USDA-FOREST SERVICE Date of Report: 5-24-93

BURNED-AREA REPORT
(Reference FSH 2509.13, Report FS-2500-8)

PART I - TYPE OF REQUEST

A. Type of Report

[X] 1. Funding request for estimated FFFS-FW22 funds
[ ] 2. Accomplishment Report

B. Type of Action

[X] 1. Initial Request (Best estimate of funds needed to complete eligible rehabilitation measures)

[ ] 2. Interim Report
[ ] Updating the initial funding request based on more accurate site data and design analysis
[ ] Status of accomplishments to-date

[ ] 3. Final report - following completion of work

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: EAGLE B. Fire Number: CNF-519

C. State: CALIFORNIA D. County: SAN DIEGO
E. Region: 05 PACIFIC SOUTHWEST F. Forest: 02 CLEVELAND
G. District: 53 PALOMAR

H. Date Fire Started: MAY 9, 1993 I. Date Fire Controlled: MAY 16, 1993
J. Suppression Cost: $ 1,975,000

K. Fire Suppression Damages Repaired with FFFS-PF12 Funds:
1. Fireline waterbarred (miles) 2.5 $8,200
2. Fireline seeded (miles) 0
3. Other (identify)

L. Watershed Number: 1807030402

M. NFS Acres Burned: 3260 Total Acres Burned: 4600
Ownership type:
(140)CITY (900)BIA (100)PVT (200)HELIX

N. Vegetation Types: COASTAL SAGE - CHAPARRAL (4000 AC.) includes Diegan sage scrub (1,000 ac.), Riparian (90 ac.)
O. Dominant Soils: Cieneba - (4000 ac.) Fallbrook, Las Posas, Sheephead Ramona (600)
P. Geologic Types: Granitic 95%

Q. Miles of Stream Channels by Order or Class:
NFS 3 miles other 4 miles all perennial
R. Transportation System:
Trails: 0 (miles) Roads: 0 (miles)

PART III - WATERSHED CONDITION

A. Fire Intensity (Acres): 30% (low) 70% (moderate) 0% (high)

B. Water Repellant Soil (Acres): _____

C. Soil Erosion Hazard Rating (Acres):
_____ (low) _____ (moderate) 100% (high)

D. Erosion Potential: 100 tons/acre (Davis 1980) (Sinclair,1954)
E. Sediment Potential: 133,000 cu. yds/sq. mile (Rowe et.al, 1954)

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period: 3-5 years. 10-20 without project
B. Design Chance of Success: _____ percent.
C. Equivalent Design Recurrence Interval: _____ years.
D. Design Storm Duration: _____ hours.
E. Design Storm Magnitude: _____ inches.
F. Design Flow:_____ cfsm.
G. Estimated Reduction in Infiltration: _____ percent.
H. Adjusted Design Flow: _____ cfsm.

PART V - SUMMARY OF ANALYSIS

A. Describe Emergency: Over 4000 acres of Coastal Sage - Chaparral Scrub burned in an early season fire. Current literature and past monitoring have shown that there is a substantial risk that this vegetation type will require an exceptionally long time to recover (10-20 years) due to the season of the burn. (see narrative report attached) Seeding and mulching may be needed to quickly establish cover especially along drainages adjacent to the San Diego River. There is a concern for maintaining on-site soil productivity in the habitat of a Federally listed bird species, the California Gnatcatcher. Approximately 90% of this species occupied habitat on Forest land was lost in the fire.

B. Emergency Treatment Objectives: Establish a buffer strip of vegetation cover to maintain soil productivity for habitat recovery along the San Diego River. Focus on minor drainages on lower slopes. Recover desired cover of Coastal Sage - Chaparral Scrub within 5 years. Accomplish this by seeding native species known to occur on the site as shown in the attached narrative report.

