

**A SUMMARY OF AFFECTED FLORA AND FAUNA IN THE
SAN DIEGO COUNTY FIRES OF 2003**

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In the pages contained in this summary the unique flora and fauna of San Diego County are apparent. Globally, the California Floristic Province is one of five Mediterranean-type ecosystems on the global list of threatened biodiversity hotspots (Mittermeier et al, 2001). A major portion of San Diego County is within this hotspot, with its unique and threatened flora. This formula has lead to a rich biodiversity that makes San Diego unique; unfortunately, it also has distinction of having one of the highest rates of protected species in the continental United States.

Though California has a land area of about 156,000 sq. mi., San Diego County only has an area of about 4,300 sq. mi. (2.7M acres), which amounts to 2.75% of California's total land area. Statewide, California has about 6,000 species of vascular plants and although San Diego County has a small fraction of the total land area, it supports about a third of the state's flora. In the fires of 2003, the loss of diversity of these areas is troubling; some species may have been lost. With an area burned of approx. 390, 000 acres in the county, amounting to about nearly 15% of the land area, the state has never seen a loss of this magnitude. Fortunately researchers have been studying San Diego County for decades.

The goal of this document is to share, freely, the information that has been collected over the years, with the Burned Area Emergency Response (BAER) Program members. Please contact the authors, listed below for access to their information, references and suggestions for other contact information.

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FLORA & COMMUNITIES

Vegetation Communities Affected

T. Oberbauer

Each of the habitat communities that occur within the preserve system will need some sort of rehabilitation as a result of the fire. The descriptions below refer to broad categories. For example, the Chaparral and Mixed chaparral categories include a number of specific subtypes like Southern mixed chaparral and Northern mixed chaparral, Chamise chaparral, Desert transition chaparral and Red shank chaparral. The individual communities are listed below.

Coastal sage scrub – Coastal sage scrub is a vegetation community of shrubs predominantly confined to the coastal regions of Southern California. It is dominated by California sage brush (*Artemisia californica*), Flat topped buckwheat (*Eriogonum fasciculatum*), and Laurel sumac (*Malosma laurina*). Coastal sage scrub supports a number of endemic species that have been or could be listed as rare and endangered. This community is adapted to periodic fire, however, disturbance from fires may provide an avenue for infestation by weed species including a number of non-native invasive species. Particularly vulnerable areas are south facing slopes in the San Diego River and Harbison Canyon and Crest areas and the south side and lower slopes of Otay Mountain. Furthermore, the species for which this habitat has been preserved may be affected by the scale of the impact. Specifically, the California gnatcatcher, a Federally listed Threatened species, requires Coastal sage scrub. The large scale of the burn of this habitat region wide may not provide adequate refugia from which the birds can be reestablished in the recovering vegetation. Furthermore, San Diego County is now becoming invaded by West Nile Virus, a disease that has caused tremendous loss of bird populations elsewhere. The combination of West Nile Virus and reduction in population as a result of the fire may be a major impact to the California gnatcatcher.

Rehabilitation of this community will require monitoring and removal of weedy species that may act to displace the Coastal sage scrub habitat. Monitoring over a period of several years will also be necessary to determine the effects of the fire on the population of the Federally Threatened California gnatcatcher and other species that were intended to be conserved in the preserve system. In addition, specific key areas will need to be addressed to insure that erosion does not occur on a large scale and may require treatments for erosion control.

Chaparral – Chaparral in various forms is the predominant vegetation community in San Diego County and the burned areas and it provides the basic wildlife habitat for the region. Chaparral in the burned areas consists of a variety of forms including Mixed chaparral composed of several species of Ceanothus, Scrub oak, and Manzanitas, and Chamise chaparral dominated by Chamise. This type of vegetation needs to be monitored to insure that weed species do not displace the natural chaparral components as they recover from the fire. Erosion control measures will need to be applied in specific key locations. Chaparral that occurs on Gabbro soil is especially susceptible to erosion when the soil has been disturbed. Any bulldozer or cleared lines may need specific attention including replanting with local shrubs.

Oak Woodland and Oak Forest – Oak woodland vegetation is relatively resistant to fires under normal condition. However, intense heat during extreme fire conditions may have killed drought stressed oaks. It will be necessary to perform specific revegetation action for oak

woodlands including direct seeding and planting of container stock. Oak forest is also less shade tolerant than some of the other vegetation communities. It may be necessary to evaluate the effects of overshadowing of dead forest trees in areas in which forest oaks survive and enhancement of forest health may include removal of some dead material.

Coniferous Forest – Coniferous Forest will require the greatest level of management associated with the fires. It is likely that little old growth forest survived intact on the Cuyamaca Mountains. The combination of the density of shade tolerant undergrowth trees that created a flammable biomass enhanced by bark beetle death from the drought and competition for water created conditions for hot crown fires that likely consumed all conifers. Seedling reproduction should be able to take place, but in many locations, overtopping dead trunks may overshadow the new propagules. It will be necessary in some locations to remove some of the intensely packed dead trunks remaining from the forest in order to allow the replacement generation of seedlings to thrive. The cost of thinning of the dead trunks may be \$7,500 per acre. Ongoing maintenance through controlled burns will be required in perpetuity to insure that the regrowth does not reach fuel levels that will result in fires that will cause stand replacement.

Montane Meadows and Seeps – The montane meadows consumed in the Cedar fire are some of the most interesting, diverse and undisturbed in the region. Montane meadows are generally resistant to biological impacts from fire. However, mechanical clearing within meadows will need to be reconfigured to their natural condition and revegetated utilizing adjacent species. It is important that seed from outside sources are not applied to the Cuyamaca meadow area.

Cypress Forest – King Creek on the west side of Cuyamaca Peak supports Cuyamaca cypress (*Cupressus stephensonii* / *C. arizonica* ssp. *arizonica*). Those trees are included under Coniferous Forest. Otay Mountain supports the world's largest population of Tecate cypress (*Cupressus forbesii*). Fires that have burned too frequently in the last 35 years may have eliminated major portions of the cypress population reducing its distribution. Particularly, areas that burned in the Otay fire in 1996 reburned in 2003. Young Tecate cypress were not large enough to produce many cones and enough seed to replace themselves when considering seed and seedling mortality. Therefore cypress burned in the 2003 fire may require manual replanting using local seed source. The Cuyamaca cypress that burned would have been approximately 33 years old since they last burned in the Boulder Creek Fire of 1970. They should be able to reproduce if invasive weeds do not become established. However, it will be vitally important to limit future fires in both the areas of the Cuyamaca Cypress and Tecate Cypress for at least three decades or both could become extirpated.

Pinyon Juniper Woodlands – A limited amount of this vegetation burned in the fire. It is expected that the burn through this vegetation community would have been of relatively low intensity so that the community may not need special treatments at this time.

Grassland – A variety of grassland locations burned during the fire, especially parts of Barona valley. Grassland habitats within these burned areas are predominantly those supporting introduced annuals, but all grasslands also contain a number of native annuals as major components. Grassland habitats are relatively resilient to fire. Grassland areas provide habitat for endangered species of rodents and raptor foraging. Areas of this habitat that may require rehabilitation are those that were mechanically altered during the fire fighting action such as fuel breaks, and fire lines. These will require reseeding using local native seed.

Vernal Pool – Vernal pool habitats burned on the Miramar Marine base as well as the mesas around Lower Otay reservoir. Vernal pools will need to be monitored to prevent invasion by weed species.

Riparian Woodland – A wide variety of Riparian woodlands burned in the fires, ranging from narrow strips of Willows and Cottonwoods to broad expanses of gallery forest. Large areas of Riparian woodland burned near the fire's source in the San Diego River canyon and parts of the San Luis Rey River in the Paradise burn. Riparian woodlands will need to be monitored and managed for removal of Tamarisk, Arundo and other invasive species in areas in which the riparian vegetation has burned. Burned Riparian vegetation may require erosion control measures with specific application of local seed mix.

Freshwater Marsh – Land will need to be monitored and managed for invasive species.

Vegetation and Plants burned in the fire

T. Oberbauer

San Diego County is known nation wide for the high diversity of species that occur here. The diversity of species combined with a rapid rate of urban and agricultural development has created a situation in which a high number of species are in peril of extinction. In the January 1997 issue of Science Magazine, San Diego County was identified as one of two counties with the highest potential for listings of rare and endangered species.

Within this biologically varied county, the areas burned in the wildfires of October 2003 include plant assemblages that support some of the highest numbers of species. The Cedar fire burned through the Cuyamaca Mountains and the vicinity of Cuyamaca Lake. This region contained a variety of habitats ranging from pristine 500 year old Mixed coniferous forest, Oak and Riparian forests to montane meadows that support a large number of unusual and endemic plants to dry rocky ridges and gravel benches that contain species that have been found nowhere else. The fire also burned into the desert transition where a mixed mosaic of upper desert and montane habitats existed. The Cuyamaca Mountains themselves are composed of Gabbro rock, an igneous intrusive form that contains a high concentration of magnesium and iron. These minerals have an influence on the vegetation and supports specific species that are of very limited distribution. Consequently, this area contained a large number of endemic species of plants, both those found nowhere else and those limited to the montane regions of the Peninsular Ranges. A few of the endemic plants include *Arabis hirshbergiae*, Cuyamaca meadow foam (*Limnanthes gracilis* ssp. *parishii*), Cuyamaca larkspur (*Delphinium hesperium* var. *cuyamaca*), and the Cuyamaca downingia (*Downingia concolor* var. *brevior*).

The western slopes of the Cuyamaca Mountains were also burned. This land includes several proposed Federal Wilderness areas including the San Diego River Gorge, Cedar Creek, Eagle Peak, Sill Hill and an adjacent one without a name. These are pristine lands of chaparral, oak woodlands and Riparian woodlands. The Sill Hill and San Diego River Gorge areas contain several waterfalls and the associated freshwater habitats.

The Mine fire burned over Otay Mountain, a range composed of ancient metamorphosed Jurassic aged volcanic rock that behaves in a similar manner to the gabbro in its effect on the distribution of plant species. Otay Mountain itself supports more than 20 species of plants that are considered rare, threatened or endangered to some degree, and it supported the world's largest stand of Tecate cypress.

The Paradise fire burned through Rancho Guejito and Angel Mountain, one of the last intact Ranchos in California and a land of extensive meadows, grasslands, oak woodlands and a mountain with coniferous forest. Rodriguez Mountain in the middle of the burn area included a 700 foot high cliff above woodlands near the San Luis Rey River where the Pacific Madrone, a remnant from the Pleistocene forests grows in perennial shade. The western ridge of Rodriguez Mountain above Hell Hole Canyon also consists of gabbro rock with a set of unusual plants.

