AN EXAMPLE OF THE CALIFORNIA GNATCATCHER NESTING IN RESTORED COASTAL SAGE SCRUB

M. W. (BILL) O'CONNELL and RICHARD A. ERICKSON, LSA Associates, Inc., One Park Plaza, Suite 500, Irvine, California 92614-5982

Creation of coastal sage scrub has become an important component of long-term management for the California Gnatcatcher (*Polioptila californica*) and other sensitive species in southern California. We describe successful gnatcatcher nesting in four-year-old restored coastal sage scrub in coastal Orange County, California, in 1995; the birds continued to nest there from 1996 to 1998. Our intent is to demonstrate that restored coastal sage scrub has been used by gnatcatchers, not to recommend specific restoration procedures.

In 1988, as a condition of residential development in Enclave VII in the Turtle Rock area of Irvine, the city's planning commission required 1:1 replacement of coastal sage scrub eliminated by construction, though it applied no standards for the replacment habitat's performance. In January 1989 LSA Associates, Inc., developed a revegetation plan (one-sheet drawing) that specified the conversion of 2.4 ha of annual (non-native) grassland to coastal sage scrub on specified open space dedicated to the city of Irvine. Dominant species on the site were wild oats (*Avena fatua*), ripgut grass (*Bromus diandrus*), foxtail chess (*Bromus madritensis* ssp. *rubens*), and artichoke thistle (*Cynara cardunculus*). [Plant taxonomy and nomenclature follow J. C. Hickman (ed.), 1993, The Jepson Manual: Higher Plants of California, Univ. of Calif. Press, Berkeley.] The site was approximately 250 m from the nearest patch of extant coastal sage scrub, on heavy clay soils with a southern exposure (Figure 1).

RESTORATION PROCEDURES

Preparation of the site consisted of treating annual grasses and artichoke with herbicide (Roundup at the dosage specified on the label), and disking the accessible portion of the site. The west end of the site consists of a draw that was too steep to disk. An accidental grass fire in that area, however, created an excellent seed bed that required no further preparation.

On 5 April 1991, immediately following the second application of herbicide, the seed specified in the plan (Table 1) was purchased and sown in the flatter portion of the site by means of a seed drill (Figure 2). On 8 April 1991, the part of the site that did not lend itself to being worked with farm equipment was hydroseeded with the same species mix at the same application rate, along with 600 pounds of wood-fiber mulch per hectare. Following seeding, five species of plants in one-gallon containers were planted on 10 and 11 April 1991 (Table 1). Because of the lack of normal winter rainfall and the lateness of the season, a temporary irrigation system was installed immediately following seeding and planting. The site was irrigated until July 1991.

Of the 11 species initially sown, only California encelia (*Encelia californica*) and bush monkey-flower (*Mimulus aurantiacus*) had grown to an

Figure 1. Aerial views of the project site before and after restoration.

acceptable number of individuals by July 1991, and much of the site was occupied by annual grasses and other weeds, along with small seedlings of scrub species. Weeds and grasses were either pulled out, cut off, or treated with Roundup in the larger areas devoid of native vegetation.

Table 1 Plants Used in Restoration of Coastal Sage Scrub at Turtle Rock Enclave VII, Irvine, Orange County, California, April 1991

Seed Mix	
California sagebrush	*Artemisia californica*
California encelia	*Encelia californica*
California buckwheat	*Eriogonum fasciculatum*
Coastal goldenbush	*Isocoma menziesii*
Golden yarrow	*Eriopyllum confertiflorum*
Bladderpod	*Isomeris arborea*
Arroyo lupine	*Lupinus succulentus*
Bush monkeyflower	*Mimulus aurantiacus*
White sage	*Salvia apiana*
Black sage	*Salvia mellifera*
Foxtail fescue	*Vulpia myuros*
Container plants	
Toyon	*Heteromeles arbutifolia*
Prickly pear	*Opuntia littoralis*
Lemonadeberry	*Rhus integrifolia*
Laurel sumac	*Malosma laurina*
Blue elderberry	*Sambucus mexicana*

Figure 2. Drilling seed following site preparation, March 1991. View to the east.