C. Probability of Completing Treatment Prior to First Major Damage Producing Storm:
Land 90 % Channel _____ % Roads _____ % Other _____ %

D. Probability of Treatment Success

<----Years after treatment----->

	1	3	5
Land	30%	80%	90%
Channel			
Roads			
Other			

E. Cost of No-Action (Including Risk): $ 758,500

F. Cost of Selected Alternative (Including Risk): $ 384,000

G. Skills Represented on Burned-Area Survey Team ("x" appropriate boxes):

[X] Hydrology	[ ] Soils	[ ] Geology	[ ] Range
[ ] Timber	[X] Wildlife	[ ] Fire Mgmt.	[ ] Engineering
[ ] Contracting	[X] Ecology	[ ] Research	[ ] Archaeology
[X] Botany	[ ] _____	[ ] _____	[ ] _____

Team Leader: Tom White
Phone: (619) 674-2955 DG Address: T.White:R05F02A

H. Treatment Narrative:
Describe the emergency treatments, where and how they will be applied, and what they are intended to do. This information helps to determine qualifying treatments for the appropriate funding authorities. For seeding treatments, include species, application rates and species selection rationale.

Apply rice straw mulch to 50 acres in strips along steeper slopes and side drainages. An application rate of 2,000 pounds per acre will be used. This will provide cover rapidly in key areas of the burn.

Sample sprouting of dominant Diegan Sage Scrub species. If mortality is greater than 50 percent by September 1993 than initiate a seed collection contract. If less than 50 percent mortality occures then cancel request for seeding funds. Apply the low rate of seeding shown in appendix A of the narrative report as follows: Artemesia californica 1.249 lbs/ac. and Eriognum faciculatum 5.8 lbs/ac and Salvia apiana .75 lbs/ac. Broadcast seed with belly grinders along drainage ways within 1/4 mile of the San Diego River. Rake in as necessary. Research plots will be protected from seeding by identifying them and marking them with flagging. No seeding will occur within these flagged areas. This seeding is intended to accelerate recovery of vegetation cover along key drainages to act as filter strips while the remaining sites recover. These planted strips will provide a seed source to help recover the remainder of the site.

Areas of potential OHV access will be signed to discourace use.

PART VI - EMERGENCY REHABILITATION TREATMENTS AND SOURCE OF FUNDS BY LAND OWNERSHIP

NOTE: Emergency rehabilitation is work done promptly following a wildfire and is not to solve watershed problems that existed prior to the wildfire.

			NFS Lands			Other Lands			All
Line Items	Units	Unit Cost $	Number of Units	FFFS-FW22 $	Other $ ident.	Number of Units	Fed $ ident.	Non-Fed $ ident.	Total $
A. LAND TREATMENTS									
Seeding	Acres	250	100	25,000					25,000
Signing				500					500
Mulching	Acres	600	50	30,000					30,000
B. CHANNEL TREATMENTS									
C. ROADS AND TRAILS									
D. STRUCTURES									
E. BAER EVALUATION/ ADMINISTRATIVE SUPPORT									
Sampling for Seeding	plots	100	50	5,000					5,000
Report Preparation	rpts	2500	2	5,000					5,000
F. TOTALS				65,500					65,500

PART VII - APPROVALS

1. /s/ _____ _____
   Forest Supervisor (Signature) Date

2. /s/ _____ _____
   Regional Forester (Signature) Date

RAMONA COMPLEX EMERGENCY BURNED AREA REHAB REPORT
NARRATIVE

On Sunday May 9, 1993 three fires started on the Cleveland National Forest. Two of the fires were apparent rekindles of prescribed burns which had been conducted earlier in the week. The Troy fire burned 50 acres and was suppressed within the planned project boundary. The Boden fire on the Palomar Ranger District burned 1200 acres. (715 acres private and 585 acres Forest). A third fire which started in the Cedar Creek Falls area of the Palomar Ranger District from an illegal campfire burned 4600 acres (3260 acres Forest, 900 acres Indian Reservation, 140 acres City of San Diego, 200 acres Helix Irrigation District and 100 acres private) along the San Diego River and Cedar Creek. Suppression related rehab efforts have been completed on the fires with District resource advisors directing installation of water bars. Approximately 8 miles of fire line have been rehabed.