West of the mountains themselves, the fires burned through valleys that contain major stream courses and down onto sedimentary mesas at Miramar Marine base as well as Otay Mesa and the vicinity of Lower Otay Reservoir. Because of an impermeable sedimentary layer, soil depressions on these mesas regularly fill with rainwater and form vernal pools that support an array of endemic plants and animals including the San Diego Mesa mint (*Pogogyne abramsii*), Orcutt's brodiaea (*Brodiaea orcuttii*), the Otay Mesa mint (check fire burn area near jail) and the San Diego fairy shrimp (*Branchinecta sandiegonensis*) and Riverside fairy shrimp (*Streptocephalus woottoni*). In the foothills east of El Cajon and north of Alpine, several of the mountains burned in the fire are composed of Gabbro rock. In these locations, a number of rare gabbro dependent shrubs exist including Parry's tetracoccus (*Tetracoccus parryi*), and the Dehesa beargrass (*Nolina interata*).

Biological Soil Crusts

M. Hawke

The soil surface in many parts of San Diego County forms a biologically active, living layer that plays a critical role in the health of our local ecosystems. Biological soil crusts (sometimes called cryptogamic or microbiotic crusts) are an intimate association between soil particles and cyanobacteria, algae, lichens, fungi, and bryophytes. They play important roles as pioneer organisms, nitrogen fixers, and contributors to soil stabilization and erosion control. The presence of biological soil crusts can significantly change the physical and chemical soil environment (e.g., soil surface roughness, soil texture, thermal conditions, and availability of nutrients, organic matter, and water) in ways that affect the germination, survival, and nutritional status of vascular plants (Belnap and Lange 2003). Soil crusts are prevalent in the coastal chaparral and in valley and foothill woodlands of San Diego County, including grasslands (Belnap and Lange 2003).

Lichens too, are abundant here on bark, rock, and soil and are important biological indicators of air quality, soil quality and ecosystem health in general. They are used as food and nesting materials for some invertebrates and birds. Soil lichens have soil-anchoring structures (rhizines) that penetrate the uppermost soil layers and bind them together into a stable matrix, and some fix nitrogen. While large filamentous cyanobacteria colonize the soil first (followed by smaller cyanobacteria and green algae) lichens and mosses represent a later successional stage that appears when the soil surfaces have stabilized.

Fire can have a devastating impact upon soil crusts but wildfires are of uneven intensity and often leave behind a mosaic of biological soil crust patches, some of which survive unharmed (Johansen et al. 1993). Historically, biological soil crusts have been ignored in the rehabilitation process (Kaltenecker 1997), even though they may compose as much as 40% to 70% of the soil cover in some parts of the West (Belnap 1993). It is very important to understand the role that these crusts can play in the post-fire recovery in San Diego, so that actions taken in wild lands out of concern for controlling soil erosion, or re-establishing native plants do not cause more harm than good. Clearly, soil crusts will recover if they are left alone, and in doing so will aid in the recovery of native species. It is thought that their

consolidation of the soil actually prevents the germination of non-native species (particularly non-native annual grasses) while allowing the germination of native seeds from the buried seed bank (Kaltenecker 1997). Misguided attempts to apply mulches or seed mixes to the soil in wild lands will likely cause trampling by humans and/or equipment, compromising the integrity and recovery of the crusts along with their ability to exclude undesirable species. Invasion of native plant communities by non-native grasses can set in motion a grass/fire cycle that can lead to an increase in the frequency, area, and even intensity of subsequent fires (D'Antonio and Vitousek 1992).

Texosporium sancti-jacobi is a rare, soil dwelling lichen (listed as a species of special concern in California by the CDFG) that has been found to be associated with the same habitat used by the federally listed endangered Quino checkerspot butterfly or QCB (Riefner et al. 2003). It was once thought to be extirpated from San Diego County, but renewed interest in this unique lichen resulted in three new occurrences being discovered here in the past year by a single person (Knudsen 2003). The link between *Texosporium* and the QCB, as well as its role as a pioneer in soil crust formation in QCB habitat needs to be investigated further. Significant QCB habitat burned in the recent fires, particularly in the Otay fire. If *Texosporium* (or *Acarospora thelococcoides*, another uncommon pioneer lichen that is found in QCB habitat) survived the fires can their presence be used as a bioindicator of potential foci of recovery for QCB habitat?

In San Diego County, I have noted extensive soil crusts on Otay Mountain beneath Tecate cypress that had burned in previous fires. These crusts can and will survive fires, and assist in the recovery of native plant communities.

Recommendations:

- Do not physically disturb soils in wild lands, particularly those areas that had mature native vegetation, and were relatively undisturbed before the recent fires
- Do not reseed these areas – let the native vegetation recover via the seed bank
- Allow the surviving soil crusts to provide stability to the soil, and to help seal the soil surface against invasion by non-native species
- Do not perform frequent prescribed burns and/or repeatedly disturb soils in old-growth and undisturbed areas because the health of the soil crusts and their ability to provide important ecological functions declines with repeated disturbance
- Consider the importance of recommending and/or supporting studies documenting the recovery of lichens and soil crusts after these fires because of their roles as pioneer species, soil stabilizers, nitrogen fixers, and important bioindicators of local ecological condition.

Invasive Weed Species

T. Oberbauer

Mediterranean and other weed species have become part of the landscape in San Diego County. The annual grasslands that occur within the coastal valley and foothill grassland habitats are partially composed on species that are not native to this region. Many of them were introduced when the first explorers entered this region. However, they still have not invaded every location that Disturbance enhances the spread of these species. Prior to the introduction of the weedy species, the native plants that appeared after disturbance were mostly annual wildflowers. In fact, annual wildflowers still appear following fires if the fire did not bring in a set of weed seeds.

The major issues associated with weeds is the potential for conversion of shrubby vegetation to weedy grass and forb habitat. While under conditions of Pre-European influence, fires that occur often enough to replace shrubs would have converted to flower fields, in modern times they are converted to non-native annuals. The Coastal sage scrub habitat that is adjacent to major weed sources is more vulnerable than other areas. In Riverside County, it has been documented that Coastal sage scrub that burns too often and which is exposed to nitrogen deposition from automobile exhaust will convert to grassy patches.

The other major weed issue involves lands along major stream courses and rivers. Fires as a disturbing force may provide an avenue for introduction and spread of the non-native wild cane (*Arundo donax*), and Tamarisk. These species may displace the willows and cottonwoods that occurred in the stream courses prior to the disturbance. In most cases, willows and cottonwoods do resprout following a fire, and may be able to be re-established naturally, but *Arundo* and Tamarisk need to be monitored and an action plan established for their removal.

Two other species of specific concern are the Pepperweed (*Lepidium campestre*) and Purple loosestrife (*Lythrum salicaria*). They have invaded portions of the Riparian habitats in coastal San Diego County and are known as noxious weeds. It will be important to monitor for spread of these species and eradicate any occurrences.

Vernal Pool habitats are also subject to weed invasion. The occurrence of the fire on the Miramar military base may increase the probability that weeds invade the vernal pools that are present there.

Finally, weeds that have not yet been known to be problems and new locations of weeds may appear in post fire burn areas. Monitoring of introductions of new weeds needs to occur.

Recommendations:

- Prepare an action program for limiting invasion of weedy species into burned habitats that have existed in relatively undisturbed condition. Consideration should be made toward limiting seed dispersal into burned preserve locations.
- Specific concern areas are Rancho Jamul, and bulldozer fire suppression trails.
- The action program needs to address in particular the Coastal sage scrub potential for type conversion, the *Arundo* and Tamarisk, Pepperweed and Purple loosestrife in the Riparian woodland areas.
- Monitor for potential introduction of new weeds not yet known from this region as problem species.
- Any reseedling in wild areas, including areas affected by bulldozer lines needs to be carefully considered. If the bulldozer lines exist in the midst of natural and otherwise undisturbed habitat, reconditioning by placing debris from the adjacent slopes onto the disturbed strip may be all that is necessary for reestablishing the habitat.

Vernal Pool Resources Affected

T. Oberbauer/J. Buegge

Southern California supports a unique set of ecosystems referred to as vernal pools. These are temporary, isolated wetlands that become inundated with winter rains and dry out during the summer months. Starting with the first rains, a variety of uniquely adapted plants and animals emerge from the soil to create a highly adapted community that lasts only a few months before going dormant.

Watersheds are very important to vernal pools. Most watersheds slope into a stream system, but vernal pool watersheds are isolated. Occasionally they may drain very slowly (laminar flow) into a series of pools and even into a stream system; these are referred to as “vernal swales.” Vernal pools and swales often appear in “complexes” – a series of pools that share a watershed and function as a biological unit. Pools in a complex may merge if they receive enough water, but usually remain separate. However, they may exchange genes by migration, cross-pollination, or translocation of seeds and cysts. Recent genetic work done by the City of San Diego has shown that vernal pools have a high degree of genetic diversity between pools, but low diversity within a particular pool. This means that every pool or pool complex carries a unique population of plants and animals.

San Diego County supports a unique subset of vernal pools, different from the main concentration of pools in the Central Valley. Many of these pools have been lost to development, as they occur on relatively level, easily developed landscapes that have clay soils or underlying hardpan. Due to this disappearance of habitat, several species unique to vernal pools have been listed as threatened or endangered (see Table 2). It is estimated that 3% of historical vernal pools still exist in San Diego County, and 10% in all of California.

Impacts of fire on vernal pools: The impacts for the Cedar fire were analyzed using the perimeter published on the CDF website labeled October 30, 2003. The ability to precisely locate vernal pool complexes within this perimeter were limited. The following impacts, therefore, are conservative estimates of impacts from the Cedar fire.

The impacts of the Otay fire were analyzed according to personal communications that areas around Proctor Valley and Otay Lakes had burned but that Otay Mesa and Marron Valley had not burned.

Table 1. Impacts to vernal pools in recent fires. Pool complex names are given followed by the complex code assigned by E. Bauder (1986).

Cedar Fire (11 complexes)
Tierrasanta (A), Grossmont College (Q – addition to Bauder, mapped by City of San Diego near Tierrasanta), Kearny Villa North (F), Landmark (U), Sim J. Harris (V), South Mirimar NAS (W), East Mirimar NAS (AA), Mirimar NAS within gates (EE, FF, GG)
Otay Fire (2 complexes)
Otay River (K; 87 basins mapped by City of San Diego in 2003), Proctor Valley (R; 19 basins mapped by City of San Diego in 2003)
Paradise Fire
No vernal pool resources were affected by this fire.

