio Site
Carson River, East Fork	• High-quality montane riparian – CARA • Aquatic Portfolio Site
Carson River, West Fork	• High-quality montane riparian – CARA • One of two black swift colonies selected in subregion • Aquatic Portfolio Site
Consumnes River	• One of two west-side montane riparian scrub sites selected in ecoregion • Swainson's thrush • Aquatic Portfolio Site
Cooks/Lights Creek	• One of two Great Valley cottonwood riparian forests selected in subregion • Montane riparian scrub
Dixie Creek	• Montane riparian scrub
Dry Creek – BUT	• One of two Great Valley cottonwood riparian forests in subregion
Feather River, Middle Fork	• One of two black swift colony sites selected in subregion • Aquatic Portfolio Site
French Creek Basin	• Excellent Swainson's thrush HABITAT?
Haskins Valley	• Outstanding Swainson's thrush habitat • One of two west-side montane riparian scrub sites selected in ecoregion • Contains rare plant: *Stellaria obtusa* G5S2.3
Independence Creek/Secret Meadow	• High-quality riparian – SNEP Significant Natural Area • Sierra Nevada mountain beaver • Aquatic Portfolio Site
Lakes Basin	• Excellent Swainson's thrush site
Little Truckee River	• Sierra Nevada mountain beaver • Aquatic Portfolio Site
Murphy Meadows	• Sierra Nevada mountain beaver
Rubicon River	• High-quality riparian – CARA • Swainson's thrush • Contains rare plants*: Lewisia serrata* G2S2.2 & *Phacelia stebbinsii* G3S3.2 • Aquatic Portfolio Site
Sagehen/Carpenter Valley	• Sierra Nevada mountain beaver • Montane riparian scrub • Aquatic Portfolio Site

SITE NAME	PORTFOLIO ATTRIBUTE
Slinkard Valley	• Sierra Nevada mountain beaver
Truckee River/Canyon	• Excellent Sierra Nevada mountain beaver habitat, encompassing over half the 15 total riparian occurrences • Only east-side lowland riparian selected in subregion • High-quality riparian – CARA • Aquatic Portfolio Site
Upper Truckee River	• High-quality montane riparian scrub – CARA • Contains rare plants: *Lewisia serrata* G2S2.2, *Phacelia stebbinsii* G3S3.2, and *Rorippa subumbellata* G1S1.2
CENTRAL SUBREGION	
Clavey River	• Westside riparian – geographic representation • Aquatic Portfolio Site
Convict Creek	• Waterbirch riparian scrub • Aquatic Portfolio Site
Jerseydale	• Only white alder riparian forest in subregion
Jose Creek	• Lowland riparian – westside • Aquatic Portfolio Site
Little Walker	• One of three aspen riparian forests selected in ecoregion • One of two montane riparian scrub sites selected in subregion
Mammoth Creek	• One of only two Sierra Nevada mountain beaver occurrences in subregion
McGee Creek	• Waterbirch riparian scrub • One of two montane black cottonwood forests in subregion
Merced River	• Good habitat for black swift and one of only two sites selected for the species in subregion • Aquatic Portfolio Site
Parker Creek, South	• One of three aspen riparian forest sites selected in ecoregion
Pine Creek	• Waterbirch riparian scrub • One of two Modoc-Great Basin riparian scrub sites selected in ecoregion
Rock Creek –INY	• One of two montane black cottonwood riparian forests in central subregion • Waterbirch riparian scrub
San Joaquin, North Fork	• West-side high-elevation riparian – geographic representation • Aquatic Portfolio Site

SITE NAME	PORTFOLIO ATTRIBUTE
San Joaquin River, South Fork	• High-quality riparian habitat – CARA • Aquatic Portfolio Site
Stanislaus, South Fork	• West-side high-elevation riparian – geographic representation • Aquatic Portfolio Site
Tioga Lake/Pass	• One of two montane riparian scrub examples selected in subregion • Aquatic Portfolio Site
Tuolumne River	• "Outstanding" riparian resource – CARA
Upper Deadman	• One of only two Sierra Nevada mountain beaver occurrences in subregion
West Walker River	• One of two Modoc-Great Basin riparian scrub selected in subregion • Aquatic Portfolio Site
SOUTHERN SUBREGION	
Ash Creek	• One of three montane riparian scrub sites in subregion • High-quality neotropical migrant site • Aquatic Portfolio Site
Birch Creek	• Good example of waterbirch riparian scrub
Butterbredt Canyon	• Good neotropical migrant site – Audubon National Important Bird Area
Cow Heaven Canyon	• Good neotropical migrant site
Deer Creek – TUL	• One of three sycamore alluvial woodlands in ecoregion • Aquatic Portfolio Site
Dry Creek – TUL	• Sycamore alluvial woodlands
Freeman Canyon	• Only Modoc-Great Basin Cottonwood-willow riparian forest in ecoregion
Haiwee Creek	• High-quality riparian • High-quality neotropical migrant site • Aquatic Portfolio Site
Hogback Creek	• High-quality riparian • Waterbirch riparian scrub • One of two Western yellow-billed cuckoo occurrences in subregion • Neotropical migrants (yellow-breasted chat)
Kaweah River	• High-quality riparian – SNEP Significant Natural Area • One of three montane riparian scrub sites in subregion • Only high-quality west-side neotropical migrant site in ecoregion

SITE NAME	PORTFOLIO ATTRIBUTE
	• Aquatic Portfolio Site
Kelso Creek	• Southernmost west-side high-quality neotropical migrant site in ecoregion • Contains rare plant: *Mimulus shevockii* G1S1.2
Kern River Canyon	• One of two Great Valley cottonwood stands in subregion
Kern River, North Fork Upper	• Only montane black cottonwood riparian forest in subregion • Contains rare plant: *Erigeron multiceps* G1S1.2 • Aquatic Portfolio Site
Kern River, South Fork	• High-quality riparian – SNEP Significant Natural Area • Largest contiguous stand of Great Valley cottonwood riparian in state • Largest population of Western yellow-billed cuckoos in California • Neotropical migrants site (yellow warbler & yellow-breasted chat) • Contains nearly all occurrences of the Kern River Daisy, *Erigeron multiceps* G1S1.2 • Aquatic Portfolio Site
Kings River	• High-quality riparian – SNEP Significant Natural Area • Aquatic Portfolio Site
Kings River, South Fork & Middle Fork	• "Outstanding" riparian resource– CARA • Swainson's thrush • Aquatic Portfolio Site
Mt Baxter	• High-quality riparian – SNEP Significant Natural Area • Waterbirch riparian scrub
Mill Creek	• One of three sycamore alluvial woodlands in subregion.
Olancha Creek	• High-quality neotropical migrant site • Aquatic Portfolio Site
Sand Canyon	• High-quality riparian • PIF outstanding neotropical migrants site – southernmost on east-side
Shepard Creek	• Waterbirch riparian scrub
Taboose Creek	• Good example of waterbirch riparian scrub
Tinemaha Creek	• Good example of waterbirch riparian scrub
Tule River North & Middle Forks	• High-quality riparian – SNEP Significant Natural Area • Only white alder riparian site in subregion

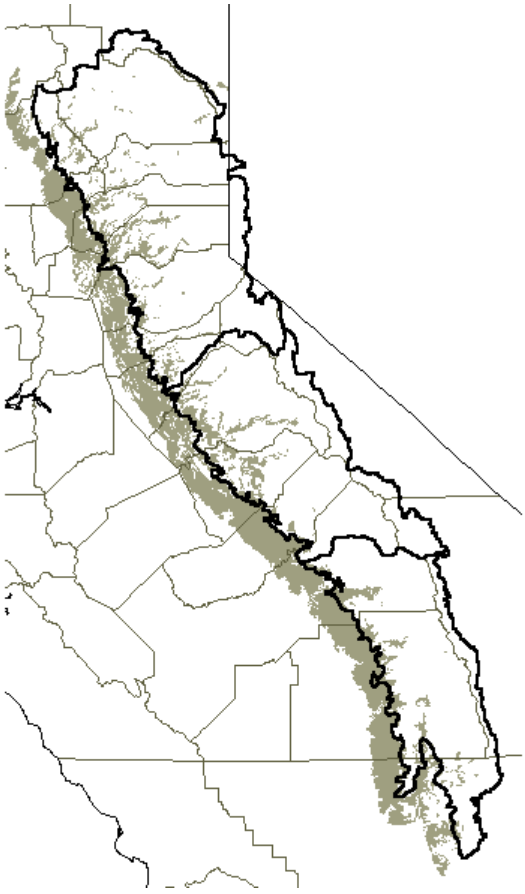
SITE NAME	PORTFOLIO ATTRIBUTE
	• Only black swift occurrence selected in subregion • Swainson's thrush

NEXT STEPS

Although the best available information was used, the actual distributions of riparian target communities and species are more extensive than the data sources indicate. Several on-going and future riparian surveys will provide additional information for evaluation of riparian areas and will aid in future portfolio refinement:

- The CARA analysis – The initial assessment was a pilot evaluation, ranking only 30% of the stream segments California-wide. Future iterations of the analysis should rank additional stream segments, as well as refine the criteria to reduce ranking biases and to account for different ecological environments (i.e., directly comparing riparian cover between dry and wet climates).
- The USFS Stream Condition Inventory – a procedure that is increasing in usage depending on individual forests.
- Lake Tahoe Basin Management Unit riparian studies.
- The USFS assessment of the southern portion of the west slope between Mokelumne and Kern rivers.
- PRBO's study on songbirds in riparian communities along the eastern Sierra Nevada – To date, PRBO completed only one year of the field study but plans to continue the monitoring.

C. FOOTHILL WOODLANDS



DESCRIPTION

Broadleaved woodlands and forests dominate the foothills along the western edge of the Sierra Nevada ecoregion. Covering some 22% of the ecoregion, these woodlands are unique to California, although not to the Sierra Nevada – they extend around the Central Valley. Of all the vegetation types in the Sierra Nevada ecoregion, the foothill woodlands support the highest native biodiversity (SNEP Vol. I p. 11).

The lower edge of this band is savanna, comprised of annual grasslands and widely spaced valley oak (*Quercus lobata*) or blue oak (*Quercus douglasii*); middle elevations are dominated by blue oak and foothill pine (*Pinus sabiana*) woodlands; and higher elevations just below the montane zone are characterized by black oak (*Quercus kelloggii*) and isolated pockets of Oregon oak (*Quercus garryana*). Interior live oak (*Quercus wislizenii*) and canyon live oak (*Quercus chrysolepis*) are concentrated around rock outcrops and steep north-facing slopes throughout the foothills.

CONSERVATION ISSUES

- At least 47 vertebrate species whose principal range includes the Sierra Nevada require non-riparian foothill habitats for population viability (SNEP Vol. II pp. 727-734).
- Many Sierran bird species that specialize in or reach high densities in oak woodland habitats appear to be decreasing, including band-tailed pigeon; Lewis' and acorn woodpeckers; scrub jay; plain titmouse; blue-gray gnatcatcher; western bluebird; and lesser and Lawrence's goldfinches (SNEP Vol. II p. 719).
- Secondary cavity-nesters comprise 35-45% of the breeding bird species in foothill oak woodlands. Most excavated nest cavities in these habitats can be attributed to keystone species such as

acorn and Nutall's woodpeckers (Verner et. al. 1997). Some evidence suggests increasing populations of European starlings may be occupying many of these nest sites.

- Foothill communities of the Sierra Nevada offer mild winter conditions and comparatively higher productivity when the remainder of the ecoregion is cold or under snow, and thus attracts migratory birds and wintering mammals that spend their summer at higher elevations (SNEP Vol. II pp. 722).
- Foothill woodlands have the second highest concentration of rare and endemic plants, behind coniferous forests, in the Sierra Nevada (SNEP Vol. II p. 700).
- Since 1850, the herbaceous layer of foothill woodlands has changed from native perennial to alien annual grasses and forbs. This has contributed to altered fire regimes and a decrease in overall plant diversity. The frequent occurrence of low-intensity fires prior to 1850 was likely a prominent ecological process influencing the development and maintenance of foothill woodlands (USDA 1998).
- Sixty-eight percent of the human population of the Sierra Nevada lives in the foothill woodland zone (USDA 1998). The land most likely to be converted to human settlement is primarily in the western foothills and within commuting distance of rapidly growing cities in the Central Valley (SNEP Vol. I p.42).
- Over the past 40 years, nearly 800,000 acres of oak woodlands in the Sierra Nevada have been converted to other land uses and vegetation types, a decline of almost 16% (SNEP Summary p. 6).
- Less than 1% of the foothill zone of the Sierra Nevada is in designated reserves or other areas managed primarily for native biodiversity. Many foothill community types fall largely on private lands, notably non-native grassland (88%), valley oak woodland (98%), blue oak woodland (89%), interior live oak woodland (71%), and foothill pine-oak woodland (82%) (SNEP Vol. II pp. 671-683).

SITE IDENTIFICATION

A total of 79 potential foothill woodland sites were identified and evaluated in the Sierra Nevada ecoregion using expert workshops, SNEP data, CNDDB data, GAP vegetation data, the San Joaquin Valley Ecoregional Plan (1997), and literature.

Despite the wide variety of wildlife species dependent upon foothill woodlands in the Sierra Nevada, the data regarding their status and location was not sufficient to use any for site identification. Therefore, conservation targets were limited to five foothill natural communities ranked by CNDDB as at least G3S3 (Table 2C.1). Site identification for more common and widespread foothill woodland communities was addressed in a separate analysis by Frank Davis of the U.C. Santa Barbara.

As a matrix community, site selection for blue oak woodlands was limited to occurrences larger than 3,000 acres and away from major highways or urban areas.

Table 2C.1 Foothill Woodland Conservation Targets

CONSERVATION TARGET	ELEMENT RANK
Black oak woodland	G3S3.2
Blue oak woodland	G3S3.2
Interior live oak woodland	G3S3.2
Oregon oak woodland	G3S3.3
Valley oak woodland	G3S2.1

SITE RANKING

Potential foothill woodland sites were stratified into three subregions and the presence or absence of target communities was tabulated for each site. Sites were then scored for landscape attributes that reflect the quality of the site as a naturally functioning ecosystem. (Appendix III). Scores were assigned as follows:

- Size – Sites were scored based on the range of their sizes: larger than 10,000 ac = 1.0, sites between 10,000 ac and 5,000 ac = 0.5, and sites smaller than 5,000 ac = 0.0.
- Integrity – Scores were based on the Watershed Suitability Index (WSI), an analysis developed for the Biodiversity Management Area Selection (BMAS) model used in SNEP, that includes measures of road density, population density, and ownership patterns. Watersheds with lower WSI are less impacted by these factors and are therefore more suitable for conservation. WSI scores for each subregion were classified into three categories and assigned for each potential site. Lowest WSI = 1.0, medium WSI = 0.5, and high WSI = 0.0.
- Migratory deer winter range – Many foothill woodland areas serve as important winter habitat for migratory species. One such species with well-documented range and movement patterns is the mule deer. Critical deer movement routes may also function as potential linkages for a variety of species. Scores were based on data from the California Department of Fish and Game regarding winter ranges for migratory deer. Sites within critical winter range = 1.0, sites within winter range = 0.5, and sites outside winter range = 0.0.
- Proximity to other portfolio sites – This attribute indicates a site's potential to be protected in an efficient portfolio configuration. Scores for sites contiguous with other portfolio sites = 1.0, sites within close proximity (<5 mi.) to other portfolio sites = 0.5, and isolated sites = 0.0.

Sites were then sorted into two tiers based on the total score of landscape attributes. Sites with scores in the upper 50% were ranked as Tier 1 indicating those most likely to be viable over the long-term.

PORTFOLIO ASSEMBLY

Site selection was guided by representation and efficiency with the minimum number of sites determined by the following conservation coverage goals: black oak woodland 50%, blue oak woodland 30%, interior live oak woodland 40%, Oregon oak woodland 50%, and valley oak woodland – a peripheral community - 10%.

Portfolio sites for each subregion were first selected from Tier 1 sites. If additional sites were needed to fulfill goals, other Tier 1 and, if necessary, Tier 2 sites were chosen. Where possible, sites with any occurrences of G1G2 or S1S2 plant species (even those not specifically associated with foothill woodland habitats) were given preference over otherwise equivalent sites to capitalize on portfolio efficiency.

RESULTS

A total of 46 foothill woodland sites were selected for the portfolio (Table 2C.2). Ten sites lay outside the western ecoregion boundary but were included in this analysis since a foothill woodland portfolio was not completed for the Central Valley. These sites are noted with an (*) in the following table and will be integrated into the Central Valley portfolio.

Some key sites include: Eastern Escarpment near Honey Lake; Oregon Hills and upper Honcut Creek in Yuba County; portions of the Cosumnes River watershed; the foothills and lower canyons of the Tuolumne River; the foothills west of Sequoia National Park; the Kern River area; and the unusual oak riparian areas in the Owens Valley.

Distribution of sites is relatively even across the ecoregion, however, sites in the southern subregion tend to be greater in size due to larger stands of target communities.

Table 2C.2 Foothill Woodland Portfolio Sites

SITE NAME	PORTFOLIO ATTRIBUTE
NORTHERN SUBREGION	
Black Mountain	Black oak woodland – unusual eastside occurrence
Camptonville	Black oak woodland Interior live oak woodland
Cosumnes Foothills*	Blue oak woodland
Feather River, MFK Canyon	Black oak woodland
Foresthill Divide	Black oak woodland
French Creek Basin	Black oak woodland *Allium jepsonii, Clarkia mosquinii ssp xerophylla, Senecio eurycephalus var lewirosei*
Grizzly Flat	Black oak woodland
Honcut Creek, upper	Blue oak woodland Oregon oak woodland Valley oak woodland
Logtown Ridge*	Interior live oak woodland
Long Canyon	Black oak woodland *Allium tribracteatum, Lomatium stebbinsii*
Mapes Canyon	Black oak woodland *Ivesia aperta var aperta*
Milford	Black oak woodland – unusual eastside occurrence
Mosquito Ridge/Oak Flat	Black oak woodland
Mt Aukum	Interior live oak woodland Black oak woodland
North Table Mountain*	Interior live oak woodland *Juncus leiospermus var leiospermus, Monardella douglasii ssp veno*
Oregon Hills	Oregon oak woodland – only occurrence in subregion Black oak woodland
Quiggs Mtn.	Interior live oak woodland *Arctostaphylos myrtifolia*
Rubicon canyon	Black oak woodland
Spenceville	Blue oak woodland Interior live oak woodland
Squaw Hollow	Black oak woodland

SITE NAME	PORTFOLIO ATTRIBUTE
	Blue oak woodland Interior live oak woodland *Arctostaphylos nisseniana*
CENTRAL SUBREGION	
Big Grizzly Mountain	Black oak woodland Interior live oak woodland *Eriophyllum congdonii, Mimulus filicaulis*
Buckhorn Peak	Interior live oak woodland *Horkelia parryi*
Carpenteria	Interior live oak woodland *Carpenteria californica, Lupinus citrnus var citrinus*
Jerseydale	Black oak woodland Interior live oak woodland
Drew Meadow	Black oak woodland Blue oak woodland *Mimulus filicaulis, Clarkia australis*
Guadalupe Mountains*	Blue oak woodland Valley oak woodland – one of two occurrences in subregion
Jawbone Ridge	Blue oak woodland
Kinsman Flat	Interior live oak woodland
Mt Eaton	Black oak woodland Interior live oak woodland *Erythronium tuolumnense*
San Joaquin River Foothills*	Blue oak woodland Interior live oak woodland
Schultz Mountain*	Blue oak woodland Interior live oak woodland
Thompson Peak	Black oak woodland
Tuolumne River Canyon	Interior live oak woodland
Tuolumne River Foothills*	Blue oak woodland
SOUTHERN SUBREGION	
Bull Run	Black oak woodland *Calochortus westonii, Fritillaria brandegei*
Caliente*	Black oak woodland – southernmost occurrence in ecoregion Blue oak woodland
Greenhorn Foothills*	Interior live oak woodland Blue oak woodland *Fritillaria brandegei, Pseudobahia peirsonii, Sidalcea keckii*
Kaweah River Foothills	Blue oak woodland Interior live oak woodland *Eriogonum nudum var murinum, Mimulus norrisii*
Kern River Canyon	Blue oak woodland

SITE NAME	PORTFOLIO ATTRIBUTE
	Oregon oak woodland – southernmost occurrence in ecoregion *Heterotheca shevockii, Mimulus shevockii*
Linns Valley	Blue oak woodland Interior live oak woodland Valley oak woodland – one of two occurrences in subregion *Calochortus westonii, Fritillaria brandegii*
Milo	Blue oak woodland Interior live oak woodland *Clarkia springvillensis*
Mountain Home	Blue oak woodland Interior live oak woodland *Calochortus westonii, Clarkia springvillensis, Dudleya cymosa ssp costafolia, Erigeron inoratus var keilii, Eriogonum twisselmanii, Erythronium pusaterii, Fritillaria brandegei*
Oak Creek, South Fork	Black oak woodland – unusual eastside occurrence Interior live oak woodland – unusual eastside occurrence
Owens Valley Oaks	Interior live oak woodland – unusual eastside occurrence
Yokohl Valley	Blue oak woodland *Brodiaea insignis*

* Sites outside the Sierra Nevada ecoregion but evaluated to complete portfolio

NEXT STEPS

According to SNEP, the foothill areas and lower west slopes of all the Sierra Nevada are now in critical need of avian research and monitoring (SNEP Vol. II C25). In addition, future iterations of the portfolio should include a more comprehensive analysis of rare plants associated with the foothill woodlands.

D. CHAPARRAL

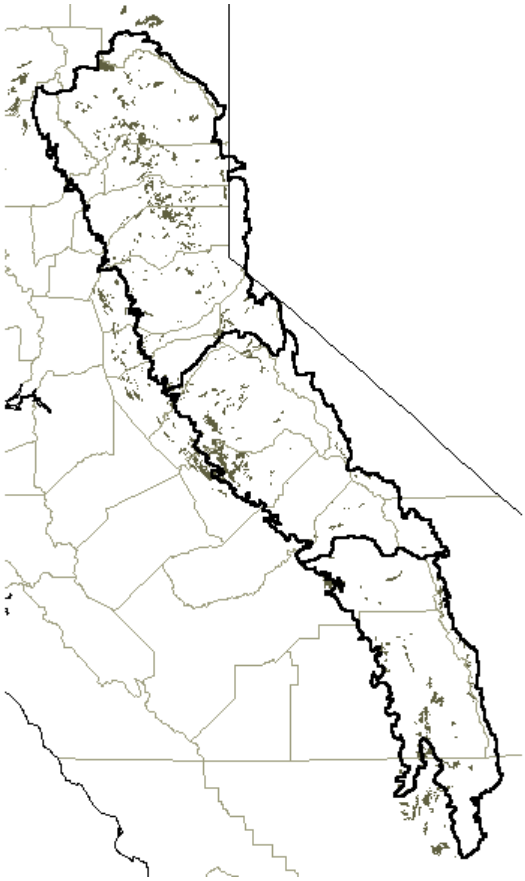
DESCRIPTION

Chaparral communities are predominantly evergreen shrublands adapted to hot, dry summers and periodic fire typical of Mediterranean climates (SNEP Vol. II p. 1049). The major types of chaparral found in the Sierra Nevada are foothill and montane chaparral (SNEP Vol. II p. 1079).

Foothill chaparral is common in the lower elevations of the Sierra Nevada, generally below the main belt of the conifer forests and above the oak woodlands on steep, often rocky, southern-facing slopes of canyons, occurring at elevations of 1,000 to 5,000 ft. In the northern Sierra, it is more widely scattered and generally more restricted to the drier slopes. Foothill chaparral has a close ecological relationship with oak woodlands, especially interior live oak woodland (SNEP Vol. II p. 1082).

Montane chaparral occurs in higher elevations than foothill chaparral in association with montane coniferous forests and, at times, as high as subalpine forest areas. The sites occupied by montane chaparral are usually exposed areas, often on steep, rocky, south-facing slopes with shallow soils. Most montane chaparral shrub species are disturbance adapted, and thus occur on sites where the original forest cover has been removed by fire, logging, landslides, or other disturbance (SNEP Vol. 11 p. 1053; Holland and Keil 1995, p. 191) Montane chaparral is often an understory element of montane coniferous forests, especially where the forest canopy is open (Holland and Keil 1995, p. 191).

All chaparral communities are highly adapted to fire and tend to persist where there are recurring fires. Stands include obligate seeders and species that resprout after fire. Vegetative responses on chaparral sites vary and are determined by a complex interaction of temperature, soil moisture, heat duration, depth of burn, and season of burn (SNEP Vol. II p. 1079).



CONSERVATION ISSUES

- The foothill chaparral communities are important for migratory species. For example, most winter ranges of deer are

in woodland and shrub habitat below 3,000 feet (SNEP Vol. II p. 722).

- Chaparral vegetation is dependent on fire as part of its life history and ecology, and each chaparral community is adapted to specific fire conditions. Consequently, the fire regime required to maintain all species at a site is complex. Altered fire regimes, including fire suppression, increased fire frequency, and prescribed burning during the wrong season, have had negative impacts on chaparral communities.
- Construction of wide fire or fuel breaks has cleared large areas of chaparral to prevent or slow the spread of fires. Once continuous chaparral stands have been broken into numerous fragmented blocks (Holland and Keil 1995).
- Foothill chaparral vegetation on the western slopes of the Sierra Nevada have been extensively modified. The native herbaceous understory in these communities was virtually replaced by introduced Eurasian grasses and dicots in the mid-19th century. Some former chaparral has been converted to grazing land and much of the remainder has become decadent or even succeeded to conifer forest owing to fire suppression. (SNEP Vol. II p. 721).
- The low-elevation, westside chaparral communities are mostly in private ownership and are receiving the greatest impacts by urbanization (CNPS 1998; SNEP Vol. II p. 700). Types of degradation include fragmentation, habitat conversion, invasion of exotic species, and inappropriate fire management.

SITE IDENTIFICATION

Sixty-five potential chaparral sites were identified within the Sierra Nevada ecoregion using conservation target data from expert interviews, SNEP, NNDB, GAP, and literature. Conservation target communities were selected based on a heritage rank of at least G3S3 (Table 2D.1). Due to the lack of chaparral-associated wildlife and plant data, only two plant species were used for site identification. However, occurrences of these plants were included only if they co-occurred with a target vegetation community.

The chaparral communities ranked as G4 or G5 were addressed separately in an analysis conducted by Frank Davis of U.C. Santa Barbara.

Table 2D.1 Chaparral Conservation Targets

CONSERVATION TARGET	ELEMENT RANK
Foothill chaparral	
Leather oak chaparral	G3S3.2
Scrub oak chaparral	G3S3.3
Semi-desert chaparral	G3S3.2
Shin oak brush chaparral	G3S3.3
Interior live oak chaparral	G3S3.3
Montane chaparral	
Bush chinquapin chaparral	G3S3.3
Huckleberry oak chaparral	G3S3.3
Arctostaphylos nissenana	G2S2.2
Carpentaria californica	G2 S2.2

Due to the fact that many forms of chaparral occur as an understory, mapped and expert information for target chaparral communities was limited. Therefore, some potential sites were identified by including areas where GAP had mapped target chapparral communities as a secondary cover type - defined as less than 20% canopy coverage.