Assessment of Emergency Burned Area Rehab Needs

Both the Troy and Boden fires will require no rehab. The Troy fire will not require burned area rehab due to the small size of the fire. The burn pattern and intensity fell with the parameters prescribed for the planned project. The Boden fire burned in Southern Mixed Chaparral (Holland 1986). Burn intensities were low to moderate and the site is expected to recover due to the strong sprouting characteristics of the shrub species found on the site. These include Chamise Adenostoma faciculatum, Mission Manzanita Xylocacus bicolor, Spice bush Gnuridium dumosum, and two species of obligate seeding ceanothus species, Hoaryleaf ceanothus Ceanothus crassifolius and Wollyleaf ceanothus Ceanothus tomentosus. The moderate burn intensity will likely reestablish these species from the soil seed bank. The chamise was flowering which could lead to a concern for higher than normal mortality, this will have to be monitored. No downstream improvements or resources would be threatened from sediment or debris flows resulting from these fires.

A significant concern has been identified for the recovery of the Eagle fire. A review of the literature and recent post burn monitoring indicate that coastal sage scrub is not as resilient as chaparral to early season (spring) fires. Recent biological surveys in this area have identified 25 pairs of the California Gnatcatcher Polioptila californica (POCA). The Gnatcatcher was listed as "Threatened" by the US Fish and Wildlife Service in March 1993. The San Diego River population of the gnatcatcher is the only known population on the Forest. The Forest has approximately 20,000 acres of potential habitat for POCA. John Stephenson (Palomar District Wildlife Biologist) estimated that 80-90 percent of the habitat for the known population of POCA was burned in the fire. Considering the significance of this habitat, loss of on-site productivity caused by poor regeneration of the dominant shrubs on this site needs to be addressed.

LITERATURE REVIEW

The effects of fire frequency, intensity, and season of burn on coastal sage scrub regeneration is not well understood. Some literature is available

which gives at least a partial understanding of potential concerns related to the current fire situation and recovery of California Gnatcatcher habitat.

California Gnatcatchers are obligate, permanent residents of coastal sage scrub (Atwood, 1990). Their present range extends from the Palos Verdes Peninsula in Los Angeles County south into Orange County, western Riverside and San Diego Counties, and Baja California (Salata, 1993). They previously occurred on the southern slopes of the San Gabriel and San Bernardino Mountains, but have apparently been extirpated from these areas (Atwood, 1990). It is estimated that 70-90 per cent of coastal sage scrub in Southern California has been lost to urban and agricultural development. Due to habitat loss and other threats. the California Gnatcatcher was federally listed as Threatened on March 25, 1993 (Salata, 1993).

Coastal sage scrubs are characterized by "mesophyllous, partially drought-deciduous and seasonally dimorphic shrubs " (Westman, 1983). In general, coastal sage scrub vegetation is shorter in stature than chaparral and has a more open structure, which allows development of a significant herbaceous layer. Four major types of coastal sage scrub are defined by Westman (1983): Diablan, Venturan, Riversidean, and Diegan. Diablan Sage Scrub occurs in the central coastal portion of California, and is not within the historical range of the California Gnatcatcher.

On the Cleveland National Forest, all known California Gnatcatcher locations are in Diegan Coastal Sage Scrub (inland form) and in a Coastal Sage Scrub/ Chaparral mix dominated by Chamise and California Sage. Gnatcatchers occur in Diegan Coastal Scrub and in Coastal Sage Scrub/Chaparral in the San Diego River watershed and in Pamo Valley.

Specific Habitat Description-Diegan Coastal Sage Scrub

Several authors have characterized California Gnatcatcher habitat in Diegan Coastal Sage Scrub. Bontrager (1991) studied habitat characteristics in coastal Orange County. He found that occupied territories of twelve pairs of gnatcatchers had an average shrub cover of 50-77%, and were dominated by Artemisia californica (50% of total shrub cover) and Eriogonum fasciculatum (37%). Mimulus aurantiacus and Salvia apiana combined comprised 8% of shrub cover, with the remaining shrub cover comsisting of 9 other species. Bontrager found that breeding territory sizes ranged from 4 to 11.5 acres, while non-breeding territories were 4.9 to 20.4 acres.

