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## Single-nest exclosures to protect endangered California least terns from off-highway vehicle traffic

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**SINGLE-NEST ENCLOSURES TO PROTECT ENDANGERED  
CALIFORNIA LEAST TERNS  
FROM OFF-HIGHWAY VEHICLE TRAFFIC**

A Thesis

Presented to

The Faculty of the Department of Biological Sciences  
San Jose State University

In Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts

By

Robert K. Burton

August 1996

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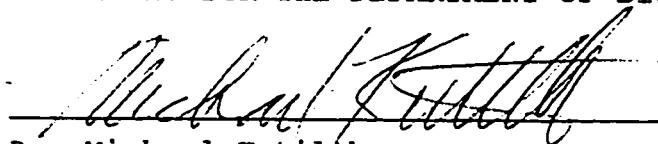
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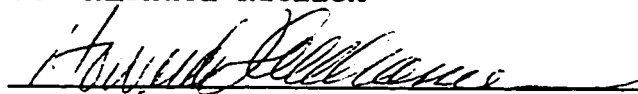
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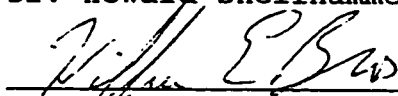
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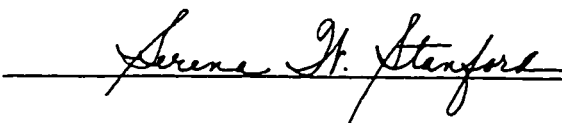


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## **ABSTRACT**

### **SMALL SINGLE-NEST ENCLOSURES TO PROTECT ENDANGERED CALIFORNIA LEAST TERNS FROM OFF-HIGHWAY VEHICLE TRAFFIC**

By Robert K. Burton

In 1991-1992 I constructed 20.4 to 30 m diameter fenced enclosures around endangered California Least Tern (Sterna antillarum browni) nests at Pismo Dunes State Vehicular Recreation Area in California. These single-nest enclosures provided effective protection for both adult birds and nests from the direct impacts related to off-highway vehicle recreational activities. As the California Least Tern population recovers, colonization of new nesting sites will continue. The use of single-nest enclosures can provide managers with an effective means for protecting small nesting colonies from a variety of impacts until long-term conservation and management strategies can be developed.



This thesis is dedicated to  
my parents,  
Katie and Robbie,  
and all of the other teachers in my life.

## **ACKNOWLEDGEMENTS**

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I would also like to extend my thanks and gratitude to the entire staff at Pismo Dunes and Pismo Dunes State Vehicular Recreation Area for their relentless commitment to this work and for their enthusiasm. In particular I thank Don Patton, Ken Anderson, and Shana Watkins. It is my fortune to have had the opportunity to work with this fine a group of people.

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## INTRODUCTION

The California Least Tern (*Sterna antillarum browni*) is a ground nesting seabird historically found along the Pacific Coast from Baja California to Monterey Bay California (Grinnel 1928). Loss of habitat to development and recreation and disturbance of nesting and feeding grounds has resulted in substantial declines in this subspecies following World War II (Atwood and Minsky 1983, U.S. Fish and Wildlife Service 1980). From 1973 to 1975, the California breeding population was estimated at around 600 pairs (Bender 1974a, 1974b, Massey 1975). The subspecies *S.a.browni* is designated endangered by both the California Department of Fish and Game (1976) and the U.S. Fish and Wildlife Service (1976).

The open coastal dunes used as nesting habitat by this species have been attractive sites for off-highway vehicle (OHV) recreation enthusiasts. OHV recreation has been identified as a major impact affecting nesting Least Terns at sites throughout the U.S. and Mexico (Blodget 1978, Burger 1989, Carvacho et al. 1989, Gochfield 1983, U.S. Fish and Wildlife Service 1980).

In this paper I describe a small single-nest enclosure designed to protect nesting Least Terns from OHV traffic. Though small single-nest enclosures have been effectively used to reduce nest predation of shorebirds (Rimmer and

Deblinger 1990), their application to Least Terns or as a deterrent to OHV traffic has not been previously described. This technique can provide effective protection from OHV traffic until more comprehensive management plans are developed.

### **STUDY AREA**

I conducted field work at Pismo Dunes State Vehicular Recreation Area (PDSVRA) in San Luis Obispo County, California. PDSVRA is 1 of 5 OHV recreation areas managed by the California Department of Parks and Recreation Off-Highway Motor Vehicle Recreation Division.

PDSVRA includes 1075 ha of beach and coastal dunes comprised of large expanses of open sand interspersed with fenced areas of vegetation dominated by arroyo willow (Salix lasiolepis) and European beach grass (Ammophila arenaria). Several freshwater lakes and creeks found beyond the perimeter of the OHV riding area act as feeding sites for Least Terns. Annual visitation at PDSVRA exceeds 1,000,000 people of which about half engage in motorized vehicle recreation.

## **METHODS AND MATERIALS**

I surveyed the beach and dunes from 1 April to 1 September of 1991 and 1992 to locate Least Tern nests in areas used for OHV recreation. When a nest was located, I remained nearby and observed the adult birds while redirecting vehicle traffic until an exclosure fence could be built.