SITE RANKING

Potential chaparral sites were separated by subregion and by cover type (primary and secondary cover type). Each site was

evaluated for the presence of target species. Each site was then awarded a landscape score to reflect the quality (Appendix III). The landscape attribute score was assigned as follows:

1. Integrity – Scores were based on the Watershed Suitability Index (WSI) as developed for the Biodiversity Management Area Selection system for SNEP. WSI measures road density, population density and ownership within each watershed. Watersheds with lower WSI are less impacted by these measures and thus are considered to have greater landscape integrity. Scores were classified into 3 categories - lowest WSI = 1.0, medium WSI = 0.5, and high WSI = 0. At least 75% of the site had to be within the category to receive that score.
2. Proximity to other target communities – Chaparral communities often occur with or integrate with other target natural communities, particularly oak woodlands in the foothills and coniferous forest in the montane zone. Thus, sites were awarded points according to their proximity to portfolio oak woodland and upland coniferous forest sites (including ALSEs as defined in the coniferous forest section). This attribute also indicates a site's potential to be protected as part of a larger landscape. Sites embedded within other portfolio oak/coniferous site = 1.0; sites adjacent to other oak or coniferous forest portfolio sites = 0.5; and isolated sites = 0.
3. Richness – Sites were awarded points for biological richness. Sites containing more than one G3 community (primary or secondary Holland cover type) = 1.0; sites containing a G4 community = 0.5; isolated sites = 0.0
4. Size – The area of the target communities as mapped by GAP was used to develop the size ranking. Scores were sorted into three categories, based on natural breaks in the data.
   - For G3 chaparral communities considered *large patch* (interior live oak and scrub oak) - sites with stands larger than 3,000 acres = 1.0, between 1,000 and 3,000 acres = 0.5, and smaller than 1,000 acres = 0.
   - For G3 chaparral communities considered *small patch* (bush chinquapin, huckleberry oak, leather oak, semi-desert scrub), sites larger than 1,000 acres = 1.0, between 500 and 1,000 acres = 0.5, and smaller than 500 acres = 0.
   - Sites identified using GAP secondary cover data did not receive a score for size since it was not possible to calculate the extent of the cover. These sites were ranked against each other based on remaining data and scores.

PORTFOLIO ASSEMBLY

The minimum conservation goals designated for each target community are as follows: Limited, large patch communities (interior live oak chaparral) = 50%; Limited, small patch communities (bush chinquapin, huckleberry oak, shin oak brush, and leather oak chaparral) = 60%; Peripheral communities (scrub oak and semi-desert chaparral) = 10%. If data were limited for any of the above target communities, a minimum of six sites stratified across the east-west gradient were selected for each subregion.

Sites were sorted into two tiers based on landscape scores. Sites with scores in the upper 50% were ranked as Tier 1. Sites in the lower 50% were ranked as Tier 2. Sites identified using GAP secondary coverage

data were ranked separately. Sites were selected for the portfolio as follows:

1. All chaparral sites within Class 1 land or an upland coniferous forest portfolio site were selected first for the portfolio.
2. Biologically unique and/or ecologically outstanding sites were then added to the portfolio.
3. All sites supporting populations of target plants were added.
4. Where additional sites were needed to fulfill conservation and geographic representation goals, sites were selected first from Tier 1 and then Tier 2 sites.

RESULTS

Forty-six sites were selected for the chaparral portfolio (Table 2D.2).

Only two rare plant species, *Carpentaria californica* and *Arctostaphylos nissenana*, are documented as co-occurring with target chaparral communities, both occurring only within one site using the site selection criteria. Additional rare plant and animal species associated with chaparral did not co-occur with target chaparral communities and thus will be included in the isolated rare plant and ensemble analysis. For example, documented occurrences of California horned lizard (G4T3T4S3S4) only co-occur with G4 chaparral types.

Target chaparral communities are underrepresented on Class 1 lands, particularly the target foothill chaparral communities ecoregion-wide and the target montane chaparral communities in the northern subregion. Only two small RNA's exist with chaparral – a small patch of huckleberry oak chaparral at Onion Creek RNA (referred to as Granite / Onion Creek in this analysis) and a small secondary bush chinquapin stand at Meiss RNA. Long Canyon is only a proposed RNA

Key areas for target montane chaparral are between the vicinity of Bucks Lake and Grizzly Mountain, where ownership is a checkerboard pattern, some of which is Class 1 land.

A key area for a mix of foothill and montane chaparral occurs along the San Joaquin River, from the foothills east to Sequoia/Kings canyon, and Volcanoville/ Gas Canyon. Additional key areas supporting a mix of chaparral communities, including desert scrub, are Paiute Mountains and Long Canyon. The southern portion of the ecoregion also supports the largest stands of interior live oak chaparral, a target foothill chaparral community.

Table 2D.2 Chaparral Portfolio Sites

SITE NAME	PORTFOLIO ATTRIBUTE
NORTHERN SUBREGION	
Bear Creek	Bush chinquapin chaparral
Bowman Lake / English Mountain	High quality huckleberry oak and bush chinquapin

SITE NAME	PORTFOLIO ATTRIBUTE
	chaparral
Bucks Mountain	Largest bush chinquapin chaparral stand in ecoregion.
Bunk Meadow	Huckleberry oak chaparral
Castle Peak / Basin Peak	Huckleberry oak chaparral
Dark Canyon	Bush chinquapin chaparral
Eastern Escarpment	Eastside bush chinquapin chaparral
Fordyce Creek	Huckleberry oak chaparral
Granite Ridge	Huckleberry oak chaparral Class 1 land
Granite / Onion Creek	Huckleberry oak and bush chinquapin chaparral RNA
Honcut Creek, Upper	1 of only 2 shin oak brush in subregion
Meiss Meadow	Eastside huckleberry oak chaparral Class 1 land
Packsaddle Pass	Southern stand of bush chinquapin chaparral
Parade Ground	Largest interior live oak chaparral stand in ecoregion (buffer) 1 of only 2 interior live oak chaparral sites in subregion
Red Rock	Eastside bush chinquapin chaparral
Sawmill Peak	1 of 2 shin oak brush chaparral in subregion
Secret Canyon	Bush chinquapin chaparral
Stag Point	Bush chinquapin chaparral
Steamboat	Bush chinquapin chaparral
Volcanoville / Gas Canyon	Only leather oak and scrub oak in subregion 1 of only 2 interior live oak in subregion *Arctostaphylos nissenana* occurrence
CENTRAL SUBREGION	
Carpentaria	Largest example of *Carpenteria californica* One of the larger interior live oak chaparral stands
Cherry Creek, NFK	Huckleberry oak chaparral

SITE NAME	PORTFOLIO ATTRIBUTE
	Class 1 land
Cherry Ridge	Most extensive stand of huckleberry oak in ecoregion Excellent landscape value
Gardner Meadow	Huckleberry oak chaparral Within ALSE
Kaiser Ridge	Largest huckleberry oak chaparral stand in ecoregion Excellent landscape attributes
Kinsman Flat	1 of 3 interior live oak chaparral
Merced River – chaparral	Only bush chinquapin in subregion Class 1 land
Richardson Pk	Huckleberry oak chaparral Class 1 land
San Joaquin R, upper NFK	Huckleberry oak chaparral Class 1 land
Silver Creek	Huckleberry oak chaparral Class 1 land
Tamarack	Huckleberry oak chaparral Within ALSE
The Tombstone	Huckleberry oak chaparral Class 1 land
Vermilion Cliffs	Huckleberry oak chaparral Good landscape value Class 1 land
Wards Ferry	1 of 3 interior live oak chaparral
SOUTHERN SUBREGION	
Banada Canyon	1 of 3 largest interior live oak chaparral occurrences in ecoregion
Caliente	Third largest interior live oak chaparral stand in ecoregion
Dennison Mountain – West	1 of only 4 shin oak chaparral sites
Little Kern	1 of only 2 huckleberry oak chaparral in subregion

SITE NAME	PORTFOLIO ATTRIBUTE
Long Canyon	Only site mapped as dominant shin oak chaparral in subregion Semi-desert chaparral present. Proposed RNA/Class 1 land
Packsaddle Canyon	Largest stand of dominant semi-desert chaparral in ecoregion (buffer)
Paiute Mountains	Excellent chaparral diversity Supports1 of 2 scrub oak One of the largest semi-desert scrub in subregion. Shin oak brush and interior live oak also present
Paradise Peak	Largest secondary shin oak chaparral stand in subregion. On class 1 land.
Pilot Knob	Only interior live woodland within ecoregion boundary. Large secondary stand of semi-desert chaparral Class 1 land
Scodie Mountains –West	Semi-desert scrub on class 1 land
Slide Bluffs	Second largest huckleberry oak chaparral stand in ecoregion 1 of only 2 huckleberry oak chaparral in subregion Class 1 land.
Whiterock/Stevenson Creek	Largest stand of scrub oak in ecoregion (buffer) 1 of only 2 scrub oak stands in subregion

NEXT STEPS

Locate any studies entailing chaparral monitoring and identifying distribution in the Sierra Nevada ecoregion to help refine portfolio selection. The available mapped data for chaparral appears to be limited. The coverage of target communities as mapped by GAP likely constitute only a small portion of actual distribution. According to Holland (1986), for example, interior live oak chaparral is extensive in the Sierra foothills from Shasta to Kern Counties. However, the data sources document only 10 sites, with over half of the potential sites occurring in the buffer of the southern subregion where the Sierra Range blends into the Transverse Range. Likewise, Holland (1986) documents bush chinquapin chaparral to occur in Cascade-Sierra extending to Kern County, though the available digital data by GAP documents it almost exclusively in the northern subregion.

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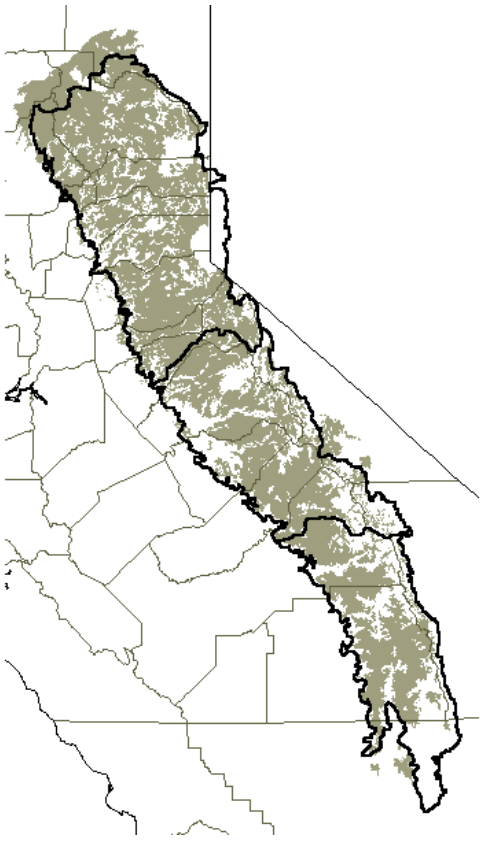
E. MONTANE AND SUBALPINE CONIFEROUS FORESTS

DESCRIPTION

Montane and subalpine coniferous forests of the Sierra Nevada comprise one of the largest and most economically important vegetation regions in California (Barbour and Major 1977). This region includes most of the east and west slopes of the Sierra from 2,000 - 5,000 ft on the lower margin to 10,000 - 11,500 ft at its upper limit. The elevation of the vegetation zone is higher in the south because warm, dry conditions extend further upslope than in the north. In general, every 1,000 ft climb in elevation is equivalent to moving a distance of 300 miles north. Increasing elevation brings with it lower temperatures, greater precipitation, shallower soils, and higher winds. These changes are gradual and so are the changes in vegetation which accompany them.

The lower montane zone of Sierran coniferous forests is composed of ponderosa pine (*Pinus ponderosa*) forests on more xeric sites and white fir (*Abies concolor*) forest on more mesic sites with special areas of giant sequoia groves. Above this zone, forming a transition to the higher subalpine forests, are the upper montane red fir (*Abies magnifica*), Jeffrey pine (*Pinus jeffreyi*), and lodgepole pine (*Pinus contorta spp. murrayana*) forests. The subalpine zone includes several geographically restricted types dominated by the mountain hemlock (*Tsuga mertensiana*), western white pine (*Pinus monticola*), whitebark pine (*Pinus albicaulis*), foxtail pine (*Pinus balfouriana*) and limber pine (*Pinus flexilis*).



CONSERVATION ISSUES

- Beginning with the gold rush, native Sierran forests of mixed conifers were

cut for housing and mine construction. The completion of the trans-Sierra railroad in 1860 opened the region to commercial timber markets. By 1880, over 1.5 million acres of pine forests had been cut or burned in the western foothills. Over the last four decades, national forest timber harvests in the Sierra Nevada averaged 650 million board feet per year and peaked in 1988 at just over 1 billion board feet. [SNEP Vol. 1 p. 18.]

- Late-successional coniferous forests in the Sierra Nevada are discrete, endemic ecosystems. Prior to 1850, such old-growth forests appear to have existed as interconnected, heterogeneous landscape units that incorporated compositional, structural, and functional elements at many scales.
- All estimates indicate that the abundance of old-growth forests in the Sierra Nevada have declined significantly since 1850. Rangewide, SNEP found old growth forests on only 14% of federal lands, mostly within National Parks (SNEP Vol. II p. 648).
- Fire suppression during the 20th century has favored an increased density of young trees throughout the Sierra Nevada. Prior to 1850, Sierran coniferous forests evolved with frequent and mostly low to moderate intensity fires.
- California spotted owls are closely associated with attributes of old-growth forest and all demographic studies in the Sierra Nevada have shown a significant population decline. Two subspecies of spotted owl have been federally listed as threatened, and without adequate protection, the California spotted owl may become listed as well.
- The current Pacific fisher population is believed to occupy less than one-half of its known historic range in the Sierra Nevada. Scientists attribute the elimination of fishers from the northern and central Sierra to the loss of structurally complex forests and well-distributed large trees, and by fragmentation of habitat by roads and rural development. Pacific fishers have been petitioned to be listed under the Federal Endangered Species Act. [USDA 1998.]
- Pine martens are associated with old-growth forests and the Sierra Nevada marks the southern-most limit of their range in North America.
- Confirmed occurrences of California wolverine in the Sierra Nevada do exist although recent evidence suggests that larger populations occur in the Oregon Cascades. Wolverines have been petitioned to be listed under the Federal Endangered Species Act.
- Sierra Nevada red foxes, like wolverine, have few verifiable occurrences. Recent data confirms their presence just to the north of the ecoregion near Lassen National Park. An introduced subspecies of red fox may be increasing its range in the Sierra Nevada from other parts of California.
- Loss of old-growth forests have likely reduced the amount of nesting and foraging habitat for northern goshawk. Although studies indicate relatively stable populations statewide, significant declines have been noted on the east side of the Sierra Nevada.

SITE IDENTIFICATION

A total of 116 montane and subalpine coniferous forest sites were identified in the ecoregion using SNEP data, NDDB data, GAP vegetation data, expert interviews and literature.

Conservation targets included seven wildlife species associated with late-successional

forests identified by SNEP as at risk and eight coniferous forest communities ranked by NDDB as at least G3S3. (Table 2E.1). Old-growth forest, as a discrete, declining ecosystem, was included as a conservation target. Site identification for more common and widespread coniferous forest communities was addressed separately in an analysis by Frank Davis of the University of California at Santa Barbara.

Table 2E.1 Montane and Subalpine Coniferous Forest Conservation Targets

CONSERVATION TARGET	ELEMENT RANK
Big tree forest	G3S3.2
Eastside ponderosa pine forest	G4S2.1
Foxtail pine forest	G3S3.3
Limber pine forest	G4S2.3
Northern interior cypress forest	G2S2.2
Southern interior cypress forest	G2S2.1
Washoe pine forest	G1S1.2
Westside ponderosa pine forest	G3S2.1
Late succesional / old growth	N/A
California spotted owl	G?S2
California wolverine	G4T2S2
Great gray owl	G5S1
Northern goshawk	G4S3
Pacific fisher	G3G4S2S3
Pine marten	G3G4S3S4
Sierra Nevada red fox	G4T2T3S1

Occurrences of target natural communities as mapped by GAP were used to identify potential sites only if confirmed by other data or experts. An exception was made for foxtail and limber pine forests which, due to a lack of other data, were identified almost exclusively by GAP. Occurrences of target wildlife species as mapped by NDDB or SNEP were used only if they co-occurred with expert or GAP identified sites.

An additional set of potential sites was identified by SNEP resource specialists for old-growth forests. Using aerial photographs, satellite images, and inventory data, more than 100 resource specialists ranked forest areas on a 6-point scale from 0 to 5. Areas ranked as Class 4 and 5 were identified as high-quality late-successional or old-growth (LSOG) forests. SNEP resource specialists concluded that a reserve network was the best strategy to conserve these forests and and recommended Areas of Late-Successional Emphasis (ALSEs) as the best approach. ALSEs were designed to combine LSOG 4 and 5 patches into larger, management units that would provide preferred habitat and withstand catastrophic fire. The ALSE network would be managed to maintain, enhance, and protect late-successional conditions and eventually double the amount of LSOG forest in the Sierra Nevada.

SITE RANKING

Potential montane and subalpine coniferous forest sites were stratified into three subregions. Within each subregion, all sites, except for the ALSE network, were evaluated and scored for biological richness and landscape attributes. (Appendix III).

Biological Score: Each site was evaluated for occurrences of coniferous forest target species and communities. Scores were assigned as follows: sites strongly supporting the target element = 1.0; sites with a marginal or questionable example of the target element = 0.5; target element absent = 0.0.

Landscape Score: Each site was also assigned a score which reflects the quality of the site as part of a naturally functioning

ecosystem. Scores were assigned using the following attributes:

- Size – Sites were ranked on the distribution of their sized: larger than 5,000 ac = 1.0, sites between 1,000 ac and 5,000 ac = 0.5, and sites smaller than 1,000 ac = 0.0.
- Integrity – Scores were based on the Watershed Suitability Index (WSI) developed for the Biodiversity Management Area Selection (BMAS) system from SNEP. WSI includes measures of road density, population density, and ownership. Watersheds with lower WSI are less impacted by these measures. WSI scores for each subregion were classified into three categories and compared with each potential site. Lowest WSI = 1.0, medium WSI = 0.5, and high WSI = 0.0.
- Proximity to other sites – This attribute indicates a site's potential to be protected as part of a larger landscape. Scores for sites contiguous with two or more other potential sites = 1.0, sites contiguous with one other potential site = 0.5, and isolated sites = 0.0.

The biological and landscape scores for each site were combined to yield a total score. Sites were then sorted into two tiers based on the total score. Sites with total scores in the upper 50% were ranked as Tier 1 indicating the most biologically diverse and sustainable sites.

PORTFOLIO ASSEMBLY

Portfolio selection was based on the following guidelines:

1. Accept SNEP's proposed ALSE network as core portfolio sites.
2. select all potential coniferous forest sites within the ALSE network. The ALSE network encompasses over two million acres of middle elevation coniferous forest. Fifty sites identified through expert workshops, literature, NDDB data, and GAP vegetation data for coniferous forest conservation targets were determined to be redundant with the ALSE network and were therefore absorbed.
3. Add sites to meet conservation goals with attributes not represented in ALSE network. The ALSE network is concentrated in federally owned middle elevation coniferous forests on the western slope of the Sierra Nevada and is therefore not sufficient in representing all conservation targets. Additional Tier 1 and, if needed, Tier 2 sites were added to complete portfolio representation and stratification goals. In addition, some sites embedded within the ALSE network were highlighted because they represent unique occurrences of conservation targets that may not necessarily correspond to old growth.

PORTFOLIO RESULTS

In addition to the ALSE network, which encompasses nearly half of all potential coniferous forest sites, the following 50 sites are recommended as portfolio sites for montane and subalpine coniferous forests in the Sierra Nevada (Table 2E.2).

Several areas are particularly noteworthy for outstanding coniferous forest attributes. On the west side, areas include East-West Yuba and Lavezolla Creek in Plumas County; Duncan/Sailor/Sunflower area in Placer County; the western portion of Yosemite National Park; the lower elevations of Kings Canyon and Sequoia National Parks; and the Paiute / Brekenridge Mountains south of the Kern River. On the east side, notable coniferous forest sites include Babbitt Peak north of Truckee; Monitor Pass to Silver King in Alpine County; Lee Vining Canyon east of Yosemite; and the Kern Plateau region in Tulare County.

Table 2E.2 Montane and Subalpine Coniferous Forests Portfolio Sites

SITE NAME	PORTFOLIO ATTRIBUTES
NORTHERN SUBREGION	
Babbitt Peak	• Washoe pine forest
Bear Creek	• Westside ponderosa pine
Black Mountain	• Old growth - eastside • Eastside ponderosa pine forest
Butterfly Valley	• Westside ponderosa pine • Northern goshawk
Duncan/Sunflower/Sailor	• Big tree forest – northern-most in Sierra
East-West Yuba	• California wolverine – best occurrence in subregion
Faith Valley	• Sierra Nevada red fox - best occurrence in subregion
Fordyce High lakes	• Pacific fisher – northern-most occurrence in Sierra
Grover Hot Springs	• Old growth - eastside
Horsethief Canyon	• Old growth – eastside • Eastside ponderosa pine
Mount Rose	• Washoe pine forest – best occurrence
Mosquito Ridge	• Westside ponderosa pine • Northern goshawk
Mud Lake RNA	• Northern interior cypress forest
Packsaddle Pass	• Eastside ponderosa pine forest – disjunct occurrence
Monitor Pass	• Old growth - eastside
Sawmill Peak	• Northern interior cypress forest
Silver King	• Old growth - eastside
Slinkard Valley	• Old growth - eastside
CENTRAL SUBREGION	
Buckeye	• Old growth - eastside
Calaveras Big Trees	• Big tree forest
Coyote Flat	• Old growth - eastside
Crane Flat	• Big tree forest
Emigrant Wilderness	• California Wolverine • Sierra Nevada red fox
Indiana Summitt RNA	• Old growth - eastside
Lee Vining Canyon	• California wolverine
Mariposa Grove	• Big tree forest
Paiute Meadows	• Old growth - eastside

SITE NAME	PORTFOLIO ATTRIBUTES
Silver-Wolf Creeks	• Old growth - eastside
Sonora Pass	• Old growth - eastside
Summit Meadows	• Old growth - eastside
Virginia Lakes	• Old growth - eastside
SOUTHERN SUBREGION	
Back Canyon	• Southern interior cypress forest
Baker Point	• Southern interior cypress forest
Big Pine Meadow	• Westside ponderosa pine forest – unusual eastern occurrence
Breckenridge Mountain	• Pacific fisher - southern-most population
Chagoopa Plateau	• Foxtail pine forest
Dennison Mountain	• Big tree forest
East Baker	• Southern interior cypress forest
General's Highway	• Big tree forest • Sierra Nevada red fox- best occurrence of in subregion
Kern River Canyon	• Southern interior cypress forest
Last Chance Meadow RNA	• Foxtail pine forest • Limber pine forest
McKinley Grove	• Big tree forest
Mineral King	• Foxtail pine forest
Mount Guyot	• Limber pine forest • Foxtail pine forest
Mountain Home	• Big tree forest
North Greenhorn Mountains	• Big tree forest
Paiute Mountains	• Southern interior cypress forest
Paradise Peak	• Big tree forest
Park Ridge	• Big tree forest
Twisselman	• Foxtail pine forest

NEXT STEPS

The ALSE network is recognized as a successful strategy for conserving westside coniferous forest of the Sierra Nevda. Though the ALSE network was developed around a set of management prescriptions for protection of late successional/old-growth forest, it does not include specific species criteria. Future iterations of the portfolio analysis should specifically assess the suitability of the ALSE for target species.

F. INTERIOR WETLANDS, MEADOWS AND ASPEN

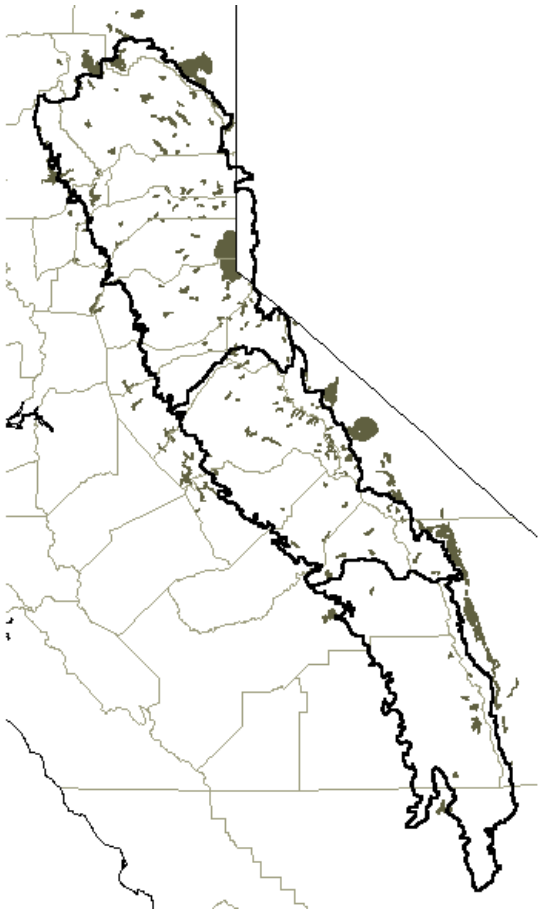
DESCRIPTION

The communities included in this analysis are montane meadow, alpine and subalpine meadow, alkali meadow and seep, northern vernal pool, fen, bog (including darlingtonia seep and sphagnum bog), montane freshwater marsh, and aspen forests.

Interior wetlands of Sierra Nevada vary in size from a few square meters to several hundred hectares and are interspersed through virtually every forest type of the montane and subalpine community (Barbour and Major 1977). These communities have great ecological importance, providing habitat for invertebrates, fish, birds, and other wildlife as well as hydrologic and water quality functions.

Meadows occur in glaciated basins of the subalpine zone down to about 4,000 ft in the northern part of the range and 6,000 ft in the southern Sierra Nevada. Though the interior wetland areas are scattered across the mountains, they comprise less than 10% of the Sierra Nevada (Ratliff 1982). All meadow types are characterized by high ground water levels that limit suitability of the site for most plant species. Soil and drainage characteristics differentiate the three prominent types of montane meadow – wet, moist, and dry. Stringer meadows are narrow features along streams. (SNEP V III p 236).

Aspen forest is included in this section due to the community's close association with meadows. In the Sierra Nevada, aspen is locally abundant in moist, high-elevation habitats – on the margins of meadows and streams (Griffin and Critchfield 1976). Aspen groves are characterized by an openness that encourages a lush growth of grass and herbs (Barbour and Major 1977). Aspen extends throughout the Sierra Nevada, but is especially abundant between 5900 and 9800 ft in the eastern Sierra.