Atwood (1990) summarizes dominant shrub species in three stands of Diegan Coastal Sage Scrub, two in the El Cajon area of inland San Diego County and one at Camp Pendleton in northern coastal San Diego County. The El Cajon sites were dominated by Artemisia californica (23 to 47%), Eriogonum fasciculatum (27 to 53%), Malosma laurina (8 to 10%), and Viguiera laciniata (10 to 13%). The Camp Pendleton site was dominated by Artemisia californica (69%) and Baccharis sp. (23%). Atwood observes that coastal sage scrub is a highly variable vegetation type, and "there is no clear indication that California Gnatcatchers are obligately dependent on particular plant species... there is some indication that (gnatcatchers) occur in lower densities in areas dominated by Salvia mellifera" (Mock et al 1990).

Mock and Bolger (1992) report further on a site in the El Cajon area. Total shrub cover in 39 California Gnatcatcher territories ranged from 39.8 to 91.5%. The most common shrubs (relative dominance) were Artemisia californica (37.6%), and Eriogonum fasciculatum (28.4%). Malosma laurina (15.7%) was frequent. Several other shrub species occurred at less than 3% relative dominance. The most common shrubs were less than 1m in height with the exception of Malosma which averaged 1-3m. Areas preferred for nesting had slopes of 20-40%. The breeding territories of 25 monitored gnatcatcher pairs averaged 20.5 acres, while the non-breeding territories averaged 34.6 acres.

Specific Habitat Description-Cleveland National Forest

Vegetation sampling was conducted at 6 plots of Diegan Coastal Sage Scrub and in 14 plots of Coastal Sage/Chaparral in the San Diego River area in April and May of 1993; and in spring and summer of 1992. The following discussion summarizes cover values for plant species detected in these surveys. Sampling of Diegan Coastal Sage Scrub consisted of establishing 50m point-transects within known gnatcatcher habitat. Plant species present at 0.5m intervals were recorded. Sampling of Coastal Sage/Chaparral consisted of establishing 0.1 acre circular plots and estimating cover values for all plant species within the plot. The plots were located in open stands of coastal sage scrub, adjacent to minor drainages, and on gentle southeast-facing slopes (5-40%). Elevations ranged from 1040 to 1140 feet.

The average shrub cover was 45% and total shrub and herb cover averaged 81%. Artemisia californica was the dominant shrub species, comprising 51% of the shrub layer. Other common shrubs included Eriogonum fasciculatum (15%), Acacia greggii (7%), Yucca whipplei (8%), and Malosma laurina (8%). Other shrubs present, but each composing less than 5% of the shrub cover, included Lotus scoparius, Opuntia littoralis, Keckiella antirrhinoides, and Salvia apiana.

All shrub species observed were native; the Acacia may have been brought from desert areas in east San Diego County by former residents of the area. The herbaceous layer was composed of a variety of native and non-native grasses and forbs. Bromus rubens (53% of herb layer) and Bromus mollis (15%) were very common non-native grasses. Non-native forbs included Centaurea melitensis (20%). Many native wildflowers were present including Filago californica (15%), Mirabilis californica (15%), Cryptantha sp(26%), and Centaurium venustum (9%). One Forest Sensitive plant species, Astragalus deanei (2%), was detected.

Fire Intensity, Frequency, and Grazing Effects

O'Leary and Westman (1988) studied four ungrazed coastal sage scrub sites in the Santa Monica Mountains (Venturan Sage Scrub) and four recently grazed inland Riversidean sage scrub sites in southwest San Bernardino Co. and Riverside County. They followed sites for four years after fire. Three of the coastal sites exhibited rapid recovery of vegetation to preburn levels. They attributed this to "substantial resprouting of subshrubs and shrubs" and resprouting and seeding of native grasses. The fourth coastal site became dominated by the non-native Bromus rubens. This site was adjacent to a grazed area.

At the four inland sites, O'Leary and Westman (1988) first observed a lack of shrub resprouting and a dominant layer of forbs and vines. After a few years, sites became dominated by annual exotic grasses, especially Bromus rubens. O'Leary and Westman suggested that this type conversion occurred at inland sites due to the lack of native grasses and the abundance of exotic seed sources available from adjacent agricultural areas. These data suggest that coastal sage scrub responds positively to fire in the absence of grazing, but is outcompeted after fire by exotic grasses where grazing is present.