Nest exclosures were circular in design ranging in diameter from 20.4 to 30 m (Fig. 1). This size exclosure allowed birds to readily approach and leave the nest from the air. The circular fence was stable without the need for additional support structures such as wood posts or braces. Exclosure fences were constructed with 1.8 m steel t-stakes, placed at 3 m intervals, and 1.2 m wide steel rolled fencing. The large rectangular mesh increased in size from 7.5 cm x 35 cm at the bottom to 20 cm x 35 cm at the top of the fence. Arched terra cotta roof tiles were placed inside each exclosure to provide cover for chicks. Two or 3 people were able to construct an exclosure in approximately 10-15 minutes.

Following the construction of the exclosure, I continued observation of the nest for several hours to look for any immediate disturbance of normal nesting behaviors caused by the fence or fence-building activities. Nests were monitored

for a minimum of 3 days each week during the breeding season to gather information on breeding success, causes of nest failure, impacts of OHV traffic, and impacts resulting from the use of exclosures.





**Figure 1.** Single nest exclosure used to protect nesting California Least Terns from off-highway vehicle traffic.

## RESULTS

Six Least Tern nests were distributed over an area of about 2 ha within the OHV riding area in 1990. The nests were protected with a single large, fenced exclosure. In 1991, there were 6 nests in the OHV riding area. A single large exclosure was impractical for these nests because they were distributed over a large area (5-7 ha). Therefore, 5 of the 6 nests were protected with small single-nest exclosures. In 1992, 4 nests were protected with single-nest exclosures.

Of the 9 nests for which I built exclosures, 1 was abandoned immediately and a second was abandoned 2-5 days after construction of the exclosure (Table 1). Both of these nests were incomplete; each contained 1 egg which the adult birds were not incubating at the time the exclosure was built. When exclosures were built around nests where adults were incubating a full clutch, the birds rarely left the vicinity; in most cases the birds returned to the nest before the fence was completed.

There were no nesting failures resulting from the direct impacts of OHV recreational activities at nests for which exclosures were built. Once a nest was protected with an exclosure, the adult birds seem undisturbed by most vehicle traffic. I regularly observed vehicles pass within 10 m of exclosures without flushing the adult birds.

**Table 1.** Summary of single-nest exclosure use for the protection of nesting California Least Terns at Pismo Dunes State Vehicular Recreation Area, San Luis Obispo County, Calif. 1 April to 1 September, 1991-1992.

Nest Number	Year	Action Taken and Nesting Results
1	1991	3 eggs in nest protected with single-nest exclosure; 2 chicks hatched and were confirmed to have fledged.
2	1991	1 egg in nest destroyed by off-highway vehicle before an exclosure could be built.
3	1991	1 egg in nest abandoned following construction of a single-nest exclosure.
4	1991	2 eggs in nest protected with a single-nest exclosure; 2 chicks hatched and were believed to have fledged.
5	1991	1 egg in nest abandoned 2-5 days after construction of a single-nest exclosure.
6	1991	2 eggs in nest protected with a single-nest exclosure; destroyed by high winds and blowing sand.
7	1992	2 eggs in nest protected with a single-nest exclosure; destroyed by high winds and blowing sand.
8	1992	2 eggs in nest protected with a single-nest exclosure; 2 chicks hatched and 1 was confirmed to have fledged.
9	1992	2 eggs in nest protected with a single-nest exclosure; destroyed by high winds and blowing sand.
10	1992	2 eggs in nest (located 2 km inland) protected with a single-nest exclosure; disrupted by high winds - 1 egg was destroyed by off-highway vehicle traffic after it was apparently blown 50 m from the nest.

Nesting behaviors such as nest exchanges, food exchanges, incubation and roosting appeared to be unaffected by the presence of the exclosure. I found no evidence, such as tracks or additional loss of nests, that suggested exclosures increased predation of nests by gulls (Larus spp.) or coyotes (Canis latrans) which were often seen in the area.

Four nests for which exclosures were built were destroyed by blowing sand during periods of exceptionally high winds. Six chicks were successfully hatched from the 3 remaining nests, of which 3-5 birds fledged.

## **DISCUSSION**

Small single-nest exclosures were used effectively to protect nests from the impacts of OHV traffic at this site. Nesting failures were attributed primarily to high winds and blowing sand (Table 1).

Least Terns typically produce 2 eggs over a period of 2 or 3 days. Egg-laying was often followed by a period of 6-24 hours when the adult birds were absent from the nest, after which the pair began incubation. The risk of nest abandonment, resulting from construction of the exclosures, appeared to have been reduced by delaying construction until the adult birds began incubating the eggs.

The successful fledging of chicks in an area where OHV activity is intense suggests that use of this type of exclosure would be highly successful at other sites where OHV recreation has impacted Least Tern nesting (Blodget 1978, Caravacho 1989). Furthermore, a modification of the basic design may provide protection for nests and chicks from a variety of other impacts, such as predation.

In addition to the use of exclosures I identified suitable nesting habitat outside the OHV riding area. In the future I plan to use decoys to encourage nesting in these undisturbed areas reducing the need for continuation of intensive management of the colony.

Conservation and management of California Least Terns as an endangered species has resulted in an increase in the overall population from about 600 to over 1900 breeding pairs during the past 20 years (Massey 1992, USFWS 1980). As the population expands, colonization of new sites will continue. The use of single-nest exclosures can provide managers with an effective means for protecting small nesting colonies until long-term conservation and management strategies can be developed.

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