CONSERVATION ISSUES

- Meadow systems are considered one of the most biologically active of the plant community types of the Sierra Nevada. Among the many functions, meadow

systems contribute a high proportion of the forage and cover for wildlife populations and help to filter sediments from waters of surrounding slopes (Ratliff 1982).

- Montane meadows are particularly important habitats for birds in the Sierra Nevada. Not only are some bird species limited to meadows, but population densities of many others that live within the forest are greatest along the forested edges of montane meadows. During summer, montane meadows may be the single most important habitat in the Sierra Nevada for birds that breed elsewhere (SNEP Vol III p. 236).
- In general, subalpine and alpine meadows are believed to be in stable condition mainly because Class 1 (wilderness) lands and difficult access limit land uses. However, lower-elevation montane meadows are vulnerable to grazing and recreational use (campers, hikers, and equestrians) (SNEP Vol II p. 719).
- Middle and low elevation meadow systems appear to be most at risk from habitat conversion due to development and agriculture.
- Although small in extent, meadows in the Sierra Nevada provide up to half the summer forage for livestock (Allen 1989). Results of using meadows for cattle pastures include overgrazed grass cover, erosion, elimination of habitat suitable for meadow dependent species, and a decline of rare taxa restricted to meadow and riparian environments (SNEP Vol II pp. 691-708).
- The Sierra Nevada montane meadow system is the stronghold of California's population of the willow flycatcher. Surveys in recent decades have indicated continuing declines and is considered of a species of high priority. Declines are believed to be related to direct degradation of nesting and foraging habitat from livestock grazing, roads, and logging activity (USDA 1998).
- Great gray owls appear to be restricted to the scattered meadow-mature forest zone on the west slope of the Sierra Nevada. Great gray owls occupy a limited area in the Sierra Nevada, north of Stanislaus National Forest to south of Yosemite National Park, the center of the species distribution. Limiting factors to the population include a decrease in quality of foraging habitat due to grazing and heavy logging of the mature forest (DFG 1987).
- Wetlands in mountain areas have received much less attention than their counterparts in lowlands and coastal areas. Physical modifications (i.e., draining, dredging, filling) on a piecemeal basis has steadily contributed to the loss of wetland functions throughout the Sierra Nevada. (SNEP Vol. III p. 236).
- Continuing degradation and loss of interior wetlands and biodiversity has been linked to impacts from dams and water diversions, overgrazing, mining, roads, forest management practices (logging and fire exclusion), recreation, ski resort and urban developments, competition from cowbirds, and submersion under reservoirs.

SITE IDENTIFICATION

The survey of the Sierra Nevada Ecoregion yielded 165 potential interior wetland, meadow, and aspen sites using data from NDDB; GAP; SNEP; National Forest Meadows Management Zone data for Stanislaus, Tahoe, and Eldorado National Forest; Significant Ecological Areas; literature; and expert interviews. Conservation targets were ranked by NDDB as at least G3/S3 or were identified by experts (Table 2F.1).

Table 2F.1 Interior Wetland, Meadow and Aspen Conservation Targets

CONSERVATION TARGETS	ELEMENT RANK
Northern vernal pool	G1S1.1
Fen	G2S1.3
Sphagnum bog	G3S1.2
Alkali meadow	G3S2.1
Alkali seep	G3S2.1
Transmontane freshwater marsh	G3S2.2
Montane meadow	G3G4S3.2
Alpine or subalpine meadow	G3S3.2
Darlingtonia seep	G4S3.2
Montane freshwater marsh	G3S3.2
Aspen forest	G5S3.2
Sierra Nevada mountain beaver	G5T3?S3?
Great gray owl	G5S1
Willow flycatcher	G5S1S2
Yellow headed blackbird	G5G5S3S4
Black tern	G5S2
California gull	G5S2
Forster's tern	G5S4
Greater sandhill crane	G5T2S2
Northern harrier	G5S3
White-faced ibis	G5S1
Migratory waterfowl	
Shorebirds	
Abronia alpina	G1S1.1
Astragalus lentiginosus var kernensis	G5T3?S.2
Botrychioum crenulatum	G3S1.2
Carex limosa	G5S3
Carex lasiocarpa	G5S1.3
Carex tiogana	G1S1.3
Darlingtonia californica	G4S3.2
Drosera anglica	G5S2S3
Epilobium howellii	G1S1.3
Epilobium oreganum	G2S2.2
Erigeron inornatus var keilii	G5T1S1.2
Ivesia unguiculata	G2S2.2
Ivesia aperta var aperta	G2T2S2.2
Ivesia aperta var canina	G2T1S1.1
Ivesia sericoleuca	G2S2.2
Lupinus lepidus var culbertsonii	G5T1S1.3
Lycopodiella inundata	G4?S1?
Marsilea oligospora	G5S3?
Mimulus filicaulis	G2S2.2
Polygonum polygaloides ssp esotericum	G4G5T1S1.1
Potamogeton robbinsii	G5S2.3
Veronica cusickii	G5S3.3
Sagittaria sanfordii	G4T2T3S2S3
Salix branchycarpa	G5T5S1.3
Scirpus clementis	G3S3.3
Scirpus subterminalis	G4G5S2S3
Trifolium bolanderi	G3S3.3

SITE RANKING

Potential interior wetland, meadow, and aspen sites were stratified into three subregions and the number of conservation targets was noted for each site. Sites were then inspected for two landscape attributes -- proximity to other declining communities and situated on Class 1 land. (Appendix III).

PORTFOLIO ASSEMBLY

Sites were evaluated separately for each of the seven target community types. A site identified with a bog and montane meadow, for example, was evaluated in the bog and fen category as well as the montane meadow category.

The number of sites selected was guided by the conservation goals designated for each target community as well as geographic representation within each subregion. The target communities are all small patch and range in rank from G1 to G4, and thus have

portfolio assembly goals ranging from 40-70%.

The following process was used to select portfolio sites:

1. All sites on Class 1 land were selected. Class 1 land, which includes Wilderness areas, National Parks, and RNAs, represent the most intact habitats.
2. All ecologically outstanding sites, as measured by target richness and landscape quality, were added to the portfolio.
3. Additional sites were selected as necessary to meet conservation goals for targets.

RESULTS.

Of the 165 potential sites, the following 135 sites are recommended as portfolio sites for the interior wetland and aspen sites (Table 2F.2). One-third of these sites are situated on Class 1 lands, particularly the aspen, montane meadows, and subalpine or alpine meadows in the central and southern subregions.

The lower and mid-elevation interior wetland systems occur largely on Forest Service and private land and thus are at risk across the ecoregion. In the northern subregion, less than 10% of these communities are represented on Class 1 land. In fact, all interior wetland communities are lacking protection in the northern subregion.

Aspen groves are small, scattered and more scarcely mapped than actually distributed on the west side, and thus it was difficult to capture complete west side representation, particularly in the central and southern subregions.

Four of the most biologically rich portfolio sites are located on private land: Sierra Valley, Perazzo Meadow Complex, Sagehen, Hope/Charity Valleys, and Markwood/ Poison Meadow.

Though Class 1 lands may capture a large suite of interior wetland, meadow, and aspen sites, they are still impacted by grazing and recreation. Development also poses a threat. For example, Ackerson Meadow and Hodgeson/Crane Flat, though situated largely on Yosemite National Park, are greatly threatened by highway traffic and potential expansion of entrance at Big Oak Flat.

Table 2F.2 Interior Wetland, Meadow, and Aspen Portfolio Sites

SITE NAME	PORTFOLIO ATTRIBUTE
NORTHERN SUBREGION	
Alpine meadow	Alpine or subalpine meadow – Class 1 land
Avalanche Meadows	Excellent alpine or subalpine meadow complex within Mokelumne Wilderness
Babbitt Peak	Only eastside aspen stand on Class 1 land
Big Meadows	Eastside representation of vernal pools
Black Mountain	Important occurrence of *Ivesia aperta var aperta* Fen (aspen and montane meadow present)

SITE NAME	PORTFOLIO ATTRIBUTE
Blue Lakes	Alpine or subalpine meadow – Class 1 land
Butterfly Valley	Westside representation of darlingtonia seep Only darlingtonia seep entirely on Class 1 land in northern subregion Important occurrence of *Darlingtonia californica*
Caples meadow	Willow flycatcher habitat Southern eastside example of aspen and subalpine or alpine meadow
Charity Valley	Excellent willow flycatcher habitat Alpine meadow and southern eastside example of aspen
Deer / Indian Valley	Excellent alpine or subalpine meadow complex within Mokelumne Wilderness
Desolation Valley	Excellent alpine or subalpine meadow complex within Desolation Wilderness
Dog Valley	Only occurrence of *Ivesia aperta var canina.* Important occurrence of *Ivesia sericoleuca* Representative montane meadow
East – West Yuba	Fen with excellent landscape qualities
Faith Valley	Excellent willow flycatcher habitat Lower eastside subalpine or alpine meadow on Class 1 land
Fales Basin	Westside representation of darlingtonia bog Portion of Fales Basin on Class 1 land
Feather River Meadows	Willow flycatcher habitat Northern example of subalpine or alpine meadow habitat
Fordyce High Lakes	Example of high montane meadows in central portion of subregion
Fowler Lake	Only westside montane freshwater marsh in northern subregion Important ccurrence of *Scirpus subterminalis* in northern subregion Representative bog habitat, with *Carex limosa*
Genesee Valley	Large, northern representation of montane meadow
Granite Mtn / Harris Meadow	Excellent darlingtonia seep, sphagnum bog and fen (westside representation) Excellent example of *Darlingtonia californica*

SITE NAME	PORTFOLIO ATTRIBUTE
Grass Lake	Largest and highest elevation sphagnum bog in Sierra Nevada Mountains Only sphagnum bog designated as RNA
Green Island Lake	Northern most representation of sphagnum bog on westside *Carex limosa* occurrence
Grover Hot Springs	One of two alkali seep in northern subregion. Great gray owl and willow flycatcher habitat
Haskins Valley	Westside occurrence of aspen and montane meadow – northern example Willow flycatcher habitat
Haypress	Great gray owl habitat Montane meadow
Hope Valley	Lower eastside example of Aspen Large subalpine or alpine meadow complex Excellent proximity to Grass Lake and other meadows.
Horsethief Canyon	Willow flycatcher habitat Good examples of aspen groves on eastside
Humbug Valley	Westside representation of fen/bog and subalpine or alpine meadow Willow flycatcher habitat
Humbug Creek	Eastside subalpine or alpine meadow and aspen Willow flycatcher habitat
Icehouse	Important westside aspen grove
Independence Creek / Secret Meadow	Excellent willow flycatcher habitat Representative fen and montane meadow Eastside representation of aspen Excellent proximity to other declining ecosystems
Jelmini-Bear Trap Basins	Important westside representation of aspen and montane meadows
Kings Meadow	Large bog (on private land)
Kyburz Marsh	Outstanding montane freshwater marsh - eastside representation Excellent migratory waterfowl habitat Important greater sandhill crane habitat Representative fen

SITE NAME	PORTFOLIO ATTRIBUTE
	Great gray owl habitat *Ivesia sericoleuca, Marsileo oligospora* present
Lake Davis	Best aspen stand in Plumas National Forest Northern example of montane meadow
Last Chance	Important occurrence of *Ivesia aperta var aperta* and *Ivesia sericoleuca* Vernal pool habitat, as well as subalpine or alpine meadow and fen
Lava Top	Westside vernal pool
Leeks Spring Valley	Westside montane meadow
Lincoln Valley	Great gray owl habitat Representative fen and montane meadow
Little Antelope Creek	Willow flycatcher habitat and northern montane meadow
Little Last Chance Canyon	Important occurrence of *Ivesia aperta var aperta* Representative example of aspen
Lyons/Needle Peak	High elevation montane meadow – (Central western representation of subalpine or alpine meadow) Good wetland heterogeneity (fens, bogs, and meadows present)
Meiss Meadow	One of the largest high elevation meadows in Sierra Nevada Important occurrence of *Epilobium oreganum*
Monitor Pass	Important lower eastside aspen stand
Mud Lake RNA	Only montane meadow and montane freshwater marsh on Class 1 land in northern subregion
Murphy Meadows	Sierra Nevada beaver Montane meadow and aspens forest present
Nelson Creek	Willow flycatcher habitat and montane meadow – northern westside example (meadows ungrazed since mid-70s)
Packsaddle Pass	Willow flycatcher habitat Westside representation of aspen Southern example of montane meadow Good habitat quality and proximity to Silver Fork of American River
Pat Yore Flat	Outstanding example of a darlingtonia seep

SITE NAME	PORTFOLIO ATTRIBUTE
	Westside representation of fen, aspen, montane meadow One of three occurrences of *Darlingtonia californica*
Patty Property / Pierce Meadow	Excellent westside meadow with high diversity of wildlife
Perazzo Meadow Complex	Excellent fen, montane meadow, and vernal pool habitat – eastside representation Finest example of montane meadow in northern subregion Best occurrence of willow flycatcher in northern subregion Excellent landscape values Great gray owl habitat Sierra Nevada mountain beaver
Picayune	High elevation, westside vernal pool Rich alpine or subalpine and riparian meadow and aspen area Only vernal pool on Class 1 land in subregion Shorebirds
Red Clover Valley	Important occurrence of *Astragalus lentiformus* and *Crarex sheldonii* Montane meadow
Red Lakes	Willow flycatcher and great gray owl habitat Sierra Nevada mountain beaver Excellent high elevation meadows Excellent proximity to other declining communities (especially meadows)
Rockbound Valley	Excellent alpine or subalpine meadow complex within Desolation Wilderness
Round Valley	Willow flycatcher and great gray owl habitat Westside montane meadow
Sagehen / Carpenter Valley	Excellent community richness – bogs, fens and montane meadows Densest concentration of fens in northern subregion Willow flycatcher habitat Important occurrence of *Darlingtonia californica* and *Ivesia sericoleuca* Central eastside example of aspen

SITE NAME	PORTFOLIO ATTRIBUTE
	Excellent connectivity to other important interior wetland sites
Sardine Valley	Montane freshwater marsh and alpine or subalpine meadow *Ivesia sericoleuca*
Shadow Lake Meadows	Excellent subalpine or alpine meadow complex within Desolation Wilderness
Sierra Valley	Highest elevation and most outstanding of the vernal pool sites - eastside representation Largest and best montane freshwater marsh in northern subregion Large, low elevation fen – at Carmen. Important habitat for greater sandhill crane, California gull, and migratory waterfowl Supports large number of sensitive plants – *Ivesia aperta var aperta. Ivesia sericoleuca, Ivesia webberi, Marsilea oligospora, Polygonum polyaloides ssp esotericum, Pyrrocoma lucida* Only occurrence of yellow headed blackbird
Silver King	Southern-most eastside bog in subregion Important eastside subalpine or alpine meadow Great gray owl habitat
Silver Lakes Meadow	Subalpine or alpine meadow
Snow Canyon	Subalpine or alpine meadow on class 1 land.
Soda Springs	One of only two alkaline seeps in subregion. Class 1 land.
South Lake Tahoe	Willow flycatcher and Forster's tern habitat Historic enormous marsh
Squaw Ridge Meadows	Excellent subalpine or alpine meadow complex within Mokelumne Wilderness
Squaw Valley	Vernal pool - eastside representation Northern eastside representation of aspen and montane meadow Good occurrence of *Ivesia sericoleuca*
Tahoe Meadow	Eastside montane meadow representative
Van Vleck Tells Creek Meadows	Montane and alpine or subalpine meadows
Wrights Lake Bog	Lower westside bog

SITE NAME	PORTFOLIO ATTRIBUTE
	Willow flycatcher habitat Class 1 land
CENTRAL SUBREGION	
Abernathy Meadow	1 of 3 occurrence of *Mimulus filicaulis* Montane meadow representative
Ackerson Meadow	Highest density of nesting great gray owl in California. Willow flycatcher habitat. 1 of only 2 vernal pools in subregion Excellent quality eastside (central) montane meadow One of 3 known occurrences of *Mimulus filicaulis* in subregion
Beashore Meadow	Willow flycatcher and montane meadow
Bell Meadow	Willow flycatcher site Westside montane meadow and aspen community Class 1 land (RNA)
Bishop Creek Aspens	Southern eastside example of aspen on class 1
Blaney Meadow	Excellent example of aspen in subregion - class 1 land (RNA)
Bourland Meadow	Excellent meadow and aspen sites. Class 1.
Burt Meadow	Aspen
Carlyle Meadow	Southern montane meadow. Class 1 land
Clear Lake	1 of 3 bogs in central subregion and only one on westside
Clover / Jackass Meadow	Only fen in central subregion 1 of only 2 examples of vernal pools within subregion Only occurrence of *Trifolium bolanderi*. One of three known occurrences of *Ivesia unguiculata.* Excellent willow flycatcher site Westside (southern) montane meadow
Conway Summit ACEC	Northern eastside aspen stand. Class 1 land.
Cow Meadow	Willow flycatcher site Montane meadow One of 3 occurrences of *Ivesia unguiculata* in subregion.
Coyote Plateau	Only example of high elevation peat bog meadow in subregion Best example of aspen and montane meadow in south

SITE NAME	PORTFOLIO ATTRIBUTE
	eastern portion of subregion Unique rare plant association
Dodge Meadow	Montane meadow with 1 of 3 occurrences of *Mimulus filicaulis*
Eagle / Three Meadows	Willow flycatcher site Westside montane meadow – northern example Best of the northern westside aspen stands
Emigrant Pass Meadow	Excellent alpine or subalpine meadows with connectivity to Emigrant Wilderness
Gibbs Canyon	Eastside aspen on Class 1
Glass Creek Meadow	Only eastside occurrence of Great gray owl in subregion Eastside (central) montane meadow
Glen Aulin	Aspen on class 1 land
Harvey Monroe Hall RNA	Only known occurrence of *Salix branchycarpa* and *Scirpus clementis.* Montane meadow and subalpine or alpine meadow Class 1 (RNA)
Herring Creek Reservoir	Westside aspen
Hilton Creek Lake	Eastside aspen on class 1
Hodgeson / Crane Flat	Important great gray owl and willow flycatcher site Outstanding subalpine or alpine meadow and aspen complex identified within Yosemite National Park - westside
Horse Meadow	Excellent alpine meadow within Yosemite National Park.
Hull Meadow	Willow flycatcher site and montane meadow
June Lake	One of three eastside willow flycatcher occurrences Eastside montane meadow and aspen
Kassabaum Meadow	Great gray owl site Lower elevation westside montane meadow
Kennedy Lake	Excellent aspen stand identified within wilderness area
Kerrick Meadow	Outstanding subalpine or alpine meadow complex identified within Yosemite National Park
Lundy Canyon	One of three eastside willow flycatcher occurrences Eastside montane meadow and aspen stand
McGee Creek	Aspen. Class 1 land
Mono Hot Springs	Only montane freshwater marsh in central subregion

SITE NAME	PORTFOLIO ATTRIBUTE
	Only eastside alkali meadow Willow flycatcher occurrence
Parker Beach	Low elevation riparian meadows and aspen – partially on Class 1 land.
Rainbow Meadow	Identified as excellent subalpine or alpine meadow within Yosemite National Park. Excellent connectivity to West Walker River
Return / Rancheria Meadow	Excellent alpine or subalpine meadow complex identified within Yosemite National Park.
Rock Creek Lake	Aspen, class 1 land.
Tuolumne Meadows	Largest complex of montane and subalpine or alpine meadow in the Sierra Nevada. Important great gray owl site Within Yosemite National Park
Westfall / Peregoy Meadow,	Important great gray owl and willow flycatcher site Class 1 land Upper montane meadow - westside (central/southern) representative
Wheats Meadow	Montane meadow and aspen, Class 1 land
SOUTHERN SUBREGION	
Breckenridge Mountain	Southern-most occurrence of willow flycatcher
Dinkey / Lost Meadow	Willow flycatcher habitat and montane meadow 1 of 3 *Ivesia unguiculata* occurrences in subregion
East Kern Plateau	Willow flycatcher habitat – at Troy Meadow Extensive montane meadow – on Class 1 land
Generals Highway	Key alpine or subalpine or alpine meadow complex identified in on westside of Sequoia/Kings National Park Excellent landscape value – large, good proximity to declining ecosystems, and on class 1 land.
Hockett Lakes	Large subalpine meadow complex identified on westside of Sequoia/Kings National Park Only occurrence *of Lupinus lepidus var culbertsonii* in subregion.
Hodgeback Creek	Only alkali seep in subregion Northern harrier
Last Chance Meadow RNA	Excellent wetland heterogeneity – the only fen and one of the two vernal pools in the subregion.

SITE NAME	PORTFOLIO ATTRIBUTE
	Subalpine or alpine meadow Within Class 1 land.
Long Meadow	Only montane freshwater marsh occurrence in subregion Montane meadow and willow flycatcher habitat Important occurrences of *Ivesia unguiculata* and *Trifolium bolanderi*.
Lynns Valley	One of the only two vernal pool sites Excellent connectivity to Poso Creek
Markwood /Poison Meadow	One of the most important sites for willow flycatcher in ecoregion Great gray owl habitat Large series of montane meadow – westside example Important occurrence of *Ivesia unguiculata.*
Monanche Meadows	Extensive meadow system Important southern willow flycatcher habitat Possible southern extent of great gray owl Rare plant habitat along meadow edges, including *Botrychium crenulatum* and the endemic *Abronia alpina* Excellent landscape attributes; within Golden Trout Wilderness
Mt. Baxter	Only one of two aspen stands in southern subregion Class 1 land
Mt. Langley	Montane meadow on wilderness land
Paradise Peak	Perhaps southern most sphagnum bog in Sierra – Oriole Lake Excellent landscape values – Class 1 land, large, and surrounded by upland coniferous forest.
Ramshaw / Templeton Meadow	Extensive meadow system Important southern willow flycatcher habitat Possible southern extent of great gray owl Rare plant habitat along meadow edges, including *Botrychium crenulatum* and the endemic *Abronia alpina* Excellent landscape attributes; within Golden Trout Wilderness
Rodeo Meadow	Northern westside representation of alpine or subalpine meadow
Siberian Outpost	Large meadow rich in meadow flora – on Class 1 land

SITE NAME	PORTFOLIO ATTRIBUTE
Smith Meadow	One of three sphagnum bogs Rare plants, especially mosses, present
Snow Corral	One of three sphagnum bog in subregion Large meadows and rare plants
South Fork Valley	One of the three largest occurrences of willow flycatcher in the Sierra, and the largest in the southern region.
Strawberry Meadow	Key subalpine/alpine montane meadow within Golden Trout Wilderness
Summit Meadow	Largest central representation of montane meadow and willow flycatcher habitat
Teakettle Creek RNA	Lower westsdie montane meadow on Class 1 land
Tinemaha Aspen	1 of only 2 aspen groves in subregion
Wallace Creek	Subalpine or alpine meadow on Class 1 land

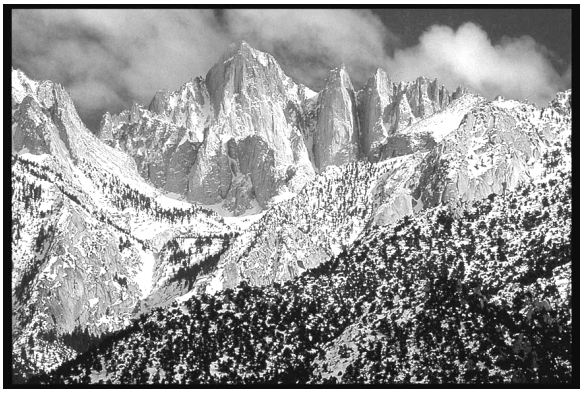
NEXT STEPS

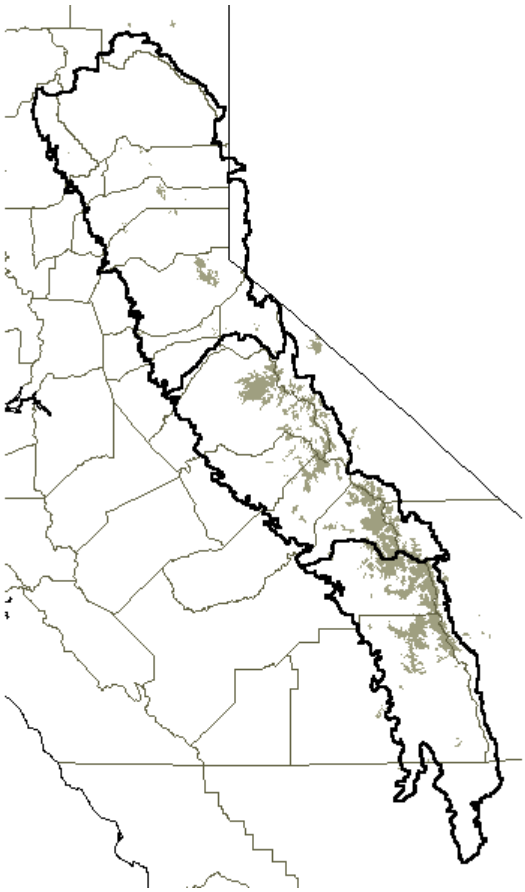
Large, shallow, lower elevation marsh habitat is not widespread in the Sierra, and most such sites occur at the periphery of the ecoregion, with the exception of Sierra Valley. Many of these habitats will be analyzed as part of Great Basin ecoregional planning, including Owens Lake, Mono Lake, and Lake Crowley. Integrate results of transmontane wetland analysis from the Great Basin and Modoc/Columbia Plateau ecoregional planning processes. The transmontane wetlands, such as Owens Lake, Lake Crowley, and Mono Lake, occur outside the ecoregion boundary but are connected with the Sierran aquatic communities.

Future iterations of the portfolio should integrate:

1. Results from all future new willow flycatcher and/or great gray owl studies
2. Results from the in-progress US Forest Service Sierra-wide meadow mapping project

G. ALPINE





DESCRIPTION

Confined to the highest peaks of the Lake Tahoe region south to the Mt. Whitney region, the alpine zone of the Sierra Nevada is a thin fringe of green near the upper limits of life. Ranging in elevation from 8,500 feet in the north to 11,500 feet in the south, the vegetation is comprised of low graminoid and forb species with a mixture of dwarf shrubs or cushion plants. Coverage may be continuous at lower elevations and on mesic sites but becomes increasingly open with altitude and exposure.

The air at this elevation retains little heat, so despite the openness of the habitat, midday summer temperatures seldom exceed 80^0F and frost occurs almost nightly. Plants hug the ground with most of their tissue below ground where it is insulated from severe cold. Most plants are herbaceous perennials that reproduce vegetatively or self-pollinate since the alpine zone has fewer pollinating organisms than any other region. Roughly 40% of alpine plants in the Sierra Nevada are shared with polar tundra or other North American mountain chains and 15% are found only in California.