Malanson and O'Leary (1982) studied the effects of an October, 1978 fire on six areas of Venturan coastal sage scrub. Four sites had burned in the afternoon at relatively high intensity, two burned at night at lower intensity. At all sites they documented substantial resprouting of the seventeen shrub species found at their sites, including Artemisia californica and Eriogonum cinereum. The resprouting response varied by about an order of magnitude, possibly due to several factors including fire intensity. In this study the sites that burned at higher intensity had about the same amount of resprouting as sites that burned at lower intensity. These findings contrasted with those of Kirkpatrick and Hutchinson (1980), who suggested that the majority of sage scrub species were unable to resprout after fire.

Westman (1981a) found that high fire intensities suppress resprouting of coastal sage shrubs, allowing the herb layer to become dominant. Less intense fires favor resprouting and lead to suppression of the herb layer. Westman et al. (1981b) also found limited recovery of Artemisia californica and other shrubs through first-year seedling recruitment after intense fire; they found that resprouting individuals apparently produced seeds that contributed to seedling recruitment in the next growing season. They postulated that seeds had not survived the fire or were viable for only one year; however they did not study seed viability or presence of seed in the soil. Malanson and O'Leary (1982) also found that shrubs that resprouted and produced seed after a fire were more important seed sources than pre-fire seed caches in the soil.

Zedler et al (1983) studied the response of a sage scrub stand to two sequential burns within a one year period. An area that burned in August 1979 was planted with annual ryegrass, and partially reburned in July 1980. (A prior burn had occurred in the 1950's). No resprouting was observed in Artemisia californica and Eriogonum fasciculatum after the 1979 burn; some resprouting of Salvia apiana occurred. All plants reproduced from seed with Artemisia californica being most abundant. After the 1980 fire, Eriogonum fasciculatum was absent from the twice-burned area. Salvia apiana and Artemisia californica were still present, with some 1-year old A.californica resprouting. Zedler et al. (1983) also suggest that the lack of resprouting at their study site "may be a local expression of a general tendency for resprouting to be less successful and obligate seeding to be more prevalent with increasing aridity in the entire chaparral zone", as postulated by Keeley (1977).

Westman and O'Leary (1986) used modeling to project changes in coastal sage scrub composition over a 200 year series of fires at a given frequency. They found that the degree of change in composition is predicted to increase with higher frequency fires. With a 10 year fire cycle, the final species composition would differ by 63% from the initial composition. Even at a 40 year fire cycle, the final composition was projected to differ by 31%.

These studies suggest that coastal sage scrub communities that have burned should be protected from grazing (even in adjacent areas) to prevent type conversion to grassland. Usually sage scrub will resprout successfully after fire and is not likely to require reseeding or other revegetation. A long fire interval, probably greater than 40 years, is desirable to maintain the species diversity. Spring burns may not recover as rapidly as discussed below under "Specific concerns for the Eagle Fire Site".

Post-fire use by Gnatcatchers

Diegan Sage Scrub at Rancho San Diego was observed to support gnatcatchers during the non-breeding season within 5-10 years after fire (Mock & Bolger, 1992). They also observed that areas being utilized by breeding gnatcatchers had not burned for at least 15-20 years. Mock has also observed that mechanically graded areas of coastal sage scrub have recovered and been occupied by gnatcatchers within 7-12 years.

On the Cleveland National Forest, portions of the Diegan Sage Scrub and Coastal Sage/Chaparral in the San Diego River drainage were burned in a prescribed fire in 1986. This area has partially recovered and is now vegetated with a sparse stand of Diegan Sage Scrub. California Gnatcatchers were observed using this area in 1993 (7 years after the fire), however they did not appear to be using the site for breeding.

Specific concerns for the Eagle Fire Site

The Eagle fire site is classified as "Inland Diegan Sage Scrub". The site was dominated by Coastal sage Artemesia californica, Flat-top Buckwheat Eriogonum californica, and White sage Salvia apiana. The data on preburn vegetation cover is described above. All six vegetation transects read in April 1993 were in the burn area.