Natural vegetation has evolved with fire and is adapted to fire so that it will generally recover from fire without substantial management. In some vernal pool watersheds, annual grasses have become very thick in the absence of fire, grazing and other thinning processes. This has resulted in a decreased amount of water filling the pools, with unknown effects on the native flora and fauna. Few of the grasslands supporting vernal pools burned with great intensity, so alteration of the soils’ physical properties should not be an issue. Where vernal pools occur within chaparral, such as on MCAS Mirimar, soils may have been altered, which may negatively affect water quality.

All vernal pools should be monitored for water quality (TDS, siltation, and pH) and presence of invasive and/or non-native species. Areas disturbed within vernal pool watersheds as a result of fire management activities (e.g., fuel breaks, vehicle traffic) should be closely monitored for invasive species and water quality.

Table 2. Sensitive species associated with vernal pools in San Diego County.

Common name	Scientific name	Description	Status	Distribution
San Diego Fairy Shrimp	<i>Brachinecta sandieogonensis</i>	Small crustacean	Endangered (US/CA)	
Riverside Fairy Shrimp	<i>Streptocephalus woottoni</i>	Small crustacean	Endangered (US)	
Little mousetail	<i>Myosurus minimus</i>	Annual flowering plant	none	
Spreading navarretia	<i>Navarretia fossalis</i>	Annual flowering plant	Threatened (US)	S. CA, Baja MX
San Diego Button Celery	<i>Eryngium aristulatum</i> var. <i>parishii</i>	Annual flowering plant	Endangered	CA
Otay mesa-mint	<i>Pogogyne nudiscula</i>	Annual flowering plant	Endangered (US/CA)	Otay mesa; Nat'l Wildlife Refuge; Baja, MX
San Diego mesa-mint	<i>Pogogyne abramsii</i>	Annual flowering plant	Endangered (US/CA)	Mirimar; Montgomery Field; Nat'l Wildlife Refuge.
California Orcutt grass	<i>Orcuttia californica</i>	Annual grass	Endangered (US/CA)	CA

FAUNAL ASSOCIATIONS

Invertebrates [see map – Appendix 1]

M. Klein and K. Williams

Harbison dun skipper (*Euphyes vestries harbisoni*) – A fairly localized subspecies found only in San Diego and Orange Counties. The Orange County population is within Silverado Canyon. Within San Diego County it is fairly widespread but seems to follow a northwest to southeast ‘corridor’ along riparian seeps. It is associated with its only host plant, San Diego sedge (*Carex spisa*). Impacts to this species have occurred within the short-term. A somewhat short-term and into long-term concerns will be 1) debris flows from rains which might uproot the plant; 2) haz-mat / toxins within the stream flow which the Carex potentially could absorb and causing the larvae next May to ingest and poisoning them. A map is attached for the known and historical locations of the skipper.

Short-term funding issues:

- Reviewing aerials for refugia adjacent to known and recent historical (1997 to current) locations.
- Truth these areas for presence of host plant, i.e. San Diego Sedge
- If present, flag and monitor for overwintering larvae
- Barriers for debris flows
- Haz-mat / tox level counts within the sedge locations
- Perform late spring to early summer (2004) surveys for presence of adults
- **Long-term funding issues:** Continue to monitor larval and adult sites within the burn areas for presence.
- Consider a re-introduction plan if host plant becomes present but adults are not
- Cost for short and long term funding is unknown currently until aerials are reviewed and host plants are mapped.

Hermes copper (*Lycaena [hermelycaena] hermes*) – is an endemic butterfly to San Diego County. It is found within sage scrub and mix chaparral habitats and is association with its only host plant, spiny redberry (*Rhamnus crocea*). The larvae are known to utilize the host plant when it is mature and recent observations have indicated that larvae will not utilize the plant until it is at least 18 years old. Based on site visits to known colonies of the butterfly within the County, it is estimated that about 90% of the public lands colonies have been impacted. This species may warrant emergency proposal for listing. The largest known population of hermes was on the Crestridge Ecological Reserve. There were over 50 colonies mapped there totaling about 1,000 butterflies (2001 data). All 100% of the colonies were burned. Another well known location was Anderson Road at Viejas Mountain in Alpine within the Cleveland National Forest. Based on what was observed, the entire mountain was burned. Another monitored location was Rancho Jamul south of Hwy 94. There were 3 colonies there and they also were burned. Finally, there were up to 25 adults observed in Mission Trails Regional Park this year north of Kumeeyee Lake and south of Hwy 52 and this area burned. Map attached of historical locations as well as reported sightings for 2003.

Short-term funding issues:

- Review aerials for refugia adjacent to current and recent historical (1997 to present) locations

- Truth these refugia for presence of host plant, i.e. spiny redberry
- If redberry is present, flag a monitor in April and May 2004 for larvae
- Perform up to 3 surveys at each refugia in June for presence of adults. If present, these would be the primary colonies to re-colonize the adjacent burned areas.

Long-term funding issues:

- Continue to monitor the refugia for up to five years at 3 visits each in June for confirmation of adults. If adults are not found within the five year period it will be assumed they were never present there in the first place.
- Monitor new-growth redberry adjacent to these refugia for up to five years. This is to ensure limited invasive weed are going to out compete the new growth.
- Continue to monitor after five years locations where the butterfly is present to document possible activity into the new growth burn area for recolonization. This could take over 18 years for recolonization.
- Costs for short-term is unknown until aials are reviewed for the number of refugia adjacent to the impacted locations. Long-term costs are also unknown until the short-term issues are addressed.

Thorne's hairstreak (*Callophrys [Mitoura] thornei*) – is an endemic butterfly to San Diego County. It is a covered species under the MSCP as well as a narrow endemic. Historically the only known location of this butterfly is Otay Mountain within the jurisdiction of the BLM. The butterfly is associated with its only host plant, Tecate cypress (*Cupressus forbesi*). Studies have indicated that the larvae eat only mature cypress and it is estimated that the tree must be between 25 – 30 years old. There are less than ten reported locations on Otay Mountain with the primary locations being Little Cedar Canyon and Cedar Canyon. These areas were burned entirely with little to no cypress stumps remaining. The species overwinters in the pupa stage within the leaf-litter under the tree. Due to the volume of burn on Otay Mountain survival of this species does not look good. This species may warrant emergency proposal for listing. A map is attached noting the known locations of the butterfly. There was some collecting done on the NE slopes of Otay Mountain in 1974 but the exact location is not mapped due to incomplete data. Either way, this area was also impacted.

Short-term funding issues:

- Review aials for refugia adjacent to known populations of the butterfly. In particular, Little Cedar and Cedar Canyons.
- Truth these refugia for mature cypress.
- Monitor these mature cypress twice in February and early March for presence of adults and twice in June (2004) for the second brood.
- Monitor re-growth of cypress to see if there is any larval activity on non-mature cypress (March – April 2004, and late June 2004).
- Identify adjacent private lands where stands of cypress are located and, with permission, monitor them twice in February and early March for presence of adults as well as twice in June (2004) for second brood adults.
- Survey the cypress stand four times (February, March and twice in June), with permission, for presence of adults.
- If adults are found within any of the areas monitor them for up to five years.

Long-term funding issues:

- If adults are found within the adjacent private lands or Orange County (Sierra Peak-Coal Canyon), monitor their presence for at least five years with a minimum of four visits to each colony.
- Monitor cypress re-growth.

- When cypress begins to mature to be able to set seed, approximately 15 years, begin a re-introduction of adult females to these areas to see if they will oviposit.
- If unsuccessful ovipositioning, then wait until cypress attains approximately 25 years and re-introduce females.
- Cost for the short-term and long-term funding issues is unknown until aerials are reviewed. Once reviewed, a more detailed short-term funding can be proposed. The long-term funding is predicated on presence of adults anywhere. Once established within the short-term funding part, then the long-term funding can be more easily addressed.

Quino Checkerspot butterfly *Euphydryas editha quino* (QCB)

This species is already targeted in the BEAR team biological assessment. Issues and areas of concern are being described to the team by Alison Anderson (USFWS), author of the recovery plan for the species. Areas of concern are within the Cedar fire (Otay Mesa and Rancho Jamul populations).

Immediate concerns:

- monitoring of affected Quino populations this spring and summer
- monitoring of Quino hostplant recovery (e.g. *Plantago erecta* and *Castilleja exserta*)

Long term issues:

- consideration of butterfly ranching on site to augment populations in the burned area
- continued monitoring of Quino and hostplant populations and possible seeding to enhance populations of native's hostplants

Laguna Mountains Skipper (butterfly) *Pyrgus ruralis lagunae* (LMS)

The nature of this research was to examine potential and existing habitats for LMS and communities. LMS is one of the rarest butterflies in North America and is known to fly in the Palomar and Laguna Mountains. Habitat surveys indicate that potential habitat for this species exists in the Cuyamacas as well. Pre-fire information on this species includes LMS surveys (recently – 1994-2003), plant surveys to species in these habitats, and butterfly and pollinator community surveys at the sites (2000-2003). The plant surveys identify the abundance of LMS larval hostplants (*Horkelia clevelandii*) as well as all other meadow plants that characterize the community and also may serve as nectar resources for LMS adults. Of special concern are sites in the Lagunas that may have burned, and might be suitable for expansion of the existing population. Also of concern are sites in the Cuyamacas that support very high quality populations of *Horkelia clevelandii* the primary (almost exclusive) host plant of LMS. Those are potential sites for recovery of LMS.

Survey sites include the following (GPS locations follow): Sites with LMS sightings recorded identified by asterisk (*) Cuyamaca sites - Stonewall Mine, Fages Monument, Lake Cuyamaca Laguna sites - El Prado Campground*, Little Laguna Lake*, Meadow Kiosk, Chico, Boiling Springs, Gator Palomar sites – Observatory Campground*, Observatory Trail*, Doane Valley*, French Valley*, Mendenhall Valley*

Immediate concerns:

- monitoring of sites that have been surveyed in the recent pre-fire years to assess LMS presence and abundance in spring and summer
- monitoring of those same sites to measure hostplant recovery (*Horkelia clevelandii*)

Long term issues:

- continued monitoring of LMS and hostplant populations (nectar and larval hosts)

San Diego County provides habitat for over 500 species of breeding or migratory birds. A significant portion of that habitat burned in the San Diego fires. Consequently, the 2003 fires may harbor short and longer-term direct and indirect adverse effects on some species.

For many species in County -- some of which are listed as endangered, threatened, or species of special concern by State and Federal agencies -- there were preexisting viability concerns which are now only heightened. Extensive habitat conversion throughout California's south coast has markedly reduced the area of available habitat for many species. Remaining habitat tends to be fragmented, which introduces a suite of fragmentation effects that often further degrades habitat quality and reduces population viability. Such effects are well-documented; San Diego County is renowned in the scientific literature for the nearly 20 years of habitat fragmentation research, elucidating the ecological mechanisms underlying the effects of area reduction, habitat isolation, and edge effects on birds and their habitats.