CONSERVATION ISSUES

- Alpine communities in the Sierra Nevada are well represented on Class 1 lands, including 89% of alpine dwarf scrub and 27% of Sierra Nevada fell-fields as mapped by GAP (SNEP Vol. II p. 681).
- Alpine areas with endemic and rare plants are generally believed to be in stable condition mainly because difficult access has limited land uses. However, many rare plants have been negatively impacted by recreational uses SNEP Vol.II p. 702).
- Alpine plants in the Sierra Nevada evolved in ecosystems which did not have permanent herds of large grazing animals. When such animals are brought to the alpine zone, vegetation is easily overgrazed and fragile soils disturbed (Barbour et.al. 1993).

- Bighorn sheep are associated with rocky alpine areas adjacent to meadows in the southern end of the Sierra Nevada. Genetic studies indicate that these sheep are a unique form, distinct from other bighorn sheep populations in western North America (USDA 1998).
- Due to human pressures beginning in the 1800s, Sierra Nevada bighorn sheep were nearly extirpated. Populations increased locally after reintroduction to a few select locations in 1979 but have declined significantly in the last decade; the total number is now estimated at 120-125 individuals in five isolated herds. The Sierra Nevada bighorn sheep is now one of the most endangered animals of North America and is likely to face imminent extirpation without urgent attention (USDA 1998).
- Primary stresses to Sierra Nevada bighorn sheep include transmission of fatal respiratory bacteria from domestic sheep, mountain lion predation, and human encroachment (USDA 1998).
- The Mount Lyell salamander is an endemic species associated with wet spots in the high Sierra Nevada. Special habitat requirements include springs and seeps near large boulder fields or talus slopes. It is known from only a few scattered populations.

SITE IDENTIFICATION

Thirty-three potential alpine sites were identified using conservation target data from GAP, NDDB, SNEP, expert interviews, and literature. The conservation targets had heritage ranks of G1-G3 and T1-T3, and included 2 natural communities, 2 special animals, and 18 rare plants (Table 2G.1).

SITE RANKING

Potential alpine sites were stratified into three subregions and evaluated for the presence of target species and communities (Appendix III). No landscape criteria was applied because all of the alpine sites received the same WSI score and the sites occurred largely on Class 1 wilderness lands.

Table 2G.1 Alpine Conservation Targets

CONSERVATION TARGETS	ELEMENT RANK
Alpine dwarf scrub	G5S4
Sierra Nevada fell-field	G4S4
California bighorn sheep	G4T1S1
Mount Lyell salamander	G3S3
Agrostis humilis	G4S1.3
Arabis bodiensis	G1S1.3
Arabis tiehmii	G1S1.3
Asplenium trichmanes-ramosum	G4S1.3
Astragalus monoensis var ravenii	G2T1QS1.3
Astragalus platytropis	G5S1.2
Chaenactis douglasii var alpina	G5T5S2.3
Claytonia umbellata	G5S1.3
Claytonia megarhiza	G4?S2S3
Draba asterophora var asterophora	G4T2S1.3
Draba asterophora var macrocarpa	G4T1S1.2
Draba cana	G5S1.3
Draba sharsmithii	G1S1.3
Eriogonum wrightii var olanchense	G5T1S1.3
Hackelia sharsmithii	G3S3.3
Lewisia longipetala	G2S2.2
Monardella beneolens	G1S1.3
Polemonium chartaceum	G1S1.3

PORTFOLIO ASSEMBLY

Sites were selected for the portfolio using the following goals:

- Capture all known viable occurrences of G1G2 (including T1T2) target wildlife and plant species

- Include at least 6 stratified occurrences of G3 or lower target wildlife and plant species per subregion
- Include at least 40% of the two target natural community occurrences per subregion. Both of the communities are small-patch and widespread in distribution and have adequately mapped distributions by GAP.

RESULTS

All potential alpine sites in the northern and central subregions and all but one in the southern subregion were selected to meet the portfolio goals, yielding a total of 32 sites (Table 2G.2). The distribution of sites range from Sierra Buttes in the north to Olancha Peak in the south and encompass all Sierra Nevada bighorn sheep ranges.

Although alpine areas of the Sierra Nevada are well represented on Class 1 land, four out of the six portfolio sites are not on Class 1 lands and are concentrated in the northern subregion: Castle/Basin Peaks, Freel Peak, Sierra Buttes, and Pole Creek.

TABLE 2G.2 Alpine Portfolio Sites

SITE NAME	PORTFOLIO ATTRIBUTES
NORTHERN SUBREGION	
Castle Peak / Basin Peak	One of four *Lewisia longipetala* sites in subregion
Desolation Valley	One of two *Draba asterophora var asterophora* sites in ecoregion
Echo Summit	Only *Draba asterophora var macrocarpa* site in subregion
Freel Peak	One of two *Draba asterophora var asterophora* sites in subregion
Lyons / Needle Peak	One of four *Lewisia longipetala* sites in subregion
Mount Rose	Only *Arabis teihmii* site in subregion One of three *Draba asterophora var asterophora* sites in subregion
Pole Creek	One of four *Lewisia longipetala* sites in subregion
Pyramid Peak	Only Mount Lyell salamander site in subregion One of four *Lewisia longipetala* sites in subregion
Roundtop	Only *Chaenactis douglasii var alpina* site in subregion
Sierra Buttes	Only *Asplenium trichomanes-ramosum* site in ecoregion
CENTRAL SUBREGION	
Coyote Plateau	One of two alpine dwarf scrub sites in subregion
Leavitt Peak	Only *Agrostis humilis* site in subregion Only *Chaenactis douglasii var alpina* site in subregion
Lee Vining Canyon	Only herd of Sierra Nevada bighorn sheep in subregion One of three *Arabis tiehmii* sites in subregion Alpine dwarf scrub
Harvey Monroe Hall RNA	Northernmost mapped occurrence of alpine dwarf scrub
Mount Lyell	Only Mount Lyell salamander site in subregion Only *Claytonia megarhiza* site in subregion
Saddlebag Lake	One of three *Arabis tiehmii* sites in subregion
Sweetwater Mountains	Only *Arabis bodiensis* site in subregion

	Only *Astragalus platytropis* site in ecoregion Only *Claytonia umbellata* site in ecoregion Only *Draba cana* site in ecoregion Only occurrence of *Polemonium chartaceum* in ecoregion
Mount Tom	One of two alpine dwarf scrub sites in subregion
Virginia Lakes	One of three *Arabis tiehmii* sites in subregion
SOUTHERN SUBREGION	
Coyote Peaks	Southernmost Sierra Nevada fell-field
Dougherty Basin	One of four Sierra Nevada fell-fields in subregion
Kings River, NFK	One of four Sierra Nevada fell-fields in subregion
Mt Baxter	One of four bighorn sheep sites in subregion Alpine dwarf scrub One of five *Hackelia sharsmitii* sites in subregion One of three *Astragalus monoensis var ravenii* sites in subregion
Mt Guyot	One of five *Hackelia sharsmitii* sites in subregion
Mt Langley	One of four bighorn sheep sites in subregion Alpine dwarf scrub One of five *Hackelia sharsmitii* sites in subregion
Mt Williamson	One of four bighorn sheep sites in subregion Alpine dwarf scrub
Olancha Peak	Alpine dwarf scrub – southern limit Only *Erigonium wrightii var olanchense* site in subregion One of two Monardella beneolens sites in subregion
Onion Valley	Only *Draba sharsmitii* site in subregion One of five *Hackelia sharsmitii* sites in subregion Alpine dwarf scrub
Siberian Outpost	Only *Arabis bodiensis* site in subregion
Spanish Needle	One of two *Monardella beneolens* sites in subregion
Taboose Creek	One of three *Astragalus monoensis var ravenii* sites in subregion Alpine dwarf scrub
White Divide	One of four Sierra Nevada fell-fields in subregion
Wheeler Ridge	One of four bighorn sheep sites in subregion One of three *Astragalus monoensis var ravenii* sites in subregion

NEXT STEPS

Integrate the following results into the Great Basin Ecoregional Plan:

1. Although two occurrences of *Arabis bodiensis* (G1S1.3) were captured, the majority of occurrences are in the Bodie Hills – an area dominated by Great Basin communities.
2. The Sweetwater Mountains had highly ranked occurrences of five species: *Arabis bodiensis, Astragalus platytropis, Claytonia umbellata, Polemonium chartaceum,* and *Draba cana.* Geographically, the Sweetwater Mountains are outside the Sierra Nevada Ecoregion but are within the 20 km buffer and are connected via the higher elevations of the Walker River watershed.

Additional information is needed regarding the following:

1. The actual distribution of alpine dwarf scrub and Sierra Nevada fell-fields is thought to range from the Lake Tahoe region south to Olancha Peak yet the mapped distribution was limited primarily to the central and southern subregions. Therefore, site selection in the northern subregion was based on target species data only.
2. Four occurrences of Mount Lyell salamander were not included in potential alpine sites since they were located well below the alpine zone. Three of these remaining occurrences are within Yosemite Valley and captured in the Merced River Site within the Aquatics Portfolio.

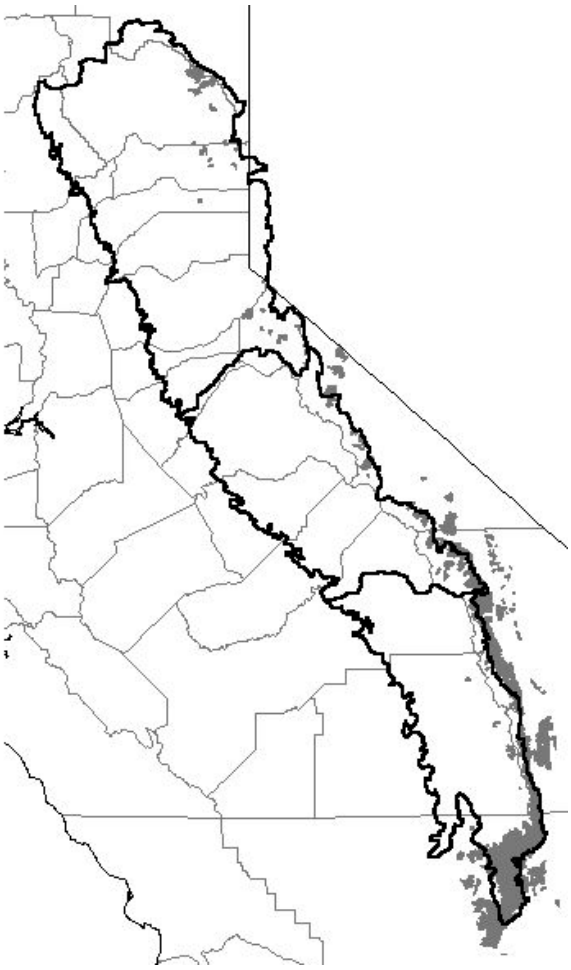
H. DESERT SCRUB AND WOODLAND

DESCRIPTION

Desert scrub and woodland communities occur along the eastern flanks of Sierra Nevada to the Transverse Range. These communities are located in areas of markedly low precipitation and are thus highly adapted to survival under harsh climatic conditions, including extreme cold and heat.

Desert scrub communities of California occur at elevations below the coniferous forests and usually below the desert woodlands (Holland and Keil 1995). These communities occur in relatively deep but well-drained, non-alkaline soils along the base of the Sierra. These shrubs have various morphological and physiological adaptations that allow them to survive prolonged limiting factors (Holland and Keil 1995). These communities can be understory layers in Joshua tree or pinyon-juniper woodland.

Desert woodlands are situated at elevations below montane coniferous forest zones and above various desert scrub communities. The two major environmental factors that determine the distribution of woodland communities are soil moisture and temperature extremes. They are widespread in dry mountain areas from 4,000 to 8,000 ft and best represented in transmontane California, though they also occur in various cismontane areas. The two major types are Pinyon pine and juniper woodland and Joshua tree woodland. Pinyon pine-juniper woodland can be seen as the lowest of the mountain communities or the uppermost desert communities. These communities are highly associated with other drought and snow tolerant communities, including sagebrush scrub, blackbush scrub, and desert chaparral.



CONSERVATION ISSUES

- Transient animal species are attracted to the woodland and scrub communities for food (acorns and berries) and browse

(particularly sagebrush scrub and antelope brush). During summer months, desert animals move up in to the pinyon-juniper woodlands to escape heat, including a variety of birds and large mammals (desert bighorn sheep). On the western edge of these communities, alpine/subalpine species move down the mountain to juniper-pinyon woodland in winter, including California bighorn sheep and various birds, particularly Clark's nutcracker and Steller's jay (Schoenherr 1992). Birds are critical for seed dispersal of plant species within these communities.

- Major threats to desert scrub and woodlands include grazing by cattle and sheep and encroachment by exotic species, particularly Russian thistle (*Salsola tragus*) and cheat grass (*Bromus tectorum*). In desert scrub, cheat grass, low in forage value and highly flammable when dry, grows densely and burns frequently, resulting in fires often hot enough to kill native bunch grasses and eliminate native shrubs.
- In desert woodlands, grazing has reduced coverage of herbaceous species and contributed to poor health of stands as juniper density increases, sometimes forming closed-canopies. Overgrazing has also greatly reduced the distribution of native grasses.
- Range management practices have also included clearing, poisoning, or burning of trees to promote growth of grasses and other forage species, often with the intent of permanently converting the desert woodland to grassland.
- Though the distribution of Joshua tree woodlands appears to be rather extensive, many stands have been cleared for agriculture and urban development. These plants are also popular in desert landscaping, and thus many have been dug up and removed from the California deserts (Holland and Keil 1995).
- Until recently, desert woodlands have suffered less damage at the hands of man than have many of California's other plant communities. Past uses of pinyon pine and junipers were limited to fuel for smelting ores in mining camps, firewood, fence posts, and seed. Recently, however, juniper woodland has become more valuable and has potential for commercial harvest (Holland and Keil 1995).

SITE IDENTIFICATION

A total of 39 potential desert scrub and woodland community sites were identified using conservation target data from NDDB, SNEP, GAP, and expert interviews. Conservation target communities had heritage ranks of G3S3 or higher (Table 2H.1). Potential sites were identified using the following guidelines:

- All previously selected portfolio sites with examples of desert scrub and woodland community targets were noted as potential sites for these targets
- New sites were delineated only for target communities under-represented in previously delineated portfolio sites
- Sites identified using GAP vegetation data were only delineated when the site was also recommended by an expert and/or supported a target species.
- Sites were delineated for target species only if it co-occurred with a target community.
- Sites were not delineated if they were within urban limits, fragmented, or small.

TABLE 2H.1 Desert Scrub and Woodland Conservation Targets

CONSERVATION TARGETS	ELEMENT RANK
Blackbush scrub	G3S3.2
Mojave mixed woody scrub	G3S3.2
Sierra mountain shrub	G3?
Silver sagebrush scrub	G3?
Subalpine sagebrush scrub	G3S3.2
Cercocarpus ledifolius	G3?
Joshua tree woodland	G4S3.2
Mojavean pinyon and juniper woodland	G4S3.2S4?
Panamint alligator lizard	G1G2S1S2
Sage grouse	
Migratory deer and bighorn sheep herds	
Astragalus ertterae	G1S1.3
Astragalus lentiformis	G2S2.2
Astragalus monoensis var monoensis	G4T3S2?
Eriogonum kennedyi var pinicola	G4T1S1.1
Ivesia aperta var aperta	G2T2S2.2
Lewisia disepala	G2S2.3
Loeflingia squarrosa var artemisiarum	G5T4S2.2
Lomatium hendersonii	G5?S2.2
Mimulus shevockii	G1S1.2
Phacelia novenmillensis	G2S2.2
Trifolium macilentum var dedeckerae	G5S2.2?

Common or widespread communities ranked as G4/G5 were addressed in a separate analysis conducted by Frank Davis of UC Santa Barbara.

SITE RANKING

Potential scrub and woodland sites were stratified into three subregions and the presence of target communities and species was tabulated for each site. Sites on Class 1 lands were also denoted. (Appendix III).

PORTFOLIO ASSEMBLY

All the target communities are more common in adjacent ecoregions, and in most cases are only peripheral to the Sierra Nevada ecoregion. Conservation goals were considered as 10% of the mapped coverage. Potential sites were designated as "portfolio" or "significant" as follows:

- Potential sites already selected for other targets were considered as portfolio sites for desert woodland and scrub
- Potential sites on Class 1 lands were considered as portfolio sites
- Potential sites added to meet conservation goals were designated as significant since final portfolio consideration should wait until completion of the Great Basin and Mojave Ecoregional plans.

RESULTS

Twenty-one sites were selected as portfolio sites for desert woodland and scrub and an additional four were designated as significant sites (Table 2H.2). All sites are situated along the eastern and southern flanks of the Sierra Nevada range.

In the Sierra Nevada, only two main areas are documented to support silver sagebrush, including Sierra Valley (northern subregion) and in the vicinity of the south fork of the Kern River at Ramshaw / Templeton and Monanche Meadows.

The documented stands of Cercocarpus ledifolius, the most restricted and highly ranked target community type, are well represented in previously identified portfolio sites (21 sites) (particularly in the northern/central subregion) and Class 1 lands (particularly in the southern

subregion). Cercocarpus appears to be extensive in Modoc and Great Basin ecoregions.

Subalpine sagebrush scrub occurs within the northern and central subregions where the documented stands are well represented on previously selected portfolio sites and Class 1 lands.

Thirteen of the sites were important in capturing rare plants and animal occurrences. Key areas within the Sierra Nevada include Sierra Valley, the vicinity of the Kern River South Fork at Ramshaw / Templeton and Monanche Meadows, Spanish Needle, and Kelso Creek.

TABLE 2H.2 Desert Scrub and Woodland Portfolio or Significant Sites

SITE NAME	SITE ATTRIBUTE
NORTHERN SUBREGION	
Antelope Valley	1 of only 2 silver sagebrush scrub stands Expert identified Cerocarpus ledifolius stand *Important occurrence of Ivesia aperta var aperta*
Ebbotts Pass*	Expert recommended subalpine sagebrush scrub
Indian Valley	Westside subalpine sagebrush scrub
Last Chance	Important occurrence of *Astragalus lentiformis and Lomatium hendersonii*.
Mount Rose	Extensive stand of Sierra Mountain scrub
Peavine	Sierra Mountain scrub Migratory deer Good proximity to other portfolios
Sierra Valley	1 of only 2 silver sagebrush scrub stands Important occurrence of *Ivesia aperta var aperta*
Tahoe Meadows	Extensive stand of Sierra Mountain scrub
CENTRAL SUBREGION	
Bishop Creek*	Blackbush scrub Mojave mixed woody scrub
Buckeye	One of only 2 subalpine sagebrush scrub stands in subregion
Lee Vining Canyon	One of only 2 subalpine sagebrush scrub stands in subregion Good connectivity from Lee Vining to Mono Lake Potential bighorn sheep corridor
Monitor Pass	Sage grouse occurrence
Mt. Tom	Expert recommended blackbush scrub site
Rock Creek	*Astragalus monoensis var monoensis*
Tungsten Hill*	Large blackbush scrub and mojave mixed

SITE NAME	SITE ATTRIBUTE
	woody scrub stand Excellent connectivity to valley floor
Warren Lake	*Loeflingia squarrosa var artemisiarum*
SOUTHERN SUBREGION	
Cyrus Canyon	Mojave pinyon and juniper woodland Important occurrence of *Mimulus shevockii* and other rare plants.
Haiwee Creek	Only known Panamint alligator lizard occurrence in ecoregion
Kelso Creek	Joshua tree woodland - westside Mojave pinyon and juniper woodland
Monache Meadow	1 of only 2 silver sagescrub scrub sites in subregion
Mt. Williamson	One of the southern-most cercocarpus ledifolius occurrences *Trifolium macilentum var dedeckerae* Potential connectivity to valley floor
Ramshaw/ Templeton Meadow	1 of only 2 silver sagescrub scrub sites in subregion
Sand Canyon – JTWLD*	Joshua tree woodland – 1 of 2 eastside stands
Scodie Mountain	Extensive stand of Mojavean pinyon and juniper woodland Important occurrences of *Astragalus ertterae* and *Lewisia disepala*.
Spanish Needle / Walker Pass	Extnsive Joshua tree woodland and Mojave pinyon and juniper woodland stands Important occurrence of *Astragalus ertterae* and *Phacelia novenmillensis*

* indicates sites considered Significant rather than Portfolio.

NEXT STEPS

- The desert scrub and woodland sites selected as “significant” should be revisited during the Great Basin and Mojave ecoregional planning projects to account for the more extensive eastward ranges of these community types.. In particular, the sites selected for the communities that are extensive in adjacent ecoregions, including blackbush scrub and Mojavean mixed woody scrub along the eastside foothills, Mojave pinyon-juniper woodland along the southern boundary, and silver sagebrush scrub along the northern boundary.

I. ISOLATED ENSEMBLE AND RARE PLANT ANALYSIS

Target natural communities were the primary "filters" of our site selection process for the Sierra Nevada ecoregion. For each ecological group, rare plant species were selected as targets but were incorporated into site identification and ranking procedures only when they co-occurred with a target community. Therefore, a number of target plant occurrences were missed in the initial portfolio. To assess whether or not the portfolio adequately captures rare plants the team conducted a "gap" analysis.

The goal of the isolated rare plant analysis was to assess the adequacy of the portfolio in capturing the following two kinds of targets: (1) isolated threatened or rare plant species, ranked as G1-G3 by CNDDB, or (2) isolated rare botanical ensembles, defined by clusters of 2 or more co-occurring ranked plants. Isolated is defined by not occurring with a target natural community.

SITE SELECTION

Heritage data from NDDB was the primary data source for this analysis. The following conservation goals were used:

- G1 Plants: the portfolio goal for G1 target plants is to capture 100% of element occurrences.
- G2 Plants: The portfolio goal for G2 target plants is to capture 75% of the element occurrences when there are > 12 occurrences, and 100% when there are ≤ 12 occurrences.
- G3 Plants: The portfolio goal for G3 target plants is to capture 50% of the element occurrences when there are > 12 occurrences, and 100% when there are ≤ 12 occurrences.

Selection priority went to (1) occurrences of higher quality (including, population size, occurrence size, or quality of occurrence as defined by NDDB); (2) occurrences within a potential site (site that was identified as a potential site but had not made it into the Sierra Nevada portfolio); and, (3) occurrences in closer proximity to a previously identified portfolio sites, within an ALSE network.

RESULTS

The initial portfolio under-represented 77 of the 112 G1-G3 plant species. In order to meet the conservation goals, 97 sites were added to the portfolio (Table 2I.1).

G1 Plants

Of the thirty-three G1 plant species occurring within the ecoregion, ten were fully captured within the initial portfolio. To capture all of the known occurrences of the twenty-three remaining G1 target plants, 20 sites were added to the portfolio.

G2 Plants

Of the fifty-four G2 plants occurring within the ecoregion, sixteen were fully captured within the initial portfolio selection. To achieve conservation goals, 60 (4 in common with G1 so not recounted here) sites were added to the portfolio.

G3 Plants
Of the twenty-five G3 plants occurring within the ecoregion, nine were fully captured within the initial portfolio. To achieve conservation goals, 17 (1 in common with G1G2 so not recounted here) sites were added to the portfolio.

Table 2I.1 Isolated Ensemble and Rare Plant Portfolio Sites

Conservation Target	Global Rank	State Rank	Site Name
Agrostis hendersonii	G1Q	S1.1	*aghe*
Arabis tiehmii	G1	S1.3	*arti*
Astragalus webberi	G1	S1.2	Halstead, Indian Valley
Calyptribium pulchellum	G1	S1.1	Meadow Lakes
Calystegia stebbinsii	G1	S1.1	American Ranch Hill
Carex tiogana	G1	S1.3	*cati*
Clarkia mosquinii ssp xerophila	G1T1	S1.1	*clmox*
Erythronium pluriflorum	G1	S1.3	Chiquito Ridge
Fremontodendron decumbens	G1	S1.2	American Ranch Hill
Horkelia tularensis	G1	S1.3	*hotu*
Lewisia congdonii	G1	S1.3	Pigeon Gulch, Devil Peak
Lupinus padre-crowleyi	G1	S1.2	Big Pine Creek
Monardella follettii	G1	S1.2	*mofo*
Monardella stebbinsii	G1	S1.3	Red Hill
Nemacladus twisselmannii	G1	S1.2	*Netw*, Church/White Domes
Rhynchospora californica	G1	S1.1	*rhca*
Sidalcea stipularis	G1	S1.1	*sist*, American Ranch Hill
Allium tribracteatum	G2	S2.2	Grant Ridge, Long Barn, Dodge Ridge.
Allium yosemitense	G2	S2.3	Big Grizzly Mountain, Pigeon Gulch, Iron Mountain, Devil Peak
Arabis constancei	G2	S2.2	Deane's Valley, Bunker Hill Ridge, Red Hill, *arco*, Spring Garden
Arctostaphylos nissenana	G2	S2.2	*arni*
Astragalus lentiformis	G2	S2.2	*asle*
Astragalus monoensis var monoensis	G2T2	S2.2	June Lake Junction

Conservation Target	Global Rank	State Rank	Site Name
Astragalus shevockii	G2	S2.3	*assh*
Calochortus striatus	G2	S2.2	Kelso Peak/Valley, *cast*
Camissonia sierrae ssp alticola	G2G3T1	S1.2	*casia*
Canbya candida	G2	S2.2	Kelso Peak/Valley
Carpenteria californica	G2	S2.2	Blue Canyon, *caca*
Chlorogalum grandiflorum	G2	S2.2	*chgr*
Clarkia australis	G2	S2.2	*clau*
Collomia rawsoniana	G2	S2.2	*cora*
Erigeron miser	G2	S2.2	*ermu*
Eriogonum twisselmannii	G2	S2.2	Tule River, upper SFK
Eriophyllum congdonii	G2	S2.2	Big Grizzly Mountain, Iron Mountain, Pigeon Gulch
Eriophyllum nubigenum	G2	S2.3	*ernu*
Erythronium tuolumnense	G2	S2.2	Grant Ridge, *ertu*
Horkelia parryi	G2	S2.2	*hopa*
Ivesia aperta var aperta	G2T2	S2.2	Antelope Valley, *ivapa*
Ivesia unguiculata	G2	S2.2	Edison, Upper Graveman Meadow, *ivun*
Ivesia webberi	G2	S2.1	*ivwe*
Lewisia disepala	G2	S2.3	*ledi*
Lewisia longipetala	G2	S2.2	*lelo*
Lewisia serrata	G2	S2.2	*lese*
Lomatium stebbinsii	G2	S2.2	Grant Ridge, *lost*, Long Barn , Dodge Ridge
Lupinus citrinus var citrinus	G2T2	S2.2	Meadow Lakes
Lupinus duranii	G2	S2.2	June Lake Junction
Lupinus spectabilis	G2	S2.2	*lusp*, Virginia Mine
Penstemon personatus	G2	S2.2	*pepe*
Raillardiopsis muirii	G2	S2.3	Church / White Domes
Sedum albomarginatum	G2	S2.2	Red Hill
Senecio layneae	G2	S2.2	Traverse Creek
Sidalcea covillei	G2	S2.1	Wilkerson Springs, Warren Lake

Conservation Target	Global Rank	State Rank	Site Name
Streptanthus fenestratus	G2	S2.3	*stfe*
Arabis rigidissima var demota	G3T2	S1.2	*arrid*
Eriogonum breedlovei var shevockii	G3T3	S3.3	Church/White Somes
Fritillaria agrestis	G3	S3.2	*frag*, Virginia Mine
Lewisia cantelovii	G3	S3.2	San Juan Ridge
Lupinus dalesiae	G3	S3.2	Feather River Saddle, Bunker Hill Ridge, *luda*
Phacelia stebbinsii	G3	S3.2	*phst*, Silver Creek (Potts Cabin)
Sagittaria sanfordii	G3	S3.2	Berry Creek
Sanicula tracyi	G3	S3.2	*satr*
Streptanthus oliganthus	G3	S2.2	Summit Meadow
Viola tomentosa	G3	S3.2	*vito*, Silver Creek (Potts Cabin)

** The number of sites listed in the column labeled “Site Name” will not equal the total number of sites added to the portfolio. All sites added to meet conservation goals for a specific target species were given the same name.