A site adjacent to the fire was burned by a prescribed fire in 1986. The prescribed fire was burned in the same season (May) as the current wildfire. Recovery of the prescribed fire has been exceptionally slow. High mortality of normally resprouting shrubs has been observed on other prescribed burn sites (White, 1992) and in a May wildfire in coastal sage scrub in Riverside County (Conard, 1993 personal communication). These observations indicate that there may be a concern about a high level of mortality in the shrubs which were dominant on this site. Many areas on the prescribed fire are still nearly totally lacking in vegetation cover. This led to the prescribed fire being very effective in protecting homes in the San Diego Country estates area during fire suppression, however, it is a major concern for maintaining site productivity. Malanson and O'Leary (1982) indicate that coastal sage regeneration is largely dependent on seed produced from sprouting shrubs which establish in openings to replace shrubs which are killed in the fire. If the sprouting shrubs are killed due to the season of burn over a wide area then it is unlikely that there will be a sufficient seed source to recover the preburn density and composition of the shrubs at the San Diego River site.

Issues Raised

There is strong opposition by the U.S. Fish and Wildlife Service to the use of non-native species or native species not known to occur on the site. Seed should be gathered from the immediate vicinity to ensure that the plants are genetically adapted to the specific conditions found on this site.

The fact that we have good preburn data on both the vegetation and POCA population makes this a valuable research site. There is a concern that artificial seeding could reduce the value of observing the response of the site to spring burning. This could provide important information for developing fire management recommendations in POCA habitat.

There is a concern that delay in seeding will make it less effective. If monitoring indicates the site is not recovering then the soil surface would be crusted over by the time seeding could be implemented. This could be mitigated on small areas by raking. There is also some evidence that seedling establishment is enhanced by the leachate from chared wood. This is expected to decrease over time and may reduce the success of later seeding treatments.

There is a concern that seeding and differential establishment of the seed could lead to a shift in species composition with potentially negative effects on POCA habitat.

There is a concern, if the site dose not recover, that excessive sedimentation could degrade the quality of the aquatic habitat of the San Diego River for species which require deep pools such as the southwestern pond turtle.

Lack of sufficient cover caused by high shrub mortality and poor establishment could lead to degradation of the site to the point that suitable POCA habitat could not be maintained or reestablished.

There is a concern that the site could recover on its own and that artificial seeding could have a negative effect.

ALTERNATIVES

The following alternatives responed to the above concerns. In all alternatives a mix of native species collected from unburned plants in the surrounding site would be used. Preburn transect data would be used to establish the desired future condition of the vegetation and develop the recommended seed mix. According to the listing from the Fire Effects Information System "California sagebrush is commonly selected for rehabilitation of degraded coastal sage scrub and watershed, and for improvement of wildlife habitat". California sage will be the primary seed used in the mix. Differential sprouting success would be used to adjust the seed mix to help reduce the chance for an undesirable shift in species composition. Research studies would be encouraged to document the consequences of spring burns and selected rehab measures. Sites where preburn vegetation data was collected, including a buffer zone, will not be seeded to preserve the research value of this information. A biological assessment will be prepared and formal consultation with the U.S. Fish and Wildlife Service will be initiated and approved before action is taken on the ground.

Alternative 1.

Monitor post burn recovery with no artificial seeding of the site. If the first year data indicates that a lack of recovery can be expected then a restoration plan will be developed and budgeted for as T&E habitat improvement and watershed improvement.

Alternative 2.

Seed all 1,000 acres of coastal sage habitat with a low seeding rate (See appendix A. $200/ac. = $200,000) of pre-burn dominant shrubs to supplement natural shrub regeneration. Mulch 500 acres with 2,000 lbs/ac. ($600/ac. = $300,000)

Alternative 3.

Seed only selected areas of potentially high quality POCA habitat. Seed slopes less than 40 percent slope adjacent to the riparian area (200 acres). Use low rate of seed application as shown in Appendix A ($250/ac. = $50,000).

Alternative 4.