Photo by Gary Dow

Figure 3. The site on 24 April 1995. View to the east.

Photo by Gary Dow

Figure 4. Draw on the west end of the site, March 1994.

Photo by Bill O'Connell

In June 1992, line-intercept transects showed 44% of the site to be covered with coastal sage scrub species, dominated by California encelia. The limited species diversity was due to the poor quality of the seed used by the contractor (proof of seed quality was not required, and it was later determined that seed of inferior quality was used). In addition, 3033 square meters of the site was found to be lacking coastal sage scrub vegetation. In January 1993, these open and weedy areas were supplemented with 2100 California sagebrush (*Artemisia californica*) plants grown in D-40 containers (deep-cell plant containers with diameters of 6.4 cm and depths of 25 cm).

In April 1993, the cover was estimated to be about the same as in June 1992, with California encelia still the dominant species. Annual grasses had diminished since June 1992, but California burclover (*Medicago polymorpha*), which had not been present previously, had overtopped all of the scrub species in some locations. The recently planted California sagebrush had grown well, with some plants 0.6 m high. The surviving original container plants were growing well, with some having achieved a height of 1.2 m and a crown diameter of 1.5 m.

By June 1994, the site appeared to have a full 70% cover, with small openings scattered throughout (Figure 3). The primary species remained California encelia, with lesser amounts of California buckwheat (*Eriogonum fasciculatum*), bush monkey-flower, California sagebrush, black sage (*Salvia mellifera*), golden yarrow (*Eriophyllum confertiflorum*), Mexican elderberry (*Sambucus mexicana*), lemonadeberry (*Rhus integrifolia*), and prickly pear (*Opuntia littoralis*), but in greater numbers than in previous years. The greatest species diversity occurred in the draw at the west end (Figure 4).

CALIFORNIA GNATCATCHER OBSERVATIONS

Robert A. Hamilton first observed a pair of California Gnatcatchers on the restoration site on 13 December 1994, three years after it was planted. Erickson watched presumably these same birds carrying nesting material to a California encelia in the eastern half of the site on 24 April 1995, and on 21 June 1995 followed the pair as they tended three fledged young in the same area.

A biologist visited the site only once in 1996. On 12 April, David R. Bontrager found two pairs, one of which was tending a nest with four young. The nest was located in a California encelia near the east end of the site. Two pairs were present again in 1997 (Bontrager pers. comm.). The eastern pair successfully fledged two broods; the western pair's nesting attempts apparently failed. During preliminary surveys in 1998, Bontrager again found two pairs, one with a nest and eggs in the western ravine.

CONCLUSIONS

Although this project involved minimal effort, it produced usable nesting habitat for the California Gnatcatcher. Since completion of the initial plan in 1990, the gnatcatcher has been listed as threatened by the U.S. Fish and Wildlife Service, resulting in much more restoration of coastal sage scrub. More rigorous procedures for restoration are typical today, techniques that should provide better habitat than did this minimal effort.

SUMMARY

Creation of coastal sage scrub suitable for use by the California Gnatcatcher has become an important component of long-term management for this threatened species. In 1988, as partial compensation for a residential development in Irvine, the city's planning commission required 1:1 replacement of coastal sage scrub. A "revegetation" plan was developed in January 1989, requiring the establishment of 2.4 ha of coastal sage scrub in grassland nearby. Initial hydroseeding, drill seeding, and planting took place in April 1991, with supplemental seeding in September 1991 and additional planting in January 1993. Vegetation at the site is now dominated by California encelia (*Encelia californica*). One pair of California Gnatcatchers successfully nested at the site in its fourth year (1995), and at least two pairs have nested in each subsequent year (1996–1998).

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