NEXT STEPS

- Integrate on-going Forest Service and CNPS rare plant inventories into future iterations of the portfolio.
- Gain a better understanding of the distribution and habitat requirements of the target rare plants to create perhaps more realistic portfolio goals.

J. COMMON AND WIDESPREAD COMMUNIITES

A portfolio based on vulnerable species and communities alone is insufficient to represent all native biodiversity. Therefore, the team invited Frank Davis of U.C. Santa Barbara to apply a method for including common and widespread communities using a multi-objective computer model called Spexan. The Spexan model allowed the team to test a variety of spatial alternatives to meet conservation goals for common and widespread communities.

The persistence of many species and communities in the portfolio is largely dependent on the surrounding landscape context. Aggregation of common and widespread communities around these sites would create larger dynamic areas the could accommodate or be managed for natural disturbance regimes and increase the diversity of the site as a whole. Given this need, the team felt it would be most efficient to test a variety of alternatives that would attempt to meet conservation goals by aggregating high quality occurrences of common and widespread communities around the initial portfolio. The team chose to test the Spexan model in the northern subregion where fragmented public ownership patterns and lack of class 1 lands result in few large protected landscapes.

Spexan Model

Target vegetation communities were allocated into planning units based on Calwater watersheds. These units average 7,000 acres in size and make logical landscape units for site selection. Each watershed unit had to have 15-35% of a mapped vegetation community occurrence to be considered a potential site for that community. In addition, each watershed unit had a suitability score based on measures of population density, road fragmentation and ownership. The overall objective of the Spexan model was to select the minimum number of suitable watershed units to meet the conservation goals for vegetation communities but in a spatially efficient pattern. The team ran 8 alternatives as follows:

Run	Name	Starting portfolio	Spatial clustering	Comments
1	NULL	None	No	Used to set an area baseline, since this is the least constrained run
2	LSOG	LSOG watersheds	Yes	Including LSOG sites adds significant area (excess coverage of Sierran Mixed Con and other forest types)
3	TNC	TNC portfolio watersheds	Yes	Only slightly more area than Null, so including TNC portfolio sites does not significantly raise “cost” of the GAP portfolio
4	TNC + LSOG	TNC portfolio and LSOG watersheds	Yes	
5	TNC + C1	TNC portfolio	Yes	Comparable to Run 3 because few

		and Status 1 watersheds		C1 watersheds
6	TNC + C12	TNC portfolio and Status 1 and 2 watersheds	Yes	
7	TNC + C1 + LSOG	TNC, LSOG, and C1 watersheds	Yes	Comparable area to Run 4 but some different sites. Looks like the best overall.
8	TNC + C12+ LSOG	TNC, C12 and LSOG watersheds	Yes	

Input data

A. TNC portfolio (based on shape file Portfolio.shp supplied by C. Mayer on 7/30/99*). A planning unit was considered a TNC portfolio site if at least 75% of the watershed overlapped with the one or more TNC portfolio areas*.

B. Land management status from the California Gap Analysis. Some alternatives included Status 1 (C1) or Status 1 and 2 (C12) lands in the starting portfolio*. A planning unit was considered Class 1 status if at least 50% of the watershed was in Status 1, and Class 12 if at least 50% of the watershed was in Status 1 or Status 2*.

C. Rank 4 and Rank 5 Late seral old growth (LSOG) forests as mapped by SNEP. *Planning units were considered LSOG areas if at least 20% of the watershed was Class 4 or 5*.

All model runs except Run 1 used the same settings: adaptive simulated annealing; 1,000,000 iterations; 10 runs (only the best run was retained) , a boundary cost weight of 0.2. For Run 1, the boundary weight was set to zero (no spatial goal). The value 0.2 for the other runs promoted selection of spatially contiguous planning units (moderately strong weight).

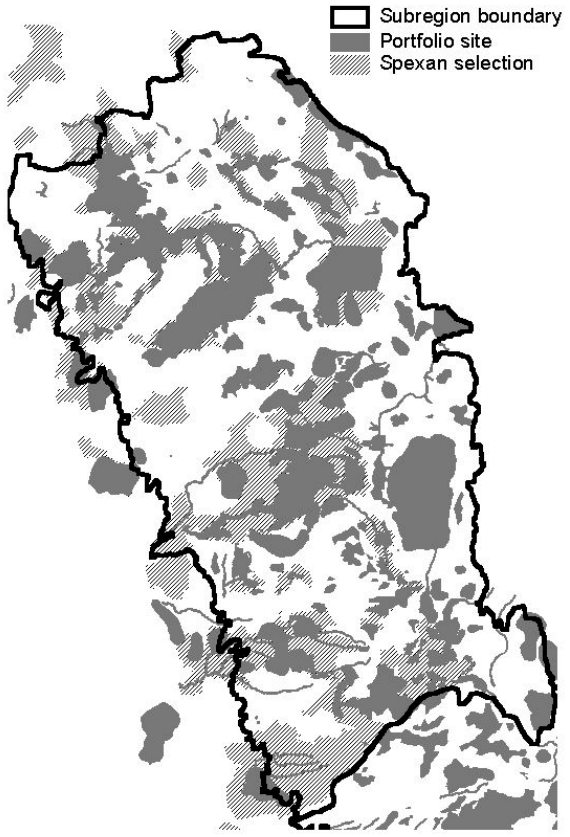


Figure 2J.1 Watershed units most frequently selected by Spexan to meet conservation goals in the Northern Subregion

Results

The null alternative with no spatial clustering yielded a baseline of 30% of the watershed units selected to meet conservation goals. The seven alternatives

with various spatial clustering criteria ranged from 31-37% watershed units selected. There was very little spatial variation between the seven alternatives. Many watershed units were repeatedly selected in each alternative indicating limited choices for some vegetation types or landscape suitability. The most often selected watersheds provide an indication of the landscapes where vulnerable species and communities "nest" within good examples of common and widespread communities (Figure 2J.1).

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APPENDIX III: Portfolio Site Profiles
(in alphabetical order)

AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Abernathy Meadow	Montane meadow	WET		SNEP-SNA
Ackerson Meadow	Clarkia australis	BOT	G2S2.2	NDDB
	Mimulus filicaulis	BOT	G2S2.2	NDDB
	Great gray owl	WET	High density	STAN
	Montane meadow	WET		STAN
	Willow flycatcher	WET	best pop. in Stanislaus	STAN
Alpine Meadows	Alpine or subalpine meadow	WET		GAP
alyo	Allium yosemitense	BOT	G2S2.3. Broad-leaved upland forest	NDDB
American Ranch Hill	Calystegia stebbinsii	BOT	G1S1.1	NDDB
	Fremontodendron decumbens	BOT	G1S1.2	NDDB
	Sidalcea stipularis	BOT	G1S1.1	NDDB
American River, MFK-NFK	Lewisia congdonii	BOT		CNDDB
	Phacelia stebbinsii	BOT		CNDDB
	Lewisia serrata	BOT	only know loc on forest, G2S2.2, EXP	SNEP-SNA
	Phacelia stebbinsii	BOT	G3S3.2; riparian associate	SNEP-SNA, EXP
American River, North Fork	Mountain yellow-legged frog	AQU		SNEP-ADA
	Foothill yellow-legged frog	AQU		SNEP-ADA
	Foothill ephemeral stream	AQU		TAH
	Hardhead	AQU		SNEP-ADA
	Spring	AQU		SNEP-ADA
	Harlequin duck	RIP	one of two recent obs in CA	NDDB
	Riparian	RIP	Substantial	CARA
	Yellow warbler	RIP	w/in headwaters, neotropical migrant	TNC
Antelope Valley	Ivesia aperta var aperta	GBS		
arco	Arabis constancei	BOT	G2S2.2	NDDB
arni	Arctostaphylos nissenana	BOT	G2S2.2. closed-cone cone,	NDDB
arrid	Arabis rigidissima var demota	BOT	G3T2S1.2	NDDB
arti	Arabis tiehmii	BOT	G1S1.3	NDDB
Ash Creek	Native amphibian spp.	AQU	div amph/rip complex	INY
	Montane riparian	RIP	div amph/rip complex; eastside foothill cyn/	INY
	Neotropical migrants	RIP	div amph/rip complex; eastside foothill cyn/	INY
asle	Astragalus lentiformis	BOT	G2S2.2	NDDB
assh	Astragalus shevockii	BOT	G2S2.3	NDDB
AT&E Mine Area	Limestone salamander	AQU	Cold Canyon, Pigeon Gulch	SIE
	Allium yosemite	BOT	G2 S2.3	NDDB
	Eriophyllum congdonii	BOT	G2 S2.2	NDDB
	Lewisia congdonii	BOT	G1 S1.2	NDDB
Avalanche Meadow	Montane meadow	WET	Class 1 land - Wilderness	SNEP

APPENDIX III: Portfolio Site Profiles
(in alphabetical order)

AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Babbitt Peak	Northern goshawk	CUF		Keeler-Wolf
	Washoe pine	CUF		TOI, Keeler-Wolf
	Aspen	WET	Class 1	Keeler-Wolf
Back Canyon	Southern interior cypress forest	CUF	southernmost piute cypress	NDDB
Baker Point	Southern interior cypress forest	CUF	Paiute cypress	SNEP-SNA
Balch Camp	Relictual slender salamander	AQU	seeps near Balch camp	SIE
Banada Ridge	Interior live oak chaparral	CHAP	1 of 3 large stands	GAP
Bear Creek	Lupinus dalesiae	BOT	G3S3.2	NDDB
	Penstemon personatus	BOT	G2S2.2	NDDB
	Bush chinquapin chaparral	CHAP		GAP
	Westside ponderosa pine	CUF		GAP
Beashore Meadow	Montane meadow	WET		
	Willow flycatcher	WET		
Bell Meadow RNA	Aspen	WET	RNA, large stand	STAN, Keeler-Wolf
	Montane meadow	WET	RNA	STAN, Keeler-Wolf
	Willow flycatcher	WET		STAN, Keeler-Wolf
Berry Creek	Sagittaria sanfordii	BOT	G3S3.2	NDDB
Big Bald Rock	Fritillaria eastwoodiae	BOT	G3S3.2	NDDB
	Agrostis hendersonii	BOT	G1QS1.1	NDDB
Big Grizzly Mtn.	Eriophyllum congdonii	BOT	G2S2.2	NDDB
	Mimulus filicaulis	BOT	G2S2.2	NDDB
	Black oak	OAK	RNA	Keeler-Wolf
	Interior live oak	OAK		Keeler-Wolf
Big Meadows	Arabis rigidissma var demota	BOT		NVHERIT
	Montane meadow	WET		TOI
	Vernal pools	WET	ephemeral wetlands.	TOI
Big Pine Ck	Lupinus padre-crowleyi	BOT	G1S1.2	NDDB
Big Pine Meadow	Westside ponderosa pine	CUF	Unusual eastern occurrence	GAP, BLM
Birch Creek	Waterbirch/western birch riparian	RIP	Good example, though common	INY, NDDB
Bishop Creek Aspens	Aspen forest	WET		GAP
Black Mountain	Ivesia aperta var aperta	BOT		NDDB
	Eastside ponderosa pine	CUF	Only uncut stand in Plumas	PLUM
	Washoe pine	CUF		PLUM
	Black oak	OAK		PLUM, GAP
	Fen	WET		
Blue Canyon	Carpentaria californica	BOT	G2S2.2	NDDB
Blue Lakes	Yosemite toad	AQU		ELD
	Mt. Lyell salamander	AQU		
	Montane meadow	WET		ELD

APPENDIX III: Portfolio Site Profiles
(in alphabetical order)

AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Bourland Meadow	Aspen	WET		Keeler-Wolf
	Montane meadow	WET	former RNA	Keeler-Wolf
Bowman Lake / English Mtn.	Bush chinquapin	CHAP		GAP
	Huckleberry oak	CHAP		GAP
Breckenridge Mountain	Breckenridge Mtn slender salamande	AQU	endemic, possibly extirpated	NDDB, SNEP
	Yellow-blotched salamander	AQU		NDDB
	Pacific fisher	CUF	southernmost population	SNEP-SNA
	Spotted owl	CUF		SNEP
	Willow flycatcher	WET		NDDB
Buckeye	Eastside ponderosa pine	CUF		TOI
	Old growth	CUF		TOI
	Subalpine sagebrush scrub	GBS		GAP
Buckhorn Peak	Horkelia parryi	BOT	G2S2.2	NDDB
	Interior live oak woodland	OAK		GAP
Bucks Mountain	Huckleberry oak chaparral	CHAP		GAP
Bull Run	Calochortus westonii	BOT	G1S1.2	NDDB
	Fritillaria brandegei	BOT	G2S2.2	NDDB, SNEP
	Black oak woodland	OAK		GAP
Bunk Meadow	Huckleberry oak chaparral	CHAP		GAP
Bunker Hill Ridge	Arabis constancei	BOT	G2S2.2	NDDB
	Lupinus dalsiae	BOT	G3S3.2	NDDB
Burt Meadow	Aspen forest	WET		GAP
Butterfly Valley	Darlingtonia californica	BOT	Botanical area	PLUM, NDDB
	Northern goshawk	CUF		NDDB
	Westside ponderosa pine	CUF		GAP
	Darlingtonia seep	WET	Botanical area	PLUM, NDDB
	Fen	WET	Botanical area	PLUM, NDDB
	Sphagnum bog	WET	Botanical area	PLUM, NDDB
By-Day Creek	Lahontan cutthroat trout	AQU		
caca	Carpentaria californica	BOT	G2S2.2	NDDB
Cache Creek	Eriogonum kennedyi var pinicola	BOT	G4T1S1.1	NDDB
Calaveras Big Trees	Big tree forest	CUF		NDDB, GAP
	Pacific fisher	CUF		STAN
	Pine martin	CUF		STAN
	Spotted owl	CUF		STAN

APPENDIX III: Portfolio Site Profiles
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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Calaveras River, NFK	California roach stream	AQU		SNEP-ADA
	Foothill ephemeral stream	AQU		SNEP-ADA
	Foothill yellow-legged frog	AQU		SNEP-ADA
	Pikeminnow/sucker stream	AQU		SNEP-ADA
	Western pond turtle	AQU		SNEP-ADA
	Hardhead/pikeminnow stream	AQU		SNEP-ADA
	Hardhead	AQU		SNEP-ADA
	San Joaquin roach	AQU		SNEP-ADA
Caliente	Interior live oak chaparral	CHAP		GAP
	Black oak woodland	OAK	southern-most stand	GAP
	Blue oak woodland	OAK		GAP
Caliente Creek	Tehachapi slender salamander	AQU	type locality	NDDB, PRC
	Yellow blotched salamander	AQU		NDDB, PRC
Camptonville	Black oak woodland	OAK		GAP
	Interior live oak woodland	OAK		GAP
Caples Meadow	Aspen	WET		ELD
	Montane meadow	WET	Ungrazed	ELD
	Willow flycatcher	WET	Potential, good habitat	ELD
Carlyle Meadow	Montane meadow	WET		SIE
Carpenteria	Carpenteria californica	BOT	G2 S2.2	SNEP-SNA
	Lupinus citrnus var citrinus	BOT	G2T2S2.2	NDDB
	Interior live oak chaparral	CHAP	one of larger sites	SNEP-SNA
	Interior live oak woodland	OAK		GAP
Carson River, EFK	Cutthroat trout/paiute sculpin str	AQU		SNEP-ADA
	Great Basin scrub snowmelt stream	AQU		SNEP-ADA
	trout headwaters	AQU		
	Lahontan cutthroat trout	AQU		SNEP-ADA
	Meadow stream	AQU		SNEP-ADA
	Mountain sucker	AQU		SNEP-ADA
	Mountain yellow-legged frog	AQU		SNEP-ADA
	Paiute cutthroat trout	AQU		SNEP-ADA
	Spring	AQU		SNEP-ADA
	Whitefish/cutthroat trout/sucker s	AQU		SNEP-ADA
	Yosemite toad	AQU		SNEP-ADA
	Montane riparian	RIP	Wild and Scenic candidate	TOI
	Riparian	RIP	Substantial	CARA
Carson River, WFK	black swift	RIP	in adjacent canyon nesting (Cloudburst Can.)	NDDB
	Montane riparian	RIP		TOI
	Riparian	RIP	Substantial	CARA
casia	Camissonia sierrae ssp alticola	BOT	G2G3T1S1.2. Largest pop around Florence Lake	NDDB

APPENDIX III: Portfolio Site Profiles
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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
cast	Calochortus striatus	BOT	G2S2.2	NDDB
Castle Peak / Basin Peak	Lewisia longipetala	BOT	G2S2.2	SNEP-SNA, NDDB
	Erigeron miser	BOT	G2S2.2	NDDB
	Huckleberry oak chaparral	CHAP		GAP
cati	Carex tiogana	BOT	G1S1.3	NDDB
Chagoopa Plateau	Foxtail pine forest	CUF		SNEP-SNA
Charity Valley	Aspen	WET		ELD
	Montane meadow	WET		ELD
	Willow flycatcher	WET		NDDB
Cherry Creek, NFK	Huckleberry oak chaparral	CHAP	secondary cover	GAP
Cherry Ridge	Huckleberry oak chaparral	CHAP	most extensive stand	GAP
chgr	Chlorogalium grandiflorum	BOT	G2S2.2. So of Sutter Cr, no of hwy 88	NDDB
Chino Creek	Red-legged frog	AQU	one of two in ecoregion	PLUM
Chiquito Ridge	Erythronium pluriflorum	BOT	G1 S1.3	SNEP-SNA
Church/White Domes	Arabis dispar	BOT	G3S2.3	NDDB
	Eriogonum breedlovei var shevockii	BOT	G3T3S3.3	NDDB
	Lewisia disepala	BOT	G2S2.3, RNA	NDDB
	Nemocladus twisselmannii	BOT	G1S1.2	NDDB, SNEP
	Raillardiopsis murii	BOT	G2S2.3	NDDB
clau	Clarkia australis	BOT	G2S2.2	NDDB
Clavey River	Spring	AQU		SNEP-ADA, PRC
	Limestone salamander	AQU		SNEP-ADA, PRC
	Western pond turtle	AQU		SNEP-ADA, PRC
	Foothill yellow-legged frog	AQU		SNEP-ADA, PRC
	Hardhead	AQU		SNEP-ADA, PRC
	San Joaquin roach	AQU		SNEP-ADA, PRC
	Mountain yellow-legged frog	AQU		SNEP-ADA, PRC
	Native fish assemblage	AQU	possibly best in Sierra	SNEP-ADA, PRC
	Pikeminnow/sucker stream	AQU		SNEP-ADA, PRC
	Riparian	RIP	steep but mostly in good condition	AQ ADMA
Clear Lake	Bog	WET		SNEP-SNA
clmox	Clarkia mosquinii ssp xerophila	BOT	G1T1S1.1. Along Feather River	NDDB
Clover / Jackass Meadow	Yosemite toad	AQU	at Jackass Meadow	SIE, SNEP-SNA
	Ivesia unguiculata	BOT	G2 S2.2	NDDB, SNEP
	Trifolium bolanderi	BOT	G3 S3.3	SNEP-SNA
	Fen	WET		SIE
	Great gray owl	WET		SIE, SNEP-SNA
	Montane meadow / grassland	WET		SIE, SNEP-SNA
	Vernal pool	WET		SIE, SNEP-SNA

APPENDIX III: Portfolio Site Profiles
(in alphabetical order)

AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Convict Creek	Mountain yellow-legged frog	AQU		INY
	Yosemite toad	AQU	best of 3 pops.	INY
	Meadow stream	AQU		
	Alpine lake/pond	AQU		
	Great Basin scrub snowmelt stream	AQU		
	Waterbirch/western birch riparian	RIP		NDDB
Conway Summitt ACEC	Aspen	WET		INY
Cooks/Lights Ck	Great Valley cottonwood riparian	RIP		GAP
	Montane riparian scrub	RIP		GAP
Cora	Collomia rawsoniana	BOT	G2 S2.2. riparian	SNEP-SNA
Cosumnes Foothills	Blue oak woodland	OAK		GAP, TNC
Cosumnes River	Pikeminnow/sucker stream	AQU		SNEP-ADA, PRC
	Meadow stream	AQU		SNEP-ADA, PRC
	Spring	AQU		SNEP-ADA, PRC
	Aquatic invertebrates	AQU	more than 300 spp.	SNEP-ADA, PRC
	California roach stream	AQU		SNEP-ADA, PRC
	Foothill ephemeral stream	AQU		SNEP-ADA, PRC
	Hardhead/pikeminnow stream	AQU		SNEP-ADA, PRC
	Mountain yellow-legged frog	AQU		SNEP-ADA, PRC
	hardhead	AQU		SNEP-ADA, PRC
	Pacific lamprey	AQU		SNEP-ADA, PRC
	Steelhead	AQU		SNEP-ADA, PRC
	Western pond turtle	AQU		SNEP-ADA, PRC
	Riparian	RIP	outstanding & substantial (incl. Clear Cr., NFK)	CARA
	Swainson's thrush	RIP		EXP
	Montane riparian scrub	RIP		GAP
Cow Meadow	Ivesia unguiculata	BOT		SIE
	Montane meadow	WET		SIE
	Willow flycatcher	WET		SIE
Coyote Peaks	Alpine fell field	ALP	southern-most in Sierra	SNEP-SNA
Coyote Plateau	Alpine dwarf scrub	ALP		GAP
	Lupinus padre-crowleyi	BOT	G1 S1.2	NDDB
	California wolverine	CUF		NDDB
	Eastside ponderosa pine	CUF	Relict stand of jeffry pine	
	Northern goshawk	CUF		NDDB
	Aspen	WET		
	Bog	WET	high elevation peat	
	Montane meadow	WET	high elevation	SNEP-SNA
Cyrus Canyon	Mimulus shevockii	BOT	G1S1.2. GBS	NDDB
Dark Canyon	Huckleberry oak chaparral	CHAP		GAP

APPENDIX III: Portfolio Site Profiles
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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Deadman Creek	Northern leopard frog	AQU	one of only 3 sites in ecoregion	
Deane's Valley	Arabis constancei	BOT	G2S2.2	NDDB
	Lupinus dalsiae	BOT	G3S3.2	NDDB
Deer / Indian Valley	Alpine or subalpine meadow	WET	Class 1 - wilderness	SNEP
Deer Creek-TUL	Hardhead/pikeminnow stream	AQU		SNEP-ADA
	California roach stream	AQU		SNEP-ADA
	Meadow stream	AQU		SNEP-ADA
	Foothill ephemeral stream	AQU		SNEP-ADA
	Native fish spp.	AQU	best condition in area	SNEP-ADA
	San Joaquin roach	AQU		SNEP-ADA, PRC
	Spring	AQU		SNEP-ADA
	hot springs outflow	AQU		
	Pikeminnow/sucker stream	AQU		SNEP-ADA
	Sycamore alluvial woodland	RIP		NDDB
Dennison Mountain	Big tree forest	CUF	largest private grove	SNEP-SNA, NDDB
	Pacific fisher	CUF		NDDB
Dennison Mountain - West	Shin oak brush chaparral	CHAP	secondary cover type	GAP
Desolation Valley	Draba asterophora var asterophora	BOT	alpine	NDDB
	Alpine or subalpine meadow	WET	w/in Desolation Wild	SNEP
Devil Peak	Allium yosemite	BOT	G2S2.3	NDDB
	Lewisia congdonii	BOT	G1S1.3	NDDB
Dinkey / Lost Meadow	Ivesia unguiculata	WET	G2S2.2	NDDB
	Montane meadow	WET		EXP
	Willow flycatcher	WET		NDDB
Dixie Creek	Montane riparian scrub	RIP		GAP
Dodge Meadow	Mimulus filicaulis	BOT	G2S2.2	EXP
	Montane meadow	WET		
Dodge Ridge	Allium tribracteatum	BOT	G2S2.2	NDDB
	Lomatium stebbinsii	BOT	G2S2.2	NDDB
	Allium tribracteatum	BOT	G2S2.2	NDDB
Dog Valley	Ivesia apera var canina	BOT	G2T1 S1.1. Endemic	TAH
	Ivesia sericoleuca	BOT	G2S2.2	TAH
	Ivesia webberi	BOT	G2S2.1	TOI, NDDB
	Montane meadow	WET		TAH
Dougherty Basin	Sierr Nevada fell-field	ALP		GAP
Drew Meadow	Clarkia australis	BOT	G2S2.2	NDDB
	Mimulus filicaulis	BOT	G2S2.2	NDDB
	Black oak woodland	OAK		GAP
	Blue oak woodland	OAK		STAN
	Montane meadow	WET		STAN

APPENDIX III: Portfolio Site Profiles
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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Dry Creek	Mountain yellow-legged frog	AQU		
	Great Valley cottonwood riparian	RIP		NDDB
Dry Creek-TUL	Sycamore alluvial woodland	RIP		NDDB
Duncan/Sunflower/Sailor	Big tree forest	CUF	Placer Big Tree Grove	TAH
	California wolverine	CUF		NDDB
	Northern goshawk	CUF	high density	TAH
	Old-growth	CUF	associated spp.	TAH
	Pine martin	CUF	at Robinson Flat	TAH
	Spotted owl	CUF	large pop.	TAH
Eagle / Three Meadows	Mountain yellow-legged frog	AQU		
	Yosemite toad	AQU		
	Aspen	WET		
	Montane meadow	WET		
	Willow flycatcher	WET		NDDB, STAN
East Baker	Southern interior cypress forest	CUF	Pauite cypress	NDDB
East Kern Plateau	Erigeron multiceps	BOT	G1S1.2	NDDB
	Horelia tularensis	BOT	G1S1.3	NDDB
	Alpine or subalpine meadow	WET		GAP
	Montane meadow	WET		GAP
	Willow flycatcher	WET		NDDB
Eastern Escarpment	Bush chinquapin chaparral	CHAP		Clifton
	Black oak	OAK		PLUM, GAP
East-West Yuba	Northwestern pond turtle	AQU		TAH
	Allium sanbornii var sanborni	BOT	G3T3S3.2	TAH
	Old-growth	CUF	Largest stand in TAH	TAH
	Pine martin	CUF	Hawley Meadow	TAH
	Spotted owl	CUF	high density	TAH
	Wolverine	CUF	at Hawley Meadow	TAH
	Fen	WET		TAH
Echo Summit	Draba asterophora var macrocarpa	BOT	G4T1S1.2 (only occurrence)	NDDB
Emigrant Wilderness	Yosemite toad	AQU	Snow Lake pop. best	STAN
	California wolverine	CUF		NDDB
	Great gray owl	CUF		NDDB
	Old growth	CUF		SNEP
	Pacific fisher	CUF		STAN
	Pine martin	CUF		STAN
	Sierra Nevada red fox	CUF		NDDB
ermu	Erigeron miser	BOT	G2S2.2. Upper montane coniferous forest	NDDB
ernu	Eriophyllum nubigenum	BOT	At Half Dome and Pilot Ridge	NDDB
ertu	Erythronium tuolumnense	BOT	G2S2.2	NDDB