Same as alternative three but further restrict seeding to focus on steeper slopes and side drainages. Seed 100 acres in strips using low rate of seed application shown in Appendix A. ($250/ac. = $25,000) to augment natural sub-shrub regeneration and mulch 50 acres in key areas ($600/ac. = $30,000).

ANALYSIS OF ALTERNATIVES

A coastal sage scrub plant community should recover under all alternatives. Rate of recovery is expected to be more variable. Evaluation of the

alternatives assumes that there would be reasonably successful response from seeding. In addition, it is assumed that that there is a 40 percent chance the site will recover rapidly on its own and that recovery will be variable based on site quality.

Alternative one would provide the slowest rate of recovery (estimated to be 10-20 years) unless after the first year it was determined that a restoration project would be needed. Restoration costs would be expected to be higher due to the delay in seed application.

Alternative two would provide a moderate rate of recovery estimated to be 5-10 years) over a broad area. As shrubs became established an increase in density could be expected over time from natural seeding.

Alternative three would lead to the highest rate of recovery (estimated to be 5 - 8 years) of a diverse habitat for California Gnatcatcher and provide a continuous buffer strip along the riparian area.

Alternative 4 would recover patches of the highest quality POCA habitat rapidly (estimated to be 5 - 8 years) and help protect drainage ways from excessive erosion. After establishment of the shrubs natural seeding into open patches could be expected to occur.

If the above assumptions are incorrect and a high level of resprouting occurs then the risk of altering the potential species composition would be variable. Alternative one would have the least risk because of monitoring before a decision to seed is made. Alternatives two and four would have a moderate level of risk due to the lower seeding rates. Alternative three would have the greatest risk due to the high seeding rates and the concentration on high quality POCA habitat. Another risk would be the unnecessary expenditure of funds which would be directly related to the cost of each alternative.

COST/RISK ANALYSIS

Three resource values were identified for the cost/risk analysis; site productivity, quality California Gnatcatcher habitat, and protection of aquatic habitat for southwestern pond turtle. Analysis focused on the 500 acres of California Gnatacatcher habitat and immediately surrounding areas. Cost of a cubic yard of soil was estimated to be $20.

Site productivity was related to successful establishment of cover the first year. A successful project was considered to be one that would establish 40 to 50 percent ground cover the first year. This would reduce the potential soil loss significantly on the lower slopes. Estimated change from 30 tons per acre without cover to 5 tons per acre with cover was the basis for comparison.

Recovery of California Gnatcatcher habitat was considered successful if the prescribed species composition, cover, and height were expected to be achieved within 8 years. An unsuccessful project was estimated to cost $2,000 per acre to restore assuming intensive site restoration was required by the Fish and Wildlife Service. This value was based on input from a well known coastal sage scrub restoration specialist, Wayne Tayson.

Aquatic habitat for southern pond turtle was considered a loss in all alternatives even if they were otherwise successful. None of the treatments would be expected to prevent the amound of sediment needed to fill the pools from reaching the stream. It was estimated that cost of removing sediment from pools was $10,000.

Cost plus risk values for each alternative were calculated as follows:

Alternative one:	probability of success 40%	$758,500
Alternative two:	probability of success 90%	$666,000
Alternative three:	probability of success 70%	$453,000
Alternative four:	probability of success 80%	$339,500

RECOMMENDATION

It is recommended that alternative four be selected with the following provisions. Delay of seeding until Fall will be necessary in order to collect seed from Coastal sage Artemesia californica. This will allow monitoring of resprouting shrubs to determine the most cost effective seed mix and areas most in need of seeding. A research site should be left to recover naturally. Alternative four will provide a reasonable chance of establishing ground cover in critical areas while minimizing the risk of inadvertently changing species composition. If monitoring indicates that no seeding is necessary before the fall then the project would be canceled.

REFERENCES

Atwood, J.L. 1990. Status review of the California Gnatcatcher (polioptila californica). Unpublished technical report, Manomet Bird Observatory, Manomet, MA. 79 pp.

Bontrager, D.R. 1991. Habitat requirements, home range and breeding biology of the California Gnatcatcher (ploioptila californica) in South Orange County, California. Unpublished report for Santa Margarita Co., Rancho Santa Margarita, CA.19 pp.