The scale, severity, and pattern of the fire may exacerbate problems for San Diego's native avifauna. With such an extensive area burned, it is unclear at this time whether there were adequate refugia for birds within or near the fire. Those individuals that survived or that will be produced in the next breeding seasons may be challenged to find suitable habitat, especially if they require later-successional habitat, or are dispersal-limited. Natal or breeding dispersal-related mortality may increase for some species. In the habitat that remains intact, we may observe crowding effects, especially during the breeding season; a concentration of individuals and species may result in increased competition for resources, increased susceptibility to nest predation, increased susceptibility to nest parasitism by Brown-headed Cowbird, and other density-dependent and community effects. Within the burned areas, food availability for insectivorous / granivorous species may be reduced in the near-term, and that may cascade to higher trophic levels. The community composition of predators of eggs, nestlings, and adult birds may also be altered. For example, snake and rodent communities may have survived the fires relatively intact; this may result in an increase in nest predation in the coming bird breeding seasons.

Direct and indirect effects of the fire on birds may be compounded by other effects, such as the effects of disease. West Nile Virus was documented in San Diego County in fall of 2003. In 2004, impacts on native avifauna are anticipated to be strong, possibly resulting in die-off, as has been observed elsewhere in the southwest. Drought also may harbor adverse impacts on depressed populations. In this semiarid region, primary and secondary productivity varies with rainfall; in drought years, passerine birds may experience reproductive failure or heightened mortality risk. Thus, the ability for populations to recover may depend in part upon climatic conditions over the next many years. Finally, in some areas fires may have been too intense or too frequent, which may result in type-conversion of habitat, possibly to dominance by non-native vegetation. For some species, this may render the loss of habitat due to the fire effectively permanent.

Riparian species of particular concern include the Southwestern Willow Flycatcher and the Least Bell's Vireo. Of the three San Diego fires, the Paradise Fire is of the most concern for these species (although the impacts to riparian species throughout the County warrant attention). The San Luis Rey river corridor was notable for containing the highest densities of

riparian nesting birds in San Diego County, including the federally endangered Least Bell's Vireo. The largest breeding population in California of the federally endangered Southwestern Willow Flycatcher is found in this corridor. These are among the factors that contributed to the designation of the upper San Luis Rey river as an "Area of High Ecological Significance" by the United States Forest Service. Fire related concerns to riparian species pertain to loss of habitat (e.g., loss of riparian vegetation due to burning, as well as potential loss of habitat due to increased runoff and scouring of drainages). Loss of habitat quality may occur if direct and indirect fire effects facilitate the invasion of non-native vegetation in drainages.

Pre-fire databases include:

San Diego County Bird Atlas/ P. Unitt, SD Natural History Museum, et al. (1997+); USGS/ B. Kus et al., multiple years of SWWF data from the San Luis Rey

Coastal Sage Scrub/Chaparral/Grassland mosaic species of potential concern include California Gnatcatcher (federally threatened), Rufous-crowned Sparrow and the Greater Roadrunner. Concerns relate to the aforementioned extensive scale of the fire. Many of the non-migratory species appear to be highly sensitive to habitat loss and habitat fragmentation, and particularly susceptible to isolation effects of habitat fragmentation; colonization of habitat isolates appears limited by urban and residential "matrix". Also, the Crestridge Reserve, with the Lakeside Archipelago of hilltops, was intended in part to provide a stepping-stone corridor for CSS avifauna species; much of its vegetation burned in the Cedar fire, potentially severing north-south CSS connectivity for the foreseeable future.

Pre-fire databases include: San Diego County Bird Atlas/ P. Unitt, SD Natural History Museum, et al. (1997+);

Dartmouth College/ D. Bolger et al., point count, demographic data on focal bird species, as well as data on nest predators and arthropod food in CSS research plots, some of which burned (1997+); UC Riverside/ K. Preston et al., multiple years of Wrentit demographic data and canyon community from Hellhole Canyon (Paradise Fire); MAPS Station Data, Miramar MCAS (#MIRA 12248) (1996-2000[+?]); USGS/ Fisher et al., Avian community point counts, Rancho Jamul (2002-2003), Santa Ysabel Ranch (2001-2003); SDSU/ M. Mendelsohn, Roadrunner distribution data across urban gradient/county (2003); PRBO/Partners in Flight, Draft Coastal Sage Scrub and Chaparral Bird Conservation Plan.

Raptors species of particular concern include the California Spotted Owl, Bald Eagle, and Golden Eagle; possibly Burrowing Owl. General concerns for raptors include the potential loss of nesting, roosting, and perching trees, and of habitat quality as a result of the burn or as a result of fuels modification/forest management practices to be initiated post-fire. Species viability of spotted owls relies upon a functional, regional metapopulation; the 2003 fires throughout the South Coast Ecoregion may have resulted in loss of some subpopulations or loss of suitable habitat patches. Spotted owl food resources, e.g., woodrats, may be limiting until the habitat regains later-successional characteristics. Juvenile dispersal is a key ecological process for spotted owl metapopulation viability; if patches become too isolated the species may cross an "extinction threshold".

Pre-fire databases include: Wildlife Research Institute/D. Bittner et al. mapped golden eagle nest sites, home ranges within much of San Diego County; USGS/R. Fisher et al., Spotted owl surveys for SY Ranch (2003); W. LaHaye et al., Spotted owl distribution data throughout the South Coast Ecoregion

Wetland species of particular concern include the federally endangered Light-footed Clapper Rail. Estuary habitat is increasingly rare for rails (as well as for other species, such as the state endangered Belding's Savannah Sparrow). Increased runoff and sediment load from burned areas may result in increased siltation / sedimentation in watersheds and estuaries. Salt marsh at the Tijuana National Estuary is being invaded by tamarisk; increased sedimentation appears to be facilitating the invasion. Toxins from burned-out homes / infrastructure / etc. may accumulate in the watershed and pose health risks for higher trophic levels.

Pre-fire database: Tijuana River Estuary database; CDFG management and population assessment documents.

Recommendations:

- Continue monitoring where pre-fire datasets exist.
- Assess viability of NCCP reserve network for focal species, e.g., California Gnatcatcher; model habitat recovery in terms of habitat suitability for the focal species.
- Monitor focal bird species for West Nile Virus infection; characterize population impacts.
- Monitor and manage invasion of non-native species in critical habitat areas for focal species.
- Conduct restoration where needed to enhance quality of critical habitat areas for focal species.
- Continue demographic studies to examine community effects on focal bird species, including effects of fire on food resources and predator communities.
- Examine subregional and regional spotted owl habitat distribution and reassess population viability.
- Develop forest management guidelines that protect both public safety as well as habitat values for focal species.

Bird Forage Discussion

K. Williams

Food for endangered and threatened bird species (CA Gnatcatcher (CAGN), and Least Bell's vireo (LBVI) – and this also applies to SW Willow Flycatcher (WIFL): Terrestrial arthropods, like insects and spiders, represent tremendous biodiversity and are critical prey for vertebrates – especially several species of endangered birds of the San Diego region, such as CAGN, LBVI and WIFL. The recovery of insects and spiders in burned habitats for riparian and coastal sage communities should be monitored to evaluate suitability for these endangered insectivores. Data on insect communities within several riparian habitats in southern California were collected (pre-fire) to compare food resources for these birds in riparian restoration projects and adjacent “reference” (or more-natural) habitats. Data on potential gnatcatcher food resources exists in JC Burger et al. (1999). Those data may serve as base-line data for comparison with the recovery of burned habitats.

Mission Trails – riparian areas of the park (all insects 1989-1992)

This study quantified insect food for riparian insectivores, targeting LBVI and insect food resources along the San Diego River. Collections were made along the San Diego river at the Cal Trans restoration site near Mast Street and near Lake Kumeyaay. These data were correlated to use by LBVI over those dates.

San Luis Rey River – Similar data to those above were collected at riparian areas of the San Luis Rey river just south of the Oceanside airport (all insects 1989-1992)

Immediate concerns:

- monitoring riparian and coastal sage habitats to assess insects and spiders as food resources for endangered birds, especially in spring and summer (during breeding seasons) – focus should be appropriate sampling from vegetation where these gleaners and flycatchers feed

Long term issues:

continued monitoring of riparian and coastal sage habitats to assess insects and spiders as food resources for endangered birds, especially in spring and summer (during breeding seasons)
 continued monitoring of riparian and coastal sage habitats to assess plant community development that would support maintenance of insects and spiders as food resources for endangered birds, especially in spring and summer (during breeding seasons) – focus would be characteristic vegetation of the habitat and flower populations supporting pollinators

Reptile and Amphibian

C. Rochester

Pre-fire Data Set Summation: Extensive amounts of data exist regarding the reptile and amphibian species which occur in the areas of San Diego County affected by the wildfires of 2003. These data have been collected and compiled over the past 50 years and represent the efforts of multiple agencies.

The United States Geological Survey – Biological Resources Discipline (USGS-BRD) has collected a wide range of information in the fire affected areas. Beginning in 1995, pitfall surveys have been conducted at numerous sites around the county, including UC San Diego’s Elliott Reserve at the west end of the Cedar fire, Little Cedar Ridge on BLM lands on Otay Mountain, Rancho Jamul Ecological Reserve at the north end of the Otay fire, Crestridge in the Lakeside area, and in the Santa Ysabel region at the extreme north end of the Cedar fire. The numbers of species detected per taxa are summarized for each of these five sites as follows:

Site Name	Frogs	Salamanders	Lizards	Snakes	Turtles	# of Arrays	# of Sample Days
Elliott Reserve	3	1	7	12	0	17	336
Crestridge	2	0	8	6	0	4	96
Little Cedar Ridge	2	1	7	12	0	9	288
Rancho Jamul	4	1	10	12	0	21	48
Santa Ysabel	3	1	8	10	0	24	46

In addition to these sites which received some degree of fire damage, the USGS has also collected pitfall data on an additional 12 study sites around the county, some of which are adjacent to fire impacted regions.

Further research by the USGS includes targeted species surveys and habitat quality assessments. In conjunction with the Technology Associates International Corporation (TAIC), in 2001, the USGS surveyed 9 reaches in the upper San Diego River watershed between El Capitan and Cuyamaca Reservoirs, wherein field efforts detected the presence of arroyo toads at two sites and coast range newts in four reaches. In addition to these two

targeted species, data were also collected on an additional three frog species, one native snake species, and the western pond turtle.