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Faith Valley	Sierra Nevada red fox	CUF		NDDB
	Montane meadow	WET		TOI, ELD
	Willow flycatcher	WET	excellent occurrence	NDDB
Fales Basin	Darlingtonia seep	WET		PLUM, NDDB
Feather River Meadows	Alpine or subalpine meadow	WET		GAP
	Willow flycatcher	WET		NDDB
Feather River Saddle	Arabis constancei	BOT	G2S2.2	NDDB
	Lewisia cantelovii	BOT	G3S3.2	NDDB
	Monardella stebbinsii	BOT	G1S1.3	NDDB
	Sedum albomarginatum	BOT	G2S2.2	NDDB
Feather River, MFK	Foothill ephemeral stream	AQU		SNEP-ADA, PRC
	Hardhead	AQU		SNEP-ADA, PRC
	Hardhead/pikeminnow stream	AQU		SNEP-ADA, PRC
	Pikeminnow/sucker stream	AQU		SNEP-ADA, PRC
	Meadow stream	AQU		SNEP-ADA, PRC
	Mountain yellow-legged frog	AQU		PRC
	Spring	AQU		SNEP-ADA, PRC
	Foohill yellow-legged frog	AQU		SNEP-ADA, PRC
	Lupinas dalesiae	BOT	G3S3.2	NDDB
	black swift	RIP		NDDB
Feather River, MFK Canyon	Penstemon personatus	BOT	G2S2.2	NDDB
	Black oak woodland	OAK		GAP
Finegold Creek	Foothill ephemeral stream	AQU		SNEP-ADA
	Sacramento hitch	AQU		SNEP-ADA
	Sacramento hitch stream	AQU		SNEP-ADA
	Springs	AQU		SNEP-ADA
	Pikeminnow/sucker stream	AQU		SNEP-ADA
Fordyce Creek	Huckleberry oak chaparral	CHAP		GAP
Fordyce High Lakes	Pacific fisher	CUF		NDDB
	Subalpine meadow	WET		SNEP-SNA
Foresthill Divide	Black oak woodland	OAK		GAP
Fowler Lake	Carex limosa	BOT	G5S3	
	Scirpus subterminalis	BOT	G4G5S2S.3	PLUM
	Bog	WET		PLUM
	Montane freshwater marsh	WET		
frag	Fritillaria agrestis	BOT	G3S3.2	NDDB
Freel Peak	Draba asterophora var asterophora	BOT	G4T2S1.3	TOI, NDDB
Freeman Canyon	Modoc-Great Basin cottonwood-willow	RIP	only known in ecoregion	GAP

APPENDIX III: Portfolio Site Profiles
(in alphabetical order)

AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
French Creek Basin	Allium jepsonii	BOT	G1S1.2	NDDB
	Clarkia mosquinii ssp xerophylla	BOT	G1T1S1.1	NDDB
	Senecio eurycephalus var lewirosei	BOT	G4T2S2.2	NDDB
	Balsamorhiza macrolepis var macrol	BOT	G3T2S2.2	NDDB
	Black oak woodland	OAK		GAP
	Swainson's thrush	RIP	high priority site	Stefani
Gardner Meadow	Huckleberry oak chaparral	CHAP		
Generals Highway	Ribes tularense	BOT	G2S2.2	NDDB
	Raillardiopsis muirii	BOT	G2S2.3	NDDB
	Big tree forest	CUF	largest complex	NDDB, GAP, SNEP-SNA
	Northern goshawk	CUF		NDDB
	Old growth	CUF		SNEP
	Pacific fisher	CUF		NDDB
	Sierra Nevada red fox	CUF		NDDB
	Subalpine meadow	WET	Class 1 land	SNEP-SNA
Genesee Valley	Montane meadow	WET		GAP
Gibbs Canyon	Aspen	WET		GAP
Glass Creek Meadow	Yosemite toad	AQU	1 of 3 pops. INY	INY
	Great gray owl	maybe		NDDB
	Montane meadow	WET	quality habitat	SNEP-SNA
Glen Aulin	Aspen	WET		SNEP-SNA
Granite / Onion Creek	Erigeron miser	BOT	G2S2.2	NDDB
	Bush chinquapin chaparral	CHAP		GAP
	Huckleberry oak chaparral	CHAP		GAP, RNA
Granite Mtn / Harris Meadow	Darlintonia californica	BOT	G4 S3.2	TAH
	Drosera anglica	BOT	G5 S2S3	TAH
	Rare plants	BOT	unique soils; pitcher plants	TAH
	Darlingtonia bog (seep)	WET	private, high quality	TAH
	Fen	WET	unique soils; pitcher plants	TAH
Granite Ridge	Huckleberry oak chaparral	CHAP		GAP
Grant Ridge	Allium tribracteatum	BOT	G2S2.2	NDDB
	Erythronium tuolumnense	BOT	G2S2.2	NDDB
	Lomatium stebbinsii	BOT	G2S2.2	NDDB
Grass Lake	Sphagnum bog	WET	largest in ecoregion	RNA, TOI
Gray Creek	Lahontan cutthroat trout	AQU		PRC
Green Island Lake	Carex limosa	BOT	G5S3?	NDDB
	Fen	WET		NDDB
	Sphagnum bog	WET		NDDB
Greenhorn Foothills	Blue oak woodland	OAK		GAP
	Interior live oak woodland	OAK		GAP

APPENDIX III: Portfolio Site Profiles
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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Grizzly Flat	Black oak woodland	OAK		GAP
Grover Hot Springs	Old growth	CUF		TOI
	Spotted owl	CUF		TOI
	Alkali seep	WET		TOI
	Great gray owl	WET		NDDB
	Willow flycatcher	WET		NDDB
Guadalupe Mtns	Blue oak woodland	OAK		GAP, TNC
	Valley oak woodland	OAK		GAP, TNC
Haiwee Creek	Native amphibian spp.	AQU	spp rich area	INY
	Neotropical migrants	RIP	spp rich area	INY
	Riparian	RIP	spp rich area	INY
Halstead	Astragalus webberi	BOT	G1S1.2	NDDB
	Lupinus dalesiae	BOT	G3S3.2	NDDB
Harvey Monroe Hall RNA	Alpine dwarf scrub	ALP		GAP
	Salix brachycarpa	BOT	G5T5S1.3?	Keeler-Wolf
	Scirpus clementis	BOT	G3S3.3, CNPS list 4	Keeler-Wolf
	Montane meadow	WET		Keeler-Wolf
	Subalpine meadow	WET		Keeler-Wolf
Haskins Valley	Stellaria obtusa	BOT	G5S2.3 moist area associate	NDDB
	Montane riparian scrub	RIP		GAP
	Swainson's thrush	RIP	high priority site	EXP
	Aspen	WET		PLUM
	Montane meadow	WET		PLUM
	Willow flycatcher	WET		NDDB
Herring Creek Reservoir	Aspen forest	WET		GAP
Hilton Creek Lake	Aspen forest	WET		GAP
Hocket Lakes	Lupinus lepidus var culbertsonii	BOT	G5T1S1.3	NDDB
	Subalpine meadow	WET	large, wet	SNEP-SNA
Hodgeson Mdw / Crane Flat	Eriophyllum congdonii	BOT	G2S2.2	NDDB
	Mimulus filicaulis	BOT	G2S2.2	NDDB
	Big tree forest	CUF		NDDB, SNEP
	Pacific fisher	CUF		NDDB
	Aspen forest	WET		LIT, NDDB
	Great gray owl	WET		LIT, NDDB
	Montane meadow	WET		LIT, NDDB
	Willow flycatcher	WET		LIT, NDDB

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Hogback Creek	Springs	AQU		
	Calochortus excavatus	BOT	G3S3.1	BLM
	Sidalcea covillei	BOT	G2S2.1	BLM
	Waterbirch/western birch riparian	RIP		NDDB
	Western yellow-billed cuckoo	RIP		EXP, NDDB
	Willow riparian forest	RIP		NDDB
	Yellow billed cuckoo	RIP	in Alabama Hills	EXP
	yellow-breasted chat	RIP	neotropical migrants	NDDB
	Alkali seep	WET	Key area in Owens Valley	NDDB
	Northern harrier	WET		NDDB
Honcut Creek, upper	Shin oak chaparral	CHAP	1 of 2 stands in sub	Clifton
	Blue oak woodland	OAK		GAP
	Oregon oak woodland	OAK		GAP
	Valley oak woodland	OAK		Clifton
hopa	Horkelia parryi	BOT	G2S2.2. 3 eos, chaparral	NDDB
Hope Valley	Aspen	WET		ELD
Horse Meadow	Alpine or subalpine meadow	WET	w/in Yosemite NP	GAP
Horsethief Canyon	Eastside ponderosa pine	CUF		GAP
	Old growth	CUF		TOI
	Aspen	WET		TOI, GAP
	Willow flycatcher	WET		TOI
Hot Creek	Northern leopard frog	AQU	Critical refuge, one of 3 sites in ecoregion	SNEP-ADA
	Owens sucker	AQU		NDDB
	Webbed-toad salamander	AQU	Critical refuge, one of only 2 sites in ecoregion	SNEP-ADA
	Owens tui chub	AQU		
	Hot springs outflow	AQU		
hotu	Horkelia tularensis	BOT	G1S1.3. at Bald Mountain	NDDB
Hull Meadow	Allium tribracteatum	BOT	G2S2.2	NDDB
	Lomatium stebbinsii	BOT	G2S2.2	
	Montane meadow	WET		
	Willow flycatcher	WET		
Humbug Creek	Alpine or subalpine meadow	WET		
	Willow flycatcher	WET		
	Lupinas dalesiae	BOT	G3S3.2	NDDB
	Alpine or subalpine meadow	WET		GAP
	Fen	WET		NDDB
	Willow flycatcher	WET		NDDB
Icehouse Road	Viola tomentosa	BOT	G3S3.2	ELD
	Aspen	WET		ELD

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Independence / Secret Mdw	Ivesia sericoleuca	BOT	G2S2.2	TAH
	Riparian	RIP	intact riparian	SNEP-SNA
	Sierra Nevada mountain beaver	RIP		TAH
	Aspen	WET		TAH
	Fen	WET		TAH
	Montane meadow	WET		GAP
	Willow flycatcher	WET		NDDB
Indian Valley	Astragalus webberi	BOT	G1S1.2	PLUM, NDDB
Iron Mountain	Allium yosemitense	BOT	G2 S2.3	SIE
	Eiophyllum congdonii	BOT	G2 S2.2	SNEP-SNA,
	Lewisia congonii	BOT	G1 S1.3	SNEP-SNA,
ivapa	Ivesia aperta var aperta	BOT	G2T2S2.2	NDDB
ivun	Ivesia unguiculata	BOT	G2S2.2. House Mdw, >1,000s	NDDB
ivwe	Ivesia webberi	BOT	G2S2.1, Near Purdy Cr.	NDDB
Jawbone Ridge	Blue oak woodland	OAK		Keeler-Wolf
Jelmini-Bear Trap Basin	Aspen	WET		STAN
	Montane meadow	WET		STAN
Jerseydale	Mimulus filicaulis	BOT	G2S2.2`	NDDB
	Black oak woodland	OAK		GAP
	Interior live oak woodland	OAK		GAP
	White alder riparian forest	RIP		GAP
Jose Creek	Foothill yellow-legged frog	AQU	only location in SIE	SIE, PRC
	Riparian	RIP		AQ
June Lake	Aspen	WET		GAP
	Osprey	WET	breeding	INY
	Willow flycatcher	WET		NDDB
June Lake Junction	Lupinus duranii	BOT	G2S2.2 pumice flat	NDDB
	Astragalus monoensis var monoenisi	BOT	G2T2S2.2 pumice	NDDB
Kaiser	Epilobium howellii	BOT	G1S1.3	NDDB
Kaiser Ridge	Huckleberry oak chaparral	CHAP	largest stand in ecoregion	GAP
Kassabaum Meadows	Great gray owl	WET		
	Montane meadow	WET		
Kaweah River	Raillardiopsis muirii	BOT	G2S2.3	NDDB
	Asplenium septentrionale	BOT	G3G4S2.3	NDDB
	Montane riparian scrub	RIP		GAP
	Neotropical migrants	RIP	only known in ecoregion	SNEP-SNA
	Riparian	RIP	Substantial & outstanding	CARA
	Riparian forest	RIP		SNEP-SNA

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Kaweah River Foothills	Eriogonum nudum var murinum	BOT	G5T2S2.2	NDDB
	Mimulus norrisii	BOT	G2S2.3	Norris
	Ribes menziesii var ixoderme	BOT	G4T3S3.2	SNEP-SNA
	Blue oak woodland	OAK	largest protected stand in ecoregion	SNEP-SNA, GAP
	Interior live oak woodland	OAK		GAP
Kaweah River, SFK	Springs	AQU		SNEP-ADA, PRC
	Meadow stream	AQU		SNEP-ADA, PRC
	California roach stream	AQU		SNEP-ADA, PRC
	Mt Lyell salamander	AQU		SNEP-ADA, PRC
	Yellow-blotched salamander	AQU		SNEP-ADA, PRC
	Foothill ephemeral stream	AQU		SNEP-ADA, PRC
	Hardhead	AQU		SNEP-ADA, PRC
	Pikeminnow/sucker stream	AQU		SNEP-ADA, PRC
	Hardhead/pikeminnow stream	AQU		NDDB
	San Joaquin roach	AQU	unusual chisel-lipped var.	SNEP-ADA, PRC
	Brodiaea insignis	BOT	G2S2.2	NDDB
	Eriogonum nudum var murinum	BOT	G5T2S2.2	NDDB
	Mimulus norrisii	BOT	G2S2.3	NDDB
	Oreoana purpurascens	BOT	G3S3.2	NDDB
Kelso Creek	Canbya candida	BOT	G2S2.2	NDDB
	Mimulus shevockii	BOT	G1S1.2 riparian associate	NDDB
	Neotropical migrants	RIP	migration corridor	AUD
Kelso Peak / Valley	Mimulus shevockii	BOT	G1S1.2	NDDB
	Canbya candida	BOT	G2S2.2	NDDB
Kennedy Lake	Aspen	WET		GAP
Kern River Canyon	Kern Canyon slender salamander	AQU	endemic	NDDB
	Heterotheca shevockii	BOT	G2S2.3	NDDB
	Mimulus pictus	BOT	G2S2.2	NDDB
	Southern interior cypress for	CUF		NDDB
	Blue oak woodland	OAK		GAP
	Oregon oak woodland	OAK		GAP
	Great Valley cottonwood riparian	RIP		GAP
Kern River, NFK lower	Hot springs outflow	AQU		SNEP-ADA
	Springs	AQU		SNEP-ADA
	Tehachapi slender salamander	AQU		SNEP-ADA
	Pikeminnow/sucker stream	AQU		SNEP-ADA
	Foothill ephemeral stream	AQU		SNEP-ADA
	Hardhead	AQU		NDDB
	Hardhead/pikeminnow stream	AQU		NDDB
	Kern Canyon slender salamander	AQU		NDDB

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Kern River, NFK upper	Endemic salamander spp.	AQU		SNEP-ADA
	Kern golden trout stream	AQU		SNEP-ADA
	Kern River rainbow trout	AQU		SNEP-SNA
	Little kern golden trout	AQU		SNEP-ADA
	Meadow stream	AQU		SNEP-ADA
	Volcano Creek golden trout	AQU		NDDB
	Erigeron multiceps	BOT	riparian associate 2 NDDB obs; G1S1.2	NDDB
	Astragalus shevockii	BOT	G2S2.3	NDDB
	Phacelia novenmillensis	BOT	G2S2.2	NDDB
	Delphinium inopinum	BOT	G3S3.2	NDDB
	Montane black cottonwood riparian	RIP		GAP
	Riparian	RIP	Outstanding & substantial	CARA
	Riparian woodland	RIP		SNEP-SNA
Kern River, SFK	Endemic salamander spp.	AQU	undescribed	SNEP-SNA
	Hardhead/squawfish stream	AQU		NDDB
	Kern golden trout stream	AQU		SNEP-ADA
	Meadow stream	AQU		SNEP-ADA
	Mountain yellow-legged frog	AQU		SNEP-ADA
	South Fork Kern golden trout	AQU		SNEP-ADA
	Volcano Creek golden trout	AQU		NDDB
	Western pond turtle	AQU		SNEP-SNA, NDDB
	Foothill ephemeral stream	AQU		SNEP-ADA, PRC
	Springs	AQU		SNEP-ADA, PRC
	Hot springs outflow	AQU		SNEP-ADA, PRC
	Pikeminnow/sucker stream	AQU		SNEP-ADA, PRC
	Kern River rainbow trout	AQU		SNEP-ADA, PRC
	Kern Canyon slender salamander	AQU		SNEP-ADA, PRC
	Mountain yellow-legged frog	AQU		SNEP-ADA, PRC
	Foothill yellow-legged frog	AQU		SNEP-ADA, PRC
	Erigeron multiceps	BOT	riparian associate 10 NDDB obs; G1S1.2	NDDB
	Horelia tularensis	BOT	G1S1.3	NDDB
	Cottonwood willow riparian	RIP	largest stand	SNEP-SNA
	Great Valley cottonwood riparian	RIP		GAP
	Riparian	RIP	Substantial	CARA
	Western yellow-billed cuckoo	RIP	largest known population	SNEP-SNA, NDDB
	yellow warbler	RIP	neotropical migrant	NDDB
	yellow-breasted chat	RIP	neotropical migrant	NDDB
Kerrick Meadows	Alpine or subalpine meadow	WET		GAP
Kings Meadow	Bog	WET	large private	ELD

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Kings River	Kern brook lamprey	AQU	spawning; isolated from CV	SIE
	Riparian	RIP		SNEP-SNA
Kings River, NFK	Sierra Nevada fell-field	ALP		GAP
	Yosemite toad	AQU		
	Mountain yellow-legged frog	AQU		
Kings River, SFK & MFK	Swainson's thrush	RIP		EXP
	Foothill ephemeral stream	AQU		SNEP-ADA
	Hardhead/pikeminnow stream	AQU		SNEP-ADA
	Pikeminnow/sucker stream	AQU		SNEP-ADA
	California roach stream	AQU		SNEP-ADA
	Foothill yellow-legged frog	AQU		SNEP-ADA
	Hardhead	AQU		SNEP-ADA
	Kern brook lamprey	AQU		SNEP-ADA
	Meadow stream	AQU		SNEP-ADA
	Mountain yellow-legged frog	AQU		SNEP-ADA
	Mt. Lyell salamander	AQU		SNEP-ADA
	San Joaquin roach	AQU		SNEP-ADA
	Springs	AQU		SNEP-ADA
	Western pond turtle	AQU		SNEP-ADA
	Carex tompkinsii	BOT	G2S2.2	NDDB
	Raillardiopsis muirii	BOT	G2S2.3	NDDB
	Streptanthus fenestratus	BOT	G2S2.3. Coniferous forest	NDDB
	Riparian	RIP	Outstanding & substantial	CARA
Kinsman Flat	Collomia rawsoniana	BOT	G2S2.2. Riparian	NDDB
	Interior live oak chaparral	CHAP		SIE
	Interior live oak woodland	OAK		GAP
Kyburz	Ivesia sericoleuca	BOT	G2S2.2	TAH
	Marsilea oligospora	BOT	G5S3?	TAH
	Migratory waterfowl	LAND		TAH
	Fen	WET	private inholdings	TAH
	Great gray owl	WET	potential	TAH
	Greater sandhill crane	WET		TAH
	Montane freshwater marsh	WET	largest on TAH	TAH
Lake Davis	Astragalus lentiformis	BOT	G2S2.2	NDDB
	Aspen	WET	best in Plumas	PLUM
	Montane meadow	WET		PLUM

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Lake Tahoe	Tahoe benthic stonefly	AQU	endemic	NDDB
	Lahontan lake tui chub	AQU		
	Mountain sucker	AQU		
	Stygobromus tahoensis	AQU	endemic	
	Stygobromus lacicolus	AQU	endemic	
	Rorippa subumbellata	BOT	G1S1.1	NDDB, NVHERIT
Lakes Basin	Swainson's thrush	RIP	high priority site	Stefani
Last Chance	Loeflingia squarrosa var artemisia	BOT		
	Astragalus lentiformis	BOT		
	Ivesia aperta var aperta	BOT	G2T2S2.2	NDDB
	Ivesia seroleuca	BOT	G2S2.2	NDDB
	Alpine/subalpine meadow	WET		PLUM
	Fen	WET		
	Vernal pool	WET		
Last Chance Meadow RNA	Foxtail pine forest	CUF		INY
	Limber pine	CUF		Keeler-Wolf
	Alpine/subalpine meadow	WET		Keeler-Wolf
	Fen	WET		Keeler-Wolf
	Vernal pool	WET		Keeler-Wolf
Lava Top	Vernal pool	WET	Basalt mesa	PLUM
Lavezolla Creek	Foothill yellow-legged frog	AQU		SNEP-ADA
	Meadow stream	AQU		SNEP-ADA
	Mountain yellow-legged frog	AQU		SNEP-ADA
Leavitt Peak	Agrostis humilus	BOT	G4S1.3	NDDB
	Chaenactis douglasii var alpina	BOT	G5T4S1.3	NDDB
leco	Penstemon personatus	BOT	G2S2.2	NDDB
	Lewisia congdonii	BOT	G1S1.3	NDDB
ledi	Lewisia disepala	BOT	G2S2.3	NDDB
Lee Vining Canyon	Alpine dwarf scrub	ALP		GAP
	Bighorn sheep range	ALP	reintroduced	INY
	Arabis tiehmii	BOT	G1S1.3	NDDB
	California wolverine	CUF		NDDB
	Limber pine	CUF		GAP
Leek Springs Valley	Montane meadow	WET		ELD
lelo	Lewisia longipetala	BOT	G2s2.2	NDDB
Lincoln Valley	Fen	WET		SNEP-SNA
	Great gray owl	WET		NDDB
	Montane meadow	WET		SNEP-SNA

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Linns Valley	Fritillaria brandegii	BOT	G2S2.2	NDDB
	Calochortus westonii	BOT	G1S1.2	NDDB
	Blue oak	OAK		SNEP-SNA, GAP
	Interior live oak woodland	OAK		GAP
	Valley oak	OAK	best stand in subregion	SNEP-SNA
	Vernal pool	WET	wildflower displays	SNEP-SNA
Little Antelope Creek	Montane meadow	WET		
	Willow flycatcher	WET		
Little Kern, Lower	Astragalus shevockii	BOT	G2S2.3	NDDB, SNEP
Little Kern, upper	Huckleberry oak chaparral	CHAP	1 of only 2 sites in subregion	GAP
Little Last Chance Canyon	Ivesia aparta var aperta	BOT	G2T2S2.2	PLUM
	Aspen	WET		PLUM
Little Truckee River	Mountain yellow-legged frog	AQU		SNEP-ADA, PRC
	Lahontan cutthroat trout	AQU		SNEP-ADA, PRC
	Mountain sucker	AQU		SNEP-ADA, PRC
	Springs	AQU		SNEP-ADA, PRC
	Meadow stream	AQU		SNEP-ADA, PRC
	Alpine lake/pond	AQU		SNEP-ADA, PRC
	Cutthroat trout headwater	AQU		SNEP-ADA, PRC
	cutthroat trout/paiute sculpin str	AQU		SNEP-ADA, PRC
	Sucker/dace/redside/trout stream	AQU		SNEP-ADA, PRC
	Sucker/dace/redside stream	AQU		SNEP-ADA, PRC
	Whitefish/trout/sucker stream	AQU		SNEP-ADA, PRC
	Sierra Nevada mountain beaver	RIP		NDDB
Little Walker	Aspen riparian forest	RIP		GAP
	Montane riparian scrub	RIP		SNEP-SNA, GAP
Logtown Ridge	Interior live oak woodland	OAK		GAP
Long Barn	Allium tribracteatum	BOT	G2S2.2	NDDB
	Lomatium stebbinsii	BOT	G2S2.2	NDDB
	Allium tribracteatum	BOT	G2S2.2	NDDB
Long Canyon	Semi-desert scrub	CHAP	Proposed RNA	GAP; RNA
	Shin oak brush chaparral	CHAP	Proposed RNA	GAP; RNA
Long Canyon - PLA	Lewisia serrata	BOT	G2S2.2	NDDB
	Phacelia stebbinsii	BOT	G3S3.2	NDDB
	Black oak woodland	OAK		GAP
Long Meadow	Botrychium crenulatum	BOT	wetland target	
	Trifolium bolanderi	BOT	wetland target	
	Montane freshwater marsh	WET		SIE, SNEP-SNA
	Montane meadow	WET		
	Southwest willow flycatcher	WET		SIE, SNEP-SNA

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
lost	Lomatium stebbinsii	BOT	G2S2.2. At Bailey Ridge. coniferous forest	NDDB
luda	Lupinas dalesiae	BOT	G3S3.2	NDDB
Lundy Canyon	Aspen forest	WET	only stand identified in area	INY
	Willow flycatcher	WET		INY
lusp	Lupinus spectabilis	BOT	G2S2.2.chl,ciswd	NDDB
Lyons / Needle Peak	Lewisia longipetala	BOT	G2S2.2	NDDB
	Veronica cusickii	BOT	G5S3.3	TAH
	Alpine / subalpine meadow	WET		TAH
	Bog	WET		TAH
	Fen	WET		TAH
Mammoth Creek	Sierra Nevada mountain beaver	RIP	1 of 2 pops. In INY	INY
Mapes Canyon	Camissonia tanacetifolia ssp	BOT	G5T3S3.2	NDDB
	Ivesia aperta var aperta	BOT	G2T2S2.2	NDDB
	Black oak	OAK		PLUM
Mariposa Creek	Sacramento hitch	AQU		SNEP-ADA
	Calyptridium puchellum	BOT	G1S1.1	NDDB
	Lupinus citrinus var deflexus	BOT	G2T1S1.2	NDDB
Mariposa Grove	Big tree forest	CUF		NDDB
	Pacific fisher	CUF		NDDB
	Spotted owl	CUF		SNEP
Markwood / Poison Meadow	Ivesia unguiculata	BOT	G2 S2.2. Wetland target	NDDB
	Great gray owl	WET	suitable habitat	SIE
	Montane meadow	WET	numerous stringer meadows	SIE, SNEP-
	Southwest willow flycatcher	WET		SIE
McGee Creek	Montane black cottonwood	RIP	uncommon	INY
	Waterbirch riparian scrub	RIP		EXP
	Aspen	WET		GAP
McKinley Grove	Big tree forest	CUF		SIE
Meadow Lakes	Lupinus citrinus var citrinus	BOT	G2T2S2.2	SNEP-SNA
	Calyptridium pulchellum	BOT	G1S1.1	NDDB
Meiss Meadow	Epilobium oreganum	BOT	G2S2.2	NDDB
	Bush chinquapin chaparral	CHAP	secondary cover type	GAP
	Alpine or subalpine meadow	WET	One of the largest	SNEP-SNA
Merced chaparral	Bush chinquapin chaparral	CHAP	only bush chinquapin in subregion	GAP