Holland, R. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. California Natural Natural Diversity Database

Kirkpatrick, J.B. and C.F. Hutchinson. 1980. The environmental relationships of California coastal sage scrub and some of its component communities and species. J. Biogeography 7:23-28.

Malanson, G.P.and J.F.O'Leary. 1982. Post-fire Regeneration Strategies of California Coastal Sage Shrubs. Oecologia 53:355-358.

Mock, P.J., B.L. Jones, M. Grishaver,J. Konecny, and D. King.1990. Home range size and habitat prefernces of the California gnatcatcher in San Diego County. Unpublished abstract, American Ornithologists Union Annual Meeting, Los Angeles, CA.

Mock, P.J. and D. Bolger. 1992. Ecology of the California Gnatatcher at Rancho San Diego. Unpublished report prepared for Home Capital Development Corp.54 pp.

O'Leary, J.F.and W.E. Westman. 1988. Regional disturbance effects on herb succession patterns in coastal sage scrub. J. Biogeography 15:775-786.

Salata, L. 1993. Endangered and Threatened Wildlife and Plants: Determination of Threatened Status of the Coastal California Gnatcatcher. Federal Register v. 58, no.59, March 30, 1993.

Westman, W.E. 1981. Diversity relations and succession in Californian coastal sage scrub. Ecology 62(1):170-184.

Westman, W.E. and J.F. O'Leary. 1986. Measures of resilience: the response of coastal sage scrub to fire. Vegetatio 65:179-189.

White, T.C., 1992. Unpublished Technical Report "Chaparral Management Monitoring - Fifth Year Evaluation". USDA-Forest Service Cleveland National Forest.

Zedler, P.H., C.R. Gautier, G.S. McMaster. Vegetation change in response to extreme events: the effect of a short interval between fires in California chaparral and coastal scrub. Ecology 64(4):809-818.

APPENDIX A.

SEED INFORMATION FOR COASTAL SAGE SCRUB RESTORATION AFTER THE EAGLE WILDFIRE 93

S&S seed cost estimates were given by Victor Schaff (805) 684-0436 via phone conversations on May 12th and May 20, 1993.

the following abbreviations will be applied to this document

Artemessia calfornica	ARCA
Eriogonum fasciculatum	ERFA
Salvia apiana	SAAP
Bromus carinatus	BRCA
Lotus scoparius	LOSC

SPECIES	LBS/ACRE	LOCALLY COLLECTED COST/LB	IN STOCK COST/LB	%PURITY	%GERMINATION	PURE LIVE SEED/LB
ARCA	2-4	$40	$20	15	50	487,000
ERFA	8-12	$6	$3	10	65	30,000
SAAP	4-6	$60	$30	70	50	114,000
BRCA	4-6	$24	$12	90	70	76,000
LOSC	6	$24	$12	40	60	243,000

IN STOCK SEED AVAILABLE FROM FOLLOWING LOCATIONS

ARCA	SAN DIEGO COUNTY
ERFA	SAN BERNARDINO
SAAP	SAN DIEGO COUNTY
BRCA	CAMP PENDLETON
LOSC	SAN DIEGO COUNTY

LOCALLY COLLECTED SEED IS DOUBLE THE COST. THESE ARE HIGHEST THE SEED WOULD BE, COSTS MAY ACTUALLY BE LOWER DURING BIDDING PROCESS.

SEEDING RATE CALCULATIONS

Desired seeding rate is 20 Pure Live Seeds/sq.ft.

Calculations for ARCA	(20 * 43,560) / 487,000	=	1.785 lbs./ ac.
ERFA	(20 * 43,560) / 30,000	=	29.000 lbs./ ac.
SAAP	(20 * 43,560) / 114,000	=	7.500 lbs./ ac.

Recommended seeding mix based on pre burn data:

ARCA 70% =	1.249 lbs./ ac.	$49.96/ac.
ERFA 20% =	5.800 lbs./ ac.	$34.80/ac.
SAAP 10% =	0.750 lbs./ ac.	$45.00/ac.
TOTAL		$129.76/ac.