Surveys specifically for the arroyo toad and the western pond turtle were conducted in 2002 on lands covered by the San Diego Multiple Species Conservation Program (MSCP). Survey sites that may have been impacted by the fires include Boden Canyon, El Monte County Park, Mission Trails Regional Park, Sycuan Peak Ecological Reserve, Rancho Jamul Ecological Reserve, Otay Mountain, Otay Lakes, Marron Valley, and the Tijuana River Valley Park. Of the 40 sites surveyed, arroyo toads and western pond turtle were only detected at two or three sites each. Similar arroyo toad research was conducted in 2002 in Cuyamaca Rancho State Park, along the Sweetwater River and its tributaries. These efforts documented the presence of four frog species, including the arroyo toad, and four snake species.

Additional data sources which exist, but can not be fully summarized at this point, include such things as the field notes of Lawrence Klauber. His notes may serve as a long term record of species detections across the county dating back to the early 1940's. These records have been digitized and incorporated into a larger data set, which also includes the records from multiple museums, and was used by Stacie Hathaway of the USGS in her thesis work at San Diego State University which looked at the distribution of reptile and amphibian records across the county. The many city, county, and non-governmental agencies existing in San Diego County will assuredly have their own data sets to contribute, strengthening the final pre-fire data set that exists for the reptile and amphibian communities of San Diego County. The USGS and undoubtedly others have data even beyond the summary given here which will serve as a strong pre-fire window on the landscape and animals of San Diego County.

Mammals

J. Diffendorfer

The recent fires burned relatively high percentages of 5 major habitat types in San Diego County, and thus potentially impacted a large number of mammal species. Thus, all species except those restricted to the east of the Cuyamacas in the desert regions, were potentially affected. Fires will affect all mammals within and near the burned areas both directly via mortality, and indirectly via changes in habitat structure and resources.

Direct mortality during the fire: Most mammal species suffer low levels of direct mortality during fire. Smaller bodied species use burrow systems and rock crevices as refuge during fire. A number of studies have shown high small mammal survival rates immediately after fire, though species without belowground refugia may not escape. Currently, at least two local mammalogists (Dr. J. Diffendorfer, and S. Tremor) report active burrow systems in severely burned locations. S. Tremor has trapped throughout the burn and has captured small mammals in burned areas, corroborating previous studies showing post-fire survival. However, during road surveys, Tremor found high mortality in species not using burrow systems (rabbits, woodrats, and voles).

Larger bodied species such as deer, coyotes and mountain lions, may have outrun the fire in many cases (or retreated to underground dens), though direct mortality may have occurred when fire lines were long and moving quickly. Dr. Tremor reported active scavenging by numerous coyotes and foxes after the fire indicating post-fire survival. Furthermore, the majority of radio-collared deer in an ongoing study in the Cuyamaca's survived the fire. Overall then, though numerous mammals likely died during the fire, most mammal species did not suffer catastrophic losses in numbers during the fire.

Indirect effects after the fire: The fire destroyed above ground vegetation and seeds remaining on plants. In severely burned areas, shallowly buried seeds may have also been destroyed. Thus, mammals will be most impacted by post-fire changes in both habitat structure (cover) and food availability. Responses to these changes will likely include 1) changes in the spatial distribution of animals and 2) overall declines in abundances until recovery occurs. Combined, these two effects could result in local extirpations of some species.

Mammals are active habitat selectors and many species have already made rapid changes in habitat-use and spatial distributions since the fire. For example, many animals are moving to areas with greater cover. In burned areas, S. Tremor has captured species typically found in shrub only among rock outcroppings, while kangaroo rats continue to utilize the very open, newly burned areas. Furthermore, capture rates of rodents in unburned habitats near the burn perimeter have increased since before the fire, indicating surviving animals dispersed from burned areas to unburned habitat. A number of individuals have reported displaced wildlife in backyards and biologists have reported deer bedding in remnant patches of vegetation and in unburned riparian areas. Carnivores will likely follow their prey, moving towards the fire perimeter and into unburned locations. S. Tremor has already observed coyotes and gray foxes, which scavenged actively across all burned locations, shifting their foraging activity to the fire perimeter. Displaced mountain lions can potentially move long distances in search of prey.

Numerical responses to the fire may stem from changes in rates of mortality, reproduction, and movement. Responses to a lack of food may include dispersal to new habitats or a decline in abundances as animals die or fail to replace themselves. Additionally, a lack of vegetative cover likely increases rates of predation on small-bodied mammals, further decreasing their populations.

Small-bodied species response will depend on the severity and extent of the fires and the unique aspects of each species' life history (seed cache, winter aestivation, diet, and predator avoidance strategies). Small mammal abundances may decline after fire if food sources, depleted by the fire, remain low. A number of species maintain below ground seed banks and given the timing of the fire, we anticipate new vegetation growth and new seeds within 4 months. However, if the winter rains are sparse, vegetation re-growth and seed set may be low, resulting in reduced food availability and slower recovery in the small mammal community.

Previous studies indicate shrub specialists may be locally extirpated whereas species preferring more open habitat may actually increase in abundance during the first 1 to 3 years after fire. As vegetation structure increases, shrub specialists eventually enter the community while those species preferring open habitats decline in numbers. However, no studies of rodent responses to fire have been conducted at spatial scales as large as the Cedar Fire. If extirpations of a species occur in large areas of the burn, colonization from the burn perimeter may be necessary to reestablish populations after vegetation re-growth. If so, it may take substantially longer than in previous studies to regain species in areas long distances from the burn perimeter. For example, wood rats make above ground nests using twigs. For this species, it may take 10 to 20 years for vegetation to regrow and generate appropriately size twigs and for animals to disperse from unburned areas deep into the burned locations. Thus total recovery of the small mammal community may take long periods of time.

Larger species may also suffer increases in mortality, despite their ability to move the long distances required to find unburned habitat. As animals move into new habitats road mortality

will likely increase. Furthermore, deer may suffer higher rates of predation by mountain lions as they move into novel habitat and bed down in less protected locations. The movement of displaced individuals into existing territories may cause aggressive interactions among individuals, or result in resource depletion as displaced and resident animals compete for the same food.

Three specific items are worth mentioning. The fire did not directly affect any threatened or endangered mammal species and the indirect effects of fire do not further imperil any mammal species. The fire will likely displace mountain lions. The change in their distribution may have two effects. First, the incidence of human-mountain lion interactions may increase during the next year. Public education may be the best response to this situation. Second, if mountain lions were displaced towards the desert, the endangered desert bighorn may suffer increased mortality rates. Mountain lions kill a large proportion of the population annually, and even one additional adult mountain lion preying on the population could have significant impacts. Ongoing studies of mountain lions may be able to detect changes in mountain lion space use and distribution, while sheep demographic rates may show increased mortality. If so, appropriate management strategies can be employed.

Rodent communities, given their strong impacts as seed and sprout predators, may influence: 1) post-fire succession trajectories; and 2) the rates of post-fire invasion by exotic species. Research done in other arid landscapes and during a post-fire growth in chaparral indicates small mammal predation of seeds, seedlings and resprouting vegetation is not random as they prefer large, nutritious seeds and feed on some plants over others. Thus the question how rodent predation (thought ants and birds may also play a role) affects rates of post-fire exotic invasion is of management interest. Small rodent exclosures and vegetation sampling will help answer this question.

Fish

T.Oberbauer

Native rainbow trout (*Oncorhynchus mykiss*) strains are reported to have occurred in the Cedar Creek, Boulder Creek, and upper Sweetwater River, with each stream course supporting its own population (Glenn Greenwald pers. Comm.). The effect of the 5 years of drought in San Diego County mountains has significantly reduced the carrying capacity of native perennial streams with trout being subject to isolation in small water hole refugia. The occurrence of the Cedar Creek fire may have not only heated the water in these individual refugia, in some, the heat from the fire may have caused the water holes to evaporate altogether. It has been suggested that the native trout from this region are genetic ancestors to trout throughout the west coast of North America. Each of the individual populations represents a genetically distinct and important line of evolution.

In addition to the trout, Partially armored three spined stickleback (*Gasterosteus aculeatus microcephalus*) is a native freshwater species of fish that survives in small perennial streams of coastal California and northwestern Baja California. It is considered threatened in Baja California. A population was known from the upper Sweetwater River.

The Partially armored threespined stickleback may also have been reduced in number by the fire itself. However, both the trout and the stickleback may be affected adversely by sedimentation and erosion associated with runoff from denuded slopes. Furthermore, the concentrations of ash in the streams may alter the acidity of the water courses, and adversely affect these fish.

Recommendations:

- Monitor through 2004, the Cedar and Boulder Creeks and upper Sweetwater river for presence of trout and sticklebacks.
- Prepare a contingency plan with implementation procedures for reestablishment of these fish if the majority of their distribution has been lost.

IMPACTED RESERVES AND WILDLIFE AREAS

Cuyamaca Mountain range

T. Oberbauer

The Cuyamaca Mountain range in San Diego County is a portion of the Peninsular Range province. These mountains form a north south ridge with the highest, Cuyamaca peak, reaching over 6,500 feet high. While average seasonal precipitation in coastal San Diego County ranges from 10 to 18 inches, these mountains receive more than 35 inches per season on average at Cuyamaca Lake and higher levels on the upper slopes of North, Middle and Cuyamaca peaks.. This relatively high level of precipitation supported a vegetation that consisted of forests similar to those in the Sequoia and Sierra National Forests in the Southern Sierra Nevada range. Dominant species are California Black Oak, White Fir, Incense cedar, Coulter pine, Ponderosa pine, Jeffrey pine and the largest pine, the Sugar pine. Old growth forest existed on all of these peaks into the early 1950's even surviving extensive logging associated with gold mining operations of the nineteenth century. However, in 1953, a fire burned over the top of Cuyamaca Peak killing Sugar pines that were reported to have been 180 feet tall and approaching 6 feet in diameter. That same area burned again in 1970 as part of the Boulder Creek fire, still producing vigorous young trees that were 33 years old.

The north and east slope of Middle Peak survived those earlier fires and supported a heavy forest of conifers including trees half a millennia in age. These trees were growing at the time that San Diego was first discovered by Europeans. The density had been increasing resulting from White fir saplings growing beneath the shade of the taller trees. Prescribed burns had been discussed for more than a decade though not carried out. The positive effect of what controlled burns could have provided in this area is not measurable at this time. The fires of October 2003 killed all of the trees. Opportunities for reproduction still remain, however, the density of burned and standing trunks may still make it difficult for the Sugar Pine seedlings to become reestablished. Furthermore, it will be necessary to set into place a forest management process that enables the seedlings to grow to full size that will be somewhat immune to low fires carried by dry winds. A clearly defined and well implemented forest management concept needs to be put into place for this area in perpetuity.