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Merced River	Hardhead/pikeminnow stream	AQU		SNEP-ADA
	Limestone salamander	AQU		SNEP-ADA
	Mountain yellow-legged frog	AQU		SNEP-ADA
	Mt. Lyell salamander	AQU		NDDB
	hot springs outflow	AQU		
	black swift	RIP	numerous occurrences in Yosemite	NDDB
	San Joaquin roach	AQU		
	hardhead	AQU		
	Yosemite toad	AQU		SNEP-ADA
	Carex tompkinsii	BOT	G2S2.2	NDDB
	Clarkia lingulata	BOT	G1S1.1	NDDB
	Eriophyllum congdonii	BOT	G2S2.2	NDDB
Merced River, NFK	California roach stream	AQU		SNEP-ADA, PRC
	Foothill ephemeral stream	AQU		SNEP-ADA, PRC
	Foothill yellow-legged frog	AQU		SNEP-ADA, PRC
	Limestone salamander	AQU		SNEP-ADA, PRC
	Springs	AQU	limestone	SNEP-ADA, PRC
	Western pond turtle	AQU		SNEP-ADA, PRC
	Mimulus filicaulis	BOT	G2S2.2	NDDB
Merced River, SFK	Hardhead/pikeminnow stream	AQU		PRC
	Meadow stream	AQU		SNEP-ADA
	Springs	AQU		
	Allium yosemitensis	BOT	G2S2.3	NDDB
	Eriophyllum congdonii	BOT	G2S2.2	NDDB
	Lewisia congdonii	BOT	G1S1.3	NDDB
	Eriophyllum nubigenum	BOT	G2S2.3	NDDB
Milford	Black oak woodland	OAK	unusual eastside eo.	GAP, PLUM
Mill Creek	Sycamore alluvial woodland	RIP		NDDB
Milo	Clarkia springvillensis	BOT	G1S1.1	NDDB
	Blue oak woodland	OAK		GAP
	Interior live oak woodland	OAK		GAP
Mineral King	Asplenium septentrionale	BOT	G3G4S2.3	NDDB
	Foxtail pine forest	CUF	largest single tree	GAP, SNEP-SNA
Mokelumne River, NFK	Foothill yellow-legged frog	AQU		SNEP-ADA, PRC
	Mountain yellow-legged frog	AQU		SNEP-ADA, PRC
	Western pond turtle	AQU		SNEP-ADA, PRC
	Yosemite toad	AQU		SNEP-ADA, PRC
	Meadow stream	AQU		SNEP-ADA, PRC

APPENDIX III: Portfolio Site Profiles
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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Monanche Meadow	Abronia alpina	BOT	G1S1.1	INY, GAP, SNEP-SNA
	Botrychium crenulatum	BOT	G3S1.2	INY, GAP, SNEP-SNA
	Botrychium crenulatum	BOT	G3S1.2	NDDB
	Silver sagebrush scrub	GBS		GAP
	Alpine or subalpine meadow	WET		INY, GAP, SNEP-SNA
	Great gray owl	WET		INY, GAP, SNEP-SNA
	Montane meadow	WET		INY, GAP, SNEP-SNA
	Willow flycatcher	WET		INY, GAP, SNEP-SNA
Monitor Pass	Fisher	CUF		TOI
	Old growth	CUF		TOI
	Pine martin	CUF		TOI
	Sage grouse	GBS		TOI
	Subalpine sagebrush	GBS		TOI, GAP
	Aspen	WET		TOI, GAP
Mono Hot Springs	Alkali meadow	WET	surrounded by development	SIE
	Hotspring outflow	AQU	surrounded by development	SIE
	Camissonia sierrae ssp alticola	BOT	G2G3T1 S1.2	NDDB
	Montane freshwater marsh	WET		SIE
	Willow flycatcher	WET		NDDB
Mosquito Ridge / Oak Flat	Lewisia serrata	BOT	G2S2.2	NDDB
	Black oak	OAK		SNEP-SNA
Mount Rose	Arabis tiehmii	BOT	G1S1.3	Nachlinger
	Draba asterophora var asterophora	BOT	G4T2S1.3	NVHERIT, Nachlinger
	Washoe pine	CUF		TOI, SNEP-
Mountain Home	Clarkia springvillensis	BOT	G1S1.1	NDDB
	Dicentra nevadensis	BOT	G3S3.3	SNEP-SNA
	Dudleya cymosa ssp costafolia	BOT	G5T2S2.2	NDDB
	Erigeron inoratus var keilii	BOT	G5T1S1.2	NDDB
	Eriogonum twisselmanii	BOT	G2S2.2	NDDB
	Erythronium pusaterii	BOT	G2S2.3	NDDB
	Fritillaria brandegei	BOT	G2S2.2	NDDB
	Oreonana purpurascens	BOT	G3S3.2	NDDB
	Calochortus westonii	BOT	G1S1.2	NDDB
	Delphinium inopinum	BOT	G3S3.2	NDDB
	Big tree forest	CUF		NDDB, GAP
	Pacific fisher	CUF	largest population in ecoregion	SNEP-SNA
	Spotted owl	CUF		SNEP
	Blue oak woodland	OAK		GAP
	Interior live oak woodland	OAK		GAP

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Mt Aukum	Black oak woodland	OAK		GAP
	Blue oak woodland	OAK		GAP
Mt. Baxter	Alpine dwarf scrub	ALP		GAP
	Bighorn sheep range	ALP		INY
	Astragalus monoensis var ravenii	BOT	G2T1QS1.3	NDDB
	Hackelia sharsmithii	BOT	G3S3.3	NDDB
	Cercocarpus ledifolius	GBS		GAP
	Riparian	RIP		SNEP-SNA
	Waterbirch/western birch riparian	RIP		NDDB
	Aspen	WET		SNEP-SNA
Mt. Eaton	Erythronium tuolumnense	BOT	G2S2.2	NDDB
	Black oak woodland	OAK		GAP
	Interior live oak woodland	OAK		GAP, STAN
Mt. Langley	Alpine dwarf scrub	ALP		GAP
	Bighorn sheep range	ALP		INY
	Montane meadow	WET		GAP
Mt. Lyell	Mount Lyell salamander	ALP		SIE, NDDB
	Claytonia megarhiza	BOT	G4?S2S3	NDDB
Mt. Tom	Alpine dwarf scrub	ALP		GAP
	Blackbush scrub	GBS	common btwn Bishop-Lone Pine	INY
Mt. Williamson	Alpine dwarf scrub	ALP		GAP
	Bighorn sheep range	ALP		INY
	Trifolium macilentum var dedeckera	BOT		NDDB
	Cercocarpus ledifolius	GBS		GAP
Mud Lake RNA	Northern interior cypress forest	CUF	RNA, southern limit Baker cypress	NDDB, Keeler-Wolf
	Montane freshwater marsh	WET	RNA	Keeler-Wolf
Murphy Meadows	Sierra Nevada mountain beaver	RIP		NDDB
	Montane meadows	WET		GAP
Nelson Creek	Montane meadow	WET	McRae Meadow ungrazed	PLUM
	Willow flycatcher	WET	potential	PLUM
netw	Nemacladus twisselmannii	BOT	G1S1.2. Jeffrey pine forest. Edge of Kern Plateau	NDDB
New York Ravine	Caddisflies	AQU	2 rare caddisflies	TAH
	Springs	AQU		TAH
North Greenhorn Mts.	Big tree forest	CUF	southern-most stands	NDDB, GAP
	Pacific fisher	CUF		NDDB
	Spotted owl	CUF		SNEP
North Table Mountain	Juncus leiospermus var leiosp	BOT	G2T2S2.2	NDDB
	Monardella douglasii ssp veno	BOT	G5T1S1.1	NDDB
	Interior live oak woodland	OAK		GAP

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Oak Creek, South Fork	Black oak forest	OAK	unusual eastside occ.	INY
	Interior live oak forest	OAK	unusual eastside occ.	INY
Olancha Creek	Native amphibian spp.	AQU	div amph/rip complex	INY
	Neotropical migrants	RIP	div amph/rip complex	INY
Olancha Peak	Alpine dwarf scrub	ALP		GAP
	Eriogonum wrightii var olanchense	BOT	G5T1S1.3	NDDB
	Monardella benolens	BOT	G1S1.3	NDDB
	Trifolium macilentum var dedeckera	BOT	G?T2S2.3	NDDB
Onion Valley	Alpine dwarf scrub	ALP		GAP
	Draba sharsmithii	BOT	G1S1.3	NDDB
	Hackelia sharsmithii	BOT	G3S3.3	NDDB
Oregon Hills	Black oak woodland	OAK		GAP
	Orgeon oak woodland	OAK		GAP
Owens Valley oaks	Calochortus excavatus	BOT	G3S3.1	NDDB
	Live oak	OAK	5 stands	SNEP-SNA
Packsaddle Canyon	Semi- desert chaparral	CHAP	largest stand	GAP
Packsaddle Pass	Bush chinquapin chaparral	CHAP		GAP
	Eastside ponderosa pine	CUF	disjunct	
	Aspen	WET		GAP
	Montane meadow	WET		NDDB
	Willow flycatcher	WET		NDDB
Paiute Meadows	Old growth	CUF		TOI
Paiute Mountains	Calochortus palmeri var palme	BOT	G2T2S2.2	NDDB
	Delphinium inopinum	BOT	G3S3.2	NDDB
	Interior live oak chaparral	CHAP		GAP
	Scrub oak chaparral	CHAP	1 of 2 in subregion	GAP
	Semi-desert scrub chaparral	CHAP	1 of 2 largest	GAP
	Shin oak brush chaparral	CHAP		GAP
	Southern interior cypress forest	CUF	Bodfish Botanical Area	SNEP-SNA,
	Spotted owl	CUF		SNEP
	Mojavean pinyon juniper woodland	GBS		GAP
Parade Ground	Interior live oak chaparral	CHAP		GAP

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Paradise Peak	Calochortus westonii	BOT	G1S1.2, proposed ACEC	SNEP-SNA
	Ribes tularensis	BOT	G2S2.2	NDDB
	Shin oak brush chaparral	CHAP	largest secondary cover type	GAP
	Big tree forest	CUF		SNEP-SNA,
	Northern goshawk	CUF		NDDB
	Old growth	CUF		SNEP
	Pacific fisher	CUF		NDDB
	Spotted owl	CUF		SNEP-SNA
	Shpagnum bog	WET	southernmost in ecoregion	SNEP-SNA
Park Ridge	Erigeron aequifolius	BOT	G2S2.3	NDDB
	Big tree forest	CUF		NDDB, GAP,
	Northern goshawk	CUF		NDDB
	Old growth	CUF		SNEP
	Pacific fisher	CUF		NDDB
Parker Bench	Carex tiogana	BOT	G1S1.3	NDDB
	Aspen forest	WET		GAP
	Montane meadow	WET		GAP
Parker Creek, South	Aspen riparian forest	RIP		GAP
Pat Yore Flat	Darlingtonia californica	BOT		TAH
	Darlingtonia bog	WET	with insectivorous plants	TAH
	Fen	WET		TAH
Peavine Peak	Sierra mountain shrub	GBS		GAP
	Eriogonum robustum	BOT		Nachlinger
	Plagiobothrys glomeratus	BOT		Nachlinger
pepe	Penstemon personatus	BOT	coniferous forest	NDDB
Perazzo Meadow Complex	Lahontan cutthroat trout	AQU		TAH
	Springs	AQU		TAH
	Alpine or subalpine meadow	WET	excellent quality	TAH
	Aspen	WET		TAH
	Fen	WET		TAH
	Great gray owl	WET	potential habitat	TAH
	Sierra Nevada mountain beaver	WET		TAH
	Willow flycatcher	WET	largest viable pop. in Sierra	TAH
phst	Phacelia stebbinsii	BOT	G3S3.2	NDDB
Picayune	Aspen	WET		TAH
	Montane meadow	WET		TAH, SNEP-SNA
	Vernal pool	WET		TAH, SNEP-SNA
Pierce Meadow	Montane meadow	WET	excellent westside meadow	TAH

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Pigeon Gulch	Lewisia congdonii	BOT	G1S1.3	NDDB
	Eriophyllum congdonii	BOT	G2S2.2	NDDB
	Allium yosemitense	BOT	G2S2.3	NDDB
Pilot Knob	Interior live oak chaparral	CHAP	only occ. In subregion	GAP
	Semi-desert chaparral	CHAP	large secondary cover type	GAP
Pine Ck	Modoc-Great Basin riparian scrub	RIP		GAP
	Waterbirch/western birch riparian	RIP		NDDB
Pine Hill	Calystegia stebbinsii	BOT	G1S1.1	
	Fremontodendron decumbens	BOT	G1S1.2	
Pole Creek	Lahontan cutthroat trout	AQU	critical refuge	TAH, SNEP-ADA
	Lewisia longipetala	BOT	G2S2.2	NDDB
Prosser Reservoir	Ivsesia sericoleuca	BOT	G2S2.2, good quality	TAH
pspe	Pseudobahia peirsonii	BOT	G2S2.1	NDDB
	Sidalcea keckii	BOT	G1S1.1, extripated?	NDDB
Pyramid Peak	Mount Lyell salamander	ALP	northernmost population	NDDB
	Lewisia longipetala	BOT	G2S2.2	NDDB
Quiggs Mtn	Arctostaphylos myrtifolia	BOT	G2S2.2	NDDB
	Interior live oak woodland	OAK		GAP
Rainbow Meadow	Alpine meadow	WET	pot. RNA	SNEP-SNA, TOI
Ramshaw / Templeton Meadow	Silver sagebrush scrub	GBS		GAP
	Joshua tree woodland	GBS		GAP
	Abronia alpina	WET	only occ. In subregion	INY, LIT,
	Alpine or subalpine meadow	WET		INY, LIT,
	Botrychium crenulatum	WET	G3S1.2	INY, LIT,
	Great gray owl	WET		INY, LIT,
	Montane meadow	WET		INY, LIT,
	Willow flycatcher	WET	excellent	INY, LIT,
Rancheria Creek	Meadow stream	AQU		SNEP-ADA
	High quality aquatic habitat	AQU	nearly pristine	SNEP-ADA
Red Clover Valley	Astragalus lentiformis var kernens	BOT	G2S2.2	NDDB
	Carex sheldonii	BOT	G4S2.2	NDDB
	Montane meadow	WET	Large, private	PLUM
Red Hills	Allium tuolumnense	BOT	G2S2.2	NDDB
	Brodiaea pallida	BOT	G1S1.1	NDDB
	Chlorogallum grandiflorum	BOT	G2S2.2	NDDB
	Fritillaria agrestis	BOT	G3S3.2	NDDB
	Lomatium congdonii	BOT	G2S2.2	NDDB
	Vebena californica	BOT	G2S2.1	NDDB

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Red Lakes	Alpine or subalpine meadow	WET		ELD
	Great gray owl	WET		NDDB
	Sierra Nevada mountain beaver	WET		NDDB
	Willow flycatcher	WET		ELD
Red Rock	Bush chinquapin chaparral	CHAP		GAP
Return / Rancheria Mdws	Montane meadow	WET		GAP
rhca	Rhynchospora californica	BOT	G1S1.1. Bucks Mdw., powerlines	NDDB
Richardson Pk	Huckleberry oak chaparral	CHAP		GAP
Rock Creek	Western pond turtle	AQU		
Rock Creek Lake	Aspen forest	WET		GAP
Rock Creek-INY	Owens speckled dace	AQU		
	Astragalus monoensis var monoensis	BOT	G2T2S2.2	NDDB
	Cercocarpus ledifolius	GBS		GAP
	Montane black cottonwood riparian	RIP	uncommon	INY
	Waterbirch riparian scrub	RIP		NDDB
Rockbound Valley	Alpine or subalpine meadow	WET	wilderness area	SNEP
Rodeo Meadow	Alpine or subalpine meadow	WET	Class 1 land	SIE
Rose Creek	California roach stream	AQU		SNEP-ADA, PRC
	Foothill ephemeral stream	AQU		SNEP-ADA, PRC
	Foothill yellow-legged frog	AQU		SNEP-ADA, PRC
	Western pond turtle	AQU		SNEP-ADA, PRC
	San Joaquin roach	AQU		SNEP-ADA, PRC
	Erythronium tuolumnense	BOT	G2S2.2	NDDB
Round Valley	Great gray owl	WET		
	Montane meadow	WET		
	Willow flycatcher	WET		
Roundtop	Chaenactis douglasii var alpina	BOT	G5T5S2.3	NDDB
Rubicon Canyon	Lewisia serrata	BOT	G2S2.2 riparian associate	NDDB
	Phacelia stebbinsii	BOT	G3S3.2 riparian associate	NDDB
	Black oak	OAK		ELD, GAP
Rubicon River	Foothill yellow-legged frog	AQU		ELD
	Riparian	RIP	substantial	CARA
	Swainson's thrush	RIP		EXP
Rubicon River, upper	Mount Lyell salamander	AQU	near Pyramid Peak, northern limit	NDDB
Saddlebag Lake	Arabis tiehmii	BOT	G1S1.3	NDDB

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Sagehen/Carpenter Valley	Caddisflies	AQU	3 rare spp, including Cold Spring Caddisfly; within Little Truckee	TAH
	Mountain yellow-legged frog	AQU	within Little Truckee site	TAH
	Drosera anglica	BOT	G5 S2S3	TAH
	Ivesia sericoleuca	BOT	G2 S2.2	TAH
	Montane riparian scrub	RIP	south of sagehen/carpenter valley	GAP
	Sierra Nevada mountain beaver	RIP		TAH, NDDB
	Aspen	WET		TAH
	Bog	WET	numerous	TAH
	Fen	WET		TAH
	Montane meadow	WET	Carpenter Valley private	TAH
	Willow flycatcher	WET		NDDB
Salt Creek-TUL	Clarkia springvillensis	BOT	G1S1.1	SNEP-SNA
San Joaquin R., SFK	Aspen	WET	at Blaney Meadow	SIE
	Yosemite toad	AQU		
	Camissonia sierrae	BOT	G2G3T1S1.2	NDDB
	Riparian	RIP	Substantial	CARA
San Joaquin R., upper NFK	Mountain yellow-legged frog	AQU		PRC
	Huckleberry oak chaparral	CHAP	secondary cover type	GAP
	Riparian	RIP		AQ
San Joaquin River Foothills	Blue oak woodland	OAK		GAP, TNC
	Interior live oak woodland	OAK		GAP
	Northern basalt flow vernal pool	WET		SIE, NDDB
	Northern vernal pool	WET		NDDB, EXP
Sand Canyon	Neotropical migrants	RIP	ACEC, PIF site	BLM
	Riparian	RIP		BLM
Sand Canyon Woodlands	Joshua tree woodland	GBS		GAP
Sardine Valley	Ivesia sericoleuca	BOT	G2 S2.2	TAH
	Migratory shorebirds	WET		TAH
	Montane freshwater marsh	WET		TAH
	Wetland	WET	waterfowl	TAH
satr	Sanicula tracyi	BOT	G3S3.2	NDDB
Sawmill Peak	Allium jepsonii	BOT	G1S1.2	NDDB
	Shin oak chaparral	CHAP		Clifton
	Northern interior cypress forest	CUF		Clifton
School House Creek	Northern leopard frog	AQU	crit refuge. ADA	SNEP-ADA
Schultz Mountain	Blue oak woodland	OAK		GAP
	Interior live oak woodland	OAK		GAP

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Scodie Mountains	Astragalus ertterae	BOT	G1S1.3	NDDB, SNEP
	Lewisia disepala	BOT	G2S2.3	NDDB
	Mojave mixed woody scrub	GBS		GAP
	Mojavean pinyon juniper woodland	GBS		GAP
Scodie Mountains - West	Semi-desert chaparral	CHAP	secondary cover type	GAP
Secret Canyon	Bush chinquapin chaparral	CHAP		GAP
Shadow Lake Meadows	Alpine or subalpine meadow	WET	Aggregation of meadows	SNEP
Shepard Ck	Waterbirch/western birch riparian	RIP		NDDB
Siberian Outpost	Arabis bodiensis	BOT	G1S1.3	NDDB
	Subalpine meadow	WET	unusually dry sandy	SNEP-SNA
Sierra Buttes	Asplenium trichomanes-ramosum	BOT	G4S1.3 only known occ.	TAH, NDDB
Sierra Valley	Ivesia aperta var aperta	BOT	G2T2 S2.2	TAH
	Ivesia sericoleuca	BOT	G2 S2.2	TAH
	Ivesia webberi	BOT	G2 S2.1	TAH
	Marsilea oligospora	BOT	G5S3?	TAH
	Polygonum polygaloides ssp es	BOT	G4G5T1S1.1. GBS	
	Pyrrocoma lucida	BOT	G1S1.2	TAH
	Silver sagebrush scrun	GBS		
	Migratory waterfowl	LAND		TAH
	Alkali meadow	WET		TAH
	Black tern	WET	largest breeding pop. in ecoregion	TAH
	California gull	WET	potential	TAH
	Greater sandhill crane	WET		TAH
	Montane freshwater marsh	WET		TAH
	Vernal pool	WET		TAH
	Wilson's phalarope	WET	southernmost pop.	TAH
	Yellow headed blackbird	WET	largest pop. In ecoregion	TAH
Silver / Wolf Creeks	Aspen	WET		SNEP-SNA
Silver Creek	Huckleberry oak chaparral	CHAP	secondary cover type	GAP
Silver Creek - Plumas	Lupinus dalesiae	BOT	G3S3.2	NDDB
	Monardella follettii	BOT	G1S1.2	NDDB
	Westside ponderosa pine	CUF		GAP
Silver Creek (Potts Cabin)	Viola tomentosa	BOT	G3S3.2	NDDB
	Phacelia stebbinsii	BOT	G3S3.2	NDDB

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Silver King	Mountain yellow-legged frog	AQU	see Carson River, EFK	TOI
	Paiute cutthroat trout	AQU	see Carson River, EFK	TOI, NDDB
	Yosemite toad	AQU	see Carson River, EFK	
	Northern goshawk	CUF		TOI
	Old growth	CUF		TOI
	Bog	WET		TOI
	Great gray owl	WET		TOI
	Subalpine/alpine meadow	WET		GAP
Silver Lakes Meadows	Alpine or subalpine meadow	WET	meadow complex	GAP
sist	Sidalcea stipularis	BOT	G1S1.1. Along hwy 174. Psture, pot hwy expansion by caltrans,	NDDB
Six Bit Gulch	Red Hills roach	AQU	only known occurrence	NDDB
Slide Bluffs	Huckleberry oak chaparral	CHAP	primary and secondary cover	GAP
Slinkard Valley	Old growth	CUF	old growth ponderosa pine	BLM
	Pine martin	CUF		BLM
	Sierra Nevada mountain beaver	RIP		BLM
Smith Meadow	Montane meadow	WET		SIE
	Sphagnum bog	WET	potential	SIE
Snow Canyon	Montane meadow	WET	RNA	ELD
Snow Corral	Montane meadow	WET		SIE
	Sphagnum bog	WET	acidic	SIE
Soda Springs	Springs	AQU		TOI
	Alkali seep	WET		TOI
Sonora Pass	Old growth	CUF		SNEP
South Fork Valley	Mimulus pictus	BOT	G2S2.2	NDDB
	Willow flycatcher	WET		NDDB
South Lake Tahoe	Alpine or subalpine meadow	WET		Shufford
	Forster's tern	WET		Shufford
	Willow flycatcher	WET		NDDB
Spanish Needle	Allium shevockii	BOT	G1S1.3	NDDB
	Ericamerica gilmanii	BOT	G1S1.3	NDDB
	Erigeron aequifolius	BOT	G2S2.3	NDDB
	Eriogonum breedlovei var shevockii	BOT	G3T3S3.3	NDDB
	Lomatium shevockii	BOT	G1S1.3	NDDB
	Monardella benolens	BOT	G1S1.3	NDDB
	Phacelia nashiana	BOT	G3S3.2	NDDB
	Raillardiopsis murii	BOT	G2S2.3	NDDB
	Trifolium macilentum var dedeckera	BOT	G?T2S2.3	NDDB
	Phacelia novenmillensis	BOT	G2S2.2	NDDB
	Mojave mixed woody scrub	GBS		GAP
	Joshua tree woodland	GBS		GAP

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
	Mojavean pinyon juniper woodland	GBS		GAP
	Phacelia novenmillensis	GBS		NDDB
Spenceville	Blue oak woodland	OAK		GAP
	Interior live oak woodland	OAK		GAP
	Valley oak woodland	OAK		GAP
Spring Garden	Lupinas dalesiae	BOT	G3S3.2	NDDB
	Arabis constancei	BOT	G2S2.2	NDDB
Squaw Hollow	Arctostaphylos nisseniana	BOT	G2S2.2	NDDB
	Black oak woodland	OAK		GAP
	Blue oak woodland	OAK		GAP
	Interior live oak woodland	OAK		GAP
Squaw Valley	Astragalus lentiformis	BOT	G2S2.2	NDDB
	Ivesia sericoleuca	BOT	G2S2.2	NDDB
	Aspen	WET		PLUM
	Fen	WET		PLUM
	Montane meadow	WET	Large	PLUM
	Vernal pool	WET		PLUM
Squaw Valley Meadows	Alpine or subalpine meadow	WET	complex within Mokelumne wilderness	SNEP
Stag Point	Bush chinquapin chaparral	CHAP		GAP
Stanislaus River, SFK	Meadow stream	AQU		SNEP-ADA
	Spring	AQU		SNEP-ADA
	Foothill yelow-legged frog	AQU		SNEP-ADA
	Mount Lyell salamander	AQU		SNEP-ADA
	Mountain yellow-legged frog	AQU		SNEP-ADA
	Yosemite toad	AQU		
	Riparian	RIP	watershed in excellent condition	SNEP-ADA
Steamboat	Bush chinquapin chaparral	CHAP		GAP
stfe	Streptanthus fenestratus	BOT	G2S2.3	NDDB
Strawberry Meadow	Alpine or subalpine meadow	WET		GAP
	Montane meadow	WET		GAP
Summit Meadow	Streptanthus oliganthus	BOT	G3S2.2	NDDB
	Old growth	CUF		TOI
	Montane meadow	WET		TOI
	Willow flycatcher	WET		NDDB
Sunset Lakes	Dystrophic lake	AQU	see Mokelumne River, NFK	
Sycamore Creek	Western pond turtle	AQU	common - better example	SIE
	Kern brook lamprey	AQU		
	Carpenteria californica	BOT	G2S2.2, good habitat	SIE