The Cuyamaca Mountains support large populations of wildlife as well as a diversity of plant species. The plants that occur on the meadows has been discussed elsewhere includes several Peninsular Range endemics and the Cuyamaca lake downingia that has been found nowhere else other than Cuyamaca lake. The activities associated with the fire suppression did affect the northern edge of Cuyamaca meadow and will need careful restoration. The use of seed from outside of the area may be detrimental.

The main loss of the Cuyamaca Mountain portion of the burn is that a truly pristine and ancient forest has been destroyed. It can be restored, but much of it will never appear as it did prior to the fire. The park will be very different for several generations.

Management Issues:

- It is imperative that specific forest management practices be set into place in the areas where the old growth forest formerly existed.
- Management in order to prevent fires in Cuyamaca cypress must be implemented
- Restoration of fire suppression scars must be carefully implemented

Otay Mountain is composed of metamorphosed Jurassic age volcanic rock. It is the base remnant of an ancient mountain range that extended up to 15,000 to 18,000 feet in elevation. The metavolcanic rock has chemical attributes that allow for unusual plants to survive there. The elevation of the mountain at approximately 3,500 feet, creates a level of rainfall that supports a unique forest of Tecate cypress on the unusual soils. The Tecate cypress occurs in several locations of Southern California and northern Baja California, but the stand on Otay Mountain has generally been considered the largest of all. In addition to the Tecate cypress, Otay Mountain supports a number of unusual and limited species of plants. Approximately 20 different species of plants occur on Otay Mountain that have been considered to be rare, endangered or threatened. The Otay Lotus (*Lotus crassifolius otayensis*), Otay Manzanita (*Arctostaphylos otayensis*), Otay Ceanothus (*Ceanothus otayensis*), and Gander's pitcher sage (*Lepechinia ganderi*) are just a few of those that occur there. Species new to the United States have been found here in the last half decade with the discovery of Cedros Island oak (*Quercus cedrosensis*) on the south side of the mountain. A new species of Monardella has also been discovered on the mountain with populations on the north side as well as two of the deep, south side canyons.

The north side of Otay Mountain includes deeply incised canyons, the largest of which is the Cedar Canyon. Cedar canyon consists of a gorge hundreds of feet deep, in which huge stands of cypress grew. The largest known stand of the Mexican flannel bush (*Fremontodendron mexicanum*) occurs on the lower reach of Cedar canyon. This species is known in the wild from only two locations, this one and a remote location in northern Baja California.

The lower northern slopes of the mountain include rolling hills and terraces that are covered with Coastal sage scrub habitat and some grasslands. Significantly large populations of the endangered Quino checkerspot butterfly have been found on these hills.

The south side of the Mountain also supports a couple of large canyons, the largest being Copper Canyon. It supports steep walls, a waterfall following rainy periods, and extensive cypress and oak vegetation.

Riparian woodlands occur in the area of Marron Valley where the Tijuana River passes into the United States from Mexico. They also occur to a lesser degree in the larger drainages on the north side of the mountain.

Otay Mountain has over the years been subject to a large number of crossings by undocumented immigrants. These crossings have also caused impacts to the vegetation and resulted in high levels of trash. In addition, they provide numerous ignition sources and may be the cause of the current Otay fire. However, in the late 1990's the Bureau of Land Management worked cooperatively with the Border Patrol and the U.S. Fish and Wildlife Service to create a border pack trail to be used to patrol the border itself. This has aided greatly in reducing the illegal crossings and allowing the continued existence of a more natural habitat.

The Thorne's hairstreak butterfly is an endemic species that appeared to be nearly completely confined to the Tecate cypress forests on Otay Mountain. Please see the discussion of butterflies for a specific analysis of the problems that this species will be facing as a result of the fires.

Recommendations:

- It is imperative that a defensible space be created around Otay Mountain to protect the Tecate Cypress forest. Fires have been occurring too frequently for sufficient reproduction of the cypress. Any additional fires within the next several decades will cause a real reduction in the area of the Tecate cypress forest. A fire action plan needs to be created to prevent any future fires within the cypress.
- Monitoring of the cypress reproduction in the areas that burned in the 1996 and 2003 fires needs to take place. A Cypress planting program needs to be prepared in the likely event that seedling reproduction does not occur naturally from the 7 year old trees.
- Northeast side and south side communities of Coastal sage scrub may be impacted by weedy grasses. This process needs to be monitored extensively and an action plan created and implemented for reducing spread of weeds into areas that currently lack them.

San Vicente Preserve/Boulder oaks

T. Oberbauer

The County of San Diego manages the San Vicente Preserve that consists of approximately 1,375 acres of land north of San Vicente reservoir. It includes areas of Chamise and Southern Mixed chaparral as well as Coastal sage scrub in the watershed above San Vicente Reservoir. The area also supports Quino checkerspot butterfly and high quality habitat that serves as a core area in the north central portion of the County Multiple Species Conservation Program. This area along with the land in the ownership of the City of San Diego around San Vicente reservoir and the Boulder oaks property combined create an important connection between the military lands to the west and the Cleveland National Forest to the east. These natural areas provide habitat to the entire array of wildlife that are included to be conserved in the regional natural resource programs.

Boulder oaks as described by its name, is a large block (approximately 1,250 acres) of oak woodland and chaparral habitat. A large percentage of the oaks is the Engelmann oak (*Quercus engelmannii*), a species that is predominantly confined to San Diego County. It also includes mesa lands with vernal pool habitats. These vernal pools will need to be evaluated to determine their importance. Monitoring of weeds is the primary concern in these areas, though the Boulder oaks property has especially been subject to cattle grazing for a long period of time and portions already have a number of weeds.

Recommendations:

- Monitor the effect of potential weed expansion
- Monitor Quino checkerspot butterfly to determine its survival.

Crestridge Ecological Reserve

M. Klien

The Crestridge Ecological Reserve is an approximately 2,600-acre area east of the City of El Cajon, north and adjacent to the Community of Crest and south of the Community of Flinn Springs. The Reserve is owned and managed by the California Department of Fish and Game (DFG). It is a large island of habitat almost entirely surrounded by residential development. It is centrally located at the eastern edge of urban development between MSCP lands to the north of Interstate 8 and MSCP lands to the south of Interstate 8 and therefore functions as a habitat linkage. A draft Management Plan was produced by Conservation Biology Institute (CBI) for the DFG.

Nine vegetation communities are identified onsite with Southern Mixed Chaparral taking up nearly 74% of it. Extensive biological surveying was performed over a 2 ½ year period for assisting in the Management Plan. Many sensitive plants and animals were noted and mapped onsite. These maps are part of the Management Plan.

T&E or sensitive plants mapped onsite were: *Acanthamintha illicifolia*, *Artemisia palmeri*, *Ceanothus cyaneus*, *Clarkia delicate*, *Harpagonella palmeri*, *Horkellia truncate*, *Machaeranthera juncea*, and *Quercus engelannii*. Sensitive wildlife noted were: *Accipiter cooperii* (nesting), *Elanus leucurus*, *Euphyes vestries harbisoni*, and *Lycaena [Hermelycaena] hermes*. The *Ceanothus cyaneus* was considered the largest population in the County. The *Lycaena hermes* was considered to be the largest population in the world.

Initial assessments of the Reserve is that probably less than 5% did not burn or was singed. It appears that the entire population of *Ceanothus cyaneus* burned as well as the entire population of *Lycaena hermes*. Recovery of the *Ceanothus* should do well but monitoring should be provided for locating the new growth. The *Lycaena hermes* will only recolonize if adjacent unburned colonies are found. This will take approximately 18 years. Monitoring adjacent unburned areas is recommended for the *hermes*. Also there was impact the *Euphyes vestries harbisoni* but it is too early to assess any potential short or long term impacts to them. At a minimum, monitoring of unaffected host plant in May will give a better indication of how well they might recover.

Primary issues which need to be addressed for the short-term:

- Invasive weed control due to the proximity of development surrounding the Reserve
- Noting and mapping of refugia where sensitive species may still be present
- Late spring to early summer monitoring in 2004 for *hermes* copper colonies
- Late spring to early summer monitoring in 2004 for *harbison* dun skipper
- Policing the area to keep OHV activity to a minimum to none at all

Long-term issues:

- Continued monitoring of *hermes* copper colonies
- Continued monitoring of *harbison* dun skipper colonies
- Continued aggressive invasive weed control
- Continued policing for OHV activity
- Begin monitoring of above listed sensitive species other than *hermes* and *harbison* to ensure recovery.
- Cost estimate is undetermined due to unknown variables related to aerals. Once aerals are presented, then onsite truthing can be done to establish the short-term and long-term funding issues.

Rancho Jamul Ecological Reserve and Hollenbeck Canyon Wildlife Area J. Diffendorfer

Rancho Jamul Ecological Reserve and Hollenbeck Canyon Wildlife Area as an ideal post-fire study site is located about 5 miles east of Jamul and northeast of Lower Otay Lake, the 1,390 acre Rancho Jamul Ecological Reserve (RJER) and the adjacent 3,210 acre Hollenbeck Canyon Wildlife Area (HCWA) represent a diverse mix of burned and unburned riparian, coastal sage scrub, chaparral, oak woodland, and grassland habitat. These reserves, owned by the California Department of Fish and Game, provide continuous habitat between the Otay Mountain and Jamul Mountain and are bisected by highway 94.

RJER and Hollenbeck encompass a highly diverse region in the eastern edge of the Multiple Species Conservation Plan (MSCP). Most of the CSS stands, though historically grazed, are relatively intact with low levels of exotic invasion, though levels of invasion vary across the reserve with some sites being highly invaded. The CSS stands include species from Baja California, and include a number of rare plants, including host plants for 2 endangered butterfly species. In addition, the sites support highly diverse mammal and reptile communities, with high numbers of species than other nearby areas. Finally, the area supports a number of breeding raptors, and top carnivores (mountain lions and golden eagles) forage in the two reserves. As such, the RJER/HCWA complex represents perhaps on the most diverse and ecologically intact reserves within the MSCP.