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AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Table Mountain	Allium jepsonii	BOT	G1S1.2	NDDB
	Allium tuolumnense	BOT	G2S2.2	NDDB
	Chlorogalum grandiflorum	BOT	G2S2.2	NDDB
	Northern vernal pool	WET		Wood
Taboose Creek	Alpine dwarf scrub	ALP		GAP
	Astragalus monoensis var ravenii	BOT	G2T1QS1.3	NDDB
	Waterbirch/western birch riparian	RIP	numerous - good example	INY
Tahoe Meadows	Sierra mountain shrub	GBS		GAP, TOI
	Montane freshwater marsh	WET		TOI
Tamarack	Huckleberry oak chaparral	CHAP	secondary cover type	GAP
Teakettle Creek RNA	Montane meadow	WET	wet (stringer-type)	Keeler-Wol
	Raillardella muirii	WET	G2S2.3	Keeler-Wol
The Tombstone	Huckleberry oak chaparral	CHAP	secondary cover type	GAP
Thompson Peak	Black oak woodland	OAK		GAP
Tinemaha Aspen	Aspen forest	WET		
Tinemaha Creek	Calochortus excavatus	BOT	G3S3.1	NDDB
	Waterbirch/western birch ripa	RIP	numerous - good example	INY
Tioga Lake/Pass	Montane riparian scrub	RIP		GAP
Traverse Creek	Senicio layneae	BOT	G2S2.2	
Troy Meadow	Erigeron multiceps	BOT	G1S1.2	NDDB
	Horkelia tularensis	BOT	G1S1.3	NDDB
Truckee River/Canyon	Mountain yellow-legged frog	AQU		
	Lahontan cutthroat trout	AQU		
	California floater	AQU	only known site	
	Tui chub stream	AQU		
	Lowland riparian	RIP		TOI, GAP
	Riparian	RIP	substantial	CARA
	Sierra Nevada mountain beaver	RIP	8 eos	NDDB
Trumbell Peak	Allium yosemitense	BOT	G2S2.3	NDDB
	Eriophyllum congdonii	BOT	G2S2.2. foothill woodlands	NDDB
Tule River, NFK & MFK	Iris munzii	BOT	G3S3.3, largest pop.	SNEP-SNA
	black swift	RIP	only known in subregion	NDDB
	Riparian forest	RIP		SNEP-SNA
	Swainson's thrush	RIP		EXP
	White alder riparian forest	RIP	only known in subregion	ADMA
Tule River, upper SFK	Delphinium inopinum	BOT	G3S3.2	NDDB
	Eriogonum twisselmannii	BOT	G2S2.2	NDDB
	Oreonana purpurascens	BOT	G3S3.2	NDDB
Tungsten Hills	Mojave mixed woody scrub	GBS		GAP
	Blackbush scrub	GBS		GAP

APPENDIX III: Portfolio Site Profiles
(in alphabetical order)

AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Tuolumne Meadows	Yosemite toad	AQU		
	Great gray owl	WET		NDDB
	Montane meadow	WET		GAP
	Subalpine/alpine meadow	WET		
Tuolumne River	Riparian	RIP	Outstanding & Substantial	CARA
Tuolumne River Canyon	Black oak woodland	OAK		GAP
	Interior live oak woodalnd	OAK		GAP, STAN
Tuolumne River Foothills	Blue oak woodland	OAK		GAP, TNC
Tuolumne River, SFK	Mountain yellow-legged frog	AQU		SNEP-ADA
	Pikeminnow/sucker stream	AQU		SNEP-ADA
	Yosemite toad	AQU		SNEP-ADA
	San Joaquin roach	AQU		SNEP-ADA
	Hardhead	AQU		SNEP-ADA
	Clarkia australis	BOT	G2S2.2. likes roadcuts, powerlines, firebreaks	NDDB
	Mimulus filicaulis	BOT	G2S2.2	NDDB
Twisselman	Foxtail pine forest	CUF	southernmost in stand in ecoregion	SNEP-SNA
Upper Deadman	Sierra Nevada mountain beaver	RIP	1 of 2 pops. In subregion	INY
Upper Lone Pine Creek	Alpine dwarf scrub	ALP		GAP
	Slender salamander	AQU	critical refuge	SNEP-ADA
	Webbed-toed salamander	AQU	critical refuge	SNEP-ADA
	Hackelia sharsmithii	BOT	G3S3.3	NDDB
Upper Truckee River	Lewisia Serrata	BOT	G2S2.2. Along MFK, NFK American R	NDDB
	Phacelia stebbinsii	BOT	Along MFK, NFK American R	NDDB
	Cutthroat trout/paiute sculpin stream	AQU		
	Cutthroat trout headwater	AQU		
	spring	AQU		
	Lahonton cutthroat trout	AQU		
	northern leopard frog	AQU		
	Sucker/dace/redside/trout stream	AQU		
	Tui chub stream	AQU		
	Speckeled dace stream	AQU		
	Whitfish/trout/sucker stream	AQU		
	Meadow stream	AQU		
	Rorippa subumbellata	BOT	G1S1.1 sandy lake margins	NDDB, EXP
	Montane riparian scrub	RIP		GAP
	Riparian	RIP	substantial	CARA
Van Vleck Tells Creek	Montane meadow	WET		SNEP
Vermillion Cliff	Huckleberry oak chaparral	CHAP		GAP
Virginia Lakes	Arabis tiehmii	BOT	G1S1.3	NDDB
	Old growth	CUF		TOI

APPENDIX III: Portfolio Site Profiles
(in alphabetical order)

AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
Virginia Mine	Lupinus spectabilis	BOT	G2S2.2	NDDB
	Fritillaria agrestis	BOT	G3S3.2	NDDB
vito	Viola tomentosa	BOT	G3S3.2	NDDB
Volcanoville / Gas Canyon	Arctostaphylos nisseniana	BOT	G2S2.2	NDDB
	Senecio layneae	BOT	G2S2.2	NDDB
	Interior live oak chaparral	CHAP		GAP
	Leather oak chaparral	CHAP		GAP
	Scrub oak chaparral	CHAP		GAP
Wallace Creek	Subalpine/alpine meadow	WET		GAP
Wards Ferry	Interior live oak chaparral	CHAP		STAN
Warren Lake	Calochortus excavatus	BOT	G3S3.1	BLM
	Erigeron miser	BOT	G2 S2.3	TAH
	Loeflingia squarrosa var arte	BOT	G5T4S2.2	BLM
	Sidalcea covillei	BOT	G2S2.1	NDDB
	Mojave mixed woody scrub	GBS		EXP
Weber Creek	Red-legged frog	AQU	one of only pops. In ecoregion	ELD
West Walker River	Cutthroat trout headwater	AQU		SNEP-ADA
	Cutthroat trout/paiute sculpin stream	AQU		SNEP-ADA
	Great Basin scrub snowmelt stream	AQU		SNEP-ADA
	Lahontan cutthroat trout	AQU		NDDB, PRC, SNEP-ADA
	Meadow stream	AQU		SNEP-ADA
	alpine lake pond	AQU		
	trout headwaters	AQU		
	Mountain sucker	AQU		SNEP-ADA
	Springs	AQU		SNEP-ADA
	Whitefish/cutthroat trout/sucker stream	AQU		SNEP-ADA
	Yosemite toad	AQU		SNEP-ADA
	Modoc-Great Basin riparian scrub	RIP		GAP, TOI
Westfall / Peregoy Meadows	Eriophyllum nubigenum	BOT	G2S2.3	NDDB
	Great gray owl	WET		LIT, NDDB
	Montane meadow	WET		LIT, NDDB
	Willow flycatcher	WET		LIT, NDDB
Wheats Meadow	Aspen	WET		
	Montane meadow	WET		
Wheeler Lake	Mountain yellow-legged frog	AQU		
	Yosemite toad	AQU		
Wheeler Ridge	Alpine dwarf scrub	ALP		GAP
	Bighorn sheep range	ALP		INY, NDDB
	Astragalus monoensis var ravenii	BOT	G2T1QS1.3	NDDB
	Lupinus padre-crowleyi	BOT	G1S1.2	NDDB

APPENDIX III: Portfolio Site Profiles
(in alphabetical order)

AREA_NAME	TARGET	SYSTEM	NOTES	SOURCE
White Divide	Sierra Nevada fell-field	ALP		GAP
Whiterock / Stevenson	Interior live oak chaparral	CHAP		GAP
	Scrub oak chaparral	CHAP	largest stand in ecoregion	GAP
Wilkerson Springs	Calochortus excavatus	BOT	G3S3.1. Part of Benton MA	NDDB
	Sidalcea covillei	BOT	G2S2.1 Part of Benton MA	NDDB
Wrights Lake Bog	Bog	WET	class 1 land	
	Willow flycatcher	WET	class 1 land	NDDB
Yellow Creek	Dystrophic pond	AQU		SNEP
	High quality aquatic habitat	AQU		SNEP-ADA
	Lupinus dalesiae	BOT	G3S3.2	NDDB
	Sedum albomarginatum	BOT	G2S2.2	NDDB
	Monardella follettii	BOT	G1S1.3	NDDB
Yokohl Valley	Brodiaea insignis	BOT	G2S2.2	NDDB
	Blue oak woodland	OAK		GAP

APPENDIX II: CONSERVATION GOALS FOR GAP VEGETATION COMMUNITIES
Sierra Nevada Ecoregion

HOLLAND COMMUNITY	RANK	GOAL
ENDEMIC SMALL PATCH		70%
Big Tree Forest	G3	
Southern Interior Cypress Forest	G2	
Washoe Pine Forest	G1	
ENDEMIC LARGE PATCH		50%
Foxtail Pine Forest	G3	
ENDEMIC MATRIX		30%
None		
LIMITED SMALL PATCH		50%
Alkali Meadow	G3	
Black Oak Woodland	G3	
Bush Chinquapin Chaparral	G3	
Cercocarpus ledifolius woodland	G3?	
Fen	G2	
Huckleberry Oak Chaparral	G3	
Leather Oak Chaparral	G3	
Modoc-Gr. Basin Cottonwood-Willow Riparian Forest	G3	
Modoc-Great Basin Riparian Scrub	G3	
Montane Meadow	G3	
Northern Interior Cypress Forest	G2	
Northern Mixed Chaparral	G3	
Northern vernal pool	G2	
Oregon Oak Woodland	G3	
Shin Oak Brush	G3	
Sphagnum Bog	G3	
Subalpine or Alpine Meadow	G3	
Subalpine Sagebrush Scrub	G3	
Transmontane Alkali Marsh	G3	
LIMITED LARGE PATCH		40%
Blackbush Scrub	G3	
Interior Live Oak Chaparral	G3	
Interior Live Oak Woodland	G3	
Scrub Oak Chaparral	G3	
Westside Ponderosa Pine Forest	G3	
LIMITED MATRIX		30%
Alpine Dwarf Scrub	G3?	
Blue Oak Woodland	G3	
Oak-Pinyon Woodland	G3?	
Silver Sagebrush Scrub	G3?	
Transmontane Freshwater Marsh	G3	
WIDESPREAD SMALL PATCH		40%
Darlingtonia seep	G4	
Aspen Forest	G5	
Aspen Riparian Forest	G4	
Black Oak Forest	G4	
Bristlecone Pine Forest	G4	
Buck Brush Chaparral	G4	
Canyon Live Oak Forest	G4	
Chamise Chaparral	G4	
Knobcone Pine Forest	G4	
Limber Pine Forest	G4	
Mixed Montane Chaparral	G4	

APPENDIX II: CONSERVATION GOALS FOR GAP VEGETATION COMMUNITIES
Sierra Nevada Ecoregion

HOLLAND COMMUNITY	RANK	GOAL
Montane Black Cottonwood Riparian Forest	G4	
Montane Riparian Scrub	G4	
Rabbitbrush Scrub	G5	
Red Fir (Lodgepole Pine)-Western White Pine Forest	G4	
Tan-Oak Forest	G4	
Upper Sonoran Manzanita Chaparral	G4	
White Alder Riparian Forest	G4	
Whitebark Pine Forest	G4	
Whitebark Pine-Mountain Hemlock Forest	G4	
WIDESPREAD LARGE PATCH		30%
Foothill Pine-Oak Woodland	G4	
Interior Live Oak Forest	G4	
Jeffrey Pine Forest	G4	
Jeffrey Pine-Fir Forest	G4	
Lodgepole Pine Forest	G4	
Mesic North Slope Chaparral	G4?	
Montane Ceanothus Chaparral	G4	
Montane Manzanita Chaparral	G4	
Non-Native Grassland	G4	
Non-Serpentine Foothill Pine Woodland	G4	
Red Fir Forest	G4	
Sierra Nevada Fell-Field	G4	
Sierran Mixed Coniferous Forest	G4	
Sierran White Fir Forest	G4	
Upper Sonoran Subshrub Scrub	G4	
Whitebark Pine-Lodgepole Pine Forest	G4	
WIDESPREAD MATRIX		20%
Eastside Ponderosa Pine Forest	G4	
Low Sagebrush Scrub	G4	
Open Foothill Pine Woodland	G4	
PERIPHERAL SMALL PATCH		10%
Desert Sink Scrub	G3	
Great Basin Wet Meadow	G3?	
Semi-Desert Chaparral	G3	
Sycamore alluvial woodland	G1	
Valley Oak Woodland	G3	
PERIPHERAL LARGE PATCH		10%
Big Sagebrush Scrub	G4	
Desert Holly Scrub	G3?	
Shadscale Scrub	G4	
PERIPHERAL MATRIX		10%
Alkali Playa	G3	
Desert Greasewood Scrub	G3	
Desert Saltbrush Scrub	G3	
Dry Salt Flat	G3?	
Great Basin Mixed Scrub	G4	
Great Basin Woodlands	G5	
Joshua Tree Woodland	G4	
Mojave Creosote Bush Scrub	G4	
Mojave Mixed Woody Scrub	G3	
Mojavean Pinyon and Juniper Woodlands	G4	

APPENDIX I: SIERRA NEVADA ECOREGION
CONSERVATION TARGETS

TARGET	**RANK**
AQUATIC	
CENTRAL VALLEY	
Dystrophic lake/pond	SC
Spring	SC
Hot springs outflow	SC
Meadow stream	SC
Foothill/valley ephemeral stream	SC
Foothill/canyon ephemeral stream	SC
Hardhead/pikeminnow stream	SC
Pikeminnow/sucker stream	SC
California roach stream	SC
Hitch stream	T
Kern golden trout stream	SC
California red-legged frog	G4T2T3S2S3
Foothill yellow-legged frog	G3S2S3
Mountain yellow-legged frog	G5S2S3
Yosemite toad	G2G3S2S3
Mount Lyell salamander	G3G4S3S4
Limestone salamander	G1S1
Relictual slender salamander	G2?S2?
Tehachapi slender salamander	G2S2
Breckenridge Mountain slender salamander	G1S1
Kern Canyon slender salamander	G2S2
Yellow-blotched salamander	G5T2T3S2S3
Western pond turtle	G4S3
San Joaquin roach	G5T3?QS3?
Red Hills roach	G5T1?S1?
Hardhead	G3S3
Hitch	
Pacific lamprey	G5S5
Kern brook lamprey	G1S1S2
Winter steelhead	G5S2
Little Kern golden trout	G5T2S2
Volcano Creek golden trout	G5T1S1
Kern River rainbow trout	G5T1T2S1S2
GREAT BASIN	
Spring	SC
Meadow stream	SC
Alpine lake/pond	SC
Trout headwater	SC
Cutthroat trout/paiute sculpin stream	
Sucker/dace/redside/trout stream	SC
Sucker/dace/redside stream	SC

APPENDIX I: SIERRA NEVADA ECOREGION
CONSERVATION TARGETS

TARGET	**RANK**
Whitefish/trout/sucker stream	SC
Lake Tahoe	T
Tui chub stream	T
Speckled dace stream	SC
Great Basin scrub snowmelt stream	SC
Mountain yellow-legged frog	G5S2S3
Yosemite toad	G2G3S2S3
Northern leopard frog	G5S2
Owens Valley web-toed salamander	G2?S2?
Lahonton cutthroat trout	G4T2S2
Paiute cutthroat trout	G4T1T2S1S2
Mountain sucker	G5S2S3
Lahonton lake tui chub	G4T3S1S2
Owens speckled dace	G5T1T2QS1S2
Cold Spring caddisfly	G1S1
Lake Tahoe benthic stonefly	G1S1
Stygobromus tahoensis	G1S1
Stygobromus lacicolus	G1S1
RIPARIAN	
Lowland riparian	
Sycamore alluvial woodland	G1S1.1
Great Valley cottonwood riparian	G2S2.1
Modoc-Great Basin Cottonwood-Willow Riparian Forest	G3S2.1
Modoc-Great Basin riparian scrub	G3S2.1
White alder riparian forest	G4S4
Montane riparian	
Montane black cottonwood riparian forest	G4S3.2
Aspen riparian forest	G4S3.2
Montane riparian scrub	G4S4
Waterbirch/western birch riparian scrub	G?S?
Western yellow-billed cuckoo	G5T2T3S1
Sierra Nevada mountain beaver	G5T3?S3?
Black swift	G4S2
Harlequin duck	G5S2
Swainson’s thrush	G5S4
Neotropical migrants	Variable
Erigeron multiceps	G1S1.2
Mimulus shevockii	G1S1.2
Rorippa subumbellata	G1S1.1

APPENDIX I: SIERRA NEVADA ECOREGION
CONSERVATION TARGETS

TARGET	**RANK**
Lewisia serrata	G2S2.2
Solidago gigantea	G5S1.2
Sphenopholis obtusata	G5S1.2
Stellaria obtusa	G5S2.3
FOOTHILL WOODLANDS	
Black oak woodland	G3S3.2
Blue oak woodland	G3S3.2
Interior live oak woodland	G3S3.2
Oregon oak woodland	G3S3.3
Valley oak woodland	G3S2.1
CHAPARRAL	
Foothill chaparral	
Leather oak chaparral	G3S3.2
Scrub oak chaparral	G3S3.3
Semi-desert chaparral	G3S3.2
Shin oak brush chaparral	G3S3.3
Interior live oak chaparral	G3S3.3
Montane chaparral	
Bush chinquapin chaparral	G3S3.3
Huckleberry oak chaparral	G3S3.3
Arctostaphylos nissenana	G2S2.2
Carpentaria californica	G2 S2.2
MONTANE AND SUBALPINE CONIFEROUS FOREST	
Big tree forest	G3S3.2
Eastside ponderosa pine forest	G4S2.1
Foxtail pine forest	G3S3.3
Limber pine forest	G4S2.3
Northern interior cypress forest	G2S2.2
Southern interior cypress forest	G2S2.1
Washoe pine forest	G1S1.2
Westside ponderosa pine forest	G3S2.1
Late succesional / old growth	N/A
California spotted owl	G?S2
California wolverine	G4T2S2
Great gray owl	G5S1
Northern goshawk	G4S3
Pacific fisher	G3G4S2S3

APPENDIX I: SIERRA NEVADA ECOREGION
CONSERVATION TARGETS

TARGET	**RANK**
Pine marten	G3G4S3S4
Sierra Nevada red fox	G4T2T3S1
INTERIOR WETLANDS, MEADOWS, AND ASPEN	
Northern vernal pool	G1S1.1
Fen	G2S1.3
Sphagnum bog	G3S1.2
Alkali meadow	G3S2.1
Alkali seep	G3S2.1
Transmontane freshwater marsh	G3S2.2
Montane meadow	G3G4S3.2
Alpine or subalpine meadow	G3S3.2
Darlingtonia seep	G4S3.2
Montane freshwater marsh	G3S3.2
Aspen forest	G5S3.2
Sierra Nevada mountain beaver	G5T3?S3?
Great gray owl	G5S1
Willow flycatcher	G5S1S2
Yellow headed blackbird	G5G5S3S4
Black tern	G5S2
California gull	G5S2
Forster's tern	G5S4
Greater sandhill crane	G5T2S2
Northern harrier	G5S3
White-faced ibis	G5S1
Migratory waterfowl	
Shorebirds	
Abronia alpina	G1S1.1
Astragalus lentiginosus var kernensis	G5T3?S.2
Botrychioum crenulatum	G3S1.2
Carex limosa	G5S3
Carex lasiocarpa	G5S1.3
Carex tiogana	G1S1.3
Darlingtonia californica	G4S3.2
Drosera anglica	G5S2S3
Epilobium howellii	G1S1.3
Epilobium oreganum	G2S2.2
Erigeron inornatus var keilii	G5T1S1.2

APPENDIX I: SIERRA NEVADA ECOREGION
CONSERVATION TARGETS

TARGET	**RANK**
Ivesia unguiculata	G2S2.2
Ivesia aperta var aperta	G2T2S2.2
Ivesia aperta var canina	G2T1S1.1
Ivesia sericoleuca	G2S2.2
Lupinus lepidus var culbertsonii	G5T1S1.3
Lycopodiella inundata	G4?S1?
Marsilea oligospora	G5S3?
Mimulus filicaulis	G2S2.2
Polygonum polygaloides ssp esotericum	G4G5T1S1.1
Potamogeton robbinsii	G5S2.3
Veronica cusickii	G5S3.3
Sagittaria sanfordii	G4T2T3S2S3
Salix branchycarpa	G5T5S1.3
Scirpus clementis	G3S3.3
Scirpus subterminalis	G4G5S2S3
Trifolium bolanderi	G3S3.3
ALPINE	
Alpine dwarf scrub	G5S4
Sierra Nevada fell-field	G4S4
California bighorn sheep	G4T1S1
Mount Lyell salamander	G3S3
Agrostis humilis	G4S1.3
Arabis bodiensis	G1S1.3
Arabis tiehmii	G1S1.3
Asplenium trichmanes-ramosum	G4S1.3
Astragalus monoensis var ravenii	G2T1QS1.3
Astragalus platytropis	G5S1.2
Chaenactis douglasii var alpina	G5T5S2.3
Claytonia umbellata	G5S1.3
Claytonia megarhiza	G4?S2S3
Draba asterophora var asterophora	G4T2S1.3
Draba asterophora var macrocarpa	G4T1S1.2
Draba cana	G5S1.3
Draba sharsmithii	G1S1.3
Eriogonum wrightii var olanchense	G5T1S1.3
Hackelia sharsmithii	G3S3.3
Lewisia longipetala	G2S2.2
Monardella beneolens	G1S1.3
Polemonium chartaceum	G1S1.3

APPENDIX I: SIERRA NEVADA ECOREGION
CONSERVATION TARGETS

TARGET	**RANK**
DESERT WOODLAND AND SCRUB	
Blackbush scrub	G3S3.2
Mojave mixed woody scrub	G3S3.2
Sierra mountain shrub	G3?
Silver sagebrush scrub	G3?
Subalpine sagebrush scrub	G3S3.2
Cercocarpus ledifolius	G3?
Joshua tree woodland	G4S3.2
Mojavean pinyon and juniper woodland	G4S3.2S4?
Panamint alligator lizard	G1G2S1S2
Sage grouse	
Migratory deer and bighorn sheep herds	
Astragalus ertterae	G1S1.3
Astragalus lentiformis	G2S2.2
Astragalus monoensis var monoensis	G4T3S2?
Eriogonum kennedyi var pinicola	G4T1S1.1
Ivesia aperta var aperta	G2T2S2.2
Lewisia disepala	G2S2.3
Loeflingia squarrosa var artemisiarum	G5T4S2.2
Lomatium hendersonii	G5?S2.2
Mimulus shevockii	G1S1.2
Phacelia novenmillensis	G2S2.2
Trifolium macilentum var dedeckerae	G5S2.2?
ISOLATED RARE PLANTS	
Agrostis hendersonii	G1Q S1.1
Arabis tiehmii	G1 S1.3
Astragalus webberi	G1 S1.2
Calyptribium pulchellum	G1 S1.1
Calystegia stebbinsii	G1 S1.1
Carex tiogana	G1 S1.3
Clarkia mosquinii ssp xerophila	G1T1 S1.1
Erythronium pluriflorum	G1 S1.3
Fremontodendron decumbens	G1 S1.2
Horkelia tularensis	G1 S1.3

APPENDIX I: SIERRA NEVADA ECOREGION
CONSERVATION TARGETS

TARGET	**RANK**
Lewisia congdonii	G1 S1.3
Lupinus padre-crowleyi	G1 S1.2
Monardella follettii	G1 S1.2
Monardella stebbinsii	G1 S1.3
Nemacladus twisselmannii	G1 S1.2
Rhynchospora californica	G1 S1.1
Sidalcea stipularis	G1 S1.1
Allium tribracteatum	G2 S2.2
Allium yosemitense	G2 S2.3
Arabis constancei	G2 S2.2
Arctostaphylos nissenana	G2 S2.2
Astragalus lentiformis	G2 S2.2
Astragalus monoensis var monoensis	G2T2 S2.2
Astragalus shevockii	G2 S2.3
Calochortus striatus	G2 S2.2
Camissonia sierrae ssp alticola	G2G3T1 S1.2
Canbya candida	G2 S2.2
Carpenteria californica	G2 S2.2
Chlorogalum grandiflorum	G2 S2.2
Clarkia australis	G2 S2.2
Collomia rawsoniana	G2 S2.2
Erigeron miser	G2 S2.2
Eriogonum twisselmannii	G2 S2.2
Eriophyllum congdonii	G2 S2.2
Eriophyllum nubigenum	G2 S2.3
Erythronium tuolumnense	G2 S2.2
Horkelia parryi	G2 S2.2
Ivesia aperta var aperta	G2T2 S2.2
Ivesia unguiculata	G2 S2.2
Ivesia webberi	G2 S2.1
Lewisia disepala	G2 S2.3

APPENDIX I: SIERRA NEVADA ECOREGION
CONSERVATION TARGETS

TARGET	**RANK**
Lewisia longipetala	G2 S2.2
Lewisia serrata	G2 S2.2
Lomatium stebbinsii	G2 S2.2
Lupinus citrinus var citrinus	G2T2 S2.2
Lupinus duranii	G2 S2.2
Lupinus spectabilis	G2 S2.2
Penstemon personatus	G2 S2.2
Raillardiopsis muirii	G2 S2.2
Sedum albomarginatum	G2 S2.2
Senecio layneae	G2 S2.2
Sidalcea covillei	G2 S2.1
Streptanthus fenestratus	G2 S2.3
Arabis rigidissima var demota	G3T2 S1.2
Eriogonum breedlovei var shevockii	G3T3 S3.3
Fritillaria agrestis	G3 S3.2
Lewisia cantelovii	G3 S3.2
Lupinus dalesiae	G3 S3.2
Phacelia stebbinsii	G3 S3.2
Sagittaria sanfordii	G3 S3.2
Sanicula tracyi	G3 S3.2
Streptanthus oliganthus	G3 S3.2
Viola tomentosa	G3 S3.2