These two areas are ideally situated for post-burn studies primarily because large amounts of pre-burn data exist for a wide variety of species, particularly at RJER. United States Geological Survey (USGS) completed year-long baseline surveys for reptiles, amphibians, small mammals, mammalian carnivores, terrestrial arthropods, ants, bats, birds, and rare plants in early 2002. This intensive survey included sampling across the entire reserve, in all major habitat types, as well as in road culverts along the reserve boundary, resulting in 3843 observations. These data are georeferenced and in a relational database. In addition, Dr. John O'leary (San Diego State University) created a detailed vegetation and land cover map of RJER in 2001, which is encoded in a GIS coverage. In addition to these baseline surveys, Dr. Jay Diffendorfer (San Diego State University) has conducted 2 years of monitoring on 17 coastal sage scrub sites arrayed across a gradient of invasion by non-native grasses. At each site, data on birds, arthropods, and small mammals were collected 4 times a year, and detailed vegetation surveys conducted annually. 15 of the 17 sites burned during the fire and all will be resampled in January, 2004, after which time, the original contract will end. Finally, a number of single species studies occurred at RJER before the burn. These include a radio-telemetry studies of 2 snake species, the Coachwhip (*Masticophis flagellum*) and the striped racer (*Masticophis lateralis*) as well as a surveys of the endangered Quino and Hermes Copper butterflies, both of which occurred pre fire. At HCWA, USGS is currently conducting surveys for reptiles and amphibians, small mammals, ants, bats, and birds. In addition, large carnivore surveys are being conducted and preliminary bird surveys exist.

Patterns of Burn. The majority of RJER was burned during the Otay Fire while HCWA remained unburned creating high quality reference sites for post burn management actions and studies conducted at burned locations. Within RJER, only former agricultural fields, buildings/infrastructure, and 2 knolls dominated by Coastal Sage Scrub remaining unburned. Burn severity varied within the reserve, but across 85-100% of the burned area, 75-100% of the aboveground vegetation was consumed.

Within RJER, fire teams created backfires along exotic grassland - native CSS ecotones. In these cases, the exotic grasslands did not burn, but large areas of adjacent CSS did. These ecotones are ~ 2-3 km long within the reserve and represent areas of key management concern as exotic seeds can blow into the now open CSS. Potential management strategies may include controlling nearby exotic grasslands, placing mesh fencing to prevent wind dispersal of seeds across the roads into the CSS regrowth, etc. If these or other strategies are used, the resulting vegetation data can be compared to 1) pre-existing data regarding the diversity and level of invasion, 2) untreated sites, and 3) to recovering CSS sites at varying distances from the populations of exotic grasses.

Santa Ysabel Ranch Open Space Preserve

S. Morrison

The Santa Ysabel Valley contains a rare, intact mosaic of Engelmann oak woodlands, native grasslands, wet meadows, riparian forests and high desert woodlands. The region is a critical ecological connection between the coastal scrub systems of the coast and the arid lands of the lower Sonoran desert. Its ecotonal richness and complexity contributed to its designation as an area of "High Ecological Significance" by the U.S. Forest Service.

The 5,406-acre Santa Ysabel Ranch Open Space Preserve, owned and managed by San Diego County Parks, is rich with biological and cultural resources, and strategically located within a matrix of existing public reserves (including the adjacent Volcan Mountain County Preserve and Cleveland National Forest). In collaboration with the County, The Nature Conservancy recently completed a two-year (Fall 2001- Fall 2003) inventory of the biological resources of the Ranch, so as to better develop guidelines for biological and public access management. The survey protocols implemented on the reserve are similar to those employed on Rancho Jamul Ecological Reserve, a CDFG reserve of similar size. United State Geological Survey (USGS; R. Fisher, et al.) completed a multi-taxa faunal inventory that included: ant surveys, breeding bird point count stations, spotted owl surveys, herpetofaunal pitfall trapping arrays, aquatic surveys, woodrat midden surveys, large mammal tracking / photo-trapping stations, and bat surveys. Conservation Biology Institute (CBI; W. Spencer, et al.) conducted surveys for Stephens' kangaroo rat in 2001 and 2003. Ecological Outreach Services (EOS; V. Moran) conducted rare plant surveys, invasive plant mapping, and vegetation community mapping in 2002-3. The Nature Conservancy (Z. Principe) conducted Engelmann oak recruitment transect studies. The California Native Plant Society (CNPS; J. Evens) conducted vegetation relevé sampling in 2002. The site also had point locations in the San Diego County Bird Atlas (SD Natural History Museum; P. Unitt) as well as water quality sampling stations for an ongoing regional water quality study.

The fire burned over 50% of the East Ranch of the Preserve. On the adjacent Volcan Mountain Open Space Preserve (also a County Parks preserve), a similar biological inventory has been underway; much of that reserve burned in the 63,000-acre Pines Fire in August 2002. Thus, multiple years of pre-fire data exist, for considerable areas of burned and unburned habitat. Contracts for the monitoring, however, have been completed.

Recommendations:

- Continue multi-taxa floral and faunal monitoring on Santa Ysabel East Ranch to examine post-fire recovery, and guard against invasion by non-native pest plant species.
- Initiate a native grassland restoration project on the burned areas of (previously) Bromus -dominated grasslands.
- Develop fuels management guidelines for the preserve and surrounding public lands to minimize risks to public, while also managing for habitat values for focal species.

Barnett Ranch Open Space Preserve

T. Oberbauer/B. Yang

The 716.5 acre Barnett Ranch Open Space Preserve, located approximately two miles south of the unincorporated township of Ramona, just west of the intersection of Chuck Wagon Road and San Vicente Road. Pursuant to the County of San Diego's Multiple Species Conservation Program (MSCP) Sub Area Plan, the Barnett Ranch Open Space Preserve is included in the

MSCP preserve system for the purpose of protecting sensitive resources and to meet the County's obligation to the MSCP.

The pre-fire vegetation communities that existed on the Barnett Ranch Open Space Preserve include Diegan coastal sage scrub, southern coast live oak riparian forest, riparian scrub, southern willow scrub, coast live oak woodland, southern mixed chaparral, wildflower fields, non-native grassland, and eucalyptus woodland. However, the predominant vegetation communities on the preserve consisted primarily of Diegan coastal sage scrub, southern mixed chaparral, and non-native grassland.

Numerous sensitive plant and animal species were also known to occur onsite or in close proximity to the preserve. These species include but are not limited to orange-throated whiptail (*Cnemidophorus hyperythrus*), Silvery legless lizard (*Aniella pulchra*), northern red-diamond rattlesnake (*Crotalus exsul*), the Quino checkerspot butterfly (*Euphydryas editha quino*), Pacific slope flycatcher (*Empidonax difficilis*), Golden Eagle (*Aquila chrysaetos*), Common barn owl (*Tyto alba*), White-tailed kite (*Elanus leucurus*), Ringtail (*Bassariscus astutus*), San Diego desert wood rat (*Neotoma lepida intermedia*), Palmer's sage (*Artemisia palmeri*), Lakeside ceanothus (*Ceanothus cyaneus*), San Diego goldenstar (*Muilla clevelandii*), Engelmann oak (*Quercus engelmannii*), California adder's tongue fern (*Ophioglossum californicum*), and Ashy spike moss (*Selaginella cinerascens*).

Habitat Connectivity

S. Morrison

Habitat fragmentation poses one of the greatest threats to biodiversity. When core habitat reserves are isolated from one another by human land uses, diversity of native species declines. Habitat linkages allow for dispersal throughout the landscape, and that may help prevent extirpation and extinction. San Diego County is one of the most biologically rich, ecologically fragmented and rapidly changing counties in the United States. Conservation strategies will ultimately fail to conserve biodiversity of this "hotspot" unless habitat linkages are preserved and remain functional.

The scale of the 2003 fires places particular emphasis on the need for corridors and habitat linkages. For animals displaced by the fires, successful dispersal may be particularly challenging because suitable habitat may be unusually sparse or distant. Recolonization of burned areas by both animals and plants will require that they be provided safe passage through the human-modified landscape. However, many of the landscape attributes (e.g., riparian vegetation corridors) that in the past may have helped conduct movement safely through the landscape have been altered and may not function in the near-term. "Traditional" corridors (e.g., known road crossing locations) may no longer be used, if surrounding vegetation / structure has been substantially altered by fire. This might lead to increased dispersal mortality, as animals get lost, killed by traffic, and so on.

Pre-fire information and data include:

- Conservation Biology Institute, under contract by CDFG and others, completed numerous Wildlife Corridor Monitoring studies for the Multiple Species Conservation Plan, a regional reserve network for coastal biota in western San Diego County. Various 2002 and 2003 publications present data from monitoring stations within the Cedar and Otay Fire perimeters.
- CBI also conducted a corridor assessment for the Crestridge Reserve, which burned in the Cedar Fire. The Crestridge Reserve, along with the Lakeside Archipelago, comprises a linkage "chokepoint" for CSS avifauna and other biota. This stepping

stone corridor complex is critical for CSS connectivity north-south of Interstate 8. On Crestridge, as much as 95% of the vegetation has been burned, compromising the viability of this linkage.

- EDAW Environmental Consulting (C. Schaefer, et al.) recently completed a corridor monitoring study for Wildcat Canyon, which burned in the Cedar Fire.
- The San Diego Tracking Team (B. Martin, et al.) and its members hold numerous datasets from their tracking program, many being corridor-related in the area of the coastal sage-chaparral transition in the Cedar Fire.
- The Wildlife Health Center of UC Davis (WHC; W. Boyce, et al.) has conducted intensive monitoring of large mammals in the vicinity of Cuyamaca Rancho and Anza Borrego State Parks. Their efforts have focused on the inter-relationships and movements of mountain lion, bighorn sheep and deer. Many of the lions within the eastern region of the Cedar Fire perimeter were collared by this team.
- USGS (R. Fisher, et al.) and others recently completed mammal movement studies on and off the Rancho Jamul and the Santa Ysabel Ranch preserves
- The Missing Linkages Initiative, through a series of local and regional experts' workshops, identified approximately 20 corridors with regional significance in San Diego County (for the report:
<http://www.calwild.org/pubs/reports/linkages/index.htm>)

Recommendations:

- Continue monitoring of studied corridors.
- Seek funding to continue WHC study of mountain lion movements (Contact: E. Rubin, Zoological Society of San Diego). There are particular concerns of mountain lions moving eastward for prey, as that may have adverse effects on viability of endangered bighorn sheep. There are also public safety concerns, if food resources decline for mountain lions and they begin foraging in more human-dominated landscapes.
- Monitor the Lakeside Archipelago and the Crestridge Reserve for appropriate CSS community composition and structure; implement CSS restoration as needed to accelerate the recovery of this choke-point for north-south CSS connectivity.

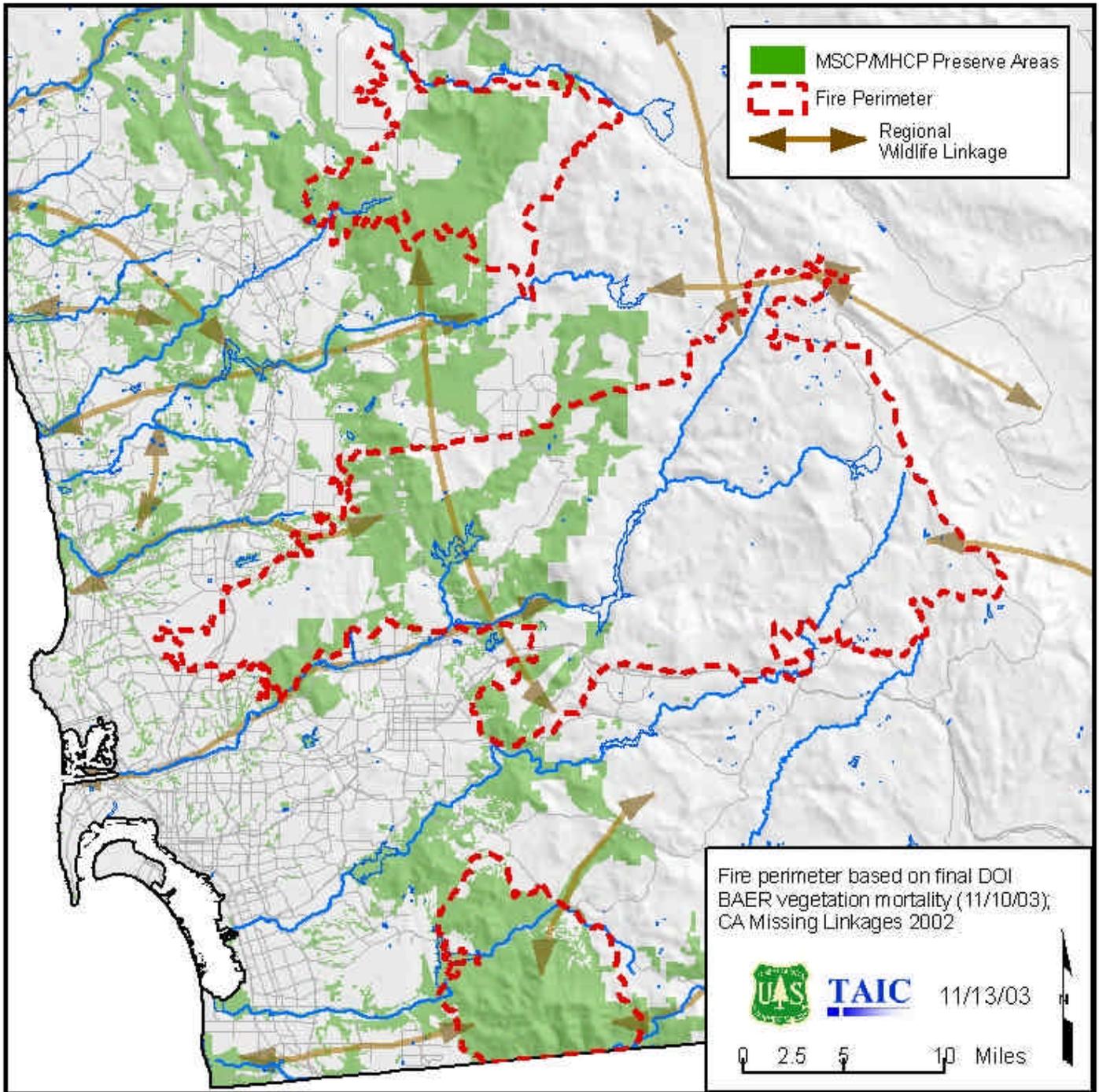


Figure 1. Regional Conservation Planning Preserve Areas and Wildlife Linkages

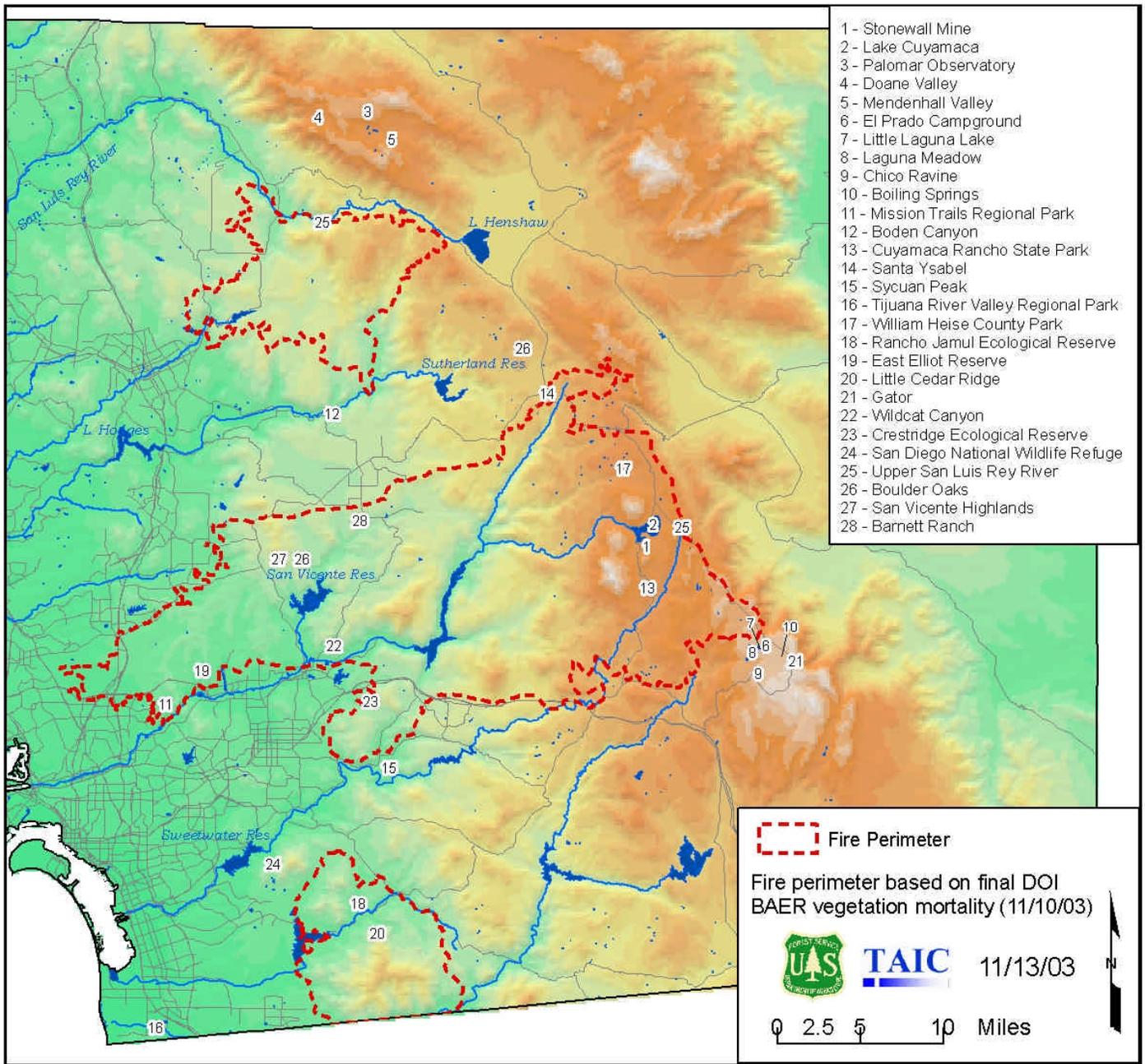


Figure 2. Cited Locations

Final Note

References, GIS layers and coordinates will be supplied freely upon request to researchers and agencies. The authors are all interested in the health and quick recovery of our county. We have been studying these areas and they are dear to us. Please feel free to call and inquire, we have a list of over 70 other associates that can fill in information when ours is lacking.

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Appendix 1

Tables

The attached tables include a variety of information that provides a background on the lands that have been burned in the fire. The most basic table includes a list of the acreages of each of the vegetation communities that burned with an assessment of the burn severity (*Initial Assessment of Burn Severity Impacts on Vegetation Types*).

The second table (*Initial Assessment of Burn Impacts on Species Occurrences*) includes a list of the species of plants and animals by scientific name for which known data locational points existed within the burn area. These data points represent institutionally known locations. However, specific researchers in the region may have additional point information and in the case of the Thorne's hairstreak, no data points have been included in the regional data base.

The third table (*Initial Assessment of Burn Impacts on Predicted Species Distributions*) includes an evaluation of the potential distribution of sensitive species in the burn areas. The County of San Diego and TAIC consultants modeled the distribution of approximately 400 species of plants and animals that are considered sensitive utilizing basic attributes of the habitats inhabited by the species and melding them with GIS layers. This table assesses the effect of the fire on the modeled distribution of each of these species. This model is only intended for analysis purposes.

The fourth table (*Initial Assessment of Burn Impacts by Watershed*) is a listing of burn area by watershed.

The fifth table (*Initial Assessment of Burn Impacts on Vegetation Types*) is a listing of Vegetation Communities that have been burned by each of the three major fires, Paradise, Cedar, and Otay.

The sixth table (*Initial Assessment of Burn Impacts on NCCP Planning Areas*) is a listing of the acreages of habitat within Natural Community Conservation Planning areas, both those that have been approved and those in process. This table is for information purposes only to assist in the determination of importance of habitats. The inclusion of the North County Multiple Species Conservation Planning Program numbers here in no way implies that it has been approved. It is included to assist in the evaluation of the effects of the fire on a the Multiple Species Conservation Program which is a cooperative planning process involving the County of San Diego and the U.S. Fish and Wildlife Service and California Department of Fish and Game.

Attachment A

**County of San Diego Parks burned in preserves
in the existing approved MSCP:**

Park Name/Location	Acres Burned	MSCP Designation
Boulder Oaks OSP	1215 acres	PAMA
San Vicente Highlands	1585 acres	PAMA (bulk is owned by CDFG, managed by DPR)
Barnett Ranch	715 acres	PAMA
Holly Oaks/Luelf Pond	87 acres	not in PAMA
Sycamore/Goodan	2135 acres	PAMA
El Capitan OSP	2839 acres	PAMA (BLM, managed by DPR)
Oakoasis OSP	397 acres	PAMA
Louis Stelzer Park	<u>370 acres</u>	PAMA
<i>Total</i>	<i>9343 acres</i>	

**COUNTY OF SAN DIEGO PARKS BURNED
IN PRESERVES NOT IN THE MSCP:**

Park Name/Location	Acres Burned	
Simon Park	650 acres	(BLM, managed by DPR)
Mt. Gower	750 acres	
Santa Ysabel	2240 acres	
Volcan	150 acres	
Hellhole Canyon OSP	<u>1712 acres</u>	
<i>Total</i>	<i>5502 acres</i>	

Total of